U.S. Army. Signal Corps

ANNUAL REPORT, 1878/79

OF THE

CHIEF SIGNAL-OFFICER

TO THE

SECRETARY OF WAR

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Annual Report of the Chief Signal Officer, U.S. Army Signal Corps

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REPORT

OF THE

CHIEF SIGNAL-OFFICER OF THE ARMY.

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL-OFFICER,
Washington, D. C., November 15, 1879.

SIR: Fort Whipple has continued to be the military school of instruction and practice for the discipline and duties of the Signal Corps. The course embraces the drill and instruction in military signaling and telegraphy, meteorology, and the duties of the Signal Service at stations of observation and report, thus including those of the service on the sea-coast, and in the interior, together with those relating to the construction, maintenance, and operation of the now extensive telegraph lines connecting frontier settlements and military posts. The drills of the corps—with arms, with Gatling guns, in the maneuvering of field telegraphic trains, and the arrangements for the defense of them, the procedures for the rapid erection of telegraphic lines, the management of the signal and other apparatus habitually used by the corps in the field or in time of war—have been regular and thorough.

Particular attention has been given in the year just passed to the drill of the force with arms and to such armed maneuvers as would be necessary for the corps in time of war. A rigorous practice of this kind is required for a force organized to act—armed, if need be—independently of other organizations, and to be capable of protecting with its own guard its own material and works.

Experiments in signaling and telegraphy are made at Fort Whipple under proper supervision. It is endeavored to keep up in all improvements with the progress made by scientific ingenuity in the special duties of the service, in the use of improved war material, and in the different modes of rapid communication now necessary and expected to be used, as of course, in war. With each ensuing year the duties of corps analogous in their service to the Signal Corps become more prominent, and hardly a month passes without some suggested improvement in telegraphic or signal apparatus, or in the methods of using them. Such are here tested as may have received the notice of this office, or to which attention is directed by higher authority. It is by following plans determined by tests had at this office and at Fort Whipple that the proper construction of the iron lines now so successfully used on the sea-coast and for the connection of posts, settlements, and stations on exposed frontiers and in the uninhabited interior has been arrived at. A practice line, 40 miles in length—a portable field-line being used—has been maintained, standing on the military reservation of the post for the experimental testing of the uses of the telephone, and for experiments had in reference to the working of the line itself when equipped with the ordinary telegraphic instruments. The telegraphic line con-

necting Fort Whipple with this office—a field line—has been in constant use, different forms of telephones being employed upon it. Telephonic communication is adopted as the usual mode for all communications between this office and Fort Whipple. The wires are so arranged and fitted with instruments that the ordinary modes of telegraphing may be used for any matters requiring to be of record. As a result of the experiments with telephones, telephonic communication has been established at points upon the sea-coast. Where connecting the life-saving stations, it has been used with fair success.

A series of experiments has been made with sun-flashes, with a view of improving upon the forms of heliograph to be adopted for the general uses of the Army. There have been other experiments, for which the post and the force stationed at it furnish, as they are intended to do, good facilities, as described in preceding reports.

The duties at this post are conducted under strict military rule. The post is controlled as connected with and as forming part of this office. The officers of the Signal Corps pass a course of drill and instruction, and serve regularly at this post before being put upon any other duty of the Signal Service. It is recommended that all officers of the Army intended to be instructed as acting signal-officers, or to be temporarily instructors in geographical military departments for the field duties of the Signal Service, be here instructed before being put upon detached duty. Instructors not themselves thoroughly instructed are worse than useless. It is aimed to furnish, through the thorough course of study and practice at Fort Whipple, a force of enlisted men, enlisted after examination, thoroughly disciplined as soldiers, and fitted by careful special instruction for the special duties of the Signal Service.

The importance of the field duties of the Signal Service, and of the modes of communication such services make possible, are now recognized throughout the world. The modes of instruction in field or outdoor signaling, now nearly similar in the Army and Navy of the United States, ought to be made so absolutely, and a course so complete established that any force of either arm will be surely competent at any time to put itself in signal communication with any other force either of its own or of the other arm within signal distance. It is not necessary now to represent at length to any who have served in or read of recent wars the propriety and the need that any armed force of any army should be able to wire or to communicate by other signals with any other of the same nationality or obeying the same general command.

The habitual practice of the duties of field signaling and telegraphy ought to become a part of the regular exercises adopted for the militia forces of the different States. To a small extent this practice has been already entered upon in some of the States,

The course of instruction at Fort Whipple, for officers to be acting signal-officers, and that for enlisted men, candidates for promotion to the grade of sergeant in the Signal Corps or to the grades of first-class privates and corporals, are given herewith. (Paper 1.) They embrace such branches of study as experience has shown best suited to fit the pupil for the different positions of duty in which he may be placed. Papers 2 and 3 exhibit the names and number of officers instructed and the amount of field practice had by each.

One hundred and twenty-two enlisted men have been instructed for the position of assistants to observers. Of this number one hundred and two completed the course of instruction, drill, and practice, passed the necessary examination, and have been ordered to duty at stations as assistants. Two were discharged the service at their own request, five

for cause upon the recommendation of the Chief Signal Officer, and thirteen are still under instruction. (Paper 4.)

Nine enlisted men have been instructed for promotion to the grade of sergeant. Of these, eight, successfully passing the examination, have been promoted and assigned to stations. One failed to pass the examination. (Paper 5.)

The action of Congress, in permanently organizing the enlisted force of the Signal Corps and increasing its number, has imposed additional labor upon the instructor.

The habitual drills with arms, at the post, of all the enlisted force stationed at the office of the Chief Signal-Officer in Washington, in connection with the enlisted force at Fort Whipple, has rendered possible thorough practice during the year. Drills of the telegraphic train complete, embracing four sections, have been regularly established.

During the year ending June 30, 1879, First Lieut. R. P. Strong, acting signal-officer, has continued in charge of the post.

The duties of instruction have been under the immediate charge of the First Lieut. F. C. Grugan, acting signal-officer, who has also acted as A. A. Q. M. and A. C. S.

Acting Assistant Surgeon L. W. Ritchie has remained in charge of the hospital.

The post is in commendable good order. The buildings are sufficient in number, commodious, and comfortable. The health of the post has continued excellent.

A fire-engine is needed for the proper protection of the buildings and valuable property stored at the post.

The number of men at Fort Whipple for duty has varied during the year from one hundred and two to forty-one, and the number of officers from nine to three. The average number of enlisted men present during the year has been seventy-six.

The morning report of Fort Whipple, Va., for June 30, 1879, exhibits fifty-seven enlisted men present for duty, of whom five were sergeants of the Signal Corps, two were corporals, forty-eight were privates, one commissary sergeant, and one hospital steward. Of this force, twentyeight privates were under instruction for the position of assistant on station.

In preceding reports the Chief Signal-Officer has expressed his conviction that the economy assured to the United States by the duties practiced at this post far exceeded the annual cost of maintaining it. Longer experience confirms this view.

As stated in that report, this post alone has made it practicable to put on station duty and in charge of stations those non-commissioned officers and men only who have been drilled, taught, tried, and so known to be fit for the labors and responsibilities to be required of them. There is no one of its varied duties but to which the force of the Signal Corps can be here habituated in practice before being brought to face the difficulties of its actual discharge. The benefits resulting from the school as one of practice, in which men are trained to be at once soldiers and students, have been evidenced throughout the United States.

The enlisted men of the Signal Corps are engaged on duty as constant in time of peace as in the presence of actual war. The uses of the post at Fort Whipple for the discipline and instruction of the officers and enlisted men of the corps do not cease while either remain in the service. The force, made useful in time of peace by employment through which it is now admitted they return to the United States more than the cost of the service, is kept in readiness for any emergency of armed duty by regular drills, in which the officers and men stationed at this office and

those whose changes of station bring them even temporarily within reach of Fort Whipple are there practiced and maneuvered as a part of accustomed duty. Men thus practiced are trained in discipline, and look upon events transpiring in their vicinity with soldierlike views.

The advantages of having distributed in the different cities of the United States a force of men with such training, habituated to acting in concert by order, and promptly; capable of reporting simultaneously by telegraph and in cipher, as a duty, upon matters of military interest to which their attention may be directed, aside from the routine duties of their station, have been sufficiently evidenced. The self-possession of the non-commissioned officers in charge of stations, their prompt, concise, and reliable reports, rapidly collected over great extents of territory, for the information of superior authorities, in emergencies which have occurred, have received the warm commendation of officers high in rank. The rapid making of reports of this character and the collection of them over the telegraphic wires, by aerial signals, or by other methods of communication, is the especial duty required in the service of the corps in time of war.

It is considered that the movements of the Army of the United States can be made by this agency as rapid on occasions of need as any of which there is record.

It is difficult to compute in money value the power of attaining such results. The advantages resulting to the War Department and to those especially charged with the management of the duties so varied and extensive as those of the Signal Service have become, from the knowledge that of all the force of the Signal Corps the course pursued leaves no man who, called upon for any duty of the service, would fail to be found fitted for it by careful instruction, are evident.

Meager reports only have been received of the instruction for the field duties of the Signal Service had elsewhere than at Fort Whipple.

The Chief Signal-Officer is confirmed in the view hitherto expressed that the general instruction of the Army to be successfully carried on should be confided to officers first carefully instructed themselves, and responsible to the Chief Signal-Officer for the discharge of their duties as instructors.

It is recommended that provision be made that a force of six subaltern officers may be constantly under instruction at Fort Whipple in the duties of field signaling and telegraphy, it being understood that as each shall have completed the course and passed the necessary examinations he shall join his company and regiment; the number under tuition at the school of instruction to be kept constant by details to be made from companies and regiments, not before instructed, as vacancies occur.

The legislation of the act approved June 20, 1878, organizing the enlisted force of the Signal Corps, providing 150 sergeants, 30 corporals, and 270 privates, has been and will be productive of good results. It has done away with annoyances and embarrassments inevitable without it. It has fixed the service on an honorable footing, and opened a career, of which they are proud, to the best class of young American citizens. The applications for enlistment are numerous. The severe examinations are successfully undergone. The clause providing "that two sergeants may in each year be appointed to be second lieutenants" gives that stimulus of permanent service and promised reward so long and earnestly sought for. The success of this desired legislation is largely attributable to the steady and strong support of the Secretary of War.

Each year, however, since the passage of this act additional duties not then contemplated have been imposed by Congress upon the corps.

In the present status of the service, employment can well be furnished to an additional force of enlisted men and be of such a nature as to certainly repay more than the money value of the expenditures incident to maintaining it.

A plan of details from regiments has provided temporarily for this increase of force. It would be better, however, if a permanent increase could be had.

The candidates for enlistment in the Signal Corps become year by year, as the service progresses and is approved, more numerously representative of the better educated classes of citizens.

The men to be enlisted are required to pass first a preliminary physical and educational examination before they are accepted for enlistment. After enlistment they are sent to Fort Whipple to be drilled and instructed. They are then tested by practice and further taught by a year of duty and study in the positions of assistants at stations. They are instructed later in higher branches at the school of instruction at Fort Whipple, and again examined and again tested by practice before being intrusted with the management of stations. They are held to a rigid observance of duty and with careful discipline at their several stations. The plan has furnished a force of soldiers of superior education and good character at the many stations throughout the United States. Their work is in evidence.

The work aggregating at this office has become each year more extensive. A field of operations actually coextensive with the northern hemisphere is now within its scope.

The details are many and complicated, each requiring to be elaborated for each day with the many checks necessary for accuracy, and each limited for its discharge to fixed and brief periods of time.

The organization of the service, improved by experience, has permitted each branch of duty to be carried on with regularity. The force on duty at this office, small in view of the onerous and extensive duties devolved upon it, has been at times, and necessarily, overworked.

The staff of the office since the date of the last annual report has been constituted as follows: First Lieuts. J. P. Story, H. H. C. Dunwoody, Robert Craig, C. E. Kilbourne, and H. W. Howgate, acting signal-officers and assistants, in charge, respectively, at different periods of records, correspondence, orders and enlistments; of the general charge of instruction, and general supervision of non-commissioned officers and assistants on station duty; the receipt, record, and publication of daily weather reports, and of the property division.

Assistants, First Lieuts. J. P. Story, H. H. C. Dunwoody, Robert Craig, and C. E. Kilbourne, acting signal-officers, and Cleveland Abbe, A. M., have alternated, under the direction of the Chief Signal Officer, in immediate charge of the issue of cautionary signals, synopses, and indications, and the preparation of the publications of the office. First Lieut. A. W Greeley, acting signal-officer, has also assisted in the work of these publications.

Lieut. W. E. Birkhimer, acting signal officer, has been in immediate charge of the telegraph room of the office and duties connected with the sea-coast lines.

First Lieuts. Robert Craig, J. McClellan, J. A. Buchanan and B. H. Gilman, and Second Lieut. C. A. Tingle, acting signal officers, have been at different times attached to the office as inspectors.

The Chief Signal-Officer refers with pleasure to the faithful services of these officers, as also of those serving at Fort Whipple and on detached duty elsewhere. The zeal and interest in the service manifested

by the acting signal officers, as a class, have won success in the duties with which they have been charged.

The aggregate of office correspondence has become very large, embracing many thousands of communications, exclusive of telegrams sent and received. The record is herewith. (Paper 6.) While the office work has increased in magnitude, it has not changed markedly in character since the date of the last annual report. As then stated, the office is in communication with numerous foreign correspondents, having now official relations with the scientific men and the chiefs of meteorological services of nearly every prominent power in the northern hemisphere. It has become the acknowledged center for meteorological information on the continent; it has succeeded in connecting itself with the meteorological work of the world. It maintains a system of exchanges valuable and interesting at once to those who send and who receive, more extensive, prompt, and regular than would have been possible for the service without the aid of military organization for its members and the incident power of regulation and control which accompanies it. Co-operation wherever sought has been cordial and courteous.

The preparation of statistics and reports upon especial requests for the uses of individuals or institutions and journals which wish to publish data is a work of magnitude. The numerous applications for information on various subjects, many of them only indirectly connected with the duties of the office, require of themselves much attention. Requests for consolidated data or the discussion of meteorological facts, requiring in compliance days of labor, are made at times apparently without thought of how much has been asked for. It has been the rule of the office to furnish whatever has been in its power whenever it has been considered to be for the public benefit. Paper 7.

The work in the property division of the office is carefully systematized. It has become extensive with the increasing duties of the service. To meet, as it was hoped, the views of Congress, an economy almost parsimonious has been practiced. The shrinkage of values everywhere has permitted a reduction of outlays, without which the continuation of the work of the office in its present scope would, with the appropriations now available, have been impracticable. The management and the accounting for the sums appropriated for the official telegraphic lines of the United States, the uses of which are, by law, in part for commercial purposes, as well as for the especial duties of this office, and for the conduct of military affairs, has become a work involving time, care, and responsibility.

A number of useful maps and charts have been prepared in the map-room of the office. The work of this room, offering, as it does, in synoptic view, and at a glance, the results had from thousands of observations extended over years of labor, and condensed, after careful consideration, into the lines of the charting, becomes yearly, with the lapse of time, more valuable for the studies daily necessary. A glance at the chart exhibits to the student what else could be known only by the personal experience of years. It is desirable to increase the force employed and the work of the room, systematizing, in this way, the series of generalizations established by the duties of the service. A number of clerks are constantly employed in the computations necessary to fix these generalizations. On the success of this duty will rest much of the permanent advance to be hoped for.

One hundred and seventy-one dollars and twelve cents have been received during the year ending June 30, 1879, from the sale of maps and

other office publications, in accordance with the act of Congress approved March 3, 1874, authorizing such sale.

The many inquiries received at this office as to the manner in which the publications of the office may be procured indicate the want of a general knowledge of the fact that the sale of copies of any or all of its publications, or of any map or papers regularly issued by it, is authorized by law to be made to any applicant upon the payment of the actual cost to the United States of the paper or publication sought for. Valuable data of the office are always procurable in this way, for the study of any sufficiently interested in the subject to which the papers have reference, by paying the very moderate cost of paper and printing.

Five hundred and eighty-four meteorological instruments have been purchased for station use, and five hundred and forty-two have been issued during the year ending June 30, 1879.

The artisans' work in the instrument and repair shop of the office has steadily increased in amount with the increased distribution of instruments and the number of stations. A number of meteorological instruments, made after original designs, have been here manufactured, to be tested in the office as to their value for practical use or for the purposes of distribution.

The practice of sending instruments by mail, in the charge of postal agents, under the special arrangement for this purpose made with the Postmaster-General, has continued to be successful, and is of material benefit to the office. The superintendent of the railway mail service and his assistants of the Post-Office Department, as well as the agents of that department generally, have rendered careful and energetic aid in this transportation. Such aid is important to a service now ramifying into every portion of the United States.

It is by the aid of the postal agents and the facilities had through them for the conveyance of instruments over their routes that the wide distribution of meteorological apparatus, rendered necessary on seas and continents by the plans of observation and study now adopted, has become possible, and will be maintained.

A considerable number of instruments, anemometers, hygrometers, water-thermometers, rain-gauges, &c., have been issued to the Chief of the Bureau of Navigation of the Navy Department for use on vessels of the United States Navy in making, in co-operation with this office, the naval series of simultaneous observations directed by the honorable Secretary of the Navy in G. O. No. 220, dated December 25, 1876. This office supplies, upon proper application and receipt, any instruments required for this purpose. Reports of naval observations transmitted to this office are entered on the international bulletin and are charted upon the international weather charts.

A number of instruments have been furnished for temporary use on vessels of the commercial marine engaged in similar co-operation upon the marine series of observations.

The library of the office now contains four thousand one hundred and forty-nine bound volumes and eight hundred and twenty-two pamphlets, being an increase since the date of the last annual report of three hundred and twenty-eight bound volumes and eighty-two pamphlets.

These works have been carefully catalogued, and are filed for ready reference. The list comprises a useful and extensive collection for meteorological research, with other works relating to the several duties of the service. Copies of some of the volumes are not to be found elsewhere, and are especially valuable. A number of important works have been obtained, without cost to the United States, from foreign societies

and associations, in courteous exchange for the publications of the office. (Paper 8.)

The total number of stations of observations in operation June 30th, 1879, within the territory of the United States and maintained for the Signal Service, was two hundred and twenty-nine, including those upon the telegraph lines in charge of this office, and the special river and sunset stations, from which reports are regularly received. Reports are also received from eighteen additional stations established by the authorities of the Dominion of Canada, also from one at St. John's, N. F., and one at York Factory, B. A. Telegraphic reports have been regularly received throughout the year from one and mail reports from two stations located in the West India Islands, and during a portion of the year telegraphic reports from five and mail reports from three others. The number of stations from which telegraphic reports are received at this office tri-daily is one hundred and thirty-three; the number from which one telegraphic report only is received daily is twenty-five, and from which two telegraphic reports are received daily is one; making the total number of separate points from which telegraphic reports are received daily one hundred and fifty-nine.

The sums expended for the service secure for the United States not only the reports from the officially established station, but incidentally those had from the additonal stations, to which reference is made elsewhere.

The following is the record of regular stations for the year ending June 30, 1879:

ALBANY, NEW YORK.

[*Official number*, 16.]

Latitude	42° 40′
Longitude	73° 45′
Elevation of barometer above mean sea-level	212.345 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.978
Mean temperature for the year ending June 30, 1879	47°.0
Amount of rain-fall for the year ending June 30, 1879	44.31 inches.

Established December 22, 1873.

Office, Dudley Observatory building.

Sergeant S. W. Beall has been in charge of the station. Private F. W. Mixer was relieved by Private G. E. Kelley, September 3, and ordered to Rochester, N. Y.

The station was inspected in July, 1878, and February, 1879, and the work of the office was reported as having given general satisfaction.

From later levelings it has been ascertained that the elevation of the barometer cistern above mean-tide level is 212.345 feet, instead of 209 feet, as formerly used, and the observer began correcting for the former elevation January 19, 1879.

Navigation closed on the Hudson River December 23, 1878, and first through-vessels from New York arrived April 1, 1879.

Extracts from the observer's semi-annual reports:

Great confidence is placed in our reports by all classes of people. Our record is frequently called into court in lawsuits against the city and corporations, and is always admitted as evidence whenever the weather has any bearing in the case. Great interest is taken in the reports from the western stations by the members of the Board of Trade during the spring or when the wheat crop is liable to be affected by the weather.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1879 ..	112,842
Number of Bulletins (manifold) issued during the year ending June 30, 1879.	8,527
Number of Local Reports issued during the year ending June 30, 1879.....	575
Number of Forms 15 (manifold) issued during the year ending June 30, 1879.	624
Number of Forms 22 issued during the year ending June 30, 1879.....	109
Total	122,677

ALPENA, MICHIGAN.

[*Official number*, 85.]

Latitude	45° 5′
Longitude	83° 28′
Elevation of barometer above mean sea-level	609.5 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.969
Mean temperature for the year ending June 30, 1879.....	42°.6
Amount of rain-fall for the year ending June 30, 1879	36.18 inches.

Established September 10, 1872.

Office, corner of Fletcher and Dock streets.

Sergeant F. J. Papst was relieved from the charge of the station by Sergeant J. A. Barwick, December 27, for neglect of duty and drunkenness, and transferred to Fort Whipple, Va., where he was discharged the service.

This station was inspected in July, 1878, September, 1878, and April, 1879, and the work of same reported as having been well and faithfully performed.

Ozone observations were commenced January 1, 1879, at 7 a. m. and 2 p. m., for the State board of health of Michigan.

Lake navigation was resumed April 5.

The display of cautionary signals was discontinued December 15, on account of the closing of navigation, and resumed March 20.

During the year thirty cautionary signals were displayed at the station.

The observer remarks as follows in reference to some of them:

September 13 *to* 14.—No vessels left port during the display. Steamer due on the 13th did not arrive until next day, reporting very heavy weather and a rough sea. Highest velocity of wind was 27 miles per hour NW. Several tow-barges broke loose from the propeller East Saginaw; one barge, the Genesee Chief, lost her cabin, steering gear, and anchor; the captain, his wife, and cook were somewhat injured. There were other disasters, but not any reliable information could be obtained.

September 19 *to* 21.—No vessels left port during the display, and several vessels, bound north, put into Thunder Bay for protection; not any disaster heard from.

October 7.—All vessels remained in port during the display. Mail steamer Dove broke her shaft during storm.

October 9.—Up signals received about fifteen hours late, on account of telegraph line being down; all vessels remained in port during the display; highest velocity of wind, 32 miles NW.; schooner E. Coyne, corn laden, lost her foresail, mainsail, mizzen and topsail during the gale; schooner Miner, laden with lumber, went ashore near Old Presque Isle light, and proved a total wreck; schooner Ontario sprung a leak and put into this port for repairs.

October 15 *to* 17.—All vessels remained in port during the display, and not any disaster heard from.

October 22 *to* 23.—No disasters reported; all vessels remained in port during the display.

October 30 *to* 31.—All vessels remained in port during the display; mail boat did not arrive; not any disasters heard from.

November 1 *to* 2.—All vessels remained in port during the display; and not any disasters have been reported.

November 5 *to* 8.—All vessels remained in port during the display; not any disaster heard from.

June 10.—All vessels remained in port during the display.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1879	10
Number of Forms 22 issued during the year ending June 30, 1879	12
Total	22

ATKA, ALASKA.

Latitude	52° 10′ 30″
Longitude	174° 0′ 30″

Established May 4, 1879; observations commenced May 7, 1879.

Private L. M. Turner arrived at Atka Island *en route* to Attou May 4, 1879. On the 6th, the instruments were temporarily put up for the purpose of taking observations, viz, standard thermometer, maximum thermometer, minimum thermometer, hygrometer, rain-gauge, and wind-vane. On May 7 he began taking observations at 1.06, 5.31, 7, 10.96 a. m., and 2, 4.31, 9 p. m., local time.

ATLANTA, GEORGIA.

[*Official number*, 198.]

Latitude	33° 45′
Longitude	84° 23′
Elevation of barometer above mean sea-level	1,131.30 feet.

Established September 25, 1878.

Office, Kimball House, Pryor street.

Sergeant G. H. Rohé established the station, and continued in charge of same until January 15, 1879, when he was relieved by Corporal H. Hall and transferred to Memphis, Tenn.

The station has not been inspected since its establishment.

Extract from the observer's semi-annual reports:

Great interest is taken in the reports and in the work of the service by the citizens generally, and the office is frequently visited by ladies and gentlemen.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	1,047
Number of Local Reports issued during the year ending June 30, 1879	54
Number of Forms 22 issued during the year ending June 30, 1879	17
Total	1,118

ATLANTIC CITY, NEW JERSEY.

[*Official number*, 116.]

Latitude	39° 22′
Longitude	74° 25′
Elevation of barometer above mean sea-level	12.86 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.031
Mean temperature for the year ending June 30, 1879	51°.2
Amount of rain-fall for the year ending June 30, 1879	40.60 inches.

Established December 10, 1873.

Office, Apsley Cottage, Rhode Island avenue. Previous to October 5, 1878, the office was, in life-saving station No. 27, in the northern end of the town, and within one hundred yards of the light-house. The present office is much better adapted to the station work than the old one.

Sergeant Dennis Moore was relieved from the charge of the station November 23, 1878, by Sergeant William Black, and transferred to duty elsewhere. Sergeant Black was relieved June 12, 1879, by Sergeant E. W. McGann, and ordered to Baltimore, Md. Five assistants have been ordered to this station during the year, and four transferred to other points.

Inspections were made in February and June, 1879, and the work of the station was reported as properly attended to.

Extracts from the observer's semi-annual reports:

The station is a source of great interest to visitors during the watering-season.

During the past summer the records of the station were used to investigate and determine the difference of climate between this place, as a watering-place, and other points on the New Jersey coast. The records for several years were examined, and the committee having the matter in hand expressed its indebtedness for the records which could not be had from any other source.

Several disasters to vessels have been reported to the Chief Signal-Officer during the time of this report, in each case as promptly as information could be had. No disaster of any note has occurred on the section that was not reported at the time, and no lives have been lost by marine disasters within the scope of the station.

Sixty-seven cautionary signals and fifty-three cautionary off-shore signals were displayed during the year at this station.

The sergeant remarks as follows in reference to some of these displays:

July 26 *and* 27.—All vessels remained in port during the display.

October 11 *to* 13.—All vessels remained in harbor during the display.

October 22 *to* 25.—Two houses demolished, and several unroofed. Telegraph lines blown down for miles.

October 30.—Two schooners put into harbor for shelter.

November 26 *to* 29.—The display favorably commented upon by the citizens.

December 3 *to* 6.—The signal was not justified at the station, but there is evidence of a dangerous wind a short distance out.

December 8 *to* 12.—This signal was displayed forty-five hours in advance of the storm.

January 2 *to* 7.—On the 2d four hunters went out to shoot ducks, the gale stranded their vessel on a barren island beach; three were rescued, the fourth fatally frozen.

The station harbor is a sheltered one, and signals are not as frequently justified here as at Barnegat, Sandy Hook, or Cape May.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	967
Number of Forms 15 (manifold) issued during the year ending June 30, 1879	1,333
Number of Forms 22 issued during the year ending June 30, 1879	24
Total	2,324

AUGUSTA, GEORGIA.

[*Official number*, 23.]

Latitude	33° 28′
Longitude	81° 54′
Elevation of barometer above mean sea-level	165.35 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.078
Mean temperature for the year ending June 30, 1879	64° .7
Amount of rain-fall for the year ending June 30, 1879	44.32 inches.

Established November 2, 1870.

Office, Cotton Exchange Building, 163 Reynolds street.

Sergeant H. R. Stockman was reduced to the ranks as a private soldier for failing to render report August 1, 1878. He was relieved January 25, 1879, by Sergeant I. A. Reed, who continues in charge. Private

F. L. Pinkham was relieved from, and Private F. Gurley assigned to, duty as assistant, May 10, 1879.

The station was inspected in September, 1878.

Highest water in the river, 19 feet 3 inches, occurred April 17, 1879; lowest water, 3 feet 10 inches, July 24, 25, 26, 27, August 12, and October 29, 1878.

Extracts from the observer's semi-annual reports:

There is a marked degree of interest in the service among all classes of this community, principally among the business men, cotton factors, cotton brokers, grocers, and speculators. The reports are read, carefully examined, and studied by the cotton factor, cotton broker, and Western produce dealer with no ordinary interest. "From your reports, the most reliable we have," said a gentleman, connected with one of the largest and most substantial cotton firms in the South, to me about the 10th of June, "we ascertain the weather effects upon the crops, cotton, grain, meat, &c., and the markets, and our investments and advances of moneys are made accordingly."

This office is frequently visited by the best citizens of the place in search of information of the weather elsewhere.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	3,980
Number of Local Reports issued during the year ending June 30, 1879	1,576
Number of Forms 22 issued during the year ending June 30, 1879	64
Total	5,620

BALTIMORE, MARYLAND.

[*Official number*, 18.]

Latitude	39° 18′
Longitude	76° 38′
Elevation of barometer above mean sea-level	45.19 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.045
Mean temperature for the year ending June 30, 1879	55°. 7
Amount of rain-fall for the year ending June 30, 1879	40.01 inches.

Established January 1, 1871.

Office, corner South and Water streets.

Sergeant E. W. McGann was relieved May 31, 1879, by Sergeant W. Black, and ordered to Atlantic City, N. J. Three assistants have been ordered to, and two relieved from, this station during the year.

The station was inspected in October, 1878, and February, 1879. The observer and his assistants were reported as understanding their station duties and instruments; also the service, office, and men were well spoken of by those with whom they came in contact, No change has been made in the location of the instruments.

The river, harbor, and basin were covered with ice January 3, 1879, and navigation was almost entirely suspended.

Extracts from the observer's semi-annual reports:

Reporters call at office daily for items of storms, marine disasters, &c.

Vessel reports have been regularly received and posted in Merchants' Exchange and given to the press. Reports of wreck disasters have been received and posted, with excellent results, as many of the wrecked vessels were either bound to or from this port.

Signal orders have been regularly and promptly repeated to Federal Hill over the telephone line.

During March a telephone was put up connecting us with the Merchants' Exchange, Corn and Flour Exchange, and other places. This has greatly facilitated our intercourse with those places, frequent inquiries being made about movement of storms, entrance of vessels, marine accidents, &c.

The Merchants' Exchange and Corn and Flour Exchange, representing wide commercial interests, acknowledge, more outspokenly than other classes, the benefit of

the reports, storm warnings, &c. The public press has also continued its unsolicited praise and eulogies, and all papers publish more complete than heretofore the reports furnished for the purpose.

The oyster-packers find reports of great value in shipping by bulk to the West. Pork-packers, sugar-refiners, and various other industries manifest more or less interest in the service.

Great interest is taken in the locating of storm-centers on the map, and they are eagerly watched for by all the members of the Corn and Flour Exchange, and are published by the press of the city.

The office has been quite regularly visited by the permanent committee of the Merchant's Exchange. The official conduct of the assistants at the station has been very good, and no man has been relieved for misconduct or neglect of duty.

Twenty-one cautionary signals and seventeen cautionary off-shore signals were displayed during the year at this station.

The sergeant remarks as follows in reference to some of these displays:

September 12 *to* 13.—Several steamers dragged their anchors. Outward-bound steamers remained in port. Many of the wharves were overflowed by the high tide; considerable damage to goods on piers.

October 23.—The highest velocity of the wind during the display was SW. 45 miles per hour, but down the bay it is estimated at 70 miles. The steamer Express, which left Baltimore for the Potomac, with a crew of twenty-one, and a large number of passengers and freight, was sunk off Barren Island, and only nine persons saved. The steamer Shirley also went ashore at that point. The steamer Theodore Weems was so badly damaged that she had to be towed into port. The steamer Massachusetts went ashore at Drum Point, and the steamer Louise on the Middle Ground; also the steamer Ida and twenty-three schooners in the same locality. A fleet of nineteen canal-boats went ashore and sunk off North Point, and several members of their crews are reported lost. Steamship Florida was compelled to put back, being badly stove in. In the city houses were unroofed, buildings in course of construction were blown down, and in the parks several of the largest shade-trees were uprooted.

November 22 *to* 23.—All vessels remained in harbor during the display. One vessel sunk, and one ashore in the Chesapeake Bay.

November 27 *to* 28.—Signal generally respected by captains of outward-bound steamers.

December 10 *to* 15.—Owing to the timely warning by the posting of a special telegram from the office of the Chief Signal-Officer, not any casualties are reported.

January 2 *to* 5.—Fourteen steam-tugs and several oyster schooners were driven ashore near Annapolis. Three oyster schooners foundered during the gale. Crews escaped on floating ice, all of whom were badly frost-bitten. The prevailing westerly winds produced the lowest tide on record; several steamships and vessels grounded in the channel.

January 25 *to* 26.—Bark Adelaide was dismasted in the Chesapeake by the violence of the storm.

March 17.—Captains of bay steamers report a severe storm on the Chesapeake during the time of the display.

March 31 *to April* 1.—All bay and river steamers detained by the gale. A small schooner was driven ashore on Gwynn's Island. Schooner V. T. Hawley had her sails blown away.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	3,464
Number of Local Reports issued during the year ending June 30, 1879	1,999
Number of Forms 15 (manifold) issued during the year ending June 30, 1879	3,813
Number of Forms 22 issued during the year ending June 30, 1879	87
Total	9,363

BANGOR, MAINE.

[*Official number*, 111.]

Latitude	44° 49′
Longitude	68° 46′

Established November 6, 1874.
Office, No. 4 Main street.

This is a station for printing the Indications (Farmers' Bulletin).

Corporal L. N. Jesunofsky was relieved October 23 by Private C. C. Buck, and transferred to the office of the Chief Signal-Officer.

The office was inspected in March, 1879, and reported in an excellent condition.

During the year one hundred and sixty-six post-offices and thirteen persons and papers were supplied with the Farmers' Bulletin.

Extracts from the observer's semi-annual reports:

The interest taken in the Farmers' Bulletins issued from this station is general, but the lumbermen and storekeepers seem to take a special interest in them. I have not been here during the warmer months, but am informed that a large number of farmers carefully study and plan their planting and harvesting by the information received from the Bulletins. Especially is this the case with the foot-note at the bottom of the Bulletin. The steamer Cambridge, of this city, during the winter season, does not leave her berth if the Bulletins indicate rough weather.

The two daily papers publish the New England section of the Indications, and the Commercial also publishes a report of the weather in Boston and New York for the forenoon of each day.

The Penobscot River closed to navigation December 19. Brisk northeast winds blew the ice from river April 24, and navigation was immediately resumed.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1879	55,744
Total	55,744

BARNEGAT, NEW JERSEY.

[*Official number*, 115.]

Latitude	39° 48′
Longitude	74° 9′
Elevation of barometer above mean sea-level	20.00 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.019
Mean temperature for the year ending June 30, 1879	50°.5
Amount of rain-fall for the year ending June 30, 1879	49.38 inches.

Established December 10, 1873.

Office, life-saving station No. 17.

Sergeant Frank Greene continued in charge of the station up to November 26, when he was transferred to duty elsewhere. Private W. Stein was in charge from November 26, 1878, to June 2, 1879, and then ordered to Sandy Hook; since June 2 Private J. D. Marx has had charge. One assistant has been relieved from, and one assigned to, this station.

This station was inspected in February and June; the office found in good order and the work properly and promptly attended to.

Extracts from the observer's semi-annual reports:

Direct telegraphic communication has been kept up with the central office, with the exception of a few breaks of short duration, the repairing of which has been greatly facilitated since a mule was sent to the station.

Indications have been received twice and reports of twelve stations thrice daily, but owing to the isolation of the station and the absence of those interests for which they are intended, they cannot be utilized, and therefore it is hard to determine what local interest is taken in the service.

Sixty-eight cautionary signals and fifty-three cautionary off-shore signals were displayed during the year at this station.

The sergeant remarks as follows in reference to some of these displays:

July 26 *to* 27.—On the main land, branches were torn from trees and corn prostrated. One yacht remained in port.

August 1 *to* 2.—Storm accompanied by lightning and heavy rain.

December 3 *to* 6.—Five schooners anchored under the beach and remained until the signals were lowered.

December 8 *to* 12.—The bark Wilhelmine ran ashore near Little Egg Harbor at 4 a. m. of the 4th, and was abandoned on the 7th.

January 15 *to* 17.—The British schooner Cuba, with a cargo of molasses, from Arricobo, bound to New York, ran ashore ten miles south of station, on the 16th, and was entirely broken up; no lives lost.

February 24 *to* 27.—Schooner David H. Tolck, from Sagua La Grande, bound to New York, with a full cargo of sugar, ran ashore six miles south of station, at 3 a. m. of the 26th; cargo and vessel a total loss; out of the crew of eleven, five were drowned, including the captain, J. E. Sawyer, and his wife.

During the display of off-shore signals March 30, 31, and April 1, seven schooners anchored under the beach and remained until signals were lowered.

April 10, schooner Mary Emmor from New York, bound to Virginia in ballast, ran ashore on Barnegat Shoals one-fourth of a mile east of station at 3.45 p. m., during the display of cautionary signals. Through the efforts of life-saving-service crew No. 17, she was successfully floated at 6.30 p. m., and taken to a safe anchorage until the storm subsided.

May 3, schooner Julia A. Berkele, with 247 tons of curb-stone, struck on Barnegat Shoals, one-fourth of a mile east of station, through the alleged carelessness of her mate. She was discovered at 7.00 a. m., and at 9.00 a. m. communication with station was established by means of the general service code, and continued until the vessel was successfully floated at 3.45 p. m. by the efforts of life-saving-service crew, after having thrown overboard about 30 tons of her cargo. In every instance the first reports of the disaster to the owners, underwriters, wreckers, and the public at large were sent through the office of the Chief Signal Officer, and all messages to persons concerned and interested were sent over the signal-service wire.

BISMARCK, DAKOTA TERRITORY.

[*Official number*, 104.]

Latitude	46° 48′
Longitude	100° 38′
Elevation of barometer above mean sea-level	1,704.3 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.991
Mean temperature for the year ending June 30, 1879	41° .5
Amount of rain-fall for the year ending June 30, 1879	19.66 inches.

Established September 15, 1874.

Office, corner First and Meigs streets.

Private D. T. Flannery was in charge of the station until October 30th, 1878, when he was relieved, for misconduct, by Sergeant C. Cramer.

The station was inspected in August and May, and the duties of the office were reported as having been satisfactorily performed.

Extracts from the observer's semi-annual reports:

A loop connecting this office with the Northwestern telegraph line has been built since last report, and reports from stations on the United States telegraph line are concentrated here and transmitted direct to Saint Paul *en route* to Washington.

Bulletins of the stage of water at stations above on the Missouri have been issued during the spring and summer, and the breaking of the ice also reported, all of which information is eagerly sought by steamboat men.

Weather reports have been regularly furnished for each issue of the weekly paper, which also publishes a monthly report. Special items have been prepared by the observer, which have led to a solicitation for more. Considering the newness of the country, a full share of interest is taken in the service by the people.

The observer was called upon to produce the records of the office in court, and they were accepted in evidence.

The interest at present taken in the office cannot be great. The observer is frequently consulted, but the country is yet but sparsely populated, and it is believed that the office will be most useful to emigrants and prospectors in furnishing them with particulars of the climate, such as amount of rain, temperatures, opening of seasons, &c.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	40
Number of Local Reports issued during the year ending June 30, 1879	284
Number of Forms 22 issued during the year ending June 30, 1879	41
Total	365

BOSTON, MASSACHUSETTS.

[*Official number*, 13.]

Latitude	42° 21′
Longitude	71° 4′
Elevation of barometer above mean sea-level	142.19 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.075
Mean temperature for the year ending June 30, 1879	48°.1′
Amount of rain-fall for the year ending June 30, 1879	62.96 inches.

Established November 1, 1870.

Office, Equitable Building, corner of Milk and Devonshire streets.

Sergeant Orin Parker was transferred January 6, 1879, to Buffalo, N. Y., and Sergeant B. M. Pursell took charge. One assistant has been relieved from, and one ordered to, station during the year.

The station was inspected in August, 1878, and March, 1879. On both occasions the work of the office was being performed satisfactorily.

During the year six hundred and fifty-nine post-offices and forty-seven persons and places were supplied with the Farmers' Bulletin.

Extracts from the observer's semi-annual reports:

The relations of the office and service with all classes have continued satisfactory in the highest degree.

Reporters of all the daily journals regularly visit the office for information of interest to their readers, concerning local and general weather news, and in nearly every case the information given is published in correct and judicious terms.

The storm warnings, as now displayed at prominent points on the immediate coast by means of sub-stations, are of the greatest benefit, many vessels being thus warned that otherwise could not receive intelligence of coming danger.

The Farmers' Bulletin has been regularly issued, and the benefits accruing to the rural population from this publication are attested to by representatives of all occupations, trades, and professions, and many requests are made for the bulletin by people too remote to receive it from this station. The post-office authorities render valuable aid in this connection by their hearty co-operation in forwarding the bulletins in the early mails, although they are frequently received at the post-office just at the time of the closing of their mails.

The local service rendered by the office continues to increase steadily; the records and predictions of the office being in demand by all classes of citizens; all information and data furnished is regarded as authoritative and conclusive by the recipient.

The records have furnished valuable information for the use of specialists in manufacturing and hygienic interests; in lawsuits, particularly in protecting the city of Boston from exorbitant claims for injuries to persons from falls on slippery sidewalks and roadways; to boards of arbitration in settling claims for damages from bad weather, and in examining accounts between contractors and the city and State.

Forty-three cautionary signals and twenty-three cautionary off-shore signals were displayed during the year at this station.

The sergeant remarks as follows in reference to some of these displays:

July 21 *to* 22.—One yacht was sunk and one man drowned. The rigging of many vessels was damaged.

October 12 *to* 13.—All vessels remained in harbor during the display. Storm unusually severe.

October 23 *to* 24.—Yacht Uncle Moses driven ashore.

November 18 *to* 19.—All vessels remained in harbor during the display.

December 1 *to* 3.—All vessels remained in harbor during the display. Gale reported as very severe east of this station. Bath-houses and other buildings near the water were damaged by the wind and high tides. Two fishing-vessels were driven ashore near Lynn, Mass.; the Alberta Story a total loss, except rigging and boats.

December 10 *to* 11.—The gale was attended by heavy rain and dense fog. The display favorably commented upon by owners of vessels and those employed in shipping.

December 21 *to* 23.—Schooner J. G. Drew, from Philadelphia, laden with coal, was driven ashore on the Outer Brewster, night of the 21st, and became a total loss.

January 9 to 10.—Not any vessels left port during the display.

January 25 *to* 26.—Storm one of the most severe known for years; chimneys blown down and several wrecks reported.

February 11 *to* 13.—Gale severe and of dangerous character. No vessels left port

during the display. Owing to the timely warning on this coast, few vessels encountered the gale, and no disasters are reported.

February 17 *to* 18.—Gale very heavy and steady, with thick weather and snow. No vessels left port. Owing to the timely warning no disasters are reported on the coast.

February 20 *to* 22.—The severest snow-storm and most protracted gale of the winter. All vessels remained in port until the gale was over. This display was of the greatest benefit to vessels here, and saved many from partial, if not total, loss.

February 25 *to* 27.—Gale very heavy and came in sudden puffs and squalls from the south, with very sudden changes of direction, sometimes from south to north and back again in a few moments.

March 27 *to* 28.—Gale very heavy and blew directly on shore. The warning saved several vessels from encountering the gale, as they would have sailed had not the signal been displayed. Not any vessels left until the gale was well over and the wind in a more favorable direction; no wrecks reported.

March 29 *to April* 1.—Heaviest and most dangerous gale of the winter. The wind blew in sudden and severe squalls and gusts, and was accompanied by heavy snow. Numerous disasters are reported along the Atlantic coast.

April 18 *to* 19.—Gale unusually severe. Not any vessels left port during the display, and a large number of vessels arrived in the harbor just before the gale began.

June 6 *to* 7.—A two-masted schooner reported sunk off Chatham, Mass.; name unknown; her topmasts are visible above the water.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1879..	219,362
Number of Bulletins (manifold) issued during the year ending June 30, 1879.	8,049
Number of Local Reports issued during the year ending June 30, 1879	2,370
Number of Forms 15 (manifold) issued during the year ending June 30, 1879.	312
Number of Forms 22 issued during the year ending June 30, 1879....	274
Total	230,367

BOISE CITY, IDAHO TERRITORY.

[*Official number*, 145.]

Latitude	43° 40′
Longitude	116° 6′
Elevation of barometer above mean sea-level	2,877 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879.	* 30.117 inches.
Mean temperature for the year ending June 30, 1879	*51°.9
Amount of rain-fall for the year ending June 30, 1879	14.51 inches.

Established July 1, 1877.

Office, Overland Hotel, NW. corner Main and Eighth streets.

Sergeant B. E. Light has had charge of station throughout the year and attended to his duties in a satisfactory manner. It was inspected in October and the records found in an excellent condition. The rain-gauge was moved from the edge to the center of the roof by the inspector to give it a better exposure; also the barometer for better light; the other instruments remain in the original positions.

Extracts from the observer's semi-annual reports:

The weekly and monthly reports have been regularly published in the Idaho Statesman (a tri-weekly newspaper).

The office still continues to be visited by the leading citizens of the city and vicinity.

During the month of June the telegraph office was moved to the farther end of the city, and the distance is such as to render it difficult to get signals in on time. The manager connected this office with a loop, and reports are now sent direct from this office.

PUBLICATIONS.

Number of Forms 22 issued during the year ending June 30, 1879	24
Total	24

* Means for August, 1878, computed for 29 days only.

BRECKENRIDGE, MINNESOTA.

[*Official number*, 82.]

Latitude	46° 11′
Longitude	96° 17′
Elevation of barometer above mean sea-level	968.00 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.964
Mean temperature for the year ending June 30, 1879	39°.8
Amount of rain-fall for the year ending June 30, 1879	23.71 inches.

Established April 10, 1872.

Office, corner of Wisconsin avenue and Fifth street.

Sergeant B. C. Anderson continued in charge up to February 27, 1879, and since that date Private C. E. Truesdell.

The station was inspected in May, 1879. The office and records were reported in good order, and the observer as faithfully attending to his duties.

Extracts from the observer's semi-annual reports:

Considering the size of the place much interest is taken in the service. Many, when examining land in the vicinity, have visited the office to learn of the coming weather and to obtain data in regard to the climate. As many at a distance imagine this a very dry country, the rain data has been particularly valuable. The newspapers in the vicinity publish the weekly reports of the weather.

PUBLICATIONS.

Number of Forms 22 issued during the year ending June 30, 1879	12
Total	12

BUFFALO, NEW YORK.

[*Official number*, 33.]

Latitude	42° 53′
Longitude	78° 55′
Elevation of barometer above mean sea-level	664.50 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.977
Mean temperature for the year ending June 30, 1879	46°.3
Amount of rain-fall for the year ending June 30, 1879	50.58 inches.

Established November 1, 1870.

Office, No. 22 Weed's Block.

Sergeant B. M. Pursell was relieved from charge of the station December 31, 1878, by Sergeant O. Parker, and transferred to Boston, Mass. Private A. T. Coumbe has been the assistant.

This station was inspected in July, 1878, and February, 1879. The office was found in excellent order, and the work at the station well and faithfully performed.

During the year two hundred and eighty-two post-offices and thirty-four persons and places were supplied with the Farmers' Bulletin daily, except Sunday.

Extracts from the observer's semi-annual reports:

No change has been made in the number of reports received from twenty-four Signal Service and twelve Canadian stations, three times daily, and forwarded direct to the Chief Signal Office. They have been bulletined as soon as received, without a failure, and posted or distributed to designated persons, places, and papers.

Great interest is manifested in these reports wherever posted or left, especially in the a. m. issue, by those interested in the lake trade, who congregate at the board of trade rooms and tug office, and eagerly scan the bulletin and large map on which the reports are posted, for the information which they have found useful in many ways in their business, as in calculating the position and controlling the movements of vessels; whether or not it is safe to move cargoes; for the weather and rain-fall in their influence

on the price of grain, present and prospective. Copies of the a. m. issues are furnished the Courier and Express (newspapers), and are published with a regularity which in itself is a sufficient indication of their value to the public, and thus reach thousands. There are few men of ordinary intelligence whose business is liable to be affected by the weather, who do not make more or less a study of these reports and the indications published in connection therewith and guide themselves accordingly.

The season has been a hard one for the lake trade on account of low freights and small offerings, and there can be no doubt that in its hard struggle for existence much help has been derived from our reports, allowing, as they do, by the information given therein, calculations to be made for quick dispatch and short passages, and consequent saving of expense.

Full local reports have been furnished the newspapers and regularly published. A weekly mean and comparative report of temperature and rain-fall has been regularly furnished and published in the Sunday News. A large number of special reports has been compiled or furnished directly from the records to parties—lawyers principally—making application therefor for use in lawsuits, arbitrations, and sometimes for purposes not specified.

The records have been called for in evidence before the courts and accepted as conclusive; September 26 and October 1, 1878.

Farmers' Bulletins have been issued daily, except Sunday, and distributed to designated persons and places. Many applications have been made for this report from places beyond the reach of the early mails, and all farmers who have access to the bulletin attest to the benefit derived therefrom. Protection is given tender plants when in the spring frosts are predicted; planting is done in advance of predicted rain, &c.

The indications and weather reports are always, and this office frequently, consulted in preparing for parades, street shows, excursions, picnics, base-ball games, &c., as to the weather likely to prevail, and sometimes postponements are made, on information gained when it is possible and the weather promises to be unfavorable.

The service gains in popularity from year to year, as it grows in usefulness with the increase in the number of those educated to understand and avail themselves of the benefits to be derived from a study of predictions and reports.

The press continues to aid the service in laying its merits before the public whenever opportunity offers.

The meteorological committee still continues to co-operate with the office whenever they can be of service.

Navigation closed on December 7, after a very long and prosperous season, which was unattended by any serious loss on this lake by storms. This immunity from disaster was doubtless due to the excellent system of warnings of the service, as the latter part of the season was marked by a number of very severe gales. I wish to call especial attention to the fact that scarcely a single captain of vessel leaves this port in the fall of the year without first consulting the sergeant in charge and the reports.

Navigation opened April 24, 1879. It was more or less obstructed during May, and at times entirely suspended by a field of ice, which gathered at this end of the lake and was kept firmly packed across the mouth of the harbor, by the southeast winds, up to the 17th.

This office is under obligations for many courtesies to the newspapers, post office authorities, telegraph companies, board of trade, and others.

Thirty-six cautionary signals were displayed during this year at the station. From December 15 to March 20 no signal orders were issued; navigation having been closed.

The sergeant remarks as follows in reference to some of these displays:

September 11 *to* 14.—A large number of vessels arrived during the gale, all more or less damaged. The signal kept a number of vessels in port, thereby lessening the list of disasters.

September 20 *to* 21.—The sailing vessel Marion W. Paige left port during the display, an was driven back with the loss of nearly all of her large sails; loss, $1,500.

September 25 *to* 26.—All vessels remained in port during the display. A number of captains called at the office for information.

October 9.—No vessel left port during the display, and no damage done to shipping, so far as ascertained. Trees and chimneys blown down in the city.

October 16 *to* 18.—But two vessels left port during the display, although a large number were ready for departure when the signal was hoisted. Many captains expressed their satisfaction at having escaped the gale. Fully twenty-four hours' warning was given.

October 30 *to November* 3.—The gale very severe and lasted an unusually long time. All vessels remained in port.

November 11 *to* 12.—All vessels remained in harbor during the display. No disasters. Forty-three captains of vessels called at the office for information during the display.

November 22 *to* 24.—One vessel left port during the display and was forced to return No damages reported, although the storm was very severe, with heavy rain-fall.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1879...	103,387
Number of Bulletins (manifold) issued during the year ending June 30, 1879..	7,426
Number of Local Reports issued during the year ending June 30, 1879.....	1,839
Number of Forms 22 issued during the year ending June 30, 1879.....	80
Total.....	112,732

BURLINGTON, IOWA.

[*Official number*, 122.]

Latitude.....	40° 49′
Longitude.....	91° 07

Established September 30, 1874.

Office No. 412 North Main street.

Corporal E. D. McKenna has remained in charge of the station. Not any meteorological observations are taken, the station having been established for printing the Farmers' Bulletin. It has not been inspected during the year.

Navigation on the Mississippi closed December 13, 1878, and opened March 16, 1879.

During the year one hundred and eighty-seven post-offices and eighty persons and places were supplied with the Farmers' Bulletin.

Extracts from the observer's semi-annual reports:

The interest manifested and the expressions of praise as to the benefit derived from the publication of the weather reports from your office are universal among all classes of persons. Those deriving the greatest amount of benefit from the publication of the Farmers' Bulletin are agriculturists. Builders and others, whose business is outdoors, are constantly giving testimony as to the advantage they derive from consulting the daily Indications issued from your office.

There has been no failure in the receipt of the Indications nor in the publication of the Farmers' Bulletin.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1879.....	58,444
Total.....	58,444

BURLINGTON, VERMONT.

[*Official number*, 45.]

Latitude.....	44° 29′
Longitude.....	73° 15′
Elevation of barometer above mean sea-level.....	267.99 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879.....	29.964
Mean temperature for the year ending June 30, 1879.....	45°.5
Amount of rain-fall for the year ending June 30, 1879.....	32.10 inches.

Established May 24, 1871.

Office, Howard Block, southwest corner of Bank and Church streets; previous to December 1, 1878, it had been in Fisher's Block, opposite corner.

Sergeant C. Cramer continued in charge of same up to September 18, when he was relieved by Private J. H. Sherman, and ordered to this office for discharge.

This station was inspected during August, 1878, and April, 1879. On both occasions the office was found in excellent order, the records well kept, and the observer reported as faithful and attentive to his duties.

Local reports have been daily furnished to the newspapers, also monthly summaries.

December 24, 1878, the barometer was changed from an elevation of 241.12 feet to 267.99 feet.

Extracts from the observer's semi-annual reports:

A greatly increased interest in the service is noticed. That its objects and benefits are becoming more clearly known is evinced by special commendatory resolutions recently forwarded by the officials of this city to the Chief Signal-Officer. Since the removal of the office to its present location in Howard Block, not only has the exposure of the instruments been all that could be desired, but convenience of access has made the office better known, and consequently more popular and useful.

The office is constantly consulted by artisans, painters, and others whose interests are affected by the weather.

The health office embodies a synopsis of the monthly meteorological summary in its reports, and the Free Press continues, as hitherto, to devote much space to the daily Indications and monthly reports.

The only change made in the present office has been the removal of the instrument shelter to the east window, where it is less subject to currents of air.

Navigation closed January 10 and was resumed April 24, 1879.

During the last term of the court, in session at Burlington, the presiding judge decided that the records of this office should be received as conclusive evidence in all cases in which they had a bearing, and the observer was, in consequence, subpœnaed in three cases during the month of September and October. Expense was thus saved on both sides, as the conflicting evidence of witnesses, depending solely on memory, was done away with. Prominence has been given to reports from this office by the press, editorially and otherwise.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1879	310
Number of Forms 22 issued during the year ending June 30, 1879	12
Total	322

CAIRO, ILLINOIS.

[*Official number*, 53.]

Latitude	37° 0′
Longitude	87° 12′
Elevation of barometer above mean sea-level	368.50 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.074
Mean temperature for the year ending June 30, 1879	59°.1
Amount of rain-fall for the year ending June 30, 1879	41.38 inches.

Established June 1, 1871.

Office, U. S. custom-house, No. 71 Ohio Levee.

Sergeant W. H. Ray has had charge of the station during the year. One assistant has been transferred from and one ordered to the station.

The station was inspected in December, 1878, and May, 1879. The records of this office were found in good order and properly kept. The observer and assistant and the work of the station were highly spoken of.

The highest water in the river, 36 feet, occurred January 25 and 26; lowest water, 6 feet, October 18 and 22.

Extracts from the observer's semi-annual reports:

The reputation of the Signal Service at this point is all that could be wished for. The river and weather reports are highly appreciated by the river men and merchants, who are mostly benefited. During the intense excitement which prevailed here in the yellow-fever season, great interest was taken in our daily p. m. weather reports received from other stations, which were eagerly noted and sought by the citizens, who thronged at the telegraph office every evening for the purpose of ascertaining the temperature and state of the weather north and south. Every cooler atmospheric wave reported as existing in or advancing from the northwest seemed to elicit great satisfaction. Assistant Miller, having been proficient in the cipher, was often requested

to translate reports before he recorded them on the manifold bulletin, and which he read from the second story of the building to the people assembled on the street below. One of the important events was the severe shock of earthquake experienced here on the 18th of November, at 11 h. 51 m. 50 s. p. m., lasting seventy seconds. It was followed by a slight shock on the morning of the 19th, at 5 h. 10 m. a. m., lasting about three seconds. Houses were distinctly felt to totter from north-northwest to east-southeast, and loose bricks were shaken from chimneys.

No change has been made in the number of p. m. weather reports from seventeen stations, recorded at this station, which have been regularly and promptly bulletined and posted. A midnight weather bulletin has been received daily (by mail) from Saint Louis and posted in the signal office. A special morning weather report of the barometer, temperature, direction of the wind, and state of weather at Leavenworth, Omaha, Yankton, and Saint Louis was received at this office from December 13 to February 28. The report was sent from Saint Louis by special message at the request and expense of the several merchants here. It was published daily in the Cairo Daily Argus.

The large weather map located in the City National Bank has been changed daily except Sundays.

The river observation taken each day at 3 p. m. has continued. The highest point reached on the river-gauge, by the Ohio River, was 36 feet, on January 26, 1879, and the lowest, 7 feet 11 inches, on the 9th of same month.

The damage done by the heavy floating ice in this vicinity, in the sinking of barges, flatboats, and the loss of cargo during the month of January is estimated at a loss of $65,000.

Navigation of the Mississippi River remained closed from December 23, 1878, to January 30, 1879, and navigation of the Ohio remained practically closed from December 25 to January 26, on account of the heavy floating ice.

The weekly meteorological records are consulted by parties for the purpose of procuring evidence in matters of law.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	3,620
Number of Local Reports issued during the year ending June 30, 1879	877
Number of Forms 22 issued during the year ending June 30, 1879	84
Number of Forms 26 issued during the year ending June 30, 1879	4,622
Total	9,203

CAPE HATTERAS, NORTH CAROLINA.

[*Official number*, 123.]

Latitude	35° 14′
Longitude	75° 30′
Elevation of barometer above mean sea-level	7.25 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.070
Mean temperature for the year ending June 30, 1879	60°.1
Amount of rain-fall for the year ending June 30, 1879	77.19 inches.

Established September 1, 1874.

Office, first floor of the assistant light-house keeper's dwelling.

Corporal D. Brooks had charge up to January 21, 1879, when he was relieved by Private W. Daly. One assistant has been ordered to and one transferred from the station for discharge.

The station was inspected in November, 1878, and the office found in good order, and the work, generally, satisfactorily performed.

Extracts from the observer's semi-annual reports:

The people of Hatteras Inlet have displayed considerable interest in this office, most of them being seafaring men. The inlet is a harbor of safety for vessels during stormy weather, and a considerable number of sailing-vessels trade there regularly.

At 11 a. m., May 25, the schooner Nellie Potter, of Washington, N. C., while rounding the Hatteras Shoals, lost foremast-head and main-topmast; she anchored six miles northeast of station until 4.30 p. m., when she proceeded north. The keeper of life-saving station No. 21 was notified from this office, and report telegraphed the Chief Signal-Officer.

The Coast Telegraph Line has been very freely used by persons connected with shipping interests, especially wrecking companies; also by officials and contractors during

the construction of life-saving stations near Hatteras Inlet. It is also worthy of note that when on line duty near Hatteras Inlet, numerous requests, especially by masters of vessels, have been made to have messages sent over the wire, and, as a rule, such messages have been sent from the cable-boxes.

One hundred iron poles were erected on the low, flat beach north of Hatteras Inlet, March 8 to 11, and there are at present two hundred more on the section, to be used as necessity requires. They are found to be far superior to wooden ones, and cause no trouble when properly put up, unless it may be in extreme cases, then only when the beach has been washed away.

The class of persons deriving most benefit from the service at this point is marine.

Seventy-five cautionary signals and thirty-three cautionary off-shore signals were displayed during the year at this station.

The sergeant remarks as follows in reference to some of these displays:

October 21 *to* 24.—The two-masted schooner Altonia, of Boston, cargo, logwood, ran ashore 11.45 p. m. of the 22d; total loss.

December 8 *to* 11.—Brig William Mallory, of Mystic, Conn., 329 tons burden, ran ashore four miles south of station. During the same gale, barkentine Belle Keith, of Windsor, N. S., ran ashore, at 5 a. m., eight miles south of station; no lives lost.

January 19 *to* 20.—An unknown schooner sunk four miles south of station.

March 30 *to* 31.—During the northeast storm, the schooner Meteor, owned by Wrecking Company, New York, was driven ashore on south side of Hatteras Inlet; reports of the disaster were forwarded to the Chief Signal-Officer from scene of wreck by Privates Kenan, of Portsmouth, and Flannery, of this station. Prompt assistance was rendered from Norfolk, Va., and the vessel successfully floated April 3, owing to information given over the coast line. The schooner Vine Oak, from Hatteras to New Berne, N. C., for supplies, &c., for the keepers of Hatteras Light, was capsized in Pamlico Sound, about three miles from Hatteras Inlet, March 30, and all on board (five) perished; information was duly telegraphed to the Chief Signal-Officer and the Light-House Department.

April 3 *to* 4.—Schooner Clara Merrick, Philadelphia, Pa., cargo, coal, sunk on Hatteras Shoal on the 4th, during display of signal; crew rescued by schooner Mary Louise, and taken to Hatteras Inlet.

PUBLICATIONS.

Number of Forms 22 issued during the year ending June 30, 1879	12
Total	12

CAPE HENRY, VIRGINIA.

[*Official number*, 118.]

Latitude	36° 56′
Longitude	76° 0′
Elevation of barometer above mean sea-level	16.00 feet
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	*30.041
Mean temperature for the year ending June 30, 1879	*58°.4
Amount of rain-fall for the year ending June 30, 1879	51.88 inches.

Established December 15, 1873.

Office, in new building, 150 yards east of light-house keeper's residence.

Sergeant R. J. Bell had charge of the station up to January 28, 1879, when he was relieved by Sergeant J. H. Bokel, and ordered in for discharge. Four assistants have been ordered to and four transferred from this station.

An inspection of this station was made in September, 1878. Sergeant Bell was reported as very attentive to the duties of the office, and thoroughly competent.

Extracts from the observer's semi-annual reports:

The reporting of vessels passing this station has been continued. The display of international signals is frequently omitted; whether it is due to the masters of vessels not being familiar with the code, or whether they do not carry them, I am unable to

* Means for August, 1878, computed for 30 days only.

say. This duty is very arduous, as it constantly requires one man at the glass. Every attention has been given to make these reports as useful and beneficial as possible to the parties interested, and can only be made perfect by masters of vessels displaying their signals promptly. During night, with the greatest watchfulness only can those vessels be reported that display such signals as this office is familiar with, and those passing that are known by this office.

The cautionary and off-shore signals are well displayed, and can be observed by vessels passing at a great distance.

June 25, the instrument-shelter was removed from the portico on the ground-floor, west side, to a window in the second story of building, directly over its former location.

The forecasts of the weather, as furnished by the indications, are given to the pilots, who in turn communicate them to outgoing vessels, by whom they are regarded with deep interest, particularly by the coastwise vessels.

January 10, First Lieut. Philip Reade, acting signal-officer, arrived at this station, with a working party of the Signal Corps, for the purpose of constructing a telephone line between this station and Kittyhawk, N. C., and connecting same with life-saving stations No. 1 to 12, sixth district. This line was completed February 12. Since the erection of the telephone line, two wrecks have occurred on this section of the coast, viz, the bark Admiral, near False Cape, Virginia, and the schooner James M. Vance, near Cape Henry, Virginia; the former on March 2 and the latter on March 31. In each instance the telephone line was used in notifying crews of life-saving stations and for the transmission of messages from wrecks to this office, whence they were forwarded to the office of the Chief Signal-Officer. In the case of the James M. Vance, not more than two minutes elapsed from the time the schooner struck until the crew of life-saving station No. 1 was notified by telephone and on its way to her assistance.

Seventy-six cautionary signals and thirty-six cautionary off-shore signals were displayed during the year at this station.

The sergeant remarks as follows in reference to some of these displays:

October 22 *to* 24.—During the hurricane of the 23d, the American ship A. S. Davis, 1,399 tons, from Callao, bound for Hampton Roads, stranded on the beach at 2 a. m., eight miles south of station. Captain and crew of twenty all lost, with the exception of one man. Ship and cargo a total loss within two hours after she had struck. During the same storm, instrument-shelter was torn from its fastenings, and anemometer cups were blown away. Maximum wind-velocity during the storm, 84 miles per hour.

December 8 *to* 11.—At 1 *a m. of the 11th, sloop* Star, *of New York, stranded on the* beach near this station. Three men on board were taken off and provided for by life-saving station No. 1, this office co-operating.

December 26 *to* 28.—British steamship Tunis, with crew of 24 all told, 886 tons registered, cargo of 3,094 bales of cotton, bound from Galveston via Norfolk, Va., to Liverpool, ran aground at 2 a. m. of the 28th about one and a half miles south of station. Crew of life-saving station No. 1 and this office promptly turned out, rendering all assistance possible; got afloat during flood-tide, early a. m., December 31.

January 2 *to* 5, 1879.—An unknown brigantine ran ashore four miles north of station on 4th instant; vessel got afloat at high water on 5th instant; no serious damage.

January 15 *to* 16.—Three vessels ran ashore nearly abreast of station; an unknown bark, at 7.30 p. m. of 15th, got afloat at 10 p. m. same night; a large steamer at midnight, and got afloat again at 3.30 a. m. of 16th, no damage; at 8.30 a. m. of 16th. British steamship Sarmatian, of the Allan Line, nearly opposite station, got afloat at flood-tide, 11.40 p. m., without sustaining any damage.

March 30 *to April* 1.—Two-masted schooner James M. Vance ran ashore two miles north of station at 9.50 a. m. of 31st; vessel total loss; captain and crew of six saved by crew of life-saving station No. 1, who were notified by this office through the telephone at the very moment the vessel struck. The James M. Vance was first observed by the sergeant in charge while she was yet several miles at sea. Realizing her helpless situation, with the wind blowing directly on shore at a rate of from sixty to seventy miles per hour, a repairman, fully equipped to open wreck station, was sent to the beach to meet her and offer all immediate assistance in his power until arrival of life-saving crew with apparatus. Schooner Gettysburg ran ashore during same gale at Ocean View, Va., eight miles north of station.

June 29 *to* 30.—Telegraph line blown down north and south of station.

PUBLICATIONS.

Number of Forms 15 (manifold) issued during the year ending June 30, 1879	14
Number of Forms 22 issued during the year ending June 30, 1879	12
Total	26

CAPE LOOKOUT, NORTH CAROLINA.

[*Official number*, 136.]

Latitude	34° 36′
Longitude	76° 36′
Elevation of barometer above mean sea-level	15.00 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.066
Mean temperature for the year ending June 30, 1879	62°.0
Amount of rain-fall for the year ending June 30, 1879	78.42 inches.

Established April 16, 1876.

Office in light-house keeper's dwelling.

Sergeant P. Belville was in charge until October 21, 1878, when he was ordered in for discharge. Private H. J. Forman has had charge since the latter date. Two assistants have been ordered to and two relieved from the station.

The station was inspected during November, 1878. The office was found in good order, and, except slight omissions, the work had been satisfactorily performed.

Extracts from the observer's semi-annual reports:

The display of cautionary and cautionary off-shore signals at this point is chiefly of benefit to the fishermen along the beach, enabling them to secure their nets and boats, and to small coasting vessels. During gales or the appearance of bad weather large vessels give these shoals a wide berth, and very seldom come near enough to the station to discern the signals displayed. Numerous excursion parties from all parts of this State and Virginia visit this point during the summer months, and all take a lively interest in the Service

Seventy cautionary signals and thirty-one cautionary off-shore signals were displayed during the year at this station.

The sergeant remarks as follows in reference to some of these displays:

September 11 *to* 13.—This display was of much benefit to fishermen.

October 4 *to* 7.—Schooners Dexter and John A. Griffin came in and anchored in the harbor.

October 21 *to* 24.—Heavy rain during storm; signal of much benefit to vessels in the harbor and fishermen on the beach. On October 22 steam-yacht Florence Witherbee anchored in harbor; on the night of the 23d she parted her chains and had to run ashore to save life; at this time the velocity of the wind was 100 miles per hour. The same night the schooner Wyoming was dismasted and driven ashore 25 miles north of this station; the captain and one consular passenger were washed overboard and lost. Through the Signal Service this vessel and crew were saved from a total loss. On October 25 the Florence Witherbee succeeded in floating off on an unusually high tide. Hearing of the wrecked Wyoming, Mr. Duncan, owner of the Witherbee, humanely offered to go to her rescue, but from his recent experience and the rough usage he had received he hesitated in again encountering the angry sea; but said if the indications from the Chief Signal-Office predicted favorable weather he would make the attempt. On October 27 this office received and gave to Mr. Duncan the indications, and on the following morning this little river pleasure-yacht steamed out with the utmost confidence and successfully brought the dismasted wreck into Beaufort harbor. That same night a severe northeast gale began, and the sea running high would have filled the wreck with water and sunk her.

November 21 *to* 24.—Gale, accompanied by thunder, lightning, and heavy rain.

January 3.—One schooner made harbor and remained until signals were lowered.

February 2.—Three schooners remained at anchor, wind-bound, until gale abated.

February 6.—Schooner made harbor; remained till signals lowered.

February 17.—Unusual heavy sea.

March 26.—Two schooners made harbor; remained until gale abated.

March 28.—Heavy sea washed away forty-five yards of bank at Old Topsail Inlet.

April 8.—One steamer and two schooners made harbor; remained till gale abated.

April 10.—Heavy sea washed away ten yards of bank at Old Topsail Inlet; tore cable from box and washed it to sea.

May 5.—Half-brig Isis struck by gale on 1st and 2d; cargo listed, and she leaking badly, came in harbor for assistance. Telegraphed Beaufort pilots, who came and took her into Beaufort Harbor.

May 23.—United States light-house steamer Fern sailed, but had to put back on account of gale; remained in harbor until signals were lowered.

June 21.—Crops on this island and on the mainland in this vicinity sustained great injury from effects of storm.

PUBLICATIONS.

Number of Forms 22 issued during the year ending June 30, 1879	12
Total	12

CAPE MAY, NEW JERSEY.

[*Official number*, 54.]

Latitude	38° 56′
Longitude	74° 58′
Elevation of barometer above mean sea-level	27.20 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.029
Mean temperature for the year ending June 30, 1879	53°.8
Amount of rain-fall for the year ending June 30, 1879	42.44 inches.

Established May 24, 1871.

Office, Block A, Lot 27, Beach avenue, Cape May Point.

Sergeant T. F. Townsend continued in charge until December, 1878, when he was relieved by Sergeant G. Onslow, and transferred to Norfolk. The latter was reduced to first-class private April 10, 1879, and ordered in for discharge. Sergeant J. R. Williams was ordered to take charge of station April 12, 1879. Three assistants have been ordered to and three relieved from station during the year.

The station was inspected during February and June, 1879. The records of the office were found properly and neatly kept, and the office in good order.

Extracts from the observer's semi-annual reports:

During the month of December the United States Coast Telegraph Line from Cape May Point to Great Egg Harbor River was put in thorough repair.

The large percentage of justification and the many vessels passing within seeing distance of the display must render cautionary and off-shore signals valuable.

Increasing confidence in, and appreciation of, the service is manifest, particularly among seamen.

The office has many visitors, and the interest in the service and its work continues unabated.

Seventy-one cautionary signals and fifty-four cautionary off-shore signals were displayed at this station.

The sergeant remarks as follows in reference to some of these displays:

July 26 *and* 27.—Schooner wrecked two miles south of Cape May City.

PUBLICATIONS.

Number of Forms 15 (manifold) issued during the year ending June 30, 1879	158
Number of Forms 22 issued during the year ending June 30, 1879	26
Total	184

CHARLESTON, SOUTH CAROLINA.

[*Official number*, 21.]

Latitude	32° 45′
Longitude	79° 55′
Elevation of barometer above mean sea-level	52.49 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.093
Mean temperature for the year ending June 30, 1879	66°.5
Amount of rain-fall for the year ending June 30, 1879	64.33 inches.

Established January 5, 1871.

Office, corner of East Bay and Broad streets.

Sergeant M. McGauran had charge until December 21, 1878, when he was transferred to Davenport, and Sergeant R. R. Martin ordered to assume control. The latter was relieved May 1, 1879, by Sergeant W. A. Chapman. One assistant has been ordered to, and one from, this station; the latter, for absence without leave.

Position of rain-gauge changed September 29, 1878, from platform of flagstaff to the center of the roof, near the northern side of the building, making its elevation about three feet less than formerly, and where it is free from obstruction of any kind.

The station was inspected during September, 1878, and January, 1879. The work at the station was reported as having been generally well performed.

Extracts from the observer's semi-annual reports:

The interest taken by the community in the service has in no wise diminished, but, on the contrary, is daily increasing, from the fact that business men who carefully study the reports find them very advantageous, and their deductions from them, in many instances, have a decided influence in regulating the amount of sales and purchases. Cotton-merchants and others consult the bulletins and weather maps daily, particularly at the time of planting, during the period of growth and until the picking is completed. During the whole time they manifest the greatest anxiety about the condition of the weather, many of whom frequently request special reports giving information which cannot be obtained from the bulletins, such as the total rain-fall for a week or month in a certain locality, any specially heavy rains, an approximation of the temperature, whether higher or lower than in previous years, &c. The statistics are made the subject of careful consideration. Much attention is also given by seamen to the cautionary signals, which, although not always justified at the point displayed, are nevertheless of great value as a preparatory warning in indicating the kind of weather that may be expected, and are generally justified by subsequent reports of rough weather and dangerous winds prevailing during the time of display at places not far distant from the station.

Ten cautionary signals and five cautionary off-shore signals were displayed during the year at this station.

The sergeant remarks as follows in reference to some of these displays:

July 3 *and* 4.—In duration and severity this storm surpassed any that has occurred this year. Many sea-captains visited the office during the display.

September 7 *to* 13.—Owing to the timely warning but little damage was done in harbor and vicinity. The office was visited both day and night by persons seeking information. The most violent storm for more than a year.

November 19.—Brisk easterly winds, accompanied by heavy rains.

December 9 *and* 10.—Vessels detained by the storm.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	6,809
Number of Local Reports issued during the year ending June 30, 1879	482
Number of Forms 15 (manifold) issued during the year ending June 30, 1879	1,555
Number of Forms 22 issued during the year ending June 30, 1879	34
Total	8,880

CHARLOTTE, NORTH CAROLINA.

[*Official number*, 199.]

Latitude	35° 13′
Longitude	80° 51′
Elevation of barometer above mean sea-level	785.85 feet.

Established October 6, 1878.

Office, in Traders' National Bank building, northeast corner of Tryon and Trade streets.

Sergeant D. O'Donoghue opened the station and has continued in charge.

The station was inspected in October, 1878, and January, 1879. The office was found in excellent order; the records correct and up to date.

Extracts from the observer's semi-annual reports:

Reports from twenty-eight stations are received in the a. m., fifteen in the p. m., and fourteen at midnight. Four copies of the manifold bulletin are issued in the a. m. and the same number in the p. m. Two bulletins of the midnight reports are made out. A great many persons have visited the office since its establishment; some from curiosity and others to gain information and see the workings of the office.

The bulletins are regularly read, especially the one in the Central Hotel, where all classes congregate.

I have no doubt but that the office here will prove a great benefit for agricultural purposes. The intelligent classes are giving it their hearty support, while the less intelligent look on it with surprise. Various parties consult this office and are guided very much in their arrangements by information received. Those mostly benefited are agriculturists and those interested in cotton. The latter class watch the weather reports very carefully, especially the rain-fall in the cotton districts.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	1,604
Number of Forms 22 issued during the year ending June 30, 1879	24
Total	1,628

CHATTANOOGA, TENNESSEE.

[*Official number*, 208.]

Latitude	35° 04′
Longitude	85° 15′
Elevation of barometer above mean sea-level	774.00 feet.

Established January 8, 1879.

Office, in Hamilton County court-house.

River and rain-fall observations were taken at this point since September 17, 1875, by a civilian observer, until establishment of the full station.

Private B. L. Goulding opened the station and has continued in charge.

Highest water in the river, 38 feet occurred January 15, 1879; lowest water, 11 inches, September 14 and 15, 1878.

Extract from the observer's semi-annual report:

A temporary office was opened in the Western and Atlantic Railroad building, corner of Ninth and Market streets, and the first observation therein taken at 4.02 p. m., January 8, with elevation of barometer above sea-level 697 feet. It was removed to its present quarters, prepared by the county court, without the loss of any observations. It is handsomely furnished, and the roof privileges are all that can be desired. The exposure of the instruments is good, the shelter occupying a commodious window facing due north, the barometer hanging near the same, the vane indicating the direction of the wind upon a circle on the ceiling of the office, and the rain-gauge, anemometer and large wind-vane well situated upon the roof.

A permanent meteorological committee was appointed by the president of the Iron, Coal and Manufacturers' Association on February 6; Dr. E. M. Wight, chairman.

The river-gauge used by Mr. C. Stivers, the special river observer, was found to be in an unserviceable condition. It has been repainted, and a ladder leading down to it constructed and bolted to the high cliff which overhangs it, thus affording facility for taking observations by day or night at any stage of water.

Those classes most benefited by the reports, are rivermen, farmers, and builders, though the office has not been long enough in operation to afford a fair test.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 40, 1879	1,020
Number of Forms 22 issued during the year ending June 30, 1879	11
Total	1,031

CHEYENNE, WYOMING TERRITORY.

[*Official number*, 68.]

Latitude	41° 12′
Longitude	104° 42′
Elevation of barometer above mean sea-level	6,057.25 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	*29.971
Mean temperature for the year ending June 30, 1879	*45° 8
Amount of rain-fall for the year ending June 30, 1879	7.90 inches.

Established November 1, 1870.

Office, Seventeenth between Ransom and Dodge streets.

Sergeant J. H. Smith has had continuous charge of the station since date of last report.

The station was inspected in December, 1878. The records of the office were reported in good order and the duties properly performed.

Extracts from the observer's semi-annual reports:

The interest manifested by the people of this section of the country in the service is limited to a few inquiries now and then about the temperature, wind, &c.

The usual display of weather reports has been continued with satisfaction to the public. The daily papers continue to give liberal space to reports and other items of meteorological interest presented for publication. Stock-growers and ranchmen are about the only class of citizens in this section of the country who appear to be interested in, and receive benefits from, the operations of the service. Cattlemen and others, before making trips to their ranches during the winter months, invariably call at this office for the weather indications as shown by the instruments, and it quite frequently happens that journeys have been undertaken, delayed, or abandoned on the information furnished, and in almost every case with satisfactory results.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	1,846
Number of Forms 22 issued during the year ending June 30, 1879	24
Total	1,870

CHICAGO, ILLINOIS.

[*Official number*, 37.]

Latitude	41° 52′
Longitude	87° 35′
Elevation of barometer above mean sea-level	657 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.998
Mean temperature for the year ending June 30, 1879	49°.5
Amount of rain-fall for the year ending June 30, 1879	33.70 inches.

Established November 1, 1870.

Office, Major Block, southeast corner Madison and La Salle streets.

Sergeant J. G. Lynch has had continuous charge since last report. Three assistants have been ordered to and three transferred from the station.

The station was inspected in September, 1878, March, 1879, and May, 1879. The office was found in good order, the records generally up to date, and the work satisfactorily performed.

* Means for October, 1878, computed for 30 days only.

During the year six hundred and thirteen post-offices and fourteen persons and places were supplied with the Farmers' Bulletin.

Extracts from the observer's semi-annual reports:

The close of navigation was officially set down in marine and marine-insurance circles for November 30, but the sailing fleet and most of the steamboat lines were not laid up until December 15. The Goodrich Transportation Company ran their steamers daily to Milwaukee and other points, and did not anticipate any interruption during the season.

April 29 the schooner R. C. Crawford arrived at this port, being the first vessel through the straits of Mackinac, although navigation in Lake Michigan was practicable some time before that.

The city authorities continue to light the city lamps by regulations based upon the reports of this service.

The amount of interest manifested in the service is constantly on the increase, if the number of visitors, daily, to this office and the very complimentary comments of the Chicago press may be taken as criterions.

The reports and records of the office have been utilized in the arbitration of a number of cases, and called in evidence in the State and Federal courts. The only instance when they were not admitted as conclusive evidence of all the meteorological conditions recorded, is the Cook County criminal court, in the La Grange murder case (December 23); the evidence was ruled out because the original record of observations could not be produced, although the court was informed that the said record was preserved among the archives of the office of the Chief Signal-Officer, at Washington, D. C.

The fire-marshal of this city has taken much interest in the Signal Service reports, and proposes to utilize them for the benefit of his department and the citizens generally by a scheme of repeating all cautionary signals at the several engine houses in the city.

Thirty-six cautionary signals were displayed during the year.

The display of signals was suspended December 15, 1878, and resumed March 20, 1879.

The sergeant remarks as follows in reference to some of these displays:

July 25 *to* 27.—The heavy rain caused considerable damage; railroads and culverts were washed, and cellars and sewers flooded.

September 19.—Vessels remained in port.

September 27 *to October* 1.—All sailing vessels remained in port; no casualties reported except the loss of light spars and canvas in two or three instances.

October 15 *to* 17.—All vessels remained in harbor.

October 30 *and* 31.—Although this signal was not justified at the station, captains of inward-bound vessels report a heavy gale on the lakes, besides several minor disasters; one vessel (name unknown) was cast ashore on the southeastern coast.

November 1 *and* 2.—All vessels remained in harbor during the display. The press reports Captain Saunders of the schooner Kelderhouse, lost overboard; bark Woodruff totally wrecked, and two of her crew missing; schooners American, Australia, Montpelier, and one unknown, were cast ashore; bark Rutter sunk, besides numerous other disasters.

November 27 *and* 28.—This signal, although not justified at the station, was considered justified by navigators on account of the heavy gale on the lake. They also report a rough, high sea long after the wind had subsided.

May 28 *to June* 1.—Schooner Asa Childs sprung a leak and sunk at Highland Park; crew barely escaped life; other vessels slightly damaged in rigging and lighter spars.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1879	300,804
Number of Bulletins (manifold) issued during the year ending June 30, 1879	9,124
Number of Local Reports issued during the year ending June 30, 1879	1,800
Number of Forms 22 issued during the year ending June 30, 1879	154
Total	311,882

CINCINNATI, OHIO.

[*Official number*, 65.]

Latitude	39° 6′
Longitude	84° 26′

Elevation of barometer above mean sea-level ..... 620.42 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879 ..... 30.048
Mean temperature for the year ending June 30, 1879 ..... 55°.9
Amount of rain-fall for the year ending June 30, 1879 ..... 41.63 inches

Established November 1, 1870.

Office, Pike's Opera House, southeast corner of Fourth and Vine.

Sergeant N. Gorom has remained in charge. Three assistants have been ordered to and three transferred from this station.

Highest water in the river, 41 feet 2 inches, occurred December 15, 1878; lowest water, 4 feet 4 inches, October 22, 23, 24.

December 19, the canal was frozen over.

December 24, the river was full of floating ice and impeded navigation to all points above. Navigation was resumed January 15.

This station was inspected in September 1878, April, 1879, and May, 1879. The office and records were reported as having been found in excellent condition, and the men on duty as promptly attending to their duties.

During the year, five hundred and forty-six post-offices and twenty persons and places were supplied with the Farmers' Bulletin.

Extracts from the observer's semi-annual reports:

The interest taken in the service steadily increases, and it would be a difficult matter to name any class of citizens who do not derive some benefits from the same, directly or indirectly. The pork-packers and provision-dealers closely watch our reports, and by a little study of our large weather map, daily, are enabled to take advantage of any favorable change in the weather some time prior to the time the change takes place here, and act accordingly; for instance, porkmen will begin to slaughter, although the temperature might be 50°, if from our reports the conditions are favorable that within eight hours the temperature will fall to 40° or less. This is a large item, and the means of saving considerable money, when packing is extensively done as in this market. All the pork-packers in the city and vicinity are greatly benefited by our reports and are entirely guided by them in killing.

The anticipation of polar waves is a very important item and the means of saving pork-packers and others considerable sums of money, and also delays the transportation of perishable goods by provision dealers, &c., until the conditions are more favorable.

Grain-dealers are mostly interested in the reports during the summer months, and are anxious for reports of rain-fall in the northwest during the planting, growing, and harvest; heavy rains in that section reported during these periods greatly influence the markets.

The river reports are consulted daily by rivermen, shippers, and coal-dealers, who often take advantage of information derived therefrom. Navigation remained suspended from December 2 to January 15. The low temperatures reported from our northwestern stations on the morning of January 2 caused numerous visits to the office by rivermen to ascertain the probable temperature for the succeeding day and the prospects for a complete closing of the river at this point. On the information obtained from the office the superintendent of the United States Mail Line decided to move his boats over into the Licking, as the indications were that the river would be frozen solid next morning. River frozen solid on the 3d, and crossing on the ice from that time until the 13th. The press has taken the usual interest in the service, and devoted a large amount of space, often going to considerable expense in publishing the reports furnished by this office.

Reports are still furnished the board of health and published in connection with the mortality statistics, and are considered of great value to medical science and to the successful sanitary condition of the city. The office is frequently visited by parties desiring information relating to temperature, rain-fall, &c.

The records are frequently called for and used as evidence in the courts, and are consulted in all cases where the weather, rain-fall, temperature, &c., have any bearing.

The Gold and Stock Telegraph Company still send an extract from the a. m. bulletin over their line, and it proves a great convenience to the merchants generally. The same information is sent from the p. m. bulletin during the winter months, more especially for the benefit of pork-packers and provision-dealers.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1879	185,459
Number of Bulletins (manifold) issued during the year ending June 30, 1879	8,171
Number of Local Reports issued during the year ending June 30, 1879	1,764
Number of Forms 22 issued during the year ending June 30, 1879	156
Number of Forms 26 issued during the year ending June 30, 1879	2,910
Total	198,460

CLEVELAND, OHIO.

[*Official number*, 34.]

Latitude	41° 30
Longitude	81° 47
Elevation of barometer above mean sea-level	689.43 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.024
Mean temperature for the year ending June 30, 1879	48°.8
Amount of rain-fall for the year ending June 30, 1879	50.15 inches.

Established November 1, 1870.

Office, room 19 National Bank, southeast corner of Superior and Water streets.

Sergeant D. Cuthbertson has continued in charge, with private S. W. Glenn as assistant.

The station was inspected in September, 1878, and February, 1879. The office and records were found carefully arranged and well kept. The observer and assistant were well spoken of, and the work of the station satisfactorily attended to.

Extracts from the observer's semi-annual reports:

The reports are anxiously watched by all classes of the community, a number of the shipping men having become so familiar with them from habitual study as to be able to predict, with an astonishing degree of accuracy, the kind of weather which will follow the issue of the a. m. bulletin. Captain McLaughlin, of the steamer Northwest, the recognized authority among seamen at this port, informs me that his bulletin is an everpresent and indispensable article in the equipment of his cabin, and that he pays as much attention to it as he does to his compass. I mention this gentleman especially from the fact that eighteen months ago he was the most skeptical captain sailing these waters in regard to the efficiency of the Signal Service. He is only one of many who now express their confidence in unlimited terms, and are ever ready and anxious to receive and act upon any information which we can give in regard to approaching storms or changes of wind.

The press and individual parties receiving reports from this office express themselves in regard to the service in a very flattering manner, and it is very patent that the local interest in the service is growing stronger every month.

Navigation closed December 15 and March 24. The lake was frozen over from December 23 to January 27, but observations of temperature of water could not be taken until March 10, in consequence of floating ice around the piers.

Referring to cautionary signals, I have to state that herein lies the principal strength of the service at this station, for immediately upon the hoisting of the flag or lantern the office is visited by merchants and shipping men anxious to know the extent of the storm anticipated and direction from which it may be expected. They acknowledge that the signals have saved unknown wealth and many lives.

As an instance of the confidence taken in the service, the tug office in this city refuses to tow vessels out of port during the display of cautionary signals. Captains and seamen visiting the office state that the warnings at these ports are of great value to all classes of the community.

During the spring, contractors, painters, and builders derived a great deal of benefit from the service in regard to approaching rain-storms.

The observer was ordered into court February 24 with the records of the station.

Thirty-seven cautionary signals were displayed during the year.

The display of signals was suspended December 15, 1878, and was resumed March 20, 1879.

The sergeant remarks as follows in reference to some of these displays:

July 23 *to* 27.—Only one vessel left port during the display. The great service rendered by the display was universally acknowledged.

August 24 *and* 25.—Two schooners left port during the display and were forced to put back. Owners of vessels admit the display prevented many disasters.

September 11 *to* 14.—This signal was fully justified, being the most severe and destructive storm felt here in many years. Over fifty vessels remained in port.

September 20 *and* 21, *and* 25 *to* 26.—These signals were fully justified. A number of vessels remained in port during the displays.

October 9.—Several sailing-vessels remained in port during the display.

October 22 *to* 24.—Over fifty sailing-vessels remained in port during the display.

November 6 *to* 8.—This signal was much appreciated by seamen and others, and was generally heeded.

November 11 *to* 13.—No sailing-vessel left port during the display. The warning gave general satisfaction to all parties and prevented many disasters.

November 26 *to* 29.—The timely warning was highly commented upon by all interested in the display, and undoubtedly prevented many disasters. Extra precaution was taken by owners and captains, owing to the announcement by telegram from the chief office of the approach of a very severe storm.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	8,142
Number of Local Reports issued during the year ending June 30, 1879	1,664
Number of Forms 15 (manifold) issued during the year ending June 30, 1879	7,050
Number of Forms 22 issued during the year ending June 30, 1879	144
Total	17,000

COLORADO SPRINGS, COLORADO.

[*Official number*, 109.]

Latitude	38° 55′
Longitude	104° 58′

Established November 12, 1873.

No meteorological observations have been taken during the year, it being a supply station to Pike's Peak.

COLUMBUS, OHIO.

[*Official number*, 187.]

Latitude	39° 57′
Longitude	83° 3′
Elevation of barometer above mean sea-level	804.00 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.012
Mean temperature for the year ending June 30, 1879	52°.4
Amount of rain-fall for the year ending June 30, 1879	34.03 inches.

Established July 1, 1878.

Office in Huntington Block, southeast corner of High street and Broadway.

Sergeant D. D. Stansell has remained in charge.

The station was inspected during October, 1878, and April, 1879. The office and records were found in good order, and the work of the office satisfactorily attended to.

Extracts from the observer's semi-annual reports:

The office was temporarily located on the second floor of the Irving House, Broadway. On July 15 it was removed to its present location, fourth floor of the Huntington building, corner Broadway and High streets, southwest.

The station is equipped with two complete sets of meteorological instruments.

The instrument shelter is located in a north window, and the several thermometers therein exposed are at an elevation above the pavement of 52 feet.

Tri-daily weather reports are received from twenty-eight different stations.

The editors of the several daily papers published here inform me that the public is manifesting a decided interest in the weather publications throughout the whole territory of their circulation; that special interest is taken by the public institutions at this point; that they are in receipt of many requests to regularly publish the weather reports, as many keep a record of them, and that it is safe to say that the interest is general throughout the city and country adjacent.

Too much credit cannot be awarded the press for their untiring interest in the service, and their generous co-operation with the observer in bringing reports before the public. They have continued to regularly publish all bulletins and press reports issued to them, and have been ever ready to contribute space in their papers for all matter of general or local interest pertaining to the service.

June 18, the general assembly of the State of Ohio enacted a law extending the privileges of the State library to the service at this point. Many people have visited the office to examine into the methods of operating the Signal Service, and to express their interest and satisfaction with the manner in which its benefits are distributed.

The benefits derived from the service are not confined to any particular branch of business or local enterprise, but are very general, all classes of citizens taking much interest in the weather reports.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	3,972
Number of Local Reports issued during the year ending June 30, 1879	489
Number of Forms 22 issued during the year ending June 30, 1879	20
Total	4,481

CORSICANA, TEXAS.

[*Official number*, 107.]

Latitude	32° 05′
Longitude	96° 30′
Elevation of barometer above mean sea-level	445.00 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.026 inches.
Mean temperature for the year ending June 30, 1879	66° 5′
Amount of rainfall for the year ending June 30, 1879	43.73 inches.

Established September 15, 1874.

Office in Commercial building, corner of Collins and Beacon streets.

Sergeant J. W. Smith was relieved January 20, 1879, by Private J. W. Clifford. The latter was relieved June 26, 1879, by Sergeant H. F. McFarland.

The station was inspected in April, 1879. It was reported that the duties had been satisfactorily discharged, but the office was found in a dirty condition.

Extracts from the observer's semi-annual reports:

Reports of rain-fall, frosts, temperature, &c., have been furnished from time to time to the officers of the Texas Central Railroad, and they have been the source of much assistance to them in several cases of litigation.

The farming community of the entire country are very much interested in the service, and during the present season no less than eleven have purchased rain-gauges of the pattern in use at this office, for the purpose of satisfying themselves as to the rain-fall in their several localities. The office is visited daily by many of this class, and on Saturdays the office is often crowded by farmers anxious to consult the records on file.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1879	627
Number of Forms 22 issued during the year ending June 30, 1879	39
Total	666

DAVENPORT, IOWA.

[*Official number*, 51.]

Latitude	41° 32′
Longitude	90° 38′
Elevation of barometer above mean sea-level	504.41 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.024
Mean temperature for the year ending June 30, 1879	50°.1
Amount of rain-fall for the year ending June 30, 1879	30.78 inches.

Established May 24, 1871.

Office in First National Bank building, southwest corner of Main and Second streets.

Sergeant R. R. Martin was relieved January 12, 1879, by Sergeant M. McGauran and transferred to Charleston, S. C.

The station was inspected during September, 1878, and April, 1879. The office records were found to have been properly kept, the office in good order, and the duties faithfully and intelligently discharged upon the former occasion, during Sergeant Martin's charge. Upon the latter visit the office and a portion of the records were reported in a very disorderly and slovenly condition, but the duties of the office well attended to.

Highest water in the river, 7 feet 10 inches, was recorded June 1, 1879; lowest water, 0 feet 11 inches, September 19 and 20, 1878.

Extracts from the observer's semi-annual reports:

Floating ice first made its appearance in the river on December 7. Navigation closed for the season on December 18. River-gauge readings were suspended on December 19 on account of ice; 20th, the ice gorged, river closed and remained frozen.

The public interest in the work of the Signal Service continues unabated. The published indications are consulted by all classes, the shipping and commercial interests being benefited in the greatest degree.

Navigation opened at this point March 16, 1879, having been closed 84 days. The steamer Tidal Wave on that day arrived from Saint Louis, destined for points farther north.. She returned on the 24th, being the first vessel of the season both ways.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	2,672
Number of Local Reports issued during the year ending June 30, 1879	66
Number of Forms 22 issued during the year ending June 30, 1879	60
Total	2,798

DEADWOOD, DAKOTA.

[*Official number*, 185.]

Latitude	44° 22′
Longitude	103° 34′

Re-established November 1, 1878.

Office, on second floor of Davis's Assay Building, corner Main and Shine streets.

The barometer cistern is 35 feet higher than during the time the old station was occupied.

Sergeant D. M. Kennedy was ordered to be relieved from the charge of the station, March 20, by Sergeant John O'Dowd. Two assistants have been ordered to and two relieved from this station during the year.

Extracts from the observer's semi-annual reports:

In order to reduce expenses, two rooms were dispensed with June 1, and the office moved across the hall to the north side of this building, which gives a better exposure to the instruments and more desirable rooms.

Two daily papers have regularly published the local observations taken at this station.

Considerable interest is manifested in the service, and numerous applications are made for reports to be used in determining the climatology of this section.

The roof affords excellent exposure for the rain-gauge, anemoscope, and anemometer, and is well suited for the erection of the large wind-vane.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1879	330
Number of Forms 22 issued during the year ending June 30, 1879	10
Total	340

DENVER, COLORADO.

[*Official number*, 76.]

Latitude	39° 45′
Longitude	105° 4′
Elevation of barometer above mean sea-level	5,269.00 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.999
Mean temperature for the year ending June 30, 1879	50°.3
Amount of rain-fall for the year ending June 30, 1879	15.47 inches.

Established November 19, 1871.

Office in Broadwell Block, corner Sixteenth and Larrimer streets.

Sergeant J. A. Barwick was relieved December 7, 1878, by Sergeant A. C. Dobbins. Sergeant A. C. Ford died of consumption January 23, 1879.

The station was inspected in December, 1878. The records of the office were reported as having been properly kept and in good order.

Extracts from the observer's semi-annual reports:

Observations on ozone have been continued during the year, and copies of the report furnished to the office of the Chief Signal-Officer, to Dr. Charles Ambrook, to the secretary of State board of health, and to Dr. G. W. Barnes, San Diego, Cal.

The telegraphic report of the sunset observations from Carson and Trinidad are received and transferred at this station.

The local weather report is published by the Denver Daily Tribune, Rocky Mountain News, and Daily Times, daily except Sunday. These papers also publish the monthly weather summary. Great interest is manifested both by the press and public in the service.

The office is held in high esteem, and no pains are spared to render all the information required.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1879	1,294
Number of Forms 22 issued during the year ending June 30, 1879	83
Total	1,377

DES MOINES, IOWA.

[*Official number*, 189.]

Latitude	41° 35′
Longitude	93° 40′
Elevation of barometer above mean sea-level	849.12 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	*30.007
Mean temperature for the year ending June 30, 1879	*48°.0
Amount of rain-fall for the year ending June 30, 1879	*25.27 inches.

Established August 1, 1878.

Office, in McCain's Block, corner of Sixth and Walnut streets.

Sergeant P. Connor has had charge of the office since the establishment

* Means for eleven months only; one observation missed in December, 1878.

of the station. Private F. M. Cleaver has been on duty as printer since January 31.

An inspection of the office was made last August. The office records and instruments were reported in good condition.

The issue of the Farmers' Bulletin was commenced on May 8, and has continued since that date. Sixty-six post-offices have been supplied regularly, and one copy issued for private use.

Extracts from the observers semi-annual reports:

The sergeant was cordially received by the mayor of the city and was materially assisted by him in establishing the station.

The Des Moines River entirely closed about the middle of December and began to break up about February 26; about March 6, the river was free from ice.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1879	3,109
Number of Bulletins (manifold) issued during the year ending June 30, 1879	790
Number of Forms 22 issued during the year ending June 30, 1879	24
Total	3,923

DETROIT MICHIGAN.

[*Official number*, 36.]

Latitude	41° 21′
Longitude	83° 7′
Elevation of barometer above mean sea-level	635.00 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.992
Mean temperature for the year ending June 30, 1879	47°.8
Amount of rain-fall for the year ending June 30, 1879	46.58 inches.

Established November 1, 1870.

Office in Bank Block, southeast corner of Griswold and Congress streets.

Sergeant T. V. Van Heusen was relieved from the charge of the station February 24 by Sergeant C. F. R. Wappenhans, and transferred to New Orleans. Two assistants have been ordered to the station, one to relieve the civilian printer employed and the other to take the place of the assistant ordered to this office.

The station was inspected in September, 1878, and March, 1879. The office and records were found to have been neatly and properly kept; the observer and assistants very well posted in their duties, and the work of the station satisfactorily attended to.

During the year, three hundred and thirty-four post-offices and sixteen persons and places were supplied with the Farmers' Bulletin.

Navigation closed December 18, 1878, and opened March 31, 1879.

Extracts from observer's semi-annual reports:

The large weather map at the board of trade has been changed daily, Sundays and holidays excepted. The members of the board have learned to appreciate the value of this map, so that it has become indispensable to many of them in the transaction of their daily business affairs. Sudden changes of weather, extremes of temperature &c., particularly at certain seasons of the year, have a marked effect upon the values of agricultural produce. To be able to foretell the nature and extent of such changes, which the majority of operators upon the board have been taught to do, is of incalculable benefit to produce dealers, as it robs speculative transactions of much of their risks. Not alone are those who deal in grain, pork, &c., able to reap benefits from a knowledge of the coming weather, as they learn it by careful study of this map, but contractors, builders, vesselmen, commission merchants and others, make this information of practical value in carrying on their various pursuits. It has been observed, again and again, that the first thing consulted by members upon entering the room, even before the commercial bulletins, market reports, &c., are glanced over, is the weather map. As proof of its value to them may be cited the applications that have

been made to have the number of stations shown upon it increased, so that information might be obtained concerning the weather in the entire western country. Could a suitable location be obtained, another map for the benefit of the general public could be displayed with good results.

The statement is advisedly made that the meteorological reports are features of the Detroit papers which are among the indispensable and best read ones.

Owing to the topographical situation of Detroit, which causes the prevailing westerly winds to be less severely felt than at other lake ports, but a small percentage of the cautionary signal displays can be reported as justified. Winds here rarely attain more than 60 to 70 per cent. of the velocity that they do at the Lake Erie and Michigan stations. During the season of navigation it is a frequent occurrence for captains of vessels to come to the office and speak of certain storms upon the lakes in this vicinity, when at the time indicated the register would show no greater velocity of wind at the station than 20 or 22 miles per hour. Often have those interested in shipping matters spoken of the timely warning given of this and that storm, and the complete verification of the signal, when the very display spoken of would of necessity be recorded and reported as "not justified," the register not having shown the required velocity of 25 miles per hour. Though the greater number of displays made during the last season were reported as not justified, a single instance is not recalled in which, upon inquiry among the vesselmen, it was not found that a storm had been experienced upon the lakes. Situated upon the banks of a narrow river or strait, through which passes the greater portion of the lake shipping, this is consequently a most important point for the display of storm warnings and the obtaining of information regarding the weather. It is not of infrequent occurrence for vessel captains, who are temporarily detained here, to visit the office to learn particulars regarding prevailing or anticipated storms, and it has been frequently stated by those who transact business along the river shore that when captains of passing vessels make hurried trips on shore for supplies, &c., they invariably asked to be directed to the nearest point where a weather bulletin is displayed. The number of those who visit the office during times of displays increases yearly, and this, too, notwithstanding the fact that the public have learned, in a great measure, to extract their own information from the published and posted reports. Owners of vessels, when telegraphed to by their captains for orders or advice, will bring the telegram to this office and ask, "How shall I answer them?" Telegrams from vessel captains have been brought to this office reading, in substance: "Signals are up here and I cannot go out." "Weather looks threatening; is storm signal up at Detroit?" "Heavy sea running; ask signal sergeant if storm is expected." "My barometer is falling rapidly; telegraph weather probabilities," &c., all of which goes to show the faith had in the efficiency of the storm warnings. Among the larger vessel owners and associations who use this office and its reports in conducting their affairs may be mentioned: Captains Nicholson, Candler, Grummond, Pridgeon, McDonald, Whipple, and others, and the Northern Transit Company, Ashley and Mitchell Line, Bay City Company, Put-in-Bay Line, Detroit and Cleveland Steamship Company, &c. This last company sends a messenger to the office each evening at 6 o'clock to learn the nature of weather and the direction and velocity of the wind at Detroit, Toledo, Sandusky, and Cleveland. Great confidence is had in the weather reports, and in several instances when informed that it would be dangerous to attempt to make the usual night trip this company has detained its boat. The establishment of the various display sections upon the lake shore has met with the warmest commendations, and it has been asserted that it detracts 20 per cent. from the risks of lake navigation. The operations of these sub-stations, so far as this office is concerned, has been generally satisfactory. As confirmation of an oft-repeated declaration, that this system of storm warnings is indispensable for the protection and advancement of commercial interests, may be cited the statement made by the marine editor of the Buffalo Express, in response to the inquiry, "Why in these great storms do we have so remarkably few marine disasters as compared with former years?" The reply given was, in substance, that the system of storm signals had been so extended and improved as to be almost perfection, and that mariners had been taught the value of the signal and learned to heed it. This opinion was extensively copied and fully indorsed by the marine editors of various papers published in cities along the lake board. Day and night signals were, as usual, duplicated by J. P. Donaldson & Company until March 24, and after that date from the flag-staff on the board of trade building, and day signals by M. S. Smith & Co.

The daily telegraphic reports posted throughout the city continue to be a medium through which a large portion of the public derive information of great pecuniary value. The increasing demand for these reports sufficiently proves their value. There are so many trades and callings, the interests of which are so largely affected by the weather, that a bulletin announcing expected changes cannot fail to be consulted by a very large number of people, now that the accuracy of the weather predictions and reports is so well known. Apart from those who have learned to interpret for themselves the meaning of the various changes in the meteorological conditions over the

different sections, there are a large number who call at the office for information. The commission merchants, fruit and oyster dealers, produce-dealers, &c., during certain seasons of the year, send daily to the office for information. Shippers forward or hold back, as the case may be, their goods in accordance with the instructions had from this office. Ice-dealers and harvesters are also similarly guided in their operations. Calls from these people increase yearly, and in certain kinds of weather they are so numerous and frequent as to be an annoyance when there are urgent duties to be performed. To be brief, if the value of the information yearly given to travelers, hunters, boating associations, excursionists, lumbermen, vesselmen, ice-dealers, brewers, &c., could be estimated in dollars and cents, it would amount to a sum sufficient to maintain the whole Signal Corps.

The records of the office continue to be consulted by lawyers engaged in civil suits for damages on account of goods ruined by changing conditions of weather, and the sergeant in charge has several times been called to the witness-stand.

The manager of the Detroit Post and Tribune has requested that the midnight manifold weather bulletin, discontinued at his request, November 22, and action approved November 26, be again supplied that paper for partial publication. He states that, since its publication has been discontinued by his paper, remonstrances against his action have been so numerous and so earnest, particularly on the part of the lumber interest, that he feels it his duty to resume the publication. When it is considered that these protests come from a class whose numbers are so limited, and who receive so little practical benefit from our reports as compared with the agricultural and marine classes, I regard them as flattering testimonials of the appreciation in which the weather reports are held. I feel confident that if these papers had discontinued this publication at any other season of the year, the remonstrances of the agricultural and marine classes would have been much more numerous and earnest than those received by the Post and Tribune from other sources.

Thirty-two cautionary signals were displayed during the year.

The display of signals was suspended for the season December 15, 1878; resumed March 20, 1879.

The sergeant remarks as follows in reference to some of these displays:

July 26.—Very rough weather reported on the lake.

September 13 *and* 14.—Although this signal was not justified at the station, captains of vessels report a heavy gale on the lake. All vessels arriving show signs of having encountered a severe storm.

September 20 *and* 21.—Chimneys, awnings, and sign-boards blown down. Buildings at the State fair grounds were sprung from their foundations by the violence of the wind.

October 9.—Vessel captains report the gale to have been especially severe upon adjoining lakes; no disasters of a serious nature reported; mariners, newspaper reporters, and others visited the office during the display for information.

December 1 to 4.—Officers of the steamer Northwest report heavy sea on Lake Erie.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1879 ..	118,780
Number of Bulletins (manifold) issued during the year ending June 30, 1879.	5,027
Number of Local Reports issued during the year ending June 30, 1879.....	1,090
Number of Forms 22 issued during the year ending June 30, 1879.....	65
Number of Forms 26 issued during the year ending June 30, 1879.....	18
Total	124,980

DODGE CITY, KANSAS.

[*Official number*, 106.]

Latitude	37° 39′
Longitude	100° 8′
Elevation of barometer above mean sea-level	2,486.00 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.667
Mean temperature for the year ending June 30, 1879	54°.5
Amount of rain-fall for the year ending June 30, 1879	14.55 inches.

Established September 15, 1874.

Office, second story, southeast corner of Walnut street and Second avenue.

Sergeant W. H. Clendenon has continued in charge, without an assistant.

The station was inspected in December, 1878. The office and records were reported in good condition and properly kept; the observer, as understanding the station duties.

Extracts from the observer's semi-annual reports:

An encouraging amount of interest continues to be manifested in the service by the public, and the signal office is looked upon as one of the institutions of this city. Few professional or scientific men visit the town without calling at the office before leaving, and strangers generally do the same. During the recent severe drought which afflicted this region the office was visited almost daily by all clases of persons, anxiously seeking for indications of rain.

PUBLICATIONS.

Number of Forms 22 issued during the year ending June 30, 1879	156
Total	156

DUBUQUE, IOWA.

[*Official number*, 98.]

Latitude	42° 30′
Longitude	90° 44′
Elevation of barometer above mean sea-level	664.62 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.008
Mean temperature for the year ending June 30, 1879	48°.8
Amount of rain-fall for the year ending June 30, 1879	32.33 inches.

Established July 10, 1873.

Office in Sullivans' Block, southwest corner of Main and Sixth streets.

Sergeant J. H. Smith has remained in charge throughout the year. He has not had an assistant.

The station was inspected in September, 1878, and March, 1879, and the following reports were made: Office, in excellent order; records, very neat and properly kept; observer's conduct, very satisfactory, and his duties faithfully attended to.

Highest water in the river, 10 feet 8 inches, occurred May 30, 1879; lowest, 1 foot 7 inches, December 13 and 17, 1878.

Navigation in the Mississippi closed December 2, 1878, on account of low water, being lowest since 1857; river full of floating ice December 6; navigation resumed March 22, 1879.

Extracts from the observer's semi-annual reports:

The afternoon (4.35 p. m.) telegraphic reports from seven stations are received and bulletined daily. The greatest interest is taken in the service by all classes of citizens, the office being daily visited by some one in search of information. The rivermen are, as heretofore, the most directly interested in the reports, and are outspoken in the recognition of their value and importance to the boating and logging interests of this port.

The publication of the river reports in the daily papers was resumed upon the opening of navigation, March 9.

The records of this office have been twice produced in court during the past six months, on June 4 and 13.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	2,150
Number of Local Reports issued during the year ending June 30, 1879	1,050
Number of Forms 22 issued during the year ending June 30, 1879	34
Number of Forms 26 issued during the year ending June 30, 1879	1,800
Total	5,034

DULUTH, MINNESOTA.

[*Official number*, 40.]

Latitude	46° 48′
Longitude	92° 8
Elevation of barometer above mean sea-level	642.72 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.979
Mean temperature for the year ending June 30, 1879	41°.3
Amount of rain-fall for the year ending June 30, 1879	31.01 inches.

Established November 1, 1870.

Office in second story Edmond's Block, southeast corner of Superior street and Lake avenue.

Sergeant H. Bessant has had continuous charge of the station during the year.

The station was inspected in August, 1878, and in May, 1879. The office was reported in good order and well arranged, the records properly kept, the observer as understanding and attentive to his duties.

Extracts from the observer's semi-annual reports:

The local interest in the service continues unabated, and great reliance is placed upon the display of cautionary signals. Captains of vessels rarely leave port without calling at the office to learn the indications, and are nearly always influenced by them. In threatening weather, also, when no signals are displayed, the office is frequently consulted by captains of vessels about to leave port as to the probable weather and direction of wind for the ensuing twenty-four hours.

The old chamber of commerce was reorganized January 15, 1879, and a meteorological committee appointed. The members make frequent visits to this office, and express themselves well pleased with the workings thereof and the benefits derived from the service.

The harbor closed with ice on the 5th of February, and on February 28 it extended outward as far as the eye could reach, having an average thickness of about 4 inches. The first departure of the season was made March 15, and the first arrival March 17.

Thirty cautionary signals were displayed during the year.

The display of signals was suspended December 15, 1878, and resumed March 20, 1879.

The sergeant remarks as follows in reference to some of these displays:

September 5.—The propeller Peerless took warning by the signal and remained in port, although loaded and ready for departure.

October 15 *to* 17.—All vessels remained in harbor during the display.

October 29.—The propeller City of Winnipeg left port while signals were hoisted, but was obliged to return, having encountered a severe wind and snow storm.

November 5 *to* 7.—The propeller China, although loaded and ready to depart on the 5th, remained until the 7th.

June 14 *and* 15.—Steamer Manitoba took warning and delayed her departure.

PUBLICATIONS.

Number of Forms 22 issued during the year ending June 30, 1879	12
Total	12

EASTPORT, MAINE.

[*Official number*, 94.]

Latitude	44° 55
Longitude	66° 54′
Elevation of barometer above mean sea-level	61.25 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.913
Mean temperature for the year ending June 30, 1879	41°.7
Amount of rain-fall for the year ending June 30, 1879	42.04 inches.

Established April 1, 1873.

Office in third story of United States custom-house, northwest corner of Washington and Water streets.

Sergeant Thomas A. Taylor was relieved October 15, 1878, for violation of paragraph 223 of Instructions to Observer Sergeants, and ordered to Fort Whipple and reduced to the rank of private. Corporal D. C. Murphy took charge the same date. One assistant has continued on duty.

The station was inspected in August, 1878, and March, 1879, with the following reports: Office in excellent order; records very neat and properly kept; observer and assistant understand the station duties and were highly spoken of.

Extracts from the observer's semi-annual reports:

Seafarng and other people frequently visit this office for information as to the weather. The people who derive the most benefit from the weather reports and the display of signals are those interested in shipping and parties who deal in fish. The latter class have informed me that they could not carry on a successful business without the weather reports.

Mr. N. B. Nutt, collector at this port, has been furnished daily since June 28 with the a. m. and midnight bulletins combined for the citizens of Calais, Me.

Forty-four cautionary signals and nineteen off-shore signals were displayed during the year at this station.

The sergeant remarks as follows in reference to some of the displays of cautionary signals:

July 26 *and* 27.—The steamer City of Portland was damaged by the heavy sea.

October 12 *and* 13.—Signal displayed nine hours in advance of storm; gale unusually severe; several schooners disabled.

October 30 *to November* 1.—All vessels remained in port during the display.

November 22 *and* 23.—A very sudden and severe storm. Numerous vessels remained in port during the display; slight damage to two small schooners; international steamers delayed.

December 1 *to* 3.—The ship Owego, of New York, went ashore on Southern Head of Campobello Island, English side; total loss; a portion of the cargo saved; no lives lost.

January 2 *to* 5.—Signal displayed four hours in advance of the storm. All vessels remained in port during the display.

February 9 *and* 10.—Five fishing-boats and United States revenue steamer Woodbury remained in port.

February 11 *to* 13.—United States mail delayed 16 hours; signal displayed 12 hours in advance of storm.

February 20 *to* 22.—Steamer New Brunswick delayed several days by the continued severity of the storm.

March 7 *to* 8.—English ship Turkish Empire, laden with one million deals, from St. Johns for Liverpool, went ashore on Grand Menan about 10 a. m. of the 7th. The crew numbered 21; seven lives lost, including the captain. The ship is reported a total loss.

March 28.—Steamer City of Portland delayed by the storm.

April 23 *and* 24.—Fifteen to twenty schooners remained in port during the display.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	3,617
Number of Form 15 (manifold) issued during the year ending June 30, 1879	29
Number of Forms 22 issued during the year ending June 30, 1879	45
Total	3,590

ERIE, PENNSYLVANIA.

[*Official number*, 97.]

Latitude	42° 7′
Longitude	80° 10′
Elevation of barometer above mean sea-level	680.10 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.992
Mean temperature for the year ending June 30, 1879	49° 4′
Amount of rain-fall for the year ending June 30, 1879	40.23 inches.

Established May 25, 1873.

Office in third story Rindernecht's Block, south corner of State and Fifth streets.

Sergeant W. A. Chapman was ordered, March 7, 1879, to be relieved by Corporal F. M. Neal, and on the 17th to proceed to Fort Whipple. Two assistants have been assigned to, and one relieved from, the station during the year.

The station was inspected in September, 1878, and February, 1879, and reported upon as follows: Office dirty, and not in satisfactory condition; records generally well kept, but not up to date; anemometer and thermometers dirty.

Extracts from the observer's semi-annual reports:

Among those deriving benefits from, and manifesting interest in, the service, may be mentioned sea-faring men, particularly masters of sailing crafts, who seldom leave port while signals are hoisted without consulting the latest bulletins and indications; freight agents, who frequently consult the records of this office to determine the conditions of the weather at certain times, when made responsible for delays and damages to goods in transportation. The general interest in the service is increasing.

Morning, evening, and midnight reports are regularly received from twenty-five stations, and promptly bulletined and posted at places designated.

Navigation opened April 25, 1879, several days later than usual.

At this station the season has been an exceptional one; so far as storms are concerned, the only marine disaster being the beaching of the schooner Seaman, on May 26, in attempting to enter this port. Cautionary signals were displayed at this station at the time, having been hoisted on the evening of the 24th. The vessel was gotten off with the help of the revenue cutter Perry, without damage.

The morning Dispatch and evening Herald publish reports from the lake stations, the former also publishing local observations of previous day. The Sunday Gazette publishes a summary of the week's observations."

Thirty-seven cautionary signals were displayed at this station during the year.

The display of signals was suspended for the season December 15, 1878; and resumed March 20, 1879.

The sergeant remarks as follows in reference to some of the displays:

July 26.—A fish-boat was blown over; crew saved.

August 24 *to* 25.—Storm accompanied by heavy rain; lake rough, and dangerous.

October 22 *to* 24.—Schooner Algerine blown ashore near Springfield, about 20 miles from this place and became a total wreck.

October 30 *to November* 3.—All vessels remained in port during the display.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	5,196
Number of Local Reports issued during the year ending June 30, 1879	363
Number of Forms 15 (manifold) issued during the year ending June 30, 1879	2,993
Number of Forms 22 issued during the year ending June 30, 1879	17
Total	8,569

ESCANABA, MICHIGAN.

[*Official number*, 49.]

Latitude	45° 46′
Longitude	87° 14′
Elevation of barometer above mean sea-level	619 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.992
Mean temperature for the year ending June 30, 1879	41°.7
Amount of rain-fall for the year ending June 30, 1879	27.15 inches.

Established May 24, 1871.

Office in second story, Adler Building, corner of Ludington and Dousman streets.

Sergeant James Gilligan was relieved March 9, 1879, by Sergeant L. A. Welsh.

The station was inspected in July, 1878, and April, 1879, and the office found in good order; work satisfactorily performed; records properly kept, and up to date; observer attentive to his duties and well spoken of.

Extracts from the observer's semi-annual reports:

Not any wrecks occurred in the vicinity of this station during the season. During the display of cautionary signals very few vessels leave the harbor. The masters visit this office frequently during each of said displays, to find out the height of barometer and force of wind, also to see if any report had been received from Office Chief Signal Officer. The parties who are mostly benefited by the service at this point are those interested in shipping, all of whom speak very highly of the benefits they receive from the display of cautionary signals; also the fishermen, of whom there are a large number in this vicinity, claim that they derive great benefit from the displays.

Thirty-seven cautionary signals were displayed during the year.

The display of signals was discontinued for the season December 15, 1878; resumed March 20, 1879.

The sergeant remarks as follows upon some of the displays—

September 30 *to October* 2.—Signal hoisted two hours in advance of storm. Nineteen vessels in harbor when the signal was hoisted; all but one remained until the signal was lowered. Captains of the different vessels visited the office each day during the display, for information.

October 7 *and* 9.—Several vessels delayed their departure until after the signal was lowered.

October 15 *to* 17.—Several vessels were ready to depart but delayed until after the lowering of the signal. Much interest and confidence is manifested in the service, and the warnings are generally observed.

October 30 *and* 31.—Two vessels were ready to sail but delayed until after lowering of signal.

November 5 *to* 7.—Rough weather reported on the lake.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1879	316
Number of Forms 22 issued during the year ending June 30, 1879	15
Total	331

FORT GIBSON, INDIAN TERRITORY.

[*Official number*, 93.]

Latitude	35° 43′
Longitude	95° 16′
Elevation of barometer above mean sea-level	511.00 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.014
Mean temperature for the year ending June 30, 1879	60°.2
Amount of rain-fall for the year ending June 30, 1879	29.73 inches.

Established April 1, 1873.

Office in second story of building used as post-office.

Sergeant O. S. M. Cone was relieved March 23, by Private J. B. Campbell. There is not any assistant on this station.

From inspections of the station, made in December, 1878, and May, 1879, the following reports result: Office, during Sergeant Cone's charge, in fair condition, but in Private Campbell's time in excellent order; records not properly kept by former, but correct and up to date by latter; Observer well spoken of, and always at his post.

Extract from the observer's semi-annual reports:

Not any reports are received at this station. A weekly summary is furnished the Indian Journal, at Muskogee, I. T. There are no papers published here.

Steamer Big Rock arrived July 16, 1878, being the first boat in eight years; left for Fort Smith at 5.20 p. m.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1879	8
Number of Forms 22 issued during the year ending June 30, 1879	12
Total	20

FORT MACON, NORTH CAROLINA.

[*Official number*, 220.]

Established May 23, 1878.

Office in building formerly occupied by commanding officer when garrisoned.

Only sunset observations are taken, it having been established as a repair station on the sea-coast telegraph line, and for displaying cautionary signals.

Private G. H. Thompson has had charge of the station. Two assistants were ordered to and three transferred from the station during the year; of the latter, two were discharged the service, and one transferred to duty elsewhere.

The station was inspected in November, 1878. The office was found in good order; duties satisfactorily discharged; records correct.

Extracts from the observer's semi-annual reports:

This station has now become fully established and widely known; is visited very frequently by captains of vessels and others interested, to obtain indications and reports of storms, &c., which are always furnished. When the revenue-cutter Colfax is in port, indications are regularly signaled by General Service Code.

The interest manifested in the station by mariners trading at the port of Beaufort, and by the citizens of Beaufort and Morehead City, has been steadily on the increase.

Cautionary signals were first displayed at this station on July 10, 1878. The class of people deriving the greatest amount of benefit from these displays are mariners trading at the port of Beaufort, owners of pleasure boats, and those interested in the fishing business. The latter is carried on extensively, and as it is only with certain winds that large hauls of fish can be made, the signals are closely watched.

Sixty-two cautionary signals and thirty cautionary off-shore signals were displayed during the year at this station.

The sergeant remarks as follows in reference to some of these displays:

July 26 to 28.—No vessels left harbor during display; two schooners put in for harbor.

August 25 to 27.—One schooner sailed before signals were hoisted, but put back on seeing them displayed; schooner put in for harbor.

September 9 to 13.—Destructive hurricane from southeast; fences and trees blown down and other damage in vicinity of Beaufort; crops destroyed and wharves washed away; a cargo of salt stored in Beaufort saved by a timely removal on first appearance of signals; ample warning was given of this hurricane.

October 22 to 24.—Terrific cyclone; fences blown down and other damage in immediate vicinity of station; timely warning given of cyclone, by signals and bulletin.

November 11 to 14.—Three schooners put in for harbor.

November 19 to 20.—Steam-tug H. M. Kinnie was taken from anchorage in sound to safer moorings.

November 21 to 24.—No vessels left port.

November 26 to 28.—Two schooners bound south delayed sailing until signals were lowered.

December 9 to 11.—House blown down in Beaufort. A fine pleasure-yacht belonging in Beaufort capsized at Bogue Inlet, the captain and two men barely escaping with their lives; no vessel left port.

December 21 to 22.—No vessels left port.

January 2 to 5.—Two schooners put in for harbor.

January 9 and 10.—No vessels left port.

January 12 and 13.—Two schooners sailed immediately on signals being lowered.

February 20 to 22.—Very heavy sea; no vessels left port.

March 11 and 12.—Schooner put back on account of heavy sea on the bar.

March 23.—No vessels left port.

March 26 *and* 27.—Revenue-cutter Colfax and steamer Eutaw waited for down signals before sailing.

March 30 *to April* 1.—One tug and three schooners came in for harbor.

June 13 *and* 14.—Schooner sailed, but finding it too rough outside put back to harbor.

June 15 *to* 17.—Revenue-cutter Colfax delayed sailing when signals were hoisted, thereby escaping a very heavy sea outside.

GALVESTON, TEXAS.

[*Official number*, 55.]

Latitude	29° 18′
Longitude	94° 50′
Elevation of barometer above mean sea-level	39.08 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.049
Mean temperature for the year ending June 30, 1879	69°.7
Amount of rain-fall for the year ending June 30, 1879	51.03 inches

Established April 19, 1871.

Office in building occupied as United States custom-house, corner of Mechanic and Twenty-first streets, since September 1, 1878; previous to that date northeast corner of Strand and Twenty-third streets.

Corporal E. O. C. MacInerny has been in charge, but was reduced from sergeant, May 26, 1879, for carelessness in preparing records. Three assistants have been ordered to and three relieved from this station; of the latter, one was transferred to this office, and two discharged the service.

The station was inspected in April, 1879. Office found in good order; work satisfactorily performed; records generally correct and up to date.

Extracts from the observer's semi-annual reports:

The display of off-shore signals enables vessels at the wharves, which have nearly completed their cargoes, to cross the bar and complete their loading from lighters outside the bars. There is not a time when off-shore signals are displayed that numbers of vessels do not take this course, fearing that if they remain at the wharves they might be detained for days until the water on the bars again deepens sufficiently to enable them to pass.

Every possible precaution was taken by the Board of Health to exclude, by a rigid quarantine, the yellow fever, and amongst the aids called into requisition was that of a system of signals with the quarantine stations, by which orders could be received at the quarantine station from the Board of Health, and thus prevent all communications between the city and the vessels lying at quarantine. I demonstrated to the authorities here that the General Service Code, as practiced by the Signal Corps, would meet all the requirements of the occasion. On the 13th of August authority was granted to instruct the quarantine physician, and carried out my proposition on 19th of August. From that time till the raising of the quarantine, on the 25th of November, I sent and received, daily, such messages as the Board of Health required. On several occasions the members of the Board of Health expressed the obligations they were under for the services rendered, as well as the opinion that the thorough effectiveness of the quarantine was in no small degree due to my exertions.

On the 26th of August a series of resolutions was adopted by the Board of Health, expressive of their deep sense of gratitude to the Chief Signal Officer for placing the services of the observer at their disposal.

It is almost impossible to convey a full understanding of the interest taken by all classes of citizens in a service which all seem to hold in the highest possible esteem. Cotton merchants and shipping men show the greatest interest as well the most intelligent comprehension of the present utility and invaluable knowledge deducible from the accurate and reliable statistics now being collected by the service. Cotton men are fully impressed with the belief that by comparing the climatic condition of each year with the cotton crop, for a reasonable time, a basis of calculation and a knowledge will be acquired which, when properly applied, will enable men to judge accurately, long before the picking season, how much and what class of cotton there is in the country, and thus they can operate with an intelligence never dreamed of by their predecessors of the past generation. This theory is equally applicable to all kinds of agricultural produce. Medical men seem to think that medical science will be equally benefited by the operations of the Signal Service.

In the month of January the superintendent of the Taylor Cotton Press had a telephone (at the expense of the Press) placed in this office, communicating with the Press, for the purpose of enabling him to receive the weather reports of the a. m. and p. m. as speedily as possible after their receipt here.

Twenty-one cautionary signals and thirty-six cautionary off-shore signals were displayed during the year at this station.

The sergeant remarks as follows in reference to some of the cautionary displays:

October 21 *and* 22.—Two fishing-smacks capsized; no lives lost.

December 31 *to January* 6.—Western Union Telegraph Company sustained a loss of $500, by telegraph-poles being blown down and fourteen miles of wire grounded.

April 8 *to* 10.—Norwegian brig Hera reported ashore on Bird Island.

April 21 *to* 24.—Loss to Telegraph Company not known; estimated to be very heavy. The shipping interests at this point were not damaged. Commerce generally, and more especially railroad traffic, has received a severe shock. Damages to railroads and bridges estimated at $100,000 alone.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	2,508
Number of Local Reports issued during the year ending June 30, 1879	711
Number of Forms 22 issued during the year ending June 30, 1879	96
Total	2,315

GRAND HAVEN, MICHIGAN.

[*Official number*, 48.]

Latitude	43° 5′
Longitude	86° 18′
Elevation of barometer above mean sea-level	616.30(?) feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.995
Mean temperature for the year ending June 30, 1879	48°.1
Amount of rain-fall for the year ending June 30, 1879	31.29 inches.

Established May 24, 1871.

Office on second floor of the Cutter House, corner of Third and Washington streets.

Sergeant S. C. Emery has continued in charge, and has not had an assistant.

The station was inspected in September, 1878, and March, 1879, and the office, records, and property were found in very good condition; the work generally, thoroughly attended to; the station gives satisfaction.

Extracts from the observer's semi-annual reports:

All classes of citizens, more particularly mariners, take a lively interest in the service. The accuracy with which the predictions are made, especially in regard to the probable direction of wind, which is very important to those engaged in lake navigation, has been of great benefit, and is favorably commented upon by all, and the service is considered as a necessity.

The larger portion of the people in this section are engaged in fruit raising, and by them the subject of meteorology is receiving a great deal of attention....Those engaged in raising vegetables have recently begun to look the matter up, and the records of this office are constantly made use of for the purpose of study. The late frosts and the extreme cold of last winter had the effect of causing some to pay more attention than formerly to the subject of meteorology, and it is frequently remarked that the good which must naturally arise from a better understanding of this important subject will, itself, more than pay for the cost of the service. Lumbermen, and those engaged in the manufacture of lumber, are among those who have an interest in the weather reports, as published in the daily papers of both Detroit and Chicago, and which reach here daily.

Cautionary signals have been displayed and the warnings have been, in many instances, of great value as a precautionary measure to all engaged in lake navigation, but more especially to owners and masters of sailing-vessels. It is quite noticeable

that these people pay more attention to the display of signals each year, and take a deeper interest in the service as they become better acquainted with its workings and see the practical benefits which result therefrom. The loss of property from marine disasters has been small, no casualties having occurred in this vicinity.

Navigation has been practically open all winter, the steamers of the Detroit and Milwaukee lines having made regular trips, except when prevented from doing so by the ice. The river and lake for a distance of three miles from shore was completely blocked with ice for about two weeks in January, and again the 18th of March, which entirely closed navigation for the time. Navigation was closed to sailing-vessels on December 15. On account of the Milwaukee line of steamers, the signals were displayed all winter and with good results. The schooner Julia B. Merrill was the first arrival of sailing-vessels for the season, on the 20th, and cleared on the 21st of March. Since that time lake navigation has continued without interruption.

Sixty-three cautionary signals were displayed during the year at the station.

The sergeant remarks as follows in reference to some of these displays:

September 25 *and* 26. Storm very severe on the lake. A large number of vessels put into this harbor for safety.

September 30 *to October* 2.—Storm very severe, accompanied by thunder, lightning, and heavy rain. A large number of vessels put into this harbor for safety.

October 8 *and* 9.—One of the most severe storms of the season. Schooner W. Bates, of Holland, went ashore at that place and is a total loss. The schooner Tempest went on the beach at Muskegon, and will also be a total loss; no lives lost.

October 15 *to* 17.—A large number of vessels remained in harbor during the display.

October 28 *and* 29.—The barque Moore and schooner Presto went ashore just north of pier; crew of both saved, and vessels will be gotten off. The timely warning of the approach of this storm has, without a doubt, been the means of preventing many marine disasters.

October 30 *and* 31.—The schooner Wescott was beached in attempting to make the harbor, and while doing so run into the Presto, which was also ashore, and damaged her considerably; no lives lost.

November 1 *and* 2.—The most disastrous storm to the shipping that has visited this shore for years. The loss to vessels and cargoes in this vicinity will not be less than a quarter of a million of dollars, but fortunately the loss of life has been comparatively small. The schooners Australian, America, and Montpelier went ashore north of government pier, and the schooner Elmira also went ashore. The crew of the Montpelier were rescued by the life-saving crew. The crews from the other vessels reached shore in safety, with the exception of one man who was killed by jumping on the pier and crushed by the vessel as she struck. Schooner L. C. Woodruff ashore at Whitehall; seven of her crew, of ten, were rescued by the life-saving crew, soon after which she went to pieces. The J. H. Rutter, one of the largest vessels on the lakes, and loaded with 60,000 bushels of grain, went on the beach at Ludington.

November 27 *and* 28.—Mr. Dale, a contractor, who is making an extension of the government pier, and has just put down two cribs, was notified of the approaching storm, and he immediately put a force of men at work to strengthen the pier. Mr. Dale states that the warning was of much value, as it probably saved the two cribs.

January 15 *and* 16.—Navigation delayed by floating ice.

May 28 *to June* 1.—Steamer Flora started for Milwaukee with a load of passengers, and was forced to return on account of the high wind and heavy sea. Steamer Alpena delayed six hours; the captain reports this as one of the heaviest gales of the season.

PUBLICATIONS.

Number of Forms 22 issued during the year ending June 30, 1879	24
Total	24

INDIANAPOLIS, INDIANA.

[*Official number* 43.]

Latitude	39° 47′
Longitude	86° 6′
Elevation of barometer above mean sea-level	746.70 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.014
Mean temperature for the year ending June 30, 1879	53°.3
Amount of rain-fall for the year ending June 30, 1879	36.47 inches.

Established February 10, 1871.

Office on the fourth floor of Blackford's Block, southeast corner of Meridian and Washington streets.

Sergeant C. F. R. Wappenhans continued in charge of the station until January 20, 1879, when he was relieved by Sergeant E. Lloyd, and transferred to Detroit, Mich. One assistant has been ordered to and one transferred from the station.

The station was inspected during October, 1878, and in April and May, 1879. The office was found in good order; records generally correct, neat, and up to date; the duties creditably and promptly discharged; conduct of the men, excellent.

Extracts from the observer's semi-annual reports:

Copies of the full indications were furnished to the Chicago, Cincinnati, Columbus and Indianapolis Railroad office, for transmittal over the wires to various stations. The information contained therein was also sent with the commercial reports of the Gold and Stock and Western Union Telegraph Companies.

The records have been frequently inspected by freight agents of railroads and others, and on various occasions have been ordered into court as testimony, and, although often attacked by opposing attorneys, the overruling opinion of the judge compelled opponents to accept the records as unassailable authority.

Firms engaged in cutting ice, and merchants who needed ice during the summer and were forced to make contracts to procure it, have frequently inspected the reports to ascertain whether these data indicated a continuance of cold weather and consequently thickening of the ice, or whether an advancing warmer area would make it more prudent to close their contracts.

Many testimonials have again demonstrated the high esteem in which the meteorological data, deductions, publications, and information of the Signal Service are held at this station. The many flattering remarks on the importance of its information and special and general usefulness, during the very frequent visits of merchants and others to this office, seeking for various information, are certain proof that the work of the Signal Service has become of great use and profit and indispensable to many branches of commerce centered here.

Persons engaged in commercial pursuits are the ones that derive the greatest amount of benefit from the service. They come to the office at all hours of the day and night to ascertain the condition of the weather in some particular locality, to which they wish to ship their commodities. We have also a goodly number of wheat merchants who call on us to solicit information relative to the atmospheric changes prior to their purchasing or investing in grain. The pork-packers (in season, fall) are very solicitous in regard to the changes in the weather, particularly in reference to the rise and fall of the temperature. They are probably more materially profited by the service here than any other class of citizens; during the fall they literally besiege this office with their inquiries and telegrams for the weather indications. The telegrams are not confined to the city, but are received from various small towns in the immediate vicinity of this city.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	8,472
Number of Local Reports issued during the year ending June 30, 1879	1,060
Number of Forms 15 (manifold) issued during the year ending June 30, 1879	8,450
Number of Forms 22 issued during the year ending June 30, 1879	146
Total	18,128

INDIANOLA, TEXAS.

[*Official number*, 84.]

Latitude	28° 32′
Longitude	96° 38′
Elevation of barometer above mean sea-level	25.92 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.047
Mean temperature for the year ending June 30, 1879	70°.6
Amount of rain-fall for the year ending June 30, 1879	21.89 inches.

Established May 1, 1872.

Office in Schultz Building, corner of Main and Cricket streets.

Private J. Kenealy was relieved from the charge of this station December 5, 1878, by Sergeant L. Dunne, and transferred to Chicago, Ills. There has not been any assistant on duty during the year.

The station was inspected in April, 1879, and reported in excellent order; work, well and faithfully attended to; records, correct and up to date.

From April 24 to May 2, 1879, during the sickness of Sergeant Dunne, Mr. W. M. Kimball, civilian, was hired to attend to the office duties.

Extracts from the observer's semi-annual reports:

Monthly mean reports continue to be furnished to the Corpus Christi Gazette, Corpus Christi Free Press, Victoria Advocate, Rockport Transcript, and Cuero Bulletin newspapers.

The best citizens of the place, as also sea-faring men, take great interest in the service, and are very generous in giving their opinions in regard to the benefits, directly and indirectly, derived from the forecasts of the weather. Masters of vessels pay particular attention to cautionary signals, and, with very few exceptions, are guided in their movements by them, the results of which are, that not any damage to vessels has occurred. The occasional telegrams received in reference to storm centers and cautionary-signal displays at other stations are regularly bulletined immediately after receipt. The position of storm centers is considered very valuable information in additiod to the other.

Twenty cautionary signals and thirty-eight cautionary off-shore signals were displayed during the year at this station.

The sergeant remarks as follows in reference to some of these displays:

September 9 *and* 10.—Signal hoisted seven hours in advance of storm; favorably commented upon by all.

October 16 *and* 17.—Owing to the storm, the steamer Galveston deferred her departure from the 17th to the 18th.

October 25 *to* 27.—The signal was hoisted 38 hours in advance of a northerly gale of 38 hour's duration.

November 16 *to* 18.—The mail steamer Day Dream left for Galveston on the 16th; owing to the violence of the gale, she was delayed 24 hours.

December 19 *to* 21.—Mail steamer Day Dream delayed.

December 31 *to* *January* 6.—Signal displayed 37 hours in advance of storm; mail steamer Day Dream delayed.

February 25 *to* 27.—All vessels remained in port.

April 21 *to* 25.—Mail steamer Day Dream sailed for Galveston; was forced to put back.

May 29 *to* *June* 2.—Gale, accompanied by a severe thunder-storm.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	2,386
Number of Local Reports issued during the year ending June 30, 1879	29
Number of Forms 22 issued during the year ending June 30, 1879	98
Total	2,513

ISLAND OF SAINT PAUL, ALASKA.

[*Official number*, 120]

Latitude	57° 38′
Longitude	169° 50′

Established August 18, 1872.

Private L. M. Turner, after having visited the station, reports under date of November 10, 1878, that Mr. H. W. McIntyre at Saint Paul's Island informed him that the station at that place is completely supplied with instruments, and that observations are regularly taken. The instruments are those left there after the death of Private E. J. Gill, and

taken charge of by Mr. McIntyre, with the exception of a maximum and minimum thermometer furnished by Private Turner.

JACKSONVILLE, FLORIDA.

[*Official number*, 73.]

Latitude	30° 24′
Longitude	80° 40′
Elevation of barometer above mean sea-level	22.90? feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.079
Mean temperature for the year ending June 30, 1879	68°.5
Amount of rain-fall for the year ending June 30, 1879	51.62 inches.

Established September 11, 1871.

Office on second floor of the Freedmans' Bank building, corner of Pine and Forsythe streets.

Sergeant F. Z. Gosewicsh had charge of the station until March 10, 1879, when he was relieved by Sergeant J. W. Smith. The work has been done without an assistant.

The station was inspected in February, 1879, and found in excellent order; work satisfactorily performed, records correct and neat.

Extracts from observer's semi-annual reports:

All classes of citizens show an interest in the service, and recognize that they are either directly or indirectly benefited by its work, and the office is visited by many persons, some for mere curiosity and many for information. Physicians, both resident and visiting, continue to show their interest in the service, and often call for records of particular seasons and data regarding the general climate.

During the winter season, when the present population is more than doubled by the influx of strangers from all parts of the United States and many of the foreign countries, the office is visited by many scientific men, and those most capable of judging are the most profuse in complimenting the service and most highly appreciate the great benefits derived from it by all classes, and the great good to be accomplished as it advances to perfection. Captains and agents of steamers and sailing-vessels visit the office frequently, and invariably when the storm-signal is flying or the weather threatening. All express their confidence in and appreciation of the service. Captain Fitzgerald, of the steamer City of Bridgeton, never leaves port without calling at this office, regardless of the weather at the time. He says that the information he has received from this source has often proved of great value, and I have often heard him compliment the service in the highest terms on the streets and other public places.

Six cautionary signals and two off-shore signals were displayed during the year at this station.

The sergeant remarks as follows in reference to some of these displays:

September 7 *to* 12.—Signal hoisted twenty hours in advance of the gale. Vessels prepared for the storm, and remained in port during the display.

October 21 *and* 22.—Steamer City of Houston sunk near Frying Pan Shoals. Passengers and crew saved.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1879	320
Number of Forms 22 issued during the year ending June 30, 1879	33
Total	353

KEOKUK, IOWA.

[*Official number*, 47.]

Latitude	40° 23′
Longitude	91° 25′
Elevation of barometer above mean sea-level	583.75 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.987
Mean temperature for the year ending June 30, 1879	53°.1
Amount of rain-fall for the year ending June 30, 1879	24.39 inches.

Established July 16, 1871.

Office on fourth floor of State National Bank, corner Second and Main streets.

Sergeant E. F. Brady was relieved October 8, 1878, for medical treatment, by Private S. Applegate, who continues in charge. One assistant was on duty until September 21, 1878.

The station was inspected in September, 1878, and April, 1879. The office was reported in good order; work generally well performed; records neat and correct, except daily journal had not been kept up to date; conduct very satisfactory.

Highest water in the river, 9 feet 2 inches, June 2, 1878; lowest water, 2 feet 3 inches, September 19, 21, 22, 23, 1879.

Extracts from the observer's semi-annual reports:

A considerable amount of interest is evinced in the service here, and the office is frequently visited by people making inquiries concerning the weather and the service.

The monthly rain-fall has been regularly forwarded by mail to Maj. J. U. Farquhar, United States Engineer Corps, Rock Island, Ill., and the monthly means and summary to Prof. F. E. Nipher, of the Washington University of Saint Louis, Mo. Dr. A. M. Carpenter, president of the board of health, visited the office in June, and requested that a monthly meteorological report be furnished the health office, which was done. The data required comprised the comparative mean temperatures and summaries for the years 1875 to 1879, inclusive.

The amount of ice harvested during the past winter is far in excess of that ever before gathered.

The records have been used in court, and the information obtained therefrom was of importance.

The navigation season has been a remarkable one. The river opened February 19, 1878, and boats ran without interruption until December 10, one of the longest seasons experienced for many years. The ice in the river began to break away March 4. On the 5th, the first river observation was taken. Navigation was open to all points south after the 5th. The Des Moines Rapids Canal opened March 22. The water in the river has been unusually low; during the months of September, April, and to the latter part of May, navigation was almost suspended.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	554
Number of Forms 22 issued during the year ending June 30, 1879	41
Total	595

KEY WEST, FLORIDA.

[*Official number*, 25.]

Latitude	24° 32′
Longitude	81° 48′
Elevation of barometer above mean sea-level	32.0 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.045
Mean temperature for the year ending June 30, 1879	75°.9
Amount of rain-fall for the year ending June 30, 1879	50.10 inches.

Established November 1, 1870.

Office in Louvre Hotel, Front street.

Sergeant M. J. Shanefelter continued in charge until May 16, 1879, when he was relieved by Sergeant F. Z. Gosewisch. The station has been without an assistant.

It was inspected in February, 1879. The office was reported in excellent condition, and the work well and faithfully discharged; records correct, neat, and very carefully kept.

Extracts from the observer's semi-annual reports;

The office is frequently visited by masters of foreign and coastwise steamships and sailing-vessels to consult the weather reports. In every instance they have expressed

their satisfaction relative to the working and usefulness of the service. The citizens, agents of steamship lines, and insurance companies, wrecking companies, merchants, auctioneers, &c., are taking, daily, more and more interest in the service, being highly pleased whenever a signal is justified, and willingly make allowance where a failure occurs. They seem to have clear ideas of its workings, and fully appreciate the benefits of the Service to them. The number of vessels plying between this port and Havana renders the Havana report very useful, and it is no uncommon thing to find persons waiting at a bulletin frame for the report when posting the bulletin.

Fourteen cautionary signals and ten off-shore signals were displayed during the year at this station.

The sergeant remarks as follows in reference to some of these displays:

September 6 to 11.—Bark Lewes T. Stocker, which was reported last week as having gone to sea, arrived at Savannah; no particulars as to her passage through the cyclone.

May 24 and 25.—Two cattle-steamers for Havana and the mail-steamer for Cedar Keys delayed their departure until the gale ended.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	4,043
Number of Forms 22 issued during the year ending June 30, 1879	49
Total	4,092

KITTYHAWK, NORTH CAROLINA.

[*Official number*, 129.]

Latitude	36° 0′
Longitude	75° 23′
Elevation of barometer above mean sea-level	22.00 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.056
Mean temperature for the year ending June 30, 1879	58°.6
Amount of rain-fall for the year ending June 30, 1879	54.89 inches.

Established January 15, 1875.

Office in upper story of United States life-saving station.

Corporal W. Davis has been continuously in charge. Two assistants have been ordered to the station and two transferred to duty elsewhere.

This station was inspected in November, 1878. The office was found in excellent order; the work properly and promptly attended to; records correct.

Seventy-seven Cautionary Signals and thirty-five off-shore signals were displayed during the year at this station.

The sergeant remarks as follows in reference to some of these displays:

October 22 to 24.—During the display a hurricane was experienced at this station. It began 6.30 p. m. of the 22d, from the southeast. The wind and rain increased rapidly until 2 a. m of the 23d, and the barometer had reached its minimum at that time; actual barometer read 29.064, and the wind velocity reached 88 miles per hour. The wind shifted suddenly from southeast to southwest, increasing in velocity and carrying away the anemometer. Damages during storm can be given briefly, as follows: Schooner Magnolia, Capt. George Wurtle, was wrecked in Albermarle Sound; vessel total loss; captain drowned. First Lieut. James A. Buchanan, acting signal-officer and inspector, was a passenger on board on his way south for the purpose of inspecting the signal stations along this coast, and was saved by lashing himself to the gunwale, after the vessel had capsized and was grounded, and swimming ashore. The American ship A. S. Davis, Capt. Ira H. Ford, 1,399 tons burden, loaded with guano, ran ashore eight miles south of Cape Henry, and became a total wreck. The crew of 23 men were all lost, with one exception. The two-masted schooner Altoona, Capt. Thomas Fitzgerald, 176 tons burden, loaded with logwood, ran ashore one mile south of Cape Hatteras; vessel not badly damaged; portion of cargo saved; crew saved.

December 8 to 11.—Barkentine Belle Keith, Capt. Thomas E. McDonald, 434 tons burden, in ballast, ran ashore on the 10th, eight miles south of Cape Hatteras; crew of ten men all saved. Brig Wm. Mallory, Capt. Thomas C. Forsyth, 329 tons burden,

ran ashore four miles south of Cape Hatteras; crew of nine men, captain and wife, all saved.

February 1 *to* 3.—A two masted schooner, Sarah Wood, of Philadelphia, Pa., loaded with lumber, had her main gaff broken at sea, and anchored five miles south of station until repairs were made.

PUBLICATIONS.

Number of Forms 22 issued during the year ending June 30, 1879	12
Total	12

KNOXVILLE, TENNESSEE.

[*Official number*, 42.]

Latitude	35° 56′
Longitude	83° 58′
Elevation of barometer above mean sea level	980.02 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.076
Mean temperature for the year ending June 30, 1879	57°.7
Amount of rain-fall for the year ending June 30, 1879	56.89 inches.

Established January 1, 1871.

Office in United States custom-house.

Sergeant John K. Payne remained in charge until December 31, 1878, when he was relieved by Private B. F. Hough and transferred to New London, Conn. The station has continued without an assistant.

The station was inspected during September, and found well arranged; records well kept and up to date.

During the sickness of Sergeant Payne in October and November, Mr. Ryan, civilian, attended to the duties.

Extracts from observer's semi-annual report:

The public interest in the service continually improves; the butchers, and especially those slaughtering hogs; every owner of an ice-house, every one contemplating trips to the mountains, importers of fruits and vegetables, and many other classes of citizens, seem this year to have taken an unusual interest in the reports and in the service. Business men, pleasure-seekers, persons going on extended journeys, pic-nic parties, &c., frequently consult the office; also physicians at home and abroad. I have been written to by persons from a distance contemplating emigration to these parts, for information concerning the climate, &c.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1879	510
Number of Forms 22 issued during the year ending June 30, 1879	52
Total	562

LA CROSSE, WISCONSIN.

[*Official number*, 87.]

Latitude	43° 48′
Longitude	91° 23′
Elevation of barometer above mean sea-level	701.94 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.984 inches.
Mean temperature for the year ending June 30, 1879	48°.2
Amount of rain-fall for the year ending June 30, 1879	31.11 inches.

Established October 15, 1872.

Office on third floor, Anderson's building, corner Main and Second streets.

Sergeant G. R. Hancock has had continuous charge of the station during the year, without an assistant.

It was inspected in September, 1878, and March, 1879, and the following report made: Office in good order; records neat and properly kept; work satisfactorily performed.

The river closed December 7, 1878, and opened to navigation March 26, 1879.

Highest water in river, 7 feet 1 inch, May 22 and 23; lowest water, 0 feet 8 inches below zero, September 16 to 19.

Extracts from the observer's semi-annual reports:

The river gauge was moved on May 2 from the Chicago and Milwaukee depot to the upper corner of Freeman's flour-mill, and there attached to a pile driven by the Chicago, Milwaukee and Saint Paul Railway Company for that purpose.

The indications are closely watched and carefully studied by all who have any interest at stake, and by many who have not. Fruit-dealers are governed in their shipments west by the information obtained from the bulletins and the indications; in short, if any one has anything to do, in which the elements may take a part, they first consult the Signal Office as to what the weather is going to be to-morrow.

The lumber interests are more directly benefited than any other. The bulletins are watched by a large number of persons in all departments of business, and are more satisfactory than the newspaper publications, for the reason that they are complete; the papers, as a rule, only publishing for this immediate section.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	1,508
Number of Local Reports issued during the year ending June 30, 1879	866
Number of Forms 22 issued during the year ending June 30, 1879	44
Total	2,418

LEAD CITY, DAKOTA.

[*Official number*, 188.]

Latitude	44° 22′
Longitude	103° 34′
Elevation of barometer above mean sea-level	Not determined.

Established June 1, 1878.

This office was discontinued October 31, 1878, and removed to Deadwood.

LEAVENWORTH, KANSAS.

[*Official number*, 52.]

Latitude	39° 19′
Longitude	94° 58′
Elevation of barometer above mean sea-level	813.38 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.995
Mean temperature for the year ending June 30, 1879	54°.3
Amount of rain-fall for the year ending June 30, 1879	29.49 inches.

Established May 21, 1871.

Office in third story, No. 315 Delaware street.

Sergeant J. R. Williams was relieved November 11, 1878, by Sergeant S. W. Rhode, and transferred to this office. One assistant has been ordered to, and one relieved from, duty as printer, the latter to be discharged the service.

The station was inspected in June, 1879, and the office found in excellent order; records properly kept and with great neatness; observer and assistant commended for faithful attention to duty.

During the year thirty-three post-offices and sixteen persons and places were regularly supplied with the Farmers' Bulletin.

The highest water in the Missouri River, 18 feet 6 inches, occurred

July 2, 3, 1878; lowest water, 3 feet 3 inches, May 1, 1879. The river was entirely frozen over December 18. First steamer arrived April 1.

Extracts from the observer's semi-annual report:

A copy of the Farmers' Bulletin is furnished to the Kansas City, Saint Joseph and Council Bluffs Railroad; Atchison, Topeka and Santa Fé Railroad; Kansas City, Lawrence and Southern Railroad, and Atchison and Nebraska Railroad, for distribution by telegraph to the different railway stations on those roads. Parties interested inform me that this method of distributing the report will be productive of good results.

The public take more interest in the service, and are now beginning to realize the value of systematized meteorological observations in the development of the agricultural, horticultural, and other resources. During the latter part of May and the first part of June last, when tornadoes were so frequent over this State, the number of persons calling for information were numerous, and some days the inquiries were almost continuous. Whenever a storm-cloud would appear above the horizon, people would come to this office to find out the atmospheric conditions, and whether they indicated the coming of a tornado. On several occasions calls of this nature were made after midnight.

The service grows continually in popular favor, and its increase and extension is desired.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1879	16,454
Number of Local Reports issued during the year ending June 30, 1879	895
Number of Forms 22 issued during the year ending June 30, 1879	124
Total	17,473

LITTLE ROCK, ARKANSAS.

[*Official number*, 230.]

Latitude	34° 40′
Longitude	92° 12′
Elevation of barometer above mean sea-level	337.00 feet.

The station was established July 1, 1879, with Sergeant William Line in charge.

Office in Stoddard's Bank building, corner Markham and Main streets.

LOGANSPORT, INDIANA.

[*Official number*, 124.]

Latitude	40° 46′
Longitude	86° 20

Established July 15, 1874.

Office removed June 23, from No. 410 Market street to Snider's Block, No. 412 Market street.

Corporal C. B. Whiting has continued in charge as printer, it being a station for the distribution of the Farmers' Bulletin.

The station has not been inspected during the year.

One hundred and eighty-four post-offices and four persons and places have been regularly supplied with the Farmers' Bulletin.

Extracts from the observer's semi-annual reports:

Much interest has been manifested by our citizens in the reports, even more than at any previous period.

The press has done a great deal for the service in this vicinity by publishing reports that would be of benefit to this community. Pork-dealers during the past winter have been guided by the forecasts, to say nothing of the many farmers who have shown, during the summer and fall, a willingness to be guided to a great extent by the reports.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1879	62,400
Total	62,400

LOS ANGELES, CALIFORNIA.

[*Official number*, 141.]

Latitude	34° 3′
Longitude	118° 16′
Elevation of barometer above mean sea-level	320.07 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.990
Mean temperature for the year ending June 30, 1879	60°.2
Amount of rain-fall for the year ending June 30, 1879	11.35 inches.

Established July 1, 1877.

Office on third floor, south side of Main street, near corner of Commercial.

Sergeant J. M. Frantz has continued in charge without an assistant.

The station was inspected during November, 1878. The office-room was found clean and everything neatly arranged; records neat and correct; observer highly spoken of and very attentive to his duties.

Extracts from the observer's semi-annual reports:

The interest in the service continues, and is steadily on the increase, as is shown by the willingness of the press to publish all reports tendered them. This office is visited by all classes of citizens, and is considered authority on all subjects pertaining to the weather. The newspapers printing the monthly abstracts of Form 22 are preserved by some professional men and others interested in meteorological data for future reference. Frequent inquiries are made for reports of rain-fall extending back over a great number of years. On two occasions I was subpœnaed before courts of law with the office records.

Efforts have been made to extend the circulation of the weather reports of this office among the different nationalties, which it is believed will prove successful. Editors of German, Spanish, and French newspapers have expressed themselves as willing to publish abstracts of monthly means similar to those now being published, commencing with the new year.

PUBLICATIONS.

Number of Bulletins (*manifold*) issued during the year June 30, 1879	1,871
Number of Local Reports issued during the year ending June 30, 1879	891
Number of Forms 22 issued during the year ending June 30, 1879	36
Total	2,798

LOUISVILLE, KENTUCKY.

[*Official number*, 64.]

Latitude	38° 18′
Longitude	85° 52′
Elevation of barometer above mean sea-level	530.00 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.041.
Mean temperature for the year ending June 30, 1879	56°.8
Amount of rain-fall for the year ending June 30, 1879	44.32 inches.

Established September 11, 1871.

Office on sixth story Courier-Journal building, corner Fourth avenue and Greene street.

Sergeant L. E. Sebree continued in charge up to November 9, 1878, when, having been appointed second lieutenant Signal Corps, U. S. A., he was relieved by Sergeant W. R. Stansbury, who remains on duty.

This station was inspected in January, 1879, and office reported in good

condition; records presenting a neat and creditable appearance; work of office and conduct of the men satisfactory.

Highest water in the river, 18 feet 6 inches, January 18, 1879; lowest water, 3 feet 0 inch, October 25, 26, and 27, 1878.

Extracts from the observer's semi-annual reports:

The first ice formed October 19. The canal was completely frozen over December 25. Navigation closed December 26, and was resumed January 22.

First frost occurred September 14, in the suburbs of the city. First snow was reported to have fallen on October 18.

Reports have been furnished to several members of the medical profession, to assist them in their investigations of the effects of climate, &c., upon the recent terrible epidemic prevalent in this section of the country. A yearly summary was furnished to Col. W. J. Davie, State commissioner of agriculture of Kentucky, for publication in his annual report, with which he was much pleased.

The press here give a large amount of space to the reports furnished by this office, and take much interest in the service, always expressing the greatest confidence in them. The office is visited daily by those desiring information about the weather, for one purpose or another, all going away satisfied that the information given them can be relied upon.

The reports are consulted by all classes interested in weather changes, and, as heretofore reported, an increase in the number of reports sent here is greatly desired.

The branches of industry most particularly benefited by the reports and forecasts are the pork-packers, produce-dealers, shippers, and river-men. During the hog-killing season, in the latter part of the fall and in early winter, when cold weather was desired by those interested in pork, this office was visited daily by numbers of prominent pork-packers in quest of indications of coming cold, and would kill or delay killing hogs as the indications were favorable or otherwise.

January 3.—Lowest temperature, —10°.

January 10.—Furnished Col. R. T. Durrett, for publication in Courier-Journal, a statement of highest and lowest temperatures for each year since establishment of this station.

January 15.—River broken up; ice-gorge passed down in early morning, carrying away several coal-barges and throwing a steamboat ashore.

January 18.—Furnished a statement of temperature at this station, from September 15 to October 15, 1877, to Messrs. Ouerbacker, Gilmore & Co., for use in a lawsuit.

January 23.—Furnished Dr. E. T. Polk with statement of mean temperature for each summer since establishment of station, for use in investigation of causes of yellow fever.

February 24.—Mr. J. H. Roe consulted records of station in connection with his investigations as to causes of yellow fever.

March 17.—Furnished statement of monthly rain-fall for 1878 to Messrs. Byrne & Speed, wholesale coal-dealers.

March 19.—Furnished Messrs. D. A. & M. A. Sachs, attorneys at law, with a statement of the monthly rain-fall for summer months of 1876, 1877, and 1878.

March 21.—Furnished Mr. E. E. McKay, attorney at law, with a statement of rain-fall for summer months of 1875, 1876, 1877, and 1878.

March 22.—Remarkably heavy rain and violent thunderstorm.

March 24.—Sergeant Stansbury subpœnaed to appear in chancery court.

March 25.—Sergeant Stansbury appeared in chancery court, and the records of the Signal Office admitted as evidence.

March 31.—Furnished Ouerbacker, Gilmore & Co., produce-dealers, with a statement of temperature from September 15 to October 15, 1876 and 1878, for use in a lawsuit.

April 16.—Station inspected by the meteorological committee of the Polytechnic Society.

From the foregoing statement it will be seen to what an extent the records of the station are of service to the public, besides the verbal information given almost daily to people calling for it. The greatest confidence is placed in the reports and predictions of the service, and the entire community is benefited by them.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	3,430
Number of Local Reports issued during the year ending June 30, 1879	3,610
Number of Forms 22 issued during the year ending June 30, 1879	156
Number of Forms 26 issued during the year ending June 30, 1879	2,389
Total	9,585

LYNCHBURG, VIRGINIA.

[*Official number*, 44.]

Latitude	37° 30′
Longitude	79° 2′
Elevation of barometer above mean sea-level	651.50 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	*30.031
Mean temperature for the year ending June 30, 1879	*58°.6
Amount of rain-fall for the year ending June 30, 1879	36.70 inches.

Established May 24, 1871.

Office in First National Bank building, No. 135 Main street.

Sergeant H. F. McFarland was in charge until May 27, 1879, when he was succeeded by Sergeant M. J. Shanefelter, who was relieved June 3, 1879, by Private H. White.

The station was inspected in August, 1878, and the office found clean and in a good condition; conduct of observer reported good.

Extracts from the observer's semi-annual reports:

The Lynchburg Daily News publishes a daily local report and extracts from Form 22. This paper has a wide circulation among planters as well as in the city, and hence renders the reports of service to a large class, particularly to the tobacco interest.

The service is universally respected, and every improvement or extension of its usefulness is heartily approved. A great deal of interest is taken therein, principally by tobacco men, as they rely to a great extent on the indications for the exposure and curing of tobacco.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1879	370
Number of Forms 22 issued during the year ending June 30, 1879	37
Total	407

MADISON, WISCONSIN.

[*Official number*, 190.]

Latitude	43° 03′
Longitude	89° 30′
Elevation of barometer above mean sea-level	956.42 feet.

Established September 29, 1878.

Office in third story, Brown's Block, southeast corner of Pinckney street and Washington avenue.

The station was opened by Sergeant F. M. M. Beall. May 31, 1879, he was transferred to this office, and succeeded by Sergeant C. A. Shaw, who remains in charge.

The station was inspected in November, 1878, with the following result: office, in excellent condition; records, properly kept and up to date; work, satisfactorily conducted.

Navigation opened on Lake Monono, by arrival of the steamer Chet Clarke from Blooming Grove, April 14, 1879.

Extracts from the observer's semi-annual reports:

The citizens of Madison have shown a lively interest in the operations of the station. The office is used quite freely by the citizens, especially when threatening weather prevails, for obtaining information of the future weather, and the service is considered as indispensable.

Considerable interest is manifested by the newspapers, two of which, one morning and one evening, publish regular local observations above the indications received

*Means for February, 1879, computed for 27 days only.

from Washington, besides frequently devoting much space to meteorological articles and notices of the service. At the depot a daily bulletin of indications is posted by the telegraph operator of the railroad company. Members of the university also frequently express their interest.

February 12.—Many members of the legislature, then in session, called at the office of observations, examined the instruments, and inquired into the working of the service with evident interest. The ice on Lake Monono measured 31 inches in thickness. The ground in the vicinity was frozen to the depth of 24 and 30 inches.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1879	473
Number of Forms 22 issued during the year ending June 30, 1879	22
Total	495

MARQUETTE, MICHIGAN.

[*Official number*, 50.]

Latitude	46° 33′
Longitude	87° 36′
Elevation of barometer above mean sea-level	666.33 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.957
Mean temperature for the year ending June 30, 1879	43°.6
Amount of rain-fall for the year ending June 30, 1879	32.21 inches.

Established May 9, 1871.

Office in third story Adams & Frazer's Block, corner Front and Spring streets.

Sergeant J. T. O'Keefe has continued in charge.

The station was inspected in July, 1878, and April, 1879. The office was found in good order, records properly kept, observer well spoken of and as attentive to his duties. Navigation closed November 30, 1878, and opened May 8, 1879.

The observations on temperature of the water were omitted from December 20 to 25, and 29 to 31, on account of ice in the harbor.

Extracts from the observer's semi-annual reports:

The service at this place is highly appreciated, especially by mariners, who invariably visit the office when sailing up or down the lake.

The office is constantly visited by large numbers of lake captains and lumber merchants, who pay special attention to all warnings sent from the Chief Signal Office.

Thirty-two cautionary signals were displayed during the year.

The display of signals was suspended for the season December 15, and was resumed March 20.

The sergeant remarks as follows in reference to some of these displays:

September 5 *and* 6.—The warnings generally observed by all vessels in port.

September 9 *and* 10.—All vessels remained in port during the display.

September 19 *and* 20.—Several captains visited the office during the display, and as the wind was not from a dangerous quarter they concluded to sail.

October 10 *and* 11.—All vessels remained in port during the display.

November 5 *to* 7.—All vessels remained in port during the display.

November 18 *to* 19.—Captains of vessels visited the office during the display, and concluded to remain until "Down Signals"; not any damages reported.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1879	52
Number of Forms 22 issued during the year ending June 30, 1879	24
Total	76

MEMPHIS, TENNESSEE.

[*Official number*, 62.]

Latitude	35° 7′
Longitude	90° 7′
Elevation of barometer above mean sea-level	320.84 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.074
Mean temperature for the year ending June 30, 1879	61°.3
Amount of rain-fall for the year ending June 30, 1879	43.46 inches.

Established February 28, 1871.

Office continued in third story of the Irwin Block, No. 254 Second street, until May 14, 1879, when it was moved to No. 260 Front street, a more desirable location.

Sergeant W. McElroy in charge, died of yellow fever September 1, 1878. Mr. T. H. Chinn, civilian, was employed, September 3, to print the Farmers' Bulletin. September 10, Private F. M. Neal was taken down with the fever, and Mr. Chinn took charge of station. October 21, Private Neal again resumed charge, having recovered, and Mr. Chinn was discharged. January 24, 1879, Sergeant G. H. Rohe relieved Private Neal, and June 11 the former was relieved by Sergeant R. R. Martin and ordered to New Orleans. One assistant has been ordered to, and one transferred from, the station.

The station was inspected during December, 1878, and April, 1879. The office was found in good order; records, generally correct and up to date; work, satisfactorily attended to; conduct of men, good.

The river was obstructed by drifting-ice from January 1 to 7, and navigation suspended from January 3 to 13.

River observations were omitted from January 10 to 13, on account of the ice.

During the year twenty post-offices and eleven persons and places were regularly supplied with the Farmers' Bulletin.

Highest water in river, 28 feet 11 inches, occurred January 28 and 29, 1879; lowest water, 3 feet 4 inches, September 21, 1878.

Extracts from the observer's semi-annual reports:

The newspapers have been furnished regularly with copies of bulletins, Forms 22, and weekly reports of rain-fall in the cotton region; also a daily summary embracing local observations of barometer, thermometer, wind, weather, maximum and minimum temperatures and rain-fall, all of which have been published from time to time. They have devoted liberal space to the publication of meteorological reports. The Cotton Exchange, in addition to daily bulletin and Form 22, is furnished with a weekly report of rain-fall in the cotton region; also a weekly report containing a summary of the observations for the week.

The Cotton Exchange, Chamber of Commerce, &c., continue to manifest great interest in the service, and are supplied with all reports and statistics called for.

Calls by medical men have been very frequent; meteorological data, comparing the last six months with the same time previous years and especially with the same time in 1873, have been furnished to a number of doctors. In fact all classes of citizens with whom I have come in contact seem to take a very great amount of interest in the reports, the river bulletins being in special demand. Mr. Porter, of Cotton Compress Company, informed me that he is governed entirely by the reports in his business; if the indications predict rain he does not put out cotton until they are favorable. I have been much pleased to notice the amount of interest manifested by the citizens generally in the service and reports.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1879	7,733
Number of Bulletins (manifold) issued during the year ending June 30, 1879	5,252
Number of Local Reports issued during the year ending June 30, 1879	741
Number of Forms 22 issued during the year ending June 30, 1879	66
Number of Forms 22 issued during the year ending June 30, 1879	2,845
Total	16,637

MILWAUKEE, WISCONSIN.

[*Official number*, 38.]

Latitude	43° 3′
Longitude	87° 54′
Elevation of barometer above mean sea-level	695.31 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.996
Mean temperature for the year ending June 30, 1879	46°.7
Amount of rain-fall for the year ending June 30, 1879	44.42 inches.

Established November 1, 1870.

Office in room No. 72 dome of Mitchell building, southeast corner of east Water and Michigan streets.

Sergeant S. W. Rhode was relieved from the charge September 18, 1878, by Sergeant W. Finn, and transferred to Saint Louis. Two assistants have been ordered to and two relieved from duty at the station.

The station was inspected in September, 1878, and March, 1879, and reported in excellent order; records, models of perfection; conduct of the men, very satisfactory and attentive to their work.

Extracts from the observer's semi-annual reports:

No change has been made in the location of the instruments, except that the thermometers have been moved out 8 inches from the window of the shelter. At the same time there was put up a door of glass on the inside, which makes an air-chamber 2 feet deep between the office and the instrument-shelter. Since that time the discrepancies in the thermometers observed during the winter have not been noticed, and it is believed this improvement will entirely obviate the difficulty in the future.

As during previous winters, the display of cautionary signals was continued at this station with advantage, and resumed at the substations on March 20, 1879. The display of signals has been satisfactory to all interested.

During the season of navigation, and especially when signals are displayed, the number of vessel captains and others interested in shipping calling for information is very large. The display of signals at the substations has been very favorably mentioned, but the usefulness of the display stations in section 1 is often much impaired by unsatisfactory telegraph service at times when the transmission of warnings and other information is of the greatest importance. The number of persons who find that the work of the service may be utilized for the purposes of every-day life is constantly increasing, and as a result the service is gaining in popularity. In the business community, especially as represented in the Chamber of Commerce and shipping interests, it would be difficult to add to the interest in the service except by increasing the number of reports received at this point. The large grain interests in this city make it especially desirable that reports should be received from all the grain-growing districts in the West.

The press maintains a friendly spirit towards the service. The leading papers publish full reports, and are desirous that they should be more complete. Reports from the South are especially desired during the summer, when many people from that section are spending the season in Wisconsin.

The meteorological committee take lively interest in the office, and are always willing to do anything in their power to increase its usefulness. All classes acknowledge their indebtedness to the service, but undoubtedly those having marine interests derive the greatest benefit from it at this place.

A large weather map was placed in the Chamber of Commerce in the early part of November, a place having been especially fitted for it in the most conspicuous part of the room. This is changed daily and fully appreciated. The large signal lamp, which had been a source of great trouble and expense, was reconstructed in the early part of November, since which time it has been used with perfect satisfaction, consuming less than one-fourth of the gas formerly used.

During the year sixty-four cautionary signals were ordered to be displayed at the station.

The sergeant remarks as follows in reference to some of these displays:

October 15 *to* 17.—A fleet of about twenty vessels took shelter in the harbor during the display. The storm was accompanied by heavy rain.

October 30 *and* 31.—The storm was accompanied by rain and snow. No vessel left port during the display.

November 27 and 28.—This signal was considered by marine men as justified, although not so reported by the observer.

December 8 to 11.—This storm was attended by heavy snow, making navigation impossible.

February 9 to 12.—Several vessels were blown from their moorings in river, but were secured without any damage.

March 23 and 24.—The schooner Saveland attempted to cross the lake, but was forced to put back.

May 23 to 26.—The schooner Christie put in here Sunday, 25th, with topsail split. Schooner Mears had her mizzen topmast and masthead splintered by lightning.

June 10.—In the northern part of the city a large tree was torn up and several insecure buildings were badly shaken.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	6,348
Number of Local Reports issued during the year ending June 30, 1879	794
Number of Forms 15 (manifold) issued during the year ending June 30, 1879	3,645
Number of Forms 22 issued during the year ending June 30, 1879	135
Total	10,922

MOBILE, ALABAMA.

[*Official number*, 27.]

Latitude	30° 42′
Longitude	87° 59′
Elevation of barometer above mean sea-level	39.37 feet.
Mean barometer (reduced to sea level) for the year ending June 30, 1879	30.084
Mean temperature for the year ending June 30, 1879	66°.8
Amount of rain-fall for the year ending June 30, 1879	56.62 inches.

Established November 7, 1870.

Office in building southeast corner of Government and Royal streets.

Sergeant L. M. Dey has continued in charge, with one assistant.

The station was inspected in March, 1879. The office was found in excellent order; the duties well and faithfully discharged; records neat and correct.

Extracts from the observer's semi-annual reports:

April 23.—The instrument shelter was destroyed by an accident, and a new one was constructed by order of the Chief Signal Officer. No change, however, has been made in the position of the shelter, or in the adjustment of the instruments. As heretofore, the question of increased reports from the cotton-growing districts is frequently and urgently pressed.

The Cotton Exchange has had made and placed in their rooms near the large weather map, a blackboard (weather bulletin), lettered and ruled, and on which is entered daily, at time of changing weather map, the total rain-fall for the twenty-four hours from each of the nine stations now received, together with remarks as to the then existing state of the weather, &c. The bulletin in connection with the symbol-map, which is daily scanned, has given great satisfaction. As heretofore, the liveliest interest is manifested by this body in the service, and everything relating to the weather is eagerly sought after. The reports of the service are mainly restricted to the cotton-growing interest.

The amount of interest taken in the local reports is very considerable, and the office is frequently visited by those in quest of information relating to the weather. The projectors of excursions, picnics, and other parties never fail to apply to the observer for such information as it is supposed he can give.

The meteorological committee of the Cotton Exchange and Board of Trade continue their monthly visits to the office for inspection and information, and are ever ready to aid in the interests of the service. In addition to the regular reports, special reports, as formerly noticed, are furnished the exchange, the health officer, and the press. The synopses of the principal items of interest from the press, monthly, are read by all classes of citizens, and considered of importance.

The health officer continues to receive a report prepared monthly, and which forms a part of his official bulletin.

Much interest was manifested by the public at large during the epidemic, and all

reports were closely studied for information in regard to changes in the weather. A special report (synopsis) of the weather conditions was prepared and published daily during the epidemic period.

Four cautionary signals and six off-shore signals were displayed during the year at this station.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	3,909
Number of Local Reports issued during the year ending June 30, 1879	789
Number of Forms 15 (manifold) issued during the year ending June 30, 1879	1,352
Number of Forms 22 issued during the year ending June 30, 1879	22
Total	6,063

MONTGOMERY, ALABAMA.

[*Official number*, 26.]

Latitude	32° 22′
Longitude	86° 23′
Elevation of barometer above mean sea-level	219 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.083
Mean temperature for the year ending June 30, 1879	65°.5
Amount of rain-fall for the year ending June 30, 1879	47.46 inches

Established November 9, 1870; closed December 18, 1870; reopened September 5, 1872.

Office, No. 10 Market street.

Sergeant J. C. Rogers was relieved September 18, 1878, by Private G. Prender, for medical treatment. December 23, 1879, the latter was relieved by Private H. C. Smythe, and ordered to this office for discharge. This station has been without an assistant.

The station was inspected in March, 1879.

Extracts from the observer's semi-annual reports:

The amount of interest taken in the local reports is very considerable, and the office is frequently visited by those in quest of information relating to the weather. The projectors of excursions, picnics, and other parties never fail to apply to the observer for such information as it is supposed he can give. As this station is the center of an extensive cotton-growing section, those interested in the growth of that staple are the most benefited by the publication of the reports, and form the majority of those who seek information.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	3,808
Number of Local Reports issued during the year ending June 30, 1879	677
Number of Forms 22 issued during the year ending June 30, 1879	33
Total	4,518

MORGANTOWN, WEST VIRGINIA.

[*Official number*, 92.].

Latitude	39° 36′
Longitude	79° 52′
Elevation of barometer above mean sea-level	962.62 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.005
Mean temperature for the year ending June 30, 1879	54°.1
Amount of rain-fall for the year ending June 30, 1879	41.95 inches.

Established January 25, 1873.

Office removed December 2, 1878, from the tower of the new building, West Virginia University, to the adjoining old building, first floor. The

instruments remained in the tower until May 21, 1879, when they were removed to the present office.

Sergeant L. Dunne was relieved, August 20, 1878, by Sergeant J. H. Bokel, and transferred to Nashville, Tenn. January 22, 1879, the latter was relieved by Private J. J. McLean, and ordered to Fort Whipple, Va.

In February, 1879, the station was inspected and reported in good order, records properly kept, observers well spoken of.

Highest water in the river, 13 feet 8 inches, occurred November 23 and 28, 1879; lowest water, 0 feet 3 inches, October 16, May 19, and from June 19 to July 1.

Extracts from observer's semi-annual reports:

The 7.23 a. m. synchronous observation has been posted every morning on the bulletin-board in the hall of the Morgantown University, and is very generally studied by the faculty and students.

During the last collegiate term twelve students were under instructions in meteorology, signaling, and telegraphy.

The residents of the place, as also the farmers of this vicinity, manifest a great interest in the Signal Office, regretting only that they are deprived of reports from adjoining stations, particularly the a. m. Synopsis and Indications, which would be of great value to many classes.

PUBLICATIONS.

Number of Forms 22 issued during the year ending June 30, 1879	12
Total	12

MOUNT WASHINGTON, NEW HAMPSHIRE.

[*Official number, 46.*]

Latitude	44° 16′ 25″
Longitude	71° 16′ 26″
Elevation of barometer above mean sea-level	6,285.60 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.957
Mean temperature for the year ending June 30, 1879	25°.9
Amount of rain-fall for the year ending June 30, 1879	93.73 inches.

Established December 1, 1870.

Office in a house on the summit, expressly built for the purpose by the Signal Service, United States Army.

Private D. C. Murphy continued in charge up to August, 1878, when he was relieved by Sergeant W. S. Jewell, and proceeded to Fort Whipple, Va., under orders for promotion. One assistant has been ordered to, and one transferred from, the station.

The station was inspected in August, 1879, and everything found in a satisfactory condition.

Extracts from the observer's semi-annual reports:

A complete record of the wind's velocity has been obtained for the months of July and August and until the 15th of September, after which time the velocity was taken by exposing anemometer from shelter on south side of station for five minutes at every observation.

Mr. Walter Aiken, manager of Mount Washington Railway, has rendered many favors, especially in laying the new telegraph cable. He placed a train at my disposal, and furnished a man to assist in reeling it from the car. He also furnished a stove and fuel for the building known as "Mike's house," situated about three-fourths of a mile from the station, where I have stored provisions, matches, blankets, &c., to be used in the case of accidents, or of being overtaken by severe storms in making the ascent of the mountain. I have also run the cable into the building, so that we can communicate with the summit by means of a pocket relay, which we invariably carry with us in going to and from the base.

The new cable furnished the station has worked in a very satisfactory manner, but one interruption having occurred in which our mountain wire was at fault, and in this instance the trouble was in the old ground wire.

We are under many obligations to kind friends below, who have supplied us with reading matter, and among the many to whom we are indebted for favors I would mention Mr. Philip S. Miller, 194 Broadway, New York City, who has not only sent us many books himself, but has interested J. B. Lippincott & Co. and D. Appleton & Co., the publishers, who have also made many additions to our stock of reading matter.

The first train of the season arrived at the summit at 10 a. m. June 21, 1879, bringing the proprietress of the Summit Hotel.

The weather, although severe, has been remarkably free from those extremes which for years past have been the distinguishing features of Mount Washington. The lowest temperature occurred January 15, at which time the thermometer registered 29° below zero. For the month of February the mean temperature is below zero. The most severe storm occurred April 1, at which time the wind attained an hourly velocity of 182 miles, and continued above 100 miles for over 48 hours. The telephone sent this station last October has been of great use in determining whether the breaks that occur in the telegraph wire are on the mountain or on the main line below, thereby saving many trips to the base which would otherwise have been necessary. The wire has worked successfully during the winter, and but little trouble has been caused by its breaking.

Copies of Form 22 have been furnished to the Hartford Times, Springfield Evening Telegram, and Lisbon Globe.

PUBLICATIONS.

Number of Forms 22 issued during the year ending June 30, 1879	48
Total	48

NASHVILLE, TENNESSEE.

[*Official number*, 63.]

Latitude	36° 11′
Longitude	86° 53′
Elevation of barometer above mean sea-level	506.81 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.072
Mean temperature for the year ending June 30, 1879	59°.7
Amount of rain-fall for the year ending June 30, 1879	48.66 inches.

Established November 1, 1870.

Office, No. 30 North College street.

Private G. Prender had charge until August 25, 1878, when Sergeant L. Dunne relieved him. The latter was relieved November 26 by Sergeant D. P. Waters, and transferred to Indianola, Tex. Sergeant Waters was reduced to the rank of corporal April 3, 1879, for neglect of duty. One assistant has been ordered to, and one transferred from, this station.

The station was inspected in October, 1878, and the following reported: Office in good order, and, generally, the work satisfactorily performed.

During the year ninety-seven post-offices and twelve persons and places were regularly supplied with the Farmers' Bulletin.

Highest water in the river, 41 feet 4 inches, occurred January 19, 1879; lowest water, 0 feet 4 inches, September 27 and October 9, 1878.

Extracts from the observer's semi-annual reports:

In addition to the regular monthly reports, annual reports, with extracts from the daily journals of 1877 and 1878, have been furnished to the city, and a lengthy summary of local observations and humidities to the State boards of health. There is no question concerning the value of weather reports and indications among the intelligent people. They are carefully scanned by every one capable of reading, and with an interest which precludes all possibility of doubt. Pork-packers, river men, and farmers are notably prominent as visitors for information and staunch friends of the service, being almost entirely governed in their business transactions by information received from this office.

A comparatively new and important feature concerning the value of our reports is the fact that many large dry-goods houses, and others who gain most by advertising under favorable atmospheric conditions, have lately developed much anxiety regarding indications of storms; and many have claimed to have gained largely by depending on

authorized information received at this office. One large firm in particular (Kremer, Herzog & Co.) have frequently tendered their thanks to this office for such information, and now rely on it for advertising.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1879	35,110
Number of Bulletins (manifold) issued during the year ending June 30, 1879	5,901
Number of Local Reports issued during the year ending June 30, 1879	704
Number of Forms 22 issued during the year ending June 30, 1879	132
Number of Forms 26 issued during the year ending June 30, 1879	2,860
Total	44,707

NEW HAVEN, CONNECTICUT.

[*Official number*, 96.]

Latitude	41° 17′
Longitude	72° 57′
Elevation of barometer above mean sea-level	107.06 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.001
Mean temperature for the year ending June 30, 1879	51°.4
Amount of rain-fall for the year ending June 30, 1879	55.61 inches.

Established December 10, 1872.

The office at this station continues in the Insurance Building, No. 370 Chapel street.

Sergeant W. A. Glassford has continued in charge, without an assistant.

The station was inspected in July, 1878, and March, 1879, and the office found in excellent condition; records properly kept, and with unusual care; the observer reported as attentive, active, and always at his post.

Extracts from the observer's semi-annual reports:

The interest taken in the station by some of the most prominent men of New Haven is an index of the general esteem in which the service is held. Under the supervision of the Chamber of Commerce the office has received so much attention that their opinion, as expressed by the meteorological committee, has spoken of the utility of the New Haven station in such terms as to bring it from the background into conspicuous importance. The growing importance of this harbor, the contemplated improvements to be made upon it, and the locality upon the Long Island Sound highway render it for cautionary signal displays of increasing importance.

During the months of April and May, when frosts are uncertain, the value of the indications predicting them has been exceedingly useful to an agricultural district where small garden vegetables are so largely cultivated. On May 22 and 23, inquiries were made by a number as to a probable frost during the night. Though the observer was quite sure frost would occur, it was determined to rely wholly on the indications, and it was arranged with the inquirers to hoist the white flag, for a few minutes, precisely at noon, if the frosts was predicted in the morning indications, not yet received. By a thin covering over their exposed garden stuff, these gentlemen are now realizing the benefit of their vigilance, and, at the same time, speak in high terms of the signal service. At numerous times have the reports of the office been consulted by lawyers and engineers, and they have invariably expressed their satisfaction. The relations of the office with the business men, business organizations, chamber of commerce, the city press, board of health, officers of the city government, the professors of Yale College, and the general public, has been of the most cordial nature, and it is an undoubted fact that the service at this place is growing in favor and esteem in every particular.

On August 9 a severe tornado passed over the village of Wallingford, upon which a special report was made and forwarded.

Forty cautionary signals and twenty-three cautionary off-shore signals were displayed during the year.

The sergeant remarks as follows in reference to some of these displays:

September 13.—The first storm of the season occurred. It was announced eleven hours in advance. By bulletin and telephone the public were made aware of the apprehended storm, and such was the confidence in the prediction that the excursion steamer J. B. Schuyler failed to sail.

October 12.—The storm, though severe, was without damage.

October 23 *and* 24.—This disastrous storm was preceded by signal several hours. The schooner Mary L. Tice, in making for this harbor, foundered in six fathoms of water outside of entrance, and the captain and steward lost; two sailors took to the rigging and were rescued. The J. B. Cunningham also went down before this harbor could be reached.

December 2.—The gale was twelve hours in length and very severe; in gusts reaching a velocity of 42 miles per hour. The timely display gave vessels an opportunity to seek shelter, the harbor having been crowded.

December 10 *and* 11.—The wind and rain storm was most severe, causing damage by floods and wind in the northern part of the State. This storm was preceded by signal nine hours, and vessels in consequence crowded the harbor.

December 24 *and* 25.—The cautionary off-shore signal was followed by a very severe storm upon the sound; vessels sought harbor protection, and steamship lines were delayed by storm and ice. The harbor became frozen over and threatened to impede the sound traffic.

January 2 *to* 5.—On the 2d a westerly gale commenced, shifted to northwest and continued till the 5th. The high sea on the sound delayed steamers that ventured out, but ice in the harbor was the most troublesome, causing hours delay in cutting from the docks to the open water.

January 16.—The signal gave warning of a severe northeast gale, accompanied by a very heavy snow-storm, which caused the detention of most every railway train within the State. Steamers were compelled in some cases to suspend trips, owing to the severe wind and blinding snow.

February 11 *to* 12.—Both cautionary and off-shore signals were justified in every particular, and the signal preceded by eleven hours the storm of wind and torrents of rain. The southwest winds sweeping up the harbor dealt roughly with vessels at the docks, doing considerable damage. The steamers E. Corning of the Starin line and Continental of the Old line were six and four hours late, respectively. The fury of the sea upon the sound forced them to put into Huntington for harbor. Within the State damage has occurred from floods, delaying trains, and in some cases putting in jeopardy lives from swollen streams and overflown valley flats.

February 20 *and* 21.—This very severe northeast to north gale cleared the sound of all vessels. The steamer Pottsville, from Philadelphia to this place, came through the sound during the gale, and the captain reports it as one of his most severe experiences.

March 31 *and April* 1.—A very severe northerly gale raged with a steady violence nearly sixteen hours, with heavy snow. The premonitions of an approaching storm on the 30th were sufficient to induce the observer to call special attention by hoisting two flags and telephoning information concerning the approaching gale. In this way vessels were kept in port, and no disasters occurred. The value of this precaution was very favorably spoken of and highly lauded by the press of the city.

April 17, 18, *and* 19.—During the signal-hoist a large fleet of vessels collected in the harbor.

June 15.—During the display of signal the insurance building was struck by lightning and the flag-staff shattered. The cautionary signal was at once transferred to the depot building.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1879	441
Number of Forms 22 issued during the year ending June 30, 1879	84
Total	525

NEW LONDON, CONNECTICUT.

[*Official number*, 14.]

Latitude	41° 22′
Longitude	72° 9′
Elevation of barometer above mean sea-level	46.59 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.008
Mean temperature for the year ending June 30, 1879	49°.7
Amount of rain-fall for the year ending June 30, 1879	50.16 inches.

Established January 10, 1871.

Office, in second story, United States custom-house, Bank street.

Sergeant I. A. Reed was relieved January 17, 1879, by Sergeant J. K. Payne, and transferred to Augusta, Ga. One assistant has been ordered to, and one transferred from, the station.

The station was inspected in July, 1878, and March, 1879, and the following reported: Office in excellent condition; records properly kept and with great neatness; observer and assistant well spoken of.

Extracts from the observer's semi-annual reports:

The mayor of New London, at my request, appointed a meteorological committee March 13, 1879, which met in the signal-office March 20; organized, James Fitch, chairman; C. W. Woodbridge, secretary; reported to the Chief Signal-Officer, and adjourned to meet monthly, or on call of chairman. It consists of the best representative men of this community, and takes an interest in the service.

Forty marine barometers have been compared for masters of vessels, who promise to report on the usual forms. Some of these reports have already been forwarded to the office of the Chief Signal-Officer.

The number of visitors to the office is large when the weather is bad, the inquiries being directed to the prospects of their being able to sail.

In the second half of June, summer visitors at the Piquot House and similar places want weather reports, and seem much pleased with the midnight bulletin, which is posted on the steam-ferry Cecile.

Frequent visits from Commodore Simpson and the officers at the naval station here have been had, also from the officers at Fort Trumbull, masters of vessels, and parties interested in barge transportation, who have expressed the hope that the day-signals would be displayed on light-houses and light-ships. During each signal display the harbor is well filled with vessels at anchor.

From August 15 to September 15.—The signals ordered up here were repeated to the displayman at Watch Hill, R. I., and from September 10 to June 30 to the displayman at the port of Stonington, Conn.

The interest displayed by the public generally is very satisfactory and encouraging. The clergy, business men, ship-owners, masters of vessels, all have given me every encouragement, and their hearty and cheerful support, which is very gratifying and promises greater usefulness for the service in the future than in the past.

Forty-two cautionary signals and twenty-four cautionary off-shore signals were displayed during the year at this station.

The sergeant remarks as follows in reference to some of these displays:

July 6.—A violent tempest of thunder, lightning, and rain visited Norwich, north of here, on the 4th. Thirty persons were prostrated by lightning shocks. One woman was killed.

July 26 *and* 27.—Harbor very rough; heavy weather outside.

August 9.—Heavy thunder-storm. Hail as large as marbels fell in the vicinity of station.

September 13 *and* 14.—Sixty-five vessels remained at anchor in this harbor during the display.

October 9 *and* 10.—No damage known. A number of vessels remained at anchor in the harbor during the display.

October 12 *and* 13.—Numerous wrecks occurred during the storm. One man drowned; Catholic church blown down, and Masonic Hall also damaged by the wind.

October 18 *to* 20.—Sixty sea-going and coasting vessels remained in harbor during the display. The steamer Bolivia, of the New York and Central Railroad Transportation Company, started on her trip to New York, and had to return, owing to the severity of the storm. The British steamer John Bramhall, loaded with arms for the Turkish Government, went ashore on Little Gull Island on the 18th.

October 23 *and* 24.—A number of vessels remained at anchor in harbor during the display. Old ship-masters and sailors generally agree in testifying that this was the severest storm in forty years.

November 22 *to* 24.—The steamers on Long Island Sound, running between Norwich, Conn., and New York, were delayed by the storm. The British steamer John Bramhall, which went ashore on the 18th of October, will be a total loss, except the machinery, which may be saved by the wreckers; her cargo of arms for the Turkish Government will be almost a total loss; vessel and cargo insured for $1,218,000.

December 10 *and* 11.—Four steamers and thirty-five sailing-vessels anchored in the harbor during the display. The Massachusetts, of Stonington and New York line of passenger steamers, put in here on the 11th instant, after having landed her passengers.

at Stonington and been unable to remain at her pier. The propeller Bolivar started for New York; returned, having been unable to proceed in consequence of the severity of the storm. It was one of the most severe known on this coast for years. Trains over the several railroads passing through the city were delayed. Signals were generally observed.

December 24 *to* 26.—The steamer Bolivar was caught in the storm, and the officers report rough weather on the sound.

February 1 *to* 3.—Sound reported very rough.

February 20 *to* 27.—Storm very severe and prolonged. No casualties.

March 22 *to* 23.—Four barges of the Eastern Transportation Company sunk off Stratford; cargo and barges a total loss.

March 27 *to* 28.—A large number of vessels took refuge in the harbor.

March 29 *to April* —.—This storm drove everything toward shelter; harbor full of vessels; several went ashore; none seriously damaged; all taken off successfully by wreckers.

April 3 *and* 4.—Sound very rough.

April 15 *to* 19.—Mr. Gregory, sound pilot, reports a succession of gales directly eastward from Montauk Point on the 15th, 16th, 17th, 18th, and 19th instant. This gives justification of two signals displayed.

PUBLICATIONS.

Number of Bulletins (*manifold*) issued during the year ending June 30, 1879	3,162
Number of Local Reports issued during the year ending June 30, 1879	172
Number of Forms 15 (*manifold*) issued during the year ending June 30, 1879	936
Number of Forms 22 issued during the year ending June 30, 1879	53
Total	4,323

NEW ORLEANS, LOUISIANA.

[*Official number*, 28.]

Latitude	29° 58′
Longitude	97° 07′
Elevation of barometer above mean sea-level	55.81 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.059
Mean temperature for the year ending June 30, 1879	69°.0
Amount of rain-fall for the year ending June 30, 1879	58.29 inches.

Established November 1, 1870.

Office in the United States custom-house.

Sergeant W. U. Simons continued in charge until January 27, 1879, when he was relieved by Sergeant T. V. Van Heusen and ordered to Fort Whipple, Va. The latter was relieved June 14, by Sergeant G. H. Rohe, and ordered to this office. Private J. Cashel, assistant, died of yellow fever October 2, 1878. One assistant has been ordered to the station. Sergeant Simons was taken sick with yellow fever August 31, 1878, but had sufficiently recovered to return to duty on September 28, when Private Cashel was attacked. Mr. John Finn (civilian) was employed as assistant from September 1 until December 21, 1878.

Highest water in the river, 3 feet 8 inches below high water of 1874, occurred February 16, 1879, lowest water, 14 feet 3 inches, November 27 and 28, 1878.

Extracts from the observer's semi-annual reports:

October 31 the issue of manifold bulletins and manifold river reports was resumed, as so many inquiries were made in regard to the weather here and at other points from which reports are received. The prohibition of mail-matter on account of the numerous quarantines (which rendered communication with many places impossible) made the reports received by telegraph very valuable, both in a commercial and sanitary way (especially the latter), as by the timely warning given of approaching cool or warm winds necessary precaution could be taken by nurses and physicians for the protection of invalids.

The first frost of the season occurred November 2. In this respect the predictions of the service have been of great value to sugar-planters, who looked anxiously for

warnings of frost during the grinding season, and many who placed reliance on the success of the predictions of the service were enabled to proceed with the grinding of cane, without the delay and expense of nightly covering, or in some way protecting the sugar cane cut during the day.

The newspapers take great interest in the service.

The interest of the members of the Cotton Exchange, and others interested in cotton or sugar planting, continues unabated in everything that pertains to the service.

Three cautionary signals were displayed during the year at the station. The sergeant remarks as follows, in reference to these displays:

August 9.—Considerable damage to signs, roofs, and awnings was done by this storm.
April 4.—Considerable local damage was done by this storm.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	8,286
Number of Local Reports issued during the year ending June 30, 1879	147
Number of Forms 22 issued during the year ending June 30, 1879	55
Number of Forms 26 issued during the year ending June 30, 1879	5,303
Total	13,791

NEWPORT, RHODE ISLAND.

[*Official number*, 130.]

Latitude	41° 29′
Longitude	71° 19′
Elevation of barometer above mean sea-level	46.00 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.993
Mean temperature for the year ending June 30, 1879	49°.6
Amount of rain-fall for the year ending June 30, 1879	52.20 inches.

Established August 1, 1875.

Office in third story of the United States custom-house, corner of Thames and Franklin street.

Sergeant J. Craig continued in charge till January 8, 1879, when he was relieved by Private C. E. Truesdell, and transferred to Salt Lake City, Utah. The latter was relieved February 15 by Sergeant W. McGillivray and ordered to Breckenridge, Minn.

The station was inspected in October, 1878, and the office found in excellent order; records properly kept; the conduct of the observer and working of the office satisfactory.

Extracts from the observer's semi-annual reports:

A daily local report is published by the Newport Daily News, and a weekly report by the Mercury and the Journal. A summary of Form 22 is also published by each of the above-named papers.

All classes of citizens are more or less interested in the service, but particularly those engaged in shipping, because they are directly benefited, and as a general rule masters of vessels place great faith in the cautionary signals; very few, if any of them, care to venture out when a signal is being displayed, and whenever they do, it is not until after they have made a careful examination of the barometer, direction of wind, and such other atmospheric conditions as are commonly observed by seamen.

No serious marine disasters have occurred near this station, owing to timely warning given by the display of cautionary signals.

Thirty-nine cautionary signals and twenty-three cautionary off-shore signals were displayed during the year at this station.

The sergeant remarks as follows in reference to some of these displays:

October 9 *and* 10.—A large number of vessels remained in harbor during display. The schooner Alida, with a cargo of 170 tons of coal, sunk off Point Judith; captain and crew rescued by a passing vessel.

October 12 *to* 15.—The schooners Pathfinder and Mary Bradford broke their moorings and were driven ashore. A number of small boats were sunk.

October 18 *to* 20.—A large fleet of vessels remained in harbor during the display. No disasters.

October 23 *to* 24.—A large fleet of vessels put into harbor. The fishing schooner Joseph, of New Bedford, ashore, and will probably prove a total loss.

November 4 *and* 5.—A large number of vessels put into harbor during display.

November 6 *to* 9.—Over fifty vessels remained in harbor during the entire display. No disasters reported.

November 12 *to* 14.—A number of vessels left on the morning of the 13th, but were forced to put back, owing to the severe weather outside.

December 10 *to* 11.—The steamer Franconia from New York to Portland, Me., put in here for harbor. New York steamers were unable to leave. Twenty vessels were forced to remain in harbor. Owing to the timely warning, no disasters occurred.

December 21 *to* 23.—About twenty-five vessels put in the harbor shortly after hoisting signals. This storm was accompanied by snow and heavy rain. The tide was unusually high, in some places overflowing the wharves.

December 24 *to* 26.—The ship Servia, from New York to London, England, ran on Gull Rock, Long Island Sound; was assisted by revenue-cutter Dexter into this harbor, leaking badly. A large number of vessels and the New York steamers delayed their departure.

January 2 *to* 5.—This storm was very severe, and lasted over forty-eight hours. A large number of vessels and steamers had to delay their departure.

January 25 *to* 26.—New York steamers delayed and several small boats lost their sails.

February 17 *to* 19.—Heavy snow-storm during the display.

February 25 *to* 27.—New York steamers remained in port.

February 27 *and* 28.—All vessels remained in port during the display.

March 29 *to April* 1.—Several vessels put in harbor for shelter.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1879	413
Number of Forms 22 issued during the year ending June 30, 1879	49
Total	462

NEW RIVER INLET, NORTH CAROLINA.

[*Official number*, 138.]

Latitude	34° 30′
Longitude	77° 25′

Established May 18, 1876, as a repair station.

Office in the house of Dr. Ward.

Corporal C. C. Corbin had charge until November 15, 1878, when he was relieved by private N. G. Brewer, and transferred to Sloop Point, N. C. Sunset observations, only, have been taken, it having been established as a repair station on the sea-coast telegraph line.

The station was inspected in November, 1878. The records were found to have been generally correct, but a portion had been lost during a severe storm.

Extracts from the observer's semi-annual reports:

The class of citizens who derive the greatest amount of benefit from the service at this point are the farmers, and the captains and owners of coasting vessels.

Farmers in the immediate vicinity of this office are greatly benefited by information furnished them, and many of them regulate their planting entirely by that information, which is obtained from the regular indications published by the Chief Signal-Officer and telegraphed along the line every day.

This section of line has remained in excellent condition, the only trouble occurring having been caused by lightning. It is now in a condition to withstand the severest storms. The section of telegraph line assigned to this section to be kept in repair is a very difficult one, there being five cables on it, which require constant attention to prevent the cable-poles from being washed away by the constant cutting down of the banks at the various inlets, to preserve the cable lightning-arresters in a proper condition, and to protect the cables from the frequent lightning experienced along this portion of the coast during the warmer seasons of the year. It is extremely difficult

to inspect the same, owing to the shallow and tortuous condition of the sound at this point, and the great strength of the tides, which render it impossible for one man, and almost impossible for two men to make progress against them.

During the severe storm of September 17, 1878, the station and records were washed away, but the records were afterward recovered in a mutilated condition. With the exception of twenty pages lost from daily journal, the records are believed to be complete.

NEW YORK, NEW YORK.

[*Official number*, 15.]

Latitude	40° 42′ 43″
Longitude	74° 0′ 3″
Elevation of barometer above mean sea-level	164.38 feet.
Mean barometer (*reduced to sea-level*) for the year ending June 30, 1879	30.026
Mean temperature for the year ending June 30, 1879	51°.5
Amount of rain-fall for the year ending June 30, 1879	43.68 inches.

Established November 1, 1870.

Office in the tower of the Equitable Insurance building, No. 120 Broadway.

Sergeant A. Dunhauser *continues in charge*. Three assistants have been ordered to, and two transferred from, the station.

The station was inspected during July, 1878, and February, 1879, and the records found in good order, and generally properly kept; office in good condition; observer and assistants very highly spoken of, and prompt in their duties.

During the year seven hundred and twelve post-offices and twenty persons and places were supplied with the Farmers' Bulletin.

Extracts from the observer's semi-annual reports:

On May 9, the printing of the daily weather map in the Graphic was commenced. These maps are already enjoying great popularity in the community, and by many they are preferred to the daily weather bulletins, as the former, when taken in connection with the daily predictions, enable intelligent people to form a tolerably good idea what the weather is likely to be for the next thirty-six or forty-eight hours. These maps are already finding their way into banking-houses and the stock and produce exchanges. Repeated applications have been made for enlarged maps, similar to those published at this station several years ago, which, although there were no isobars or isotherms traced thereon, were even then in demand. As the maps are now published in the Graphic, with storm-centers accurately located upon them, they cannot fail to be taken advantage of, and be of the utmost importance to stock-brokers and speculators. None but those connected with signal stations in a large city like this can have any idea how the quotations of stock and other securities are affected by the weather. Quite a number of leading brokers in Wall street make it a practice to send to this office daily and copy the weather of the leading Western cities.

The same attention is paid to the cautionary and off-shore signals as heretofore, and 500 circulars explaining the off-shore signals have been distributed in the past six months.

All classes of people derive more or less benefit from the weather reports, and the interest the business community manifest in the predictions is daily increasing.

The benefits that parties involved in lawsuits of all kinds derive from the service is by no means to be overlooked, for during the number of times I have been subpœnaed, I have found that the testimony referring to the weather, as shown by the records of this office, frequently is the turning point of the case.

Sixty-three ship barometers have been compared with the Signal Service standard in the Maritime Exchange, most of them aneroids of various patterns. As the captains prefer having their instruments set to receiving the error of the barometer, the former has almost invariably been done. So far, the barometers compared belonged almost exclusively to French and Italian sailing-vessels, and mariners are only too glad to avail themselves of the opportunity to set their instruments with a reliable standard. Some of these aneroids having been at sea for years without having been once compared, are out half an inch or more, and it is sometimes difficult to convince their owners that such is the case.

The large cautionary signal board furnished during the year is conspicuously displayed in the room of the Maritime Exchange, as well as the standard barometer which is of great convenience to masters of vessels.

A large new weather map has been placed in the rooms of the Maritime Exchange, which is all the more useful and instructive since the storm-centers are indicated by a large arrow.

This office is frequently called upon for meteorological data, and after the beginning of cold weather parties visit the office almost daily to inquire whether it is advisable to unload ships the cargoes of which are composed of fruit, and I find that their conduct is always governed by any advice or facts they may receive from this office. I have already been subpœnaed twice in a case where a car-load of potatoes was damaged by frost, it having been unloaded during cold weather, and in both cases the point was raised whether it was not carelessness on the part of the parties to unload fruit during the changeable season without ascertaining from the signal officer the chances.

The value of the display of the cautionary signals is now an undisputed fact, and were it possible to make reliable statistics as to damages done to shipping, the percentage would be found to have materially lessened since their display. These are the words of a prominent member of the Maritime Exchange.

Mr. Schuyler, owner of a very large number of tow-boats running on the Hudson between Albany and New York, invariably calls on this office at the approach of a storm to ascertain whether the wind is likely to attain sufficient force and velocity to justify him to send steamers up the Hudson in order to help the tow-boats to bring their convoys safely to this city. Several times he has been advised to do so, and he tells me that had he at those times refused to act according to the suggestions of this office, his boats would have sustained severe damage.

Lawyers frequently call for information, and oftentimes the data obtained is of signal value to them or their clients. At the moment of writing, an agent of the Illinois Central Railroad called at the office, stating that the reports are of great importance to the road, especially during cold weather, as it was beneficial to them to know whether the Mississippi is frozen or not. Owners of skating-rinks are wholly guided by our reports in flooding their rinks. Some lines of steamers—as, for instance, the Newport line—always consult the reports before leaving the harbor. In fact, the importance of the Signal Service is becoming more and more apparent to those interested in commerce. This is evident from the lively interest evinced in its reports among the three thousand daily visitors at the Maritime Exchange, where the reports are prominently displayed, and from the satisfaction with which new features have been noted. Among these, the establishment of the off-shore signals a year ago was of special advantage. The facilities for the comparison of ships' barometers, the coast weather reports, the daily advices of the location and movement of the storm-centers, the special reports by telegram of disasters, the bulletins indicating where signals are displayed throughout the country, are all appreciated.

Forty-seven cautionary signals and thirty-eight cautionary off-shore signals were displayed during the year at this station.

The sergeant remarks as follows in reference to some of these displays:

October 23 *to* 24.—The wind blew at the rate of fifty miles per hour for several hours, doing considerable damage. Numerous disasters reported.

December 10 *to* 12.—Although the storm was very severe, but little damage was done to shipping or general property.

January 2 *to* 4.—Several minor disasters occurred during the storm.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1879	225,672
Number of Bulletins (manifold) issued during the year ending June 30, 1879	9,889
Number of Local Reports issued during the year ending June 30, 1879	988
Number of Forms 22 issued during the year ending June 30, 1879	360
Number of Forms 26 issued during the year ending June 30, 1879	2,499
Total	239,408

NORFOLK, VIRGINIA.

[*Official number*, 30.]

Latitude	36° 51′
Longitude	76° 19′
Elevation of barometer above mean sea-level	54.50 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.058
Mean temperature for the year ending June 30, 1879	58°.9
Amount of rain-fall for the year ending June 30, 1879	44.44 inches.

Established January 1, 1871.

Office, corner of Maine and Gray streets.

Sergeant G. Onslow continued in charge until February 16, 1879, when he was relieved by Sergeant T. F. Townsend and transferred to Cape May, N. J. Five assistants have been ordered to, and five relieved from, this station.

The station was inspected in August, 1878, and the office found very neatly kept; the observer and assistants favorably spoken of, and the office duties well attended to.

Extracts from the observer's semi-annual reports:

Not any casualties of any importance have occurred in this locality.

Considerable interest is always manifested during the display of signals. Visitors to the office are frequently seeking additional information, and the reports from the coast stations are eagerly watched by sea captains who are outward bound. The force of the wind here, *in most cases, is very much less than at sea*, causing the signals to be justified within a short distance of this port, when the records of the office require it to be reported as not justified.

I find the service very popular here, and the reports furnished universally appreciated. The members of the press are courteous, and aid in disseminating *all matters* of public interest by the publication of such reports as are furnished them, giving proper credit for the same.

Various interests, prominent at different seasons of the year, such as the cotton, oyster, fish, berry, truck, &c., necessitate occasional changes in the reports published through the columns of the papers and are eagerly sought after.

The advantages of being able to furnish aid from this point to shipwrecks, through the agency of the Coast Telegraph Line, *cannot be overestimated*. Two well-equipped wrecking companies are always ready to forward relief and help at a moment's notice, and under present arrangements the revenue cutters can soon be communicated with and sent direct to any point, thus making the day when vessel and cargo had to be sacrificed for the want of facilities for sending for assistance and appliances to render the required aid a thing of the past.

The Cape Henry reports of vessels passing that station are of great benefit to those interested, particularly the *steamship companies*, as they can anticipate their arrival three hours.

Thirty-eight cautionary signals and twenty-three cautionary off-shore signals were displayed during the year at this station.

The sergeant remarks as follows in reference to some of these displays:

October 22 *and* 23.—Several pinnacles blown from Catholic church; damage estimated at $1,000; also numerous roofs, signs, awnings, fences, and trees blown down.

November 22 *and* 23.—The United States steamer Plymouth delayed her departure.

December 10 *and* 11.—The steamer Hampton was delayed by the high winds.

December 21 *and* 22.—*The steamer Hampton delayed her departure during the display.*

February 24 *to* 28.—Schooner Charles E. Paige, 199 tons, lumber laden, went ashore near New Point Comfort on the 28*th*.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	4,047
Number of Local Reports issued during the year ending June 30, 1879	936
Number of Forms 15 (manifold) issued during the year ending June 30, 1879	3,372
Number of Forms 22 issued during the year ending June 30, 1879	36
Total	8,391

NORTH PLATTE, NEBRASKA.

[*Official number*, 105.]

Latitude	41° 8′
Longitude	100° 53′
Elevation of barometer above mean sea-level	2,838.17 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.646
Mean temperature for the year ending June 30, 1879	48°.7
Amount of rain-fall for the year ending June 30, 1879	17.15 inches.

Established September 18, 1874.

Office in the court-house of Lincoln County, second story.

Sergeant H. U. Jones continues in charge without an assistant.

The station was inspected in December, 1878. The office was reported in good condition; records properly kept; observer attending to his duties promptly.

Extracts from observer's semi-annual reports:

The most marked interest taken in the Signal Service at this point is evinced by the people or corporations having land for sale, and by actual settlers. The land department of the Union Pacific Railroad Company makes frequent inquiries concerning the amount and frequency of the rain-fall, and their agent, located here, frequently examines Form 34 and other reports.

The steady increase and reliability of the amount of rain-fall, as shown by the Signal Service reports, has been the cause of an immense number of homesteads being taken in this county and vicinity during the present year.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	3,016
Number of Forms 22 issued during the year ending June 30, 1879	24
Total	3,040

OLYMPIA, WASHINGTON TERRITORY.

[*Official number*, 148.]

Latitude	47° 2′
Longitude	122° 56′
Elevation of barometer above mean sea-level	36.00 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.025
Mean temperature for the year ending June 30, 1879	45°.1
Amount of rain-fall for the year ending June 30, 1879	71.86 inches.

Established July 1, 1877.

Office in the second story of Granger's building, corner of Main and Fifth streets.

Sergeant E. F. Kubel remained in charge without an assistant until May 7, 1879, when he was relieved by Sergeant J. Dascomb.

An inspection of this station was made in October, 1878, and the office reported in a very neat condition; records neat and generally correct; duties of the office properly attended to.

Extracts from the observer's semi-annual reports:

It is a source of congratulation and pleasure to observe the interest manifested in the duties and advancement of the service by the intelligent classes of this locality. A number of gentlemen from down the sound express the desire to have more stations.

The commerce of Puget Sound is limited; agriculture, confined to small tracts; logging has been a heavy business here, but is dull now.

An extra copy of the a. m. and p. m. bulletins was posted at the Territorial Fair Grounds, during the fair week in October, and attracted the attention of visitors.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	3,939
Number of Forms 22 issued during the year ending June 30, 1879	22
Total	3,961

OMAHA, NEBRASKA.

[*Official number*, 67.]

Latitude	41° 16′
Longitude	96° 0′
Elevation of barometer above mean sea-level	1,077,33 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29,946
Mean temperature for the year ending June 30, 1879	52°.0
Amount of rain-fall for the year ending June 30, 1879	29.03 inches.

Established November 1, 1870.

Office in room No. 23, Helman's building, corner of Thirteenth and Farnham streets, until October 23, 1878, when it was moved to the United States post-office building, corner of Dodge and Fifteenth streets.

Sergeant C. Dill has remained in charge, with one assistant.

Highest water in the Missouri, 17 feet 0 inches, occurred April 9 and June 28, 1879; lowest water, 4 feet 9 inches, December 14, 1878.

Extracts from the observer's semi-annual reports:

The Omaha Herald and Republican publish the bulletin daily in an abbreviated form, and the monthly summary contained on Form 22, and the citizens generally scan them closely. They are especially utilized by commission merchants. Heavy invoices have been forwarded from this point, and ordered shipped hither on the strength of the reliable information contained in them. Merchants have come to understand and to appreciate the great importance of the reports, and to make a daily study of the atmospheric changes recorded thereon. I can safely report that the interest taken in the service by the public generally is greater than it has been heretofore.

The office continues to receive many visitors, to whom I have been able to give information that could not be obtained in the city outside of this service. I have also compared and adjusted quite a number of aneroid barometers with the standard. The river report continues to be a decided benefit to business men.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	4,553
Number of Forms 22 issued during the year ending June 30, 1879	67
Total	4,620

OSWEGO, NEW YORK.

[*Official number*, 31.]

Latitude	43° 28′ 32″
Longitude	76° 33′ 5″
Elevation of barometer above mean sea-level	299.00 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.994
Mean temperature for the year ending June 30, 1879	49°.0
Amount of rain-fall for the year ending June 30, 1879	47.54 inches.

Established November 1, 1870.

Office on third floor, Grant Block, No. 3 Bridge street.

Sergeant J. O. Barnes has been continuously in charge, with one assistant.

The station was inspected in February, 1879.

Navigation closed December 14, 1878, and was resumed March 1, 1879.

Extracts from the observer's semi-annual reports:

There seems to be a growing interest in the publications and in the service at this place by all classes of citizens. Persons with whom I have talked about the Signal Service express greater confidence in it than ever before, and now begin to realize that the reports furnished can be utilized by them in their business. This office is daily visited by people in quest of information as to the indications of the weather. Those who are engaged in commercial trade are in excess of other classes, but are by no means the only persons who are benefited. Mr. Skinner, a painter, has for years been in the habit of coming to this office for information whenever he has had outside work to do, and says the benefit he has derived by so doing is incalculable, and I believe there are many others who can say the same.

One schooner has been wrecked and one driven ashore in this vicinity; the former was a total loss, and the latter saved.

The display of cautionary signals continues to be looked upon with great favor at this point by all classes, and whether justified or not the warning is generally observed. During this season in almost every instance where vessels have started to sea while the signal was hoisted they have been forced to return on account of storms, and in one or two cases have narrowly escaped being wrecked.

During the year twenty-eight cautionary signals were displayed at this station.

The display of signals ceased December 15; resumed March 20.

The sergeant remarks as follows in reference to some of these displays:

July 26 *and* 27.—Not any vessel left the port during the display. The rain fell in torrents.

October 9 *and* 10.—Schooner Grant left harbor during the display and was forced to put back.

October 23 *and* 24.—Signal observed by all vessels in harbor.

October 30 *to November* 1.—Not any vessel left harbor during the display.

November 4.—The warning was generally observed. No damage reported.

November 6 *to* 8.—Schooner Speedwell went ashore one mile above Ford's Shoals; crew rescued by a passing vessel. No other damage reported.

November 11 *to* 13.—Propeller and schooner attempted to cross the lake and were obliged to return.

November 22 *to* 24.—Not any vessel left port during the display.

November 27 *to* 29.—Warning generally observed. No disaster reported.

December 1 *to* 5.—No vessel left port during the display.

December 9 *to* 12.—Much damage done in this vicinity by the storm. Telegraph communication cut off; trains delayed; bridges carried away; culverts washed out; a large portion of east pier destroyed; life-saving station slightly damaged.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	4,344
Number of Local Reports issued during the year ending June 30, 1879	618
Number of Forms 22 issued during the year ending June 30, 1879	36
Total	4,998

PEMBINA, DAKOTA TERRITORY.

[*Official number*, 86.]

Latitude	49° 0′
Longitude	97° 5′
Elevation of barometer above mean sea-level	790.00 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.975
Mean temperature for the year ending June 30, 1879	35°.6
Amount of rain-fall for the year ending June 30, 1879	25.36 inches.

Established November 1, 1872.

Office on lot 5, block 5.

Sergeant J. Cassidy has continued in charge without an assistant.

The station was inspected during August, 1878, and May, 1879, and the office found in good order; records properly kept; observer well-spoken of and attentive to his duties.

Navigation closed October 30, 1878. The first boat of the season left April 13, 1879.

Extracts from the observer's semi-annual reports:

The interest taken in the service since the railroad reached here has increased. Strangers from various parts of the country are constantly calling at the office, some for curiosity and others to learn something, but all seem highly pleased with the service. The citizens are now taking a great deal more interest in the condition of the weather than formerly, and come daily to receive such information as can be given. The greatest amount of interest is exhibited by the new settlers.

PUBLICATIONS.

Number of Forms 22 issued during the year ending June 30, 1879	12
Total	12

PHILADELPHIA, PENNSYLVANIA.

[*Official number*, 17.]

Latitude	39° 57′
Longitude	75° 10′
Elevation of barometer above mean sea-level	46.90 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.032
Mean temperature for the year ending June 30, 1879	53°.5
Amount of rain-fall for the year ending June 30, 1879	34.96 inches.

Established January 1, 1871.

Office in second story Chamber of Commerce building, No. 133 South Second street.

Sergeant F. M. M. Beall remained in charge until July 17, 1878, when he was relieved by Sergeant C. A. Smith, and transferred to Rochester, N. Y. Four assistants have been ordered to, and three relieved from, duty at the station; of the latter, one for medical treatment and two for transfer to duty elsewhere. Mr. J. B. Chant and Mr. Brandenberg, civilians, have been employed for short periods during the sickness of assistants to print the Farmers' Bulletin.

The station was inspected in October, 1878, and again in February, 1879. On both occasions the inspector reported everything in a very satisfactory condition.

During the year 822 post-offices and 14 persons and places were supplied with the Farmers' Bulletin.

The room occupied as an office proper is still donated free of rent by the Commercial Exchange Association, which occupies a large hall adjoining the office on the same floor.

Extracts from the observer's semi-annual reports:

The board of health continues the publication of our local series of observations, slightly abbreviated, in connection with their weekly reports of deaths and interments. The board also makes extensive use of reports from this office, the data for some of which have to be specially worked up. These annual data are charted in the annual report of the board for graphic comparison with the death rates, due credit being always given the service for furnishing it.

A large number of special telegraphic wreck reports of storms and unusual phenomena, received at this station during the year, have been regularly furnished to the Philadelphia Maritime Exchange upon blanks furnished by them for the purpose.

The Reading Railroad Company's steam colliers are also reported when observed passing in at Cape May station for the benefit of the exchange, who are the company's agents. Each vessel is now furnished with its regular number painted on canvass in white figures on a black background, which all captains of the line are directed to display while passing the signal station.

A cautionary signal board has been substituted for the cautionary signal indicator in the Maritime Exchange and gives much greater satisfaction.

The Philadelphia local and Philadelphia Reading and Pottsville Telegraph Companies are still furnished with the morning Indications, the local paragraph of which is immediately telegraphed over their entire circuits, thus assisting in a rapid and extensive diffusion of the information.

Extracts from the office records were furnished for use in the courts five times during the year, and the sergeant was called upon to testify in court or before a commissioner from the records of this station twice, and from those of Cape May station once during the same period. Extensive extracts from the records have been furnished to numerous applicants for various uses, sometimes requiring a considerable amount of time and labor in their preparation.

The reports of the service continue to be appreciated by the public generally, and I frequently hear flattering, though evidently sincere, remarks as to their usefulness. There is also a large class of people who read the reports and derive benefit therefrom without even knowing it, so familiar a habit has their perusal become.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1879	261,710
Number of Bulletins (manifold) issued during the year ending June 30, 1879	5,487
Number of Local Reports issued during the year ending June 30, 1879	2,217
Number of Forms 15 (manifold) issued during the year ending June 30, 1879	5,450
Number of Forms 22 issued during the year ending June 30, 1879	176
Total	275,040

PIKE'S PEAK, COLORADO.

[*Official number*, 99.]

Latitude	38° 48′
Longitude	104° 59′
Elevation of barometer above mean sea-level	14,150.68 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.988
Mean temperature for the year ending June 30, 1879	21°.3
Amount of rain-fall for the year ending June 30, 1879	51.26 inches.

Established November 1, 1873.

Office in a stone building on the summit, expressly erected for the purpose by the Signal Service.

Sergeant Black continued in charge until September, 1878, when he was relieved by Corporal R. Choate. Two assistants have been ordered to, and one transferred from, the station; the latter for discharge.

The station has not been inspected during the year. The observer and assistants have alternated, by months, in remaining at Colorado Springs, the supply station.

Extracts from the observer's semi-annual reports:

The most severe and continuous storms were experienced during the month of April. Nearly ten feet of snow fell during that month.

The health of the men stationed here during the winter has been excellent, and not one of whom has had occasion to complain except from the necessarily hard trips through the snow and the exposure they are obliged to endure. The station house on the Peak is comfortable and in a fair condition.

Much interest is taken in the service by the citizens of Colorado Springs and vicinity. Tourists speak very highly of the Signal Service, and those from the East become animated in their praise of the benefits received from it by them where the daily bulletins are published.

In the month of October the telegraph line was thoroughly repaired. The line having been exposed winter after winter to heavy frost and snows, easily and frequently breaks. It becomes so brittle during the winter that in repairing a break it sometimes breaks under the hand. The numerous repairs made interferes with the clear working of the line.

The first visitors arrived July 7, but were compelled to walk about a mile.

The repairs were completed September 26; west wall having been take down and rebuilt, also the northwest wall. The caves were filled, and the walls of the building pointed. A portion of the south wall was taken out and replaced, &c. All the windows were secured, and paint procured for painting office and kitchen.

PUBLICATIONS.

Number of Forms 22 issued during the year ending June 30, 1878	12
Total	12

PIOCHE, NEVADA.

[*Official number*, 140.]

Latitude	37° 57′
Longitude	114° 26′
Elevation of barometer above mean sea-level	5,778.61 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	*29.841

* Means for the 10 months and 19 days only, owing to barometer becoming unserviceable.

Mean temperature for the year ending June 30, 1879 ..... 61° .2
Amount of rain-fall for the year ending June 30, 1879 ..... 6.40 inches.

Established July 29, 1877.

Office in one-story building, east side of McCannon street.

Corporal H. Hall was relieved July 15, 1878, by Private J. J. Fitzgerald, and ordered to Fort Whipple. There has not been any assistant at the station, but the observer has instructed Mr. J. L. Sears, telegraph operator, in the station duties, to be called upon in case of sickness.

The station was inspected during September, 1878. The office was found in a clean and neat condition; the records correct; the observer well spoken of and attentive to his duties.

Extracts from the observer's semi-annual reports:

The farmers, the medical profession, and the business men of this place take great interest in the service, and compare their thermometers with those at the office, and are frequent callers for information.

The weekly and monthly weather reports furnished to and published in the weekly paper at this place are eagerly looked for by all classes.

PUBLICATIONS.

Number of Forms 22 issued during the year ending June 30, 1879 12

Total 12

PITTSBURGH, PENNSYLVANIA.

[*Official number*, 41.]

Latitude ..... 40° 32′
Longitude ..... 80° 2′
Elevation of barometer above mean sea-level ..... 776.98 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879 ..... 30.014
Mean temperature for the year ending June 30, 1879 ..... 51° .7
Amount of rain-fall for the year ending June 30, 1879 ..... 36.80 inches.

Established November 1, 1870.

Office in room No. 18, third floor, First National Bank building, corner Fifth avenue and Wood street.

Sergeant George W. Hay remained in charge until March 21, 1879, when he was relieved by Sergeant E. B. Garriott, and ordered to Fort Whipple, Va. One assistant has been ordered to station. Mr. A. Pennywitt, civilian, is employed to print Farmers' Bulletin.

The station was inspected during October, 1878, and April and June, 1879. The office was reported in good order; records neat and properly kept; observer and assistant attentive to their duties.

Highest water in the river, 24 feet 6 inches, occurred December 11, 1878; lowest water, 0 feet 7 inches below zero of gauge, October 20.

Navigation was entirely suspended August 26, on account of low water, with the river still falling, and by ice December 24. On the 25th, the Alleghany was frozen over above Mechanic street bridge, and the Monongahela closed above the first dam. Navigation opened on the Ohio and Monongahela Rivers January 27, 1879.

During the year three hundred and fourteen post-offices and seventeen persons and places were supplied with the Farmers' Bulletin.

Extracts from the observer's semi-annual reports:

The interest heretofore taken in the service has been fully maintained. The newspapers of the city now publish very complete reports, nearly all of them printing the Indications, the Daily Bulletin, and the local weather report regularly. The morning Dispatch and the Evening Telegraph have heretofore refused to publish anything but the Indications, but have been recently compelled by the public demand to include the

bulletin and local report. The members of the press, individually, appear to take great interest in the service, and are at all times willing to give space to reports or articles furnished them. There is no meteorological committee in this city.

The river reports are of considerable benefit to river men. The western reports received and bulletined, together with the Indications, are consulted by all classes, and the utmost reliance is placed in the predictions. The classes of people mostly benefited are the grain dealers and brokers, and shippers of perishable goods.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1879	105,183
Number of Bulletins (manifold) issued during the year ending June 30, 1879	6,032
Number of Local Reports issued during the year ending June 30, 1879	413
Number of Forms 22 issued during the year ending June 30, 1879	180
Number of Forms 22 issued during the year ending June 30, 1879	1,780
Total	113,588

PORT HURON, MICHIGAN.

[*Official number*, 103.]

Latitude	42° 58′
Longitude	82° 29′
Elevation of barometer above mean sea-level	630.00 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.979
Mean temperature for the year ending June 30, 1879	45°.6
Amount of rain-fall for the year ending June 30, 1879	33.67 inches.

Established July 25, 1874.

Office in second story City Hall, Huron avenue.

Sergeant J. E. Mayhew has continued in charge, with one assistant.

The station was inspected during September, 1878, and March, 1879. The office was found in a very neat and orderly condition; the records neatly and properly kept; the work of the station faithfully and satisfactorily attended to. The inspector moved the rain-gauge from the ground to the roof of the building, at an elevation of 63 feet, October 16.

Navigation on the lake closed December 15, and was resumed April 3.

Extracts from the observer's semi-annual reports:

The advantages arising from the service are strongly felt by the mariners and steamboat companies. The interest manifested by them in the cautionary signal displays is great, and no vessel is allowed to leave the port while the storm signal is up. The interest of the citizens has not in the least diminished. Every facility is rendered by them for the publishing of reports, &c. The cautionary signal displays for the past season have been particularly advantageous to the shipping interests. Vessel-owners and others interested in lake navigation at this place state that not less than half a million dollars' worth of shipping, &c., have been saved within the past six months by the timely display of storm signals.

Thirty-one cautionary signals were displayed during the year at the station.

The display of signals ceased December 15; resumed March 20.

The sergeant remarks as follows in reference to some of these displays:

September 20.—A large brig (name unknown) lost the greater part of her canvas while lying at anchor in Saint Clair River.

October 9.—The steam-barge Saulas broke her steam-valve, and was towed into port for repairs.

November 1 *and* 2.—Two steam-barges were badly damaged by the storm.

May 20 *and* 21.—A large vessel (name unknown) had a part of her canvas blown away.

May 29 *to June* 1.—Roof of freight-shed at Grand Trunk depot blown off. Schooner Stafford capsized in Saint Clair River; no lives lost.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	1,867
Number of Local Reports issued during the year ending June 30, 1879	312
Number of Forms 22 issued during the year ending June 30, 1879	36
Total	2,215

PORTLAND, MAINE.

[*Official number*, 12.]

Latitude	43° 40′
Longitude	70° 16′
Elevation of barometer above mean sea-level	45.39 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.944
Mean temperature for the year ending June 30, 1879	47°.5
Amount of rain-fall for the year ending June 30, 1879	41.10 inches.

Established January 15, 1871.

Office in second story United States custom-house, corner of Third and Fourth streets.

Sergeant W. T. Boyd has remained in charge. One assistant has been ordered to, and one relieved from, the station, the latter for discharge.

The station was inspected during August, 1878, and March, 1879. The office was found in good order; records properly kept and neat; observer and assistant attentive to their duties and highly spoken of.

August 20, display section No. 7 was established, comprising Booth Bay and Belfast, Me., and Portsmouth, N. H., and all telegraphic orders are transmitted through the Portland observer.

On April 1 Deer Isle, Me., was added to the section; June 1 Belfast, Me., was dropped from, and Rockland, Me., added.

Extracts from the observer's semi-annual reports:

The interest in the service at this station has steadily increased, as its benefits are so many and varied, reaching directly or indirectly the interests of all classes of our business men. The storm-flags warn the mariner of dangerous winds along the coast, and not any sailing-vessel will leave the harbor when they are displayed. Even the large steamers delay making their usual trips when the flags are flying.

The telegraph reports give reliable information of any sudden changes in the temperature, and the packers of perishable goods are governed thereby. The approach of rain or snow storms is predicted so accurately that the first item sought for in the morning paper is the weather indications for the day.

Lawyers find the Signal-Service reports very beneficial in many of their legal cases, when the subject of certain conditions of the weather becomes a matter of dispute. Your observer has been called upon to give testimony in court concerning the weather in many cases, and the results have been credited to the service in every case.

Medical men often search the records of the office to trace the origin and spread of different diseases, which appear at different periods of the year, and are ascribed to certain conditions of the atmosphere.

Not so many visit the office out of curiosity as formerly, the novelty of the service having died out, but a great many come for information, and all express themselves as well satisfied with the great good the Signal Service has accomplished.

No casualties to shipping have been reported in the immediate vicinity of the station, which fact is probably due to the close attention paid to the display of signals at this port.

Forty-one cautionary signals, and twenty-two cautionary off-shore signals, were displayed during the year at this station.

The sergeant remarks as follows in reference to some of these displays:

July 26 and 27.—Signs and awnings blown down throughout the city.

October 23 to 24.—The wind attained a velocity of sixty or seventy miles per hour on the 24th. Considerable damage occurred throughout the city from high wind and heavy rain. No lives lost.

November 22 *to* 24.—The tide on the 23d instant was the highest known for years. The harbor was full of coasters: all remained during the display. The steamer Mississippi attempted to make harbor during the storm, but was forced to put out to sea.

December 1 *to* 3.—The wind attained a velocity of sixty miles per hour. The tide overflowed the wharves. All vessels remained in port. No damage reported.

December 10 *and* 11.—Most of the damage in this vicinity occurred from the heavy rains.

December 21 *to* 23.—Although the wind attained a velocity of forty-four miles per hour, no damages are reported, as the timely display gave ample warning and was generally heeded.

February 20 *to* 22.—All vessels remained in harbor. No damage reported in this vicinity. Sea very rough.

March 27 *and* 28.—Heavy snow-storm during the display.

March 29 *to April* 1.—Schooner Kathadin left harbor while off-shore signals were flying and went ashore near Winthrop Head, Mass.; crew saved; vessel a total loss.

April 10 *to* 12.—All vessels remained in harbor during the display.

April 23.—Signs and awnings were blown down. No damage to shipping occurred.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	3,865
Number of Forms 15 (manifold) issued during the year ending June 30, 1879	2,679
Number of Forms 22 issued during the year ending June 30, 1879	91
Total	6,635

PORTLAND, OREGON.

[*Official number*, 74.]

Latitude	45° 30′
Longitude	122° 27′ 30″
Elevation of barometer above mean sea-level	66.50 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.111
Mean temperature for the year ending June 30, 1879	52°.3
Amount of rain-fall for the year ending June 30, 1879	37.66 inches.

Established November 1, 1871.

Office on third floor, No. 48 First street.

Corporal R. R. Hermann has been continuously in charge, with one assistant.

The elevation of the barometer heretofore used, 96.8 feet, having been found to be erroneous, that of 66.5 feet was adopted May 14, 1879.

The station was inspected during October, 1878, and the office and instruments found in a neat condition; observer and assistant attentive to their duties; the records generally neat and correct, except during Sergeant E. Lloyd's time, when many errors and omissions were apparent.

Navigation closed January 3, and opened January 13. The Willamette was frozen over from January 3 to 9, and the channel at the mouth (entrance to Columbia River) remained closed by an ice gorge until the morning of January 13.

Observations on the stage of water in the Willamette River were commenced March 16. Highest water, 20 feet 6 inches, occurred June 9; lowest 5 feet 7 inches, May 18.

Extracts from the observer's semi-annual reports:

The Indications for the Pacific Coast region have been regularly published by the daily morning Oregonian since March 1. The interest in the service has greatly increased since the indications were extended to the Pacific Coast.

The a. m. and p. m. reports, daily, of the reduced barometer and thermometer at Portland, Roseburg, and Umatilla, Oreg., and Olympia, Wash., have been furnished to Judge D. C. Lewis, of Walla Walla, Wash., by mail, since May 18, for the use of the civil engineers of the Northern Pacific Railroad.

The records of the office have been used as evidence in the United States court. Frequent requests have been made for data from the records. They have been consulted

on quite a number of occasions by parties who had entered into agreements, substantially as follows:

In the chartering of ships, agreements between merchants and ship-owners are generally so made at this port, that the ships shall carry freight for a certain consideration, and a specified number of days are allowed the merchant in which to load the vessel, "rainy days not to count." This clause, "rainy days are not to count," is frequently the cause of controversy, and in all cases, as far as I know, an amicable settlement has been arrived at, after the examination of the records.

A large number of barometers have been compared, among them seven for civil engineers and one ship's barometer.

PULICATIONS:

Number of Bulletins (manifold) issued during the year ending June 30, 1879	5,138
Number of local reports issued during the year ending June 30, 1879	66
Number of Forms 22 issued during the year ending June 30, 1879	52
Total	5,256

PORTSMOUTH, NORTH CAROLINA.

[*Official number*, 137.]

Latitude	53° 2′
Longitude	76° 4′
Amount of rain-fall for the year ending June 30, 1879	59.55 inches.

Established April 23, 1876, as a repair station; observations commenced May 9, 1876.

Office in United States Marine Hospital building.

It has been continued as a repair station, but some meteorological observations were begun during the year.

Private W. Daly continued in charge up to February 3, when he was relieved by Private L. Leonardy and transferred to Cape Hatteras, N. C. One assistant has been ordered to the station during the year.

The station has not been inspected.

Extracts from the observer's semi-annual reports:

The section under charge of this station has not been in as much trouble as formerly. Since the setting of seventeen iron poles and moving back one mile of wire, little trouble has occurred on the Ocracoke beach. The iron poles at Whalebone and Drum Inlets have done good service.

The schooner Harmon Curtis, of Havington, Me., came ashore on Ocracoke beach August 17, and became a total loss; the crew and cargo were saved, particulars of which were telegraphed to Chief Office, owners, and underwriters.

The schooner Hattie G. Dow sank near Hatteras Shoals, October 31; the crew took a small boat and landed near Ocracoke light, November 2. The particulars were telegraphed to Chief Office, and owners of vessel same date.

A portable instrument shelter was received and placed in position January 6, and the thermometers moved into it after midday observation of that date.

Schooners Melvin and Addie Henry made harbor in channel near this office, February 28, in distress; particulars were telegraphed to Chief Signal Officer and owners from this office. Revenue-cutter E. A. Stevens arrived March 2 to render assistance to them.

Private Leonardy started north March 30, to repair line; reached the Wells and was compelled to return, owing to a very heavy storm, as no harbor could be made there; he arrived at a station at 6 p. m.; crossed Ocracoke Inlet with sixty-eight miles of wind; boat lost sails and rudder, and came very near being wrecked. Private Kenan started north April 1, to repair line after the storm; put section in good order to south side Hatteras Inlet; there he found schooner Meteor ashore; opened wreck station and reported to Chief Signal Officer; was ordered to remain at wreck; steamer came to the assistance of schooner April 2, and floated her during the afternoon.

PUNTA RASSA, FLORIDA.

[*Official number*, 59.]

Latitude	26° 36′
Longitude	82° 10′
Elevation of barometer above mean sea-level	17.00 feet.

Mean barometer (reduced to sea-level) for the year ending June 30, 1879 ..... 30.067
Mean temperature for the year ending June 30, 1879 ..... 72°.9
Amount of rain-fall for the year ending June 30, 1879 ..... 32.10 inches

Established August 15, 1871.

Office in a building erected by the United States during the Indian war in Florida.

Sergeant A. W. Browne has continued in charge without an assistant.

The station was inspected in February, 1879, and the office reported in excellent order; the work well and faithfully performed; the records correct and up to date.

Extract from the observer's semi-annual report:

This station being completely isolated, the masters of the few schooners engaged in the cattle trade between Key West, Fla., and ports on the island of Cuba, and this port, are the only persons who make any inquiries or manifest any interest in the service, and they derive all possible benefit from the observations taken at this station.

PUBLICATIONS.

Number of Forms 22 issued during the year ending June 30, 1879 12

Total 12

RED BLUFF, CALIFORNIA.

[*Official number*, 143.]

Latitude ..... 40° 10′
Longitude ..... 122° 16′
Elevation of barometer above mean sea-level ..... 337.64 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879 ..... 29.992
Mean temperature for the year ending June 30, 1879 ..... 62°.6
Amount of rain-fall for the year ending June 30, 1879 ..... 21.17 inches.

Established July 1, 1877.

Office on the third floor of Crandall's Building, Main street.

Sergeant R. R. Rodgers remained in charge until April 22, 1879, when he was relieved by Sergeant R. B. Watkins and transferred to Roseburg, Oreg. The station has been without an assistant. It has not been inspected during the year.

During the absence of Sergeant Rodgers, for re-enlistment, in August, Mr. T. Fish, civilian, performed the duties.

River observations were taken from December 15, 1878, to March 15, 1879. Highest water, 22 feet 9 inches, occurred March 6; lowest, 1 foot 5 inches below zero, January 8, 9, and 10. The zero of the gauge is low water of 1876.

Extracts from the observer's semi-annual reports:

Reports furnished the press for publication have been received with the greatest approbation. The Daily Evening Sentinel made its first appearance June 9, 1879, since which date a full report of all the observations has been regularly furnished and published. The Weekly Sentinel also publishes a weekly summary—the means for each day of the week. The other paper, People's Cause, formerly published reports, but for want of space discontinued them. It however publishes amount of rain-fall, and both papers Form 22 condensed.

The service is fully appreciated, and the bulletin boards (in six different places) are early scanned by many. Woodmen and stock-dealers derive the most benefit from the service. Mr. Marsden Manson, assistant State engineer, Sacramento, was in the town in June, surveying the river. He requested and was furnished with the readings of the Signal gauge, which information was of great value, likewise the rain-fall.

December 15.—Special river observations of the Sacramento River were commenced. The bench-mark from which these measurements are made is a point of reference most commonly known to river-men, it being at level of the low water of 1876. This increase of work appears to meet with general favor, and, as the river in the

course of the season becomes very high and dangerous, there is no doubt it will prove highly beneficial.

Many wind-storms have occurred in the last six months, the maximum hourly velocity being 47 miles in January.

The rainy season ended on June 10.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	6,520
Number of Local Reports issued during the year ending June 30, 1879	28
Number of Forms 22 issued during the year ending June 30, 1879	48
Total	6,596

ROCHESTER, N. Y.

[*Official number*, 32.]

Latitude	43° 8′
Longitude	77° 51′
Elevation of barometer above mean sea-level	584.17 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.976
Mean temperature for the year ending June 30, 1879	47°.8
Amount of rain-fall for the year ending June 30, 1879	39.23 inches.

Established November 1, 1870.

Office in room No. 212, Power's Block, corner of Main and State streets.

Sergeant E. B. Garriott continued in charge until March 12, 1879, when he was relieved by Sergeant J. Gilligan and transferred to Pittsburgh. Three assistants have been ordered to, and three from, the station.

Navigation on Lake Ontario closed December 1, and opened March 8; on Erie Canal, closed December 7, and opened May 8.

This station was inspected during July, 1878, and February, 1879, and the following reports made: office and instruments in very good order; the records kept in a very neat and proper manner; work of the office conducted in a very orderly and systematic manner; during the early part of the winter, when the heavy snow-storms prevailed, the office was visited daily by railroad men for information as to the probable winds, &c.

Extracts from the observer's semi-annual reports:

The cautionary signal orders have been repeated at Charlotte, N. Y., from this station, and signals displayed there since July 14. Orders were also repeated to Cape Vincent, N. Y., from that date until July 30, Rochester having been the central station of section six. On account of the great difficulty in reaching Cape Vincent with night orders, the section was transferred to Oswego, N. Y., July 30. They have been of greatest benefit to all persons interested in lake navigation. Since the signals have been displayed at Charlotte, the orders have been without exception followed by storms, most of them being very severe, and that, taken together with the fact that in instances vessels have put out while the signals were flying, and were obliged to return in a more or less damaged condition, has had the effect of causing those contemplating a lake voyage to have respect for the red flag and lantern, and given the display of signals a still greater importance than they have formerly had. All lakemen and vessel owners affirm that they are becoming indispensable, and a discontinuance of the display during navigation would cause them the greatest inconvenience. Many wishes are expressed that they could be even more generally displayed at points along the lakes. The number who consult this office on the display of cautionary warning is increasing, thereby showing that the efficiency and accuracy of the service is duly impressed on the classes whose interests are affected by atmospheric changes.

The interest taken in the service by the public at large is shown not only by the great demand for publications, but the numerous inquiries made at this office by persons desiring data and information, as has been stated in previous reports. The records are largely consulted by lawyers for information and data in connection with lawsuits. Many cases have been decided by data obtained from this station, and it

is always taken as conclusive. Although almost every one here seems to be interested in the reports and predictions, they are of more particular benefit to lake-men, farmers, members of the medical profession, ice dealers, roofers, yatching, fishing, and picnic parties, contractors, builders, and handlers of perishable goods, such as oysters, fruit, and the like. Several of the larger ice firms visit or send to this office almost daily, during the winter season, for the temperature predictions.

During the recent snow blockades on the railroads, numerous inquiries were made by the railroad officials as to the probable direction and force of the wind, and the amount of snow likely to fall. The information received was of great value, as it enabled them to make the necessary preparations for keeping the roads clear.

Through the medium of the press the public is promptly informed of such telegrams as may affect commercial interests at all the lake ports where storm-signals are displayed. The interest in the local reports, furnished to the newspapers, is an encouraging indication that the efforts of the Service are valued, and such benefits as can be derived therefrom more widely diffused. That the public at large avails itself of the benefits of the weather forecasts may be inferred from the numerous visits to this office for the purpose of reference to the record of the weather on given dates, as well as the requests for information of a miscellaneous character relating to climatology, latitude, longitude, magnetic variations, droughts, frosts, snow-storms, tornadoes, &c.

The active co-operation of the local press is a gratifying feature, and all items relating to the aims and progress of the Service for the advancement of scientific and useful knowledge are inserted with editorial notices of commendation.

Twenty-eight cautionary signals were displayed during the year at this station.

The display of signals was suspended for the season December 15, 1878; resumed March 20, 1879.

The sergeant remarks as follows in reference to some of these displays:

September 11 *to* 14.—The schooner E. P. Dorr, of Oswego, went ashore during the storm; crew rescued by life-saving service; vessel and cargo will probably prove a total loss. The schooner Pearl also went ashore about the same time; crew rescued by a passing vessel; schooner not seriously damaged.

September 25 *and* 26.—All vessels remained in port during the display.

October 9 *and* 10.—No damage done to shipping. Considerable injury to the fruit crop by blowing it from trees.

October 23 *and* 24.—The severest storm of the season. The schooner Stad, bound for Kingston, grain-laden, went ashore while trying to make harbor at Charlotte; crew rescued by life-saving service.

November 6 *to* 8.—The schooner Wacousta, coal-laden, went ashore on the 7th instant; vessel and cargo will probably prove a total loss; crew of six rescued by the life-saving crew at Charlotte. A number of vessels put into Charlotte Harbor for shelter. The signal display at Charlotte was greatly appreciated by lake-men.

November 11 *to* 13.—Very rough weather on lake. A large number of vessels put into Charlotte Harbor for shelter. The schooner Wm. L. Preston left Charlotte during the display, and was obliged to put back with the loss of one of her jibs.

December 8 *to* 12.—Storm very severe. No disasters to shipping reported.

PUBLICATIONS.

Number of Farmer's Bulletins issued during the year ending June 30, 1879	1,792
Number of Bulletins (manifold) issued during the year ending June 30, 1879	4,310
Number of Local Reports issued during the year ending June 30, 1879	1,112
Number of Forms 15 (manifold) issued during the year ending June 30, 1879	153
Number of Forms 22 issued during the year ending June 30, 1879	98
Total	7,465

ROSEBURG, OREGON.

[*Official number*, 146.]

Latitude	43° 10′
Longitude	123° 16′
Elevation of barometer above mean sea-level	537.00 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.106
Mean temperature for the year ending June 30, 1879	51°.3
Amount of rain-fall for the year ending June 30, 1879	38.17 inches.

Established July 15, 1877.

Office on second floor of building east side of Jackson, between Oak and Washington streets.

Sergeant J. Dascomb remained in charge until May 4, 1879, when he was relieved by Sergeant R. R. Rodgers, and transferred to Olympia, Washington Territory. The station has been without an assistant.

The station was inspected in October, 1878. On account of the improper location of the rain-gauge, at the edge of the roof, it was moved by the inspector to the peak. The office was reported in a neat and clean condition; records generally neat and correct; blank forms not arranged; the observer reported as attentive to his duties and conducting himself properly. Mr. Story Sheridan, civilian, has been instructed and reported competent to take charge of the office in case of necessity.

Extracts from the observer's semi-annual reports:

A daily mean report, for week ending on Wednesday, is published in the Western Star. This report and the bulletins are of interest and value to all.

Owing to the small size of the town, only two copies of the bulletin are issued, (tri-daily) one of which is filed in the observer's office and the other posted in the stage office at the Metropolitan Hotel, the most conspicuous place in town, where it is regarded with much interest by all, considering the limited number of reports from which it is compiled. Commencing with May, a copy of Form 22 has been furnished to each of the three weekly newspapers, and in which its general items have been carefully published.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	2,193
Number of Forms 22 issued during the year ending June 30, 1879	27
Total	2,220

SACRAMENTO, CALIFORNIA.

[*Official number*, 144.]

Latitude	38° 35′
Longitude	121° 31′
Elevation of barometer above mean sea-level	76,33 feet.
Mean barometer for the year ending June 30, 1879	30.013
Mean temperature for the year ending June 30, 1879	61.0
Amount of rain-fall for the year ending June 30, 1879	17.85 inches.

Established July 1, 1877.

Office on fourth floor of St. George building, corner Fourth and J streets.

Sergeant R. B. Watkins continued in charge, except from July 25 to August 18; while on leave private J. T. Cochran was on duty, and from October 2 to 5, when absent in San Francisco for re-enlistment, Dr. F. W. Hatch, civilian, performed the duties. April 16, 1879, Sergeant Watkins was transferred to Red Bluff, California, and Sergeant M. M. Sickler assumed charge.

The station was inspected in March, 1879. The office was found in neat condition; the records complete and neat; observer highly spoken of as attentive to his duties. Dr. H. W. Hatch has been instructed and reported competent to take the observations, &c., should necessity require it.

Extracts from the observer's semi-annual reports:

Since the extension of the Indications to this region they have been regularly published in the Record-Union newspaper, copied by the observer, and posted with the Daily Bulletin. The Indications for this coast have met with a favorable reception, and are carefully consulted, especially in the rainy season, by all classes of citizens, who speak of them as being a source of great benefit.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	2,989
Number of Local Reports issued during the year ending June 30, 1879	860
Number of Forms 15 (manifold) issued during the year ending June 30, 1879	388
Number of Forms 22 issued during the year ending June 30, 1879	43
Total	4,280

SALT LAKE CITY, UTAH TERRITORY.

[*Official number*, 70.]

Latitude	41° 10′
Longitude	112° 00′
Elevation of barometer above mean sea-level	4,362,25 (?) feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.979
Mean temperature for the year ending June 30, 1879	53°.0
Amount of rain-fall for the year ending June 30, 1879	15.12 inches.

Established March 22, 1874.

Office on fourth floor Wasatch Hotel building, corner Main and South Second street.

Sergeant W. McGillivray remained in charge up to January 19, 1879, when he was relieved by Sergeant J. Craig and transferred to Newport, R. I.

The station was inspected in September, 1878, and the following reported: Records correct; office neat; observer attentive to his duties and conduct excellent.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	1,883
Number of Local Reports issued during the year ending June 30, 1879	428
Number of Forms 22 issued during the year ending June 30, 1879	73
Total	2,384

SANDUSKY, OHIO.

[*Official number*, 184.]

Latitude	41° 27′
Longitude	82° 43′
Elevation of barometer above mean sea-level	638.50 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.027
Mean temperature for the year ending June 30, 1879	50°.04
Amount of rain-fall for the year ending June 30, 1879	37.71 inches.

Established August 2, 1877.

Office, fifth story West House, corner Columbus and Water streets.

Sergeant W. A. Massey has been continuously in charge, with one assistant, since November 23, 1878.

The station was inspected during September, 1878, and March, 1879, and the office found in a neat condition; the records neatly kept; work of the station conducted to the satisfaction of the people.

The instrument shelter was moved March 8 from the office window to another in the hall upon the recommendation of the inspector, as it was apparent that the heat from the office-room affected the thermometers.

Navigation was suspended December 10. The bay was entirely frozen over on the 13th. The ice began breaking up March 9, and by the 14th it had disappeared. The first arrival occurred on the 14th, but navigation was not fully resumed until March 24.

Extracts from the observer's semi-annual reports:

The newspapers—two dailies—have continued to devote a liberal space to the publication of all the local reports and the *Indications, as telegraphed from Washington*, and are ever ready to bring to the notice of the public the extreme benefits to be derived from the works of the service.

A very great reliance is placed in the cautionary signals. Not a sailing-vessel ever, to my knowledge, left port during a display, except on one occasion. These displays, have without doubt, been the means of saving much property and many lives. The captains have, without exception, visited the office when the warnings have been given, and *in each and every instance they have expressed themselves as pleased* with the caution. To use the expressions of a number of them, "it is the best thing for sailors that has ever been given them"; *they, in all instances, giving due credit to* the central office. Those deriving the greatest benefits from the displays are, of course, the lake navigators, though dealers in lumber, coal, grain, salt, iron ore, and, *at seasons*, pork packers, fish and ice dealers, wine growers, and farmers are very largely interested, not only in the display of signals, but of the then or expected weather. In fact, the interest is very *general*, and the conviction has taken deep root that the storm-warnings and Indications of the Service can be entirely depended upon.

Thirty-seven cautionary signals were displayed during the year at the station.

The sergeant remarks as follows in reference to some of these displays:

July 26 *and* 27.—A number of vessels lost portions of the rigging.

August 24 *and* 25.—All steamers except the Louise remained at their docks during the display. Yacht Ogontz left with a pleasure party on the 25th and had mast carried away; no lives lost.

September 11 *to* 14.—*Several* lake captains visited the office during the display; all declared the signal to be most opportune, and no doubt prevented many disasters. Steamer Pearl reported *ashore near Kelley's Island; lake very rough.* Captain Cook reports over fifty steam and sailing vessels anchored behind Kelley's Island.

September 25 *and* 26.—Gale accompanied by sharp *and vivid lightning.*

October 9.—All sailing-vessels remained in port. Four sailing-vessels entered bay from lake and remained anchored until signal was lowered.

October 16 *to* 18.—Signal heeded by all sailing-vessels.

October 22 *to* 24.—Signal generally heeded by sailing-vessels. Office visited by several vessel *captains* whose *boats* were destined for different lake ports; expressed themselves as pleased with the warning. Two schooners (names unknown) reported as wrecked in lake; *no particulars.*

October 30 *to* 31.—No arrivals or departures of sailing-vessels or steamers.

November 5 *to* 8.—Tug Myrtle driven ashore on *Peele Island on the 6th, twenty-five* miles north of Sandusky.

November 26 *to* 28.—A number of captains and others visited the office during the display. All vessels remained in port.

November 30 *to December* 5.—All vessels remained in port during the display.

December 15, 1878.—*The display of cautionary* signals discontinued for the season.

March 20, 1879.—The display of cautionary signals resumed this date.

March 23 *to* 25.—*Tug Golden Eagle left port for Kelley's and Put-in-Bay* Islands, and sunk between the two places, going down in twenty-four feet of water; her bow was crushed in by heavy masses of ice. *She had thirty-five passengers and considerable freight*; passengers and freight saved.

April 3 *to* 4.—All steamers and sailing-vessels remained in port.

April 25.—All sailing-vessels remained in port.

May 23 *to* 27.—The Cooke, largest side-wheel steamer running into this port, remained at her dock.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	5,887
Number of Local Reports issued *during the year ending June 30, 1879*	367
Number of Forms 15 (manifold) issued during the year ending June 30, 1879	2,722
Number of Forms 29 issued during the year ending *June 30, 1879*	44
Total	9,020

SANDY HOOK, NEW JERSEY.

[*Official number*, 112.]

Latitude	40° 28′
Longitude	74° 1′

Elevation of barometer above mean sea-level ..... 29.25 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879 ..... 30.014
Mean temperature for the year ending June 30, 1879 ..... 51°.7
Amount of rain-fall for the year ending June 30, 1879 ..... 60.37 inches.

Established December 10, 1873.

Office at the northeast point of Sandy Hook, between the Ordnance building and the east beacon light.

Sergeant P. J. Huneke was in charge until January 17, 1879, when he was transferred to Yankton, Dak.; from January 17 to June 5, Corporal E. Davis, who was ordered to Pike's Peak, Colo.; since June 5, Corporal William Stein. Three assistants have been ordered to and four relieved from the station.

The station was inspected in July, 1878. Office found in fair condition; records in excellent order; observer and assistant well spoken of, and familiar with their station duties.

Extracts from the observer's semi-annual reports:

Over a loop connecting this office with the marine office at New York City all the reports of passing vessels, made by the Cape Henry signal station, transmitted to the New York Maritime Association. This office also receives and transmits all the reports of wrecks, &c., furnished by the office of the Chief Signal-Officer, addressed to the association and the sergeant in charge of the New York signal station. In the same manner the latter is also furnished, daily, with the reports from the stations along the coast line. The repair section of the coast line, allotted to this station, extending from Sandy Hook, N. J., to the north side of Barnegat Inlet, a distance of fifty miles, has given more trouble during the last six months than had been the case in former periods, and from the nature of the trouble found on several occasions it has been feared that the line had been tampered with by some malicious person. At present the section is in fine condition. On September 17 a mule was sent to this station, to be used in cases of wrecks, line repairs, &c.

Very little damage has been sustained from storms by the shipping in this vicinity. The attention paid to the signals has, as usual, been general. Not any vessels leave harbor during their display. When the off-shore signal is hoisted, coasters, as well as ocean vessels, avail themselves of a fair wind, if bound out.

Sixty-eight cautionary signals and fifty-five cautionary off-shore signals were displayed during the year at this station.

The sergeant remarked as follows in reference to some of these displays:

July 10.—Swedish bark Sandvik came into harbor with fore-top-gallant mast gone; rough weather outside.

September 7 *and* 8.—An unknown schooner, cargo of lumber, ran into Romar Shoals; sails, rigging, and part of cargo taken off. Abandoned.

October 22 *to* 24.—Not any known damage done to shipping in this immediate vicinity. Incoming vessels show signs of having encountered rough weather outside. Not any vessel left port during the display of cautionary signals, but many sailed when off-shore signals were hoisted.

October 27 *and* 28.—Gale accompanied by heavy rain.

November 10 *to* 14.—Not any damage to shipping heard from.

November 21 *to* 24.—Sloop Star, from New York to Florida, came ashore near Government dock. Three-masted schooner grounded on Romar Shoals. Both vessels got off at high water without damage.

December 8 *to* 12.—Schooner General Scott, from New York for Sandy Hook, sprung a leak; captain ran her ashore to save cargo; cargo saved; boat a total loss.

January 5 *and* 6.—All vessels remained in harbor.

March 21 *to* 23.—Fifteen coasting vessels bound out, came to anchor in bay, and remained during display. The gale was accompanied with thunder, lightning, and heavy rain.

March 26 *and* 27.—Twenty vessels remained in harbor during the display.

March 30 *to April* 1.—The three-masted schooner Mary J. Cook blown aground on point of Hook; was towed off in about two hours with no serious damage.

PUBLICATIONS.

Number of Forms 15 (manifold) issued during the year ending June 30, 1879... 1,058
Number of Forms 22 issued during the year ending June 30, 1879 24

Total 1,082

SAN FRANCISCO, CALIFORNIA.

[*Official number*, 29.]

Latitude	37° 47′ 35″
Longitude	122° 26′ 15″
Elevation of barometer above mean sea-level	60.00 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.038
Mean temperature for the year ending June 30, 1879	64°.6
Amount of rain-fall for the year ending June 30, 1879	24.44 inches.

Established March 8, 1871.

Office in room No. 42, third floor, Merchants' Exchange building, California street.

Sergeant C. E. Brinsmade has had charge throughout the year. Two assistants have been ordered to, and two relieved from, duty at the station.

The station was inspected in November, 1878, with the following result: Office neat and clean; records carefully kept; observer and assistants attentive to their duties.

Extracts from the observer's semi-annual reports:

Monthly means have been forwarded by mail to the office of the Chief Signal-Officer from an average of over ninety stations situated on the lines on the Central Pacific and Southern Pacific Railroads and connecting branches; also from seven signal-service stations on this coast, which are telegraphed to this office on the 1st of each month.

Reports have also been collected and forwarded which had been taken on different steamers of the Pacific Mail and Occidental and Oriental Steamship lines. The barometers of those vessels have been compared with the standard barometer when they have arrived in port, except in cases where the barometers are the property of the company, when permission cannot be obtained to take them from the wharf.

The case containing the standard barometer has been kept open daily from 12 m. to 1 p. m. since December 1 for the comparison of barometers.

The meteorological committee of the Chamber of Commerce has regularly visited the office each month and taken much interest in the same.

The midnight Indications for the Pacific coast regions are received through the Associated Press and published in the morning papers of this city.

During the rainy season nearly all of the papers publish the daily and season rainfall, and the same is kept posted on the blackboard of the Merchants' Exchange.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	2,236
Number of Local Reports issued during the year ending June 30, 1879	1,559
Number of Forms 22 issued during the year ending June 30, 1879	168
Total	3,963

SAVANNAH, GEORGIA.

[*Official number*, 22.]

Latitude	32° 5′
Longitude	81° 8′
Elevation of barometer above mean sea-level	86.84 ft.
Mean barometer (reduced to seallevel) for the year ending June 30, 1879	30.086
Mean temperature for the year ending June 30, 1879	67°.0
Amount of rain-fall for the year ending June 30, 1879	55.14 inches.

Established January 1, 1871.

Office in room No. 13, third floor, Commercial building, corner Bay and Drayton streets.

Sergeant W. S. Popple continued in charge until January 27, when he was relieved by Sergeant P. C. Guthrie and ordered to Fort Whipple, Va. One assistant has been ordered to, and one transferred from, the station.

The station was inspected in January, 1879, and the office reported in good order; records, correct; duties, faithfully discharged.

Extracts from the observer's semi-annual report:

The class of citizens deriving the greatest amount of benefit from the reports are the members of the cotton exchange, commission merchants, shippers, planters, and mariners. All classes of citizens take a lively interest in the service, and pay the office frequent calls during unsettled weather.

The office has been inspected twice by the meteorological committee of the cotton exchange.

The damage to the rice interests alone, during the September cyclone, is estimated by competent parties at $400,000. That this loss would have been much larger, had no signal been displayed, is asserted by all. All cautionary signal orders received at this station have been immediately transmitted to Tybee Island, Ga., eighteen miles east of here, on the coast (where vessels receive waiting and sailing orders), for duplication.

Every effort to make the station useful to the sea-faring men has been carried forward with energy, and by which means the station has been frequently enabled to give notice of vessels in distress in advance of other parties or stations nearer to them.

Nine cautionary signals and five cautionary off-shore signals were displayed during the year at this station.

The sergeant remarks as follows in reference to some of these displays:

September 7 to 13.—Not any damage done to the shipping of this port. The signal is spoken of by the most prominent citizens as a timely and highly beneficial display. Brig Lewis Clark, from New York, for Key West, arrived in distress.

September 21 to 23.—Steamer City Point, due here from Charleston, was delayed by the gale. Information received of the loss of the steamship General Barnes, valued at $40,000, exclusive of a valuable cargo, which left this place on the 19th instant, for New York; also the City of Houston, from New York for Galveston. Steamship Juniata reports having encountered a terrific gale on the night of the 21st.

November 19.—Heavy weather reported outside.

December 9 and 10.—British ship Mohur, which went ashore on Ossabaw shoals on the night of the 8th instant, was gotten off without damage. Trees, buildings, and other objects exposed to the wind's force sustained slight damage. A large number of vessels remained in harbor during the display. Schooner Glenwood, disabled in the gale of the 10th instant, put into Tybee on the night of the 11th.

March 30.—Trees, fences, and roofs of small buildings were destroyed.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	5,394
Number of Local Reports issued during the year ending June 30, 1879	554
Number of Forms 22 issued during the year ending June 30, 1879	50
Total	5,998

SHREVEPORT, LOUISIANA.

[*Official number, 72.*]

Latitude	32° 30′
Longitude	93° 45′
Elevation of barometer above mean sea-level	205.00 (?) feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.051
Mean temperature for the year ending June 30, 1879	66°.3
Amount of rain-fall for the year ending June 30, 1879	47.02 inches.

Established September 3, 1871.

Office on second floor of Martin's building, corner Milan street and Martin's alley.

Sergeant J. B. Campbell remained in charge until January 23, 1879, when he was relieved by Sergeant E. F. Brady, and ordered to Fort Whipple, Va. One assistant has been on duty since February 17.

The station was inspected in April, 1879. The office was found in a fair condition; duties satisfactorily performed; records correct and up

to date, excepting omissions by Sergeant Campbell; the men on duty favorably spoken of.

During the sickness of Sergeant Campbell last September, Mr. J. C. Berry, civilian, attended to the duties.

Highest water in the Red River, 24 feet 0 inches, occurred July 1, 1878; lowest water, 1 foot 0 inches, November 21, 1878. Since February 15 the observations have been taken from the United States engineers' gauge, the zero of which is one foot higher than that of the old gauge.

Extracts from the observer's semi-annual reports:

The press continues its support and readily publishes anything offered to them in relation to the service and its workings.

The medical profession have long since recognized the value and usefulness of the weather reports. This office is frequently visited by its members, and questions are asked in relation to the temperature, humidity, &c., and the information given to them is of practical importance.

The members of the cotton exchange, business men, and the general public express their high appreciation of the service.

The river men derive the most practical benefit from the river bulletin, which emanates from this office daily. The stage of water in the Red River during March and April was the lowest known for many years at that season. The river men attribute it to lack of rain. Navigation, in consequence, closed March 23 for large draft boats, and to all on April 10: opened May 20 and again closed June 24. On the 20th of June the river gauge was wrenched from its position by a flatboat.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1879	254
Number of Forms 22 issued during the year ending June 30, 1879	61
Number of Forms 26 issued during the year ending June 30, 1879	2,013
Total	2,328

SMITHVILLE, NORTH CAROLINA.

[*Official number*, 133.]

Latitude	33° 55′
Longitude	78° 1′
Elevation of barometer above mean sea-level	32.70 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.098
Mean temperature for the year ending June 30, 1879	62°.6
Amount of rain-fall for the year ending June 30, 1879	51.46 inches.

Established October 15, 1875.

Office in the house of Mr. W. J. Potter, Front street.

Sergeant R. Seyboth has continued in charge. One assistant has been ordered to and one relieved from duty at the station.

The station was inspected in December, 1878, and reported upon as follows: Office in excellent condition; records in strict accordance with instructions; flags, &c., tastefully and conveniently arranged for immediate use in case of necessity.

The Signal-Service telegraph line between Smithville and Wilmington has been of great service to the shipping interest, and it has been freely used.

Extracts from the observer's semi-annual reports:

The signals of September 11 to 13, November 19 to 20, November 22 to 23, and of December 9 to 11, 1878, were especially valuable in preparing the shipping in port for heavy gales, and preventing vessels ready to sail from going to sea. It is the opinion of our most experienced pilots that to the storm signals, together with the information obtainable at this office at all times, is mainly due the diminution of serious marine disaster in this harbor during the past few years, which have fully established their claim to confidence. In-coming vessels and pilots almost invariably report heavy weather and sea prevailing outside, and not any complaint has ever reached this office that vessels

were detained without cause, while, on the contrary, many ship masters have expressed to me their satisfaction at the timely warning which caused them to remain in harbor. The off-shore signals are usually considered a sign of clearing weather, and if the sea is not too heavy on the bar, vessels will go to sea while such signals are up. It should be said here that generally not any vessel goes to sea against the pilot's advice, and as the pilots are all familiar with our signals their proper meaning is made known to all masters.

The advantages derived by owners, masters, consignees, &c., from the free and prompt transmission of shipping messages, have been many; the value of said messages passing free over this portion of the coast line is very great; especially was this the case during the time the strict quarantine laws were enforced, which compelled vessels from southern ports to load at Smithville or go elsewhere. Over 500 such messages have been received and sent. The pecuniary benefits to those interested have varied from the stopping of advance money paid on a runaway sailor (quite a common occurrence) to the detention of a vessel, whose sailing orders or charter had been received at Wilmington, only in time to reach her by the Signal Corps wire. As an example, I may cite the Norwegian bark Success, which on December 19 was heaving up anchor, preparing to sail for Savannah, when a dispatch arrived stating that she had been chartered in Wilmington. The message was communicated to the bark by international signals, and the vessel detained. Mr. R. E. Heide, Norwegian consul at Wilmington, afterwards informed me that the timely delivery of this message was worth hundreds of dollars to him and the vessel. The reports of arrivals and departures of steamers and sailing vessels, furnished from this office to Wilmington, are a constant and great advantage to those interested.

The lines have also been of advantage, in various ways, to different branches of the government service, especially the custom and revenue marine service, Coast Survey and Light-House departments. Much delay and annoyance to their officers have been avoided by its use, especially during periods when mail communication was anything but reliable. The arrest of Capt. J. B. Morriss, of the British Brig Prince de Boe, charged with and afterward convicted of smuggling, was effected by means of the wire, on September 17, as the accused was about leaving the harbor on a New York steamer.

International signals have been frequently used in communicating with vessels in the harbor, either directing them to send ashore for telegrams or answering their inquiries relative to expected orders, &c. A more important use of them was made July 29, 1878, when the Spanish brig Dos Amados, in distress, made signals that she was filling and sinking, which signal was promptly answered, and aid promised and secured.

The General Service Code is used at times to advantage in communicating with the revenue cutter and saving delay.

Forty-six cautionary signals and twenty-four cautionary off-shore signals were displayed during the year at this station.

The sergeant remarks as follows in reference to some of these displays:

July 3 and 4.—Schooner Only Son, for Philadelphia, with a cargo of lumber, put into this port leaking badly.

September 7 to 13.—Signal timely and valuable. Vessels in port prepared for rough weather, and several pilot-boats hastened to their anchorage from the outside after signals were hoisted. Gale severest known since April, 1877.

October 10 to 12.—Not any vessels left port during the display.

October 22 and 23.—All vessels remained in port during the display; no disasters in this vicinity.

November 19 and 20.—Heavy NE. gale and rough sea on the immediate coast. Steamer Margaret, from Wilmington to New York, anchored in harbor, owing to the signal.

November 22 and 23.—Several foreign vessels anchored in harbor and remained during the display.

December 9 to 11.—Owing to the timely warning, the shipping interest escaped damage, and not any serious damage was reported from any other source.

January 12 and 13.—Not any vessel left port during the display nor damage heard of.

February 5 and 6.—Not any vessel left port during the display.

February 11 to 13.—Schooner Rescue, from Wilmington to New York, remained in port during the display.

February 19 to 22.—Heavy weather and sea reported to prevail outside.

February 24 to 28.—All vessels remained in harbor during the display. Heavy weather and sea have prevailed outside.

March 16 to 19.—Revenue steamer Colfax, ready for a lengthy cruise on the 16th, remained in harbor during the display.

March 26 and 27.—United States Coast Survey steamer Endeavor, at work thirty miles from nearest harbor, watched for and saw the signal, and made this port in time to escape danger.

April 16 to 18.—Two Norwegian barks and several schooners, ready for sea on the 16th, remained in port, owing to signal.

May 4 and 5.—Heavy sea outside. Lighter schooner Spray, bound in, sprang a leak and sunk.

May 21 to 24.—Pilots and steamboat men report heavy northeast gale and sea outside during the entire display.

June 6 to 8.—Fresh northeast gale and heavy sea reported outside during the display.

PUBLICATIONS.

Number of Forms 22 issued during the year ending June 30, 1879	12
Total	12

SPRINGFIELD, ILLINOIS.

[*Official number*, 228.]

Latitude	39° 48′
Longitude	89° 48′

Established July 1, 1879, with Sergeant T. B. Jennings in charge.

SPRINGFIELD, MASSACHUSETTS.

[*Official number*, 110.]

Latitude	42° 6′
Longitude	72° 36′
Elevation of barometer above mean sea-level	119.88 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.979
Mean temperature for the year ending June 30, 1879	49°.7
Amount of rain-fall for the year ending June 30, 1879	47.80 inches.

Established July 19, 1873.

Office in fifth story Hayne's Opera-House building, corner Main and Pynchon streets.

Sergeant L. A. Welsh remained in charge until March 2, when he was relieved by Sergeant H. R. Hathaway and transferred to Escanaba, Mich. The station has been without an assistant.

The station was inspected during August, 1878, and March, 1879, and the following reports made: Office in excellent condition; records in good order and properly kept; the observer posted in his duties.

Extracts from the observer's semi-annual reports:

The papers publishing the Indications and daily weather reports have a large circulation in the adjoining counties, towns, and agricultural districts. The published reports are regularly consulted, with confidence, by all classes of business men, and are especially used and needed by the numerous manufactories in this vicinity of articles affected by the changes in temperature and humidity.

Officers of the city government and private citizens have called at various times to obtain reliable weather data. The amount of public interest taken in the service has in nowise diminished, the citizens generally being very decided in their approbation, and some of them often expressing a wish that the station would again be established as one of the first class, with the advantages of regular telegraphic reports and daily bulletins.

The principal ones among those who derive the greatest benefits from the service, are the railroad companies, whose agents state that the data they receive from this office and information obtained from the Indications published in the newspapers are of great benefit to them. The fruit dealers also acknowledge that they receive great help from the reports at times.

PUBLICATIONS.

Number of Forms 22 issued during the year ending June 30, 1879	12
Total	12

SAINT LOUIS, MISSOURI.

[*Official number*, 66.]

Latitude	38°37′28″
Longitude	90°15′16″
Elevation of barometer above mean sea-level	543.54 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.050
Mean temperature for the year ending June 30, 1879	55°.8
Amount of rain-fall for the year ending June 30, 1879	32.56 inches.

Established November 1, 1870.

Office in sixth story Columbia Life Insurance building, corner Sixth and Locust streets.

Sergeant William Finn continued in charge until September 22, when he was transferred to Milwaukee, Wis.; Sergeant S. W. Rhode was in charge from September 22 to November 9; and Sergeant J. H. Weber from November 9 to date. Four assistants have been ordered to and four from the station; the latter transferred to other points.

The station was inspected during September, 1878, January and May, 1879, and the following result therefrom: Office in good order; records generally well kept and up to date; the duties properly attended to and as giving satisfaction.

April 1 the thermometers were moved from the shelter attached to the window to a new one upon the roof.

Highest water in the river, 22 feet 4 inches, occurred July 6, 7, and 8; lowest water, 5 feet 11 inches, December 27. Navigation was suspended from December 17 to January 31, and from February 14 to 18, on account of ice.

Extracts from the observer's semi-annual reports:

Special morning reports of thermometer and wind at Yankton, Leavenworth, Saint Louis, Omaha, Saint Paul, and Keokuk were sent by telegraph to Roswell Miller, Cario, Ill., from October 12 to October 30. Morning reports of corrected barometer, exposed thermometer, direction and velocity of wind, state of weather, and rain-fall have been telegraphed daily since December 13 to observer at Cairo, Ill.

A meteorological summary is still furnished the board of health for publication in its weekly mortality report.

Special reports of the stage of water at Yankton, Omaha, and Leavenworth were telegraphed daily to William S. Smith, engineer in charge of construction of bridge at Glasgow, Mo., until April 27.

The a. m. indications were furnished to the operator of the Toledo and Wabash Railroad from May 12 to June 27. The a. m. indications for the Upper Mississippi Valley, Tennessee and the Ohio Valley have been delivered daily since June 17 to the Western Union Telegraph Company for transmission to O. M. Shepard, superintendent Telegraph Saint Louis and Southeastern Railroad, as official business, for transmission to the various stations on that road to be posted for the benefit of the public.

Mr. John Wahl, president of the Merchants' Exchange, on April 14, appointed a meteorological sub-committee to replace the one previously appointed. This committee has visited and inspected the office twice since its appointment.

Two large weather maps are displayed and changed daily, as heretofore, in the Merchants and Cotton Exchange. A great deal of interest is taken in these maps, assistant being frequently hindered from changing the maps by merchants crowding around him to learn the state of the weather in other places. The reports posted in the Merchants' Exchange are daily consulted by all grain dealers, and large sales or future purchases are not made without consulting the Signal Service reports, and frequently the observer, as to the probable weather.

That the interest in the service has increased since my last report is manifest by the fact that the telephone exchanges (Western Union and American District) have placed

instruments in this office at the request of the Merchants' Exchange, thereby connecting the office with nearly five hundred business places. All grain dealers having telephones call up the office for weather reports of grain districts.

During winter, dealers in perishable goods consult the observer by telephone as to the probable weather at points to which their shipments are made, and, who, therefore indirectly govern their shipments. In regard to the above, Mr. Jacob Furth, importer of fruits, in his weekly commercial letter states: "The trade here is certainly under many and lasting obligations to the courteous and obliging officers in charge of the observatory here, who spare no pains to keep us posted on the weather and its changes, and thus furnish us a protection as it were against the elements."

Dr. Hutson W. Ford, chairman of the committee appointed by the Saint Louis Medical Society to investigate the causes of yellow fever, in a letter to me, writes: "We must recollect that these records, *i. e.*, the Signal-Service Records, are of very great importance to sanitary and medical science, as well as to commerce and agriculture. So evident is this, that I would like very much to know that a distinct sub-division of the bureau had been devoted exclusively to the record of the meteorological data with reference to the needs of the public health."

The Signal-Service reports are published, either wholly or in part, by the whole press of the city, and frequently special reports of unusual atmospheric changes are published. The office is at times fairly deluged with members of the press, and information is greedily received. The least atmospheric disturbance causes a general rush of reporters to this office, who frequently remain until after midnight.

An attempt to enumerate all the classes deriving benefit from the Signal Service would necessarily prove futile, because of the daily increasing appreciation of its value in this community. A brief reference, however, to a few isolated cases is certainly in place here, and will not be without interest. A prominent lawyer and ex-governor of the State recently won a suit, involving 5,000 tons of ice, by the evidence given from the records of the Signal-Office. The same party assured me that "only the Signal-Office reports were considered reliable, while those of the private observers were entirely disregarded." Mr. A. E. Faust, a prominent oyster merchant and game dealer of this city, regulates his orders and shipments by the Signal-Office reports. Railroad freight officers frequently request information as to the amount and time of rain-fall. Owners and captains of steamboats frequently visit the office, soliciting information as to the amount of rain-fall, and as to the stage of water in the river here as well as elsewhere.

During the year three hundred and sixty-eight post-offices and twenty-six persons and places were supplied with the Farmers' Bulletin.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1879	164,171
Number of Bulletins (*manifold*) issued during the year ending June 30, 1879	8,086
Number of Local Reports issued during the year ending June 30, 1879	1,607
Number of Forms 15 (*manifold*) issued during the year ending June 30, 1879	2,519
Number of Forms 22 issued during the year ending June 30, 1879	302
Number of Forms 26 issued during the year ending June 30, 1879	2,279
Total	178,964

SAINT MARK'S, FLORIDA.

[*Official number*, 24.]

Latitude	30° 10′
Longitude	84° 12′
Elevation of barometer above mean sea-level	15.00 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.077
Mean temperature for the year ending June 30, 1879	65.6°.
Amount of rain-fall for the year ending June 30, 1879	75.68 in.

Established November 10, 1874.

Office, one-fourth of a mile north of Saint Mark's Row.

Sergeant A. C. Dobbins remained in charge until October 1, when he was relieved by Private J. H. Melton, and ordered to Fort Whipple, Va., for medical treatment. The station has been without an assistant.

During March the station was inspected and everything found in an extremely satisfactory condition.

During the sickness of Sergeant Dobbins in July, August, and September, 1878, the station duties were performed by Mr. Burch, also during the sickness of Private Melton in October, November, and December, 1878.

Extracts from the observer's semi-annual reports:

The interest in the service here is limited. As a general rule, all intelligent persons visiting the office appreciate the value of the service to commerce and to the country at large. During spring and summer, quite a number of small vessels, engaged in catching sponge and coasting around, have stopped here for provisions, wood and water and to dispose of their cargoes, and their crews manifest a general interest in the service.

Six cautionary signals and five cautionary off-shore signals were displayed during the year at this station.

The sergeant remarks as follows in reference to some of these displays:

November 27.—The telegraph line blown down.
April 16 to 18.—Government steamer Laurel, while anchored off the light-house, broke her cable and lost an anchor.

PUBLICATIONS.

Number of Forms 22 issued during the year ending June 30, 1879	22
Total	22

SAINT MICHAEL'S, ALASKA.

[*Official number*, 119.]

Latitude	63° 48′
Longitude	161° 0
Elevation of barometer above mean sea-level	30.00 feet

Established June 28, 1874.

Office in a building of the Alaska Commercial Company.

No reports have been received from this station for the year.

SAINT PAUL, MINNESOTA.

[*Official number*, 39.]

Latitude	44° 53′
Longitude	93° 5′
Elevation of barometer above mean sea-level	795.50 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.943
Mean temperature for the year ending June 30, 1879	46°.0
Amount of rain-fall for the year ending June 30, 1879	23.12 inches.

Established November 1, 1870.

Office in third story, Ingersoll Block, Third street, corner of Wabash.

Sergeant R. J. Lewis continued in charge until January 31, 1879, when he was relieved by Private W. B. Greene and discharged the service for failure to take observations on time. Private Greene was relieved by Sergeant O. S. M. Cone, June 16 and transferred to this office. One assistant has been on duty since November.

The station was inspected during September, 1878, and May, 1879. On both occasions the office was reported in good order; records generally correct and up to date; observer and assistant attentive to their duties, and work of office satisfactory.

During the latter part of the summer, and continuing until the close of navigation, December 14, the stage of water was universally low. Ice

passed out of the river March 26; the first through boat from below arrived April 21. The highest water, 5 feet 4 inches, was recorded June 2, and 3; lowest, 0 feet 7 inches, December 3, and 4.

Extracts from the observer's semi-annual reports:

The reports are growing in favor every day. The three daily newspapers published in this city print our reports daily, and about the first of every month they publish the monthly mean report of the month previous, all of which are universally read.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	6,365
Number of Local Reports issued during the year ending June 30, 1879	686
Number of Forms 22 issued during the year ending June 30, 1879	44
Total	7,095

THATCHER'S ISLAND, MASSACHUSETTS.

[*Official number*, 125.]

Latitude	42° 36′
Longitude	70° 34′
Elevation of barometer above mean sea-level	49.00 feet.
Mean barometer for the year ending June 30, 1879	29.97?
Mean temperature for the year ending June 30, 1879	47°.0
Amount of rain-fall for the year ending June 30, 1879	58.67 inches.

Established December 26, 1875.

Office in Signal-Service building near light-house.

Corporal E. Davis, had charge until January 5, 1879, excepting for a portion of September during the sickness of Corporal Davis, when Private J. Cleary was temporarily assigned. He was relieved by Private E. Guthrie and transferred to Sandy Hook. Private Guthrie remained in charge until April 22, since which date Private E. C. Goss has been in charge.

The station was inspected in August, 1878, and March, 1879, and reported as follows: On former occasion, office in excellent order, but on latter, in bad order and not properly kept; records generally in good order and up to date; observers well spoken of, and understanding their station duties.

Extracts from the observer's semi-annual reports:

The Signal Service Telegraph line and cable, between the island and Rockport, have worked well, and there has not been any interruption in their working.

No wrecks have occurred near this station since the date of last report, which shows that the storm-warnings have been heeded by vessels in this vicinity.

The public interests in the service is increasing, as shown by frequent inquiries as to the condition of the weather and the approach of storms. The fishing and coasting vessels derive the greatest amount of benefit from the reports. All vessels passing the island, when the signal is up, immediately make for the harbor. Frequent inquiries are being made by captains of vessels in Boston and Gloucester as to how the weather is outside, and whether I have signals hoisted or not. Captain Webb, the largest fish dealer in this vicinity, frequently visits the office for information concerning the weather, and says he has derived at last one hundred dollars benefit per year from the service ever since this station has been established.

The cautionary off-shore signal at this point is very important to vessels bound south, because when up the captains know they can get around Cape Cod; but when the cautionary signal is up, it is impossible for them to tell which direction the wind will be from; so, rather than take chances of getting around Cape Cod, they make for harbor and wait for the signal to be lowered.

Forty-one cautionary signals and twenty-two cautionary off-shore signals were displayed during the year at this station.

The sergeant remarks as follows in reference to some of these displays:

November 6 *to* 10.—An English schooner, with distress signal flying, anchored 4 miles south of island; was towed in harbor, after the gale had moderated, by Gloucester fishing vessel; only damage being the loss of sails.

November 18 *and* 19.—Storm, accompanied by heavy rain of 36 hours' duration. Not any disasters reported.

November 22 *to* 24.—Storm, accompanied by thunder, lightning, and rain, and ended with a severe hail-storm.

December 1.—When I hoisted signal 137 vessels were in sight; by morning of 2d, before storm began, all had made harbor or put to sea.

December 21 *to* 24.—Schooner Rosina, of Machias, Me., 111 tons, coal-laden, was driven ashore on Halibut Point; vessel and cargo total loss; crew saved.

December 27 *and* 28.—Thirty-seven vessels made harbor and remained during the display.

June 15 *and* 16.—Upon hoisting signal all vessels in sight put toward Gloucester or Rockport for harbor. Heavy sea running outside.

PUBLICATIONS.

Number of Forms 22 issued during the year ending June 30, 1879	12
Total	12

TOLEDO, OHIO.

[*Official number*, 35.]

Latitude	41° 40′
Longitude	83° 32′
Elevation of barometer above mean sea-level	650.40 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.992
Mean temperature for the year ending June 30, 1879	51°.3
Amount of rain-fall for the year ending June 30, 1879	28.07 inches.

Established November 1, 1870.

Office in room No. 41, fourth floor, Chamber of Commerce building, corner Summit and Madison streets.

Sergeant W. Line continued in charge until June 19, 1879, when he was relieved by Sergeant A. Buell and ordered to Little Rock, Ark., to open a new station. Two assistants have been ordered to, and two relieved from, duty; of the latter, one was ordered to Fort Whipple for medical treatment, the other to this office.

The station was inspected during September, 1878, and March, 1879. On both occasions the office was found in very good order; records neat and properly kept; the observer, the asssistant, and the service commenced in very flattering terms.

Navigation closed December 18; opened March 13.

The records of this office have been used in the courts.

Extracts from the observer's semi-annual reports:

There has been no change in the number of reports received. The service is very favorably recognized by the majority of well-thinking people. That a genuine interest exists, is evidenced by the fact of the newspapers devoting so liberal a space to the publication of meteorological data.

The class of citizens deriving the greatest amount of benefit from the reports are grain dealers and commercial men generally, but while they are more particularly benefited, the excursionist and pleasure-seeker are, too, added to the list.

Thirty-three cautionary signals were displayed during the year at this station.

The sergeant remarks as follows in reference to some of these displays:

June 14 *to* 16.—The gale struck a portion of East Toledo, tearing up a hundred feet or more of solid sidewalk, hurling it into mid-air ten or fifteen feet, turning it com-

pletely over, and crushing it upon the earth again. Two small boys were upon it at the time and carried into the air. They fell underneath it, both being knocked senseless. One had his leg broken in two places, also arm; the other escaped injury. Parties out in sail-boats were caught in the gale; some were upset, but no lives lost.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	3,655
Number of local reports issued during the year ending June 30, 1879	26
Number of Forms 22 issued during the year ending June 30, 1879	120
Total	3,801

TYBEE ISLAND, GEORGIA.

[*Official number*, 121.]

Latitude	30° 0′
Longitude	80° 52′
Elevation of barometer above mean sea-level	28.80 inches.

Established June 21, 1874.

Office, northern end of island, 10 or 15 feet above spring tide-mark, 150 feet from the beach.

Sergeant H. R. Hathaway continued in charge until February 15, without an assistant, when it was discontinued as a station of the first class, and a display station established, with Mr. H. J. Valleau as displayman. No inspection has been made of the station during the year.

During the sickness and absence of the observer in October, the duties were performed by Mr. H. J. Valleau, telegraph operator.

Extracts from the observer's semi-annual reports:

The station continues to be of interest to the merchants and shippers of Savannah, and for the display of cautionary signals, is of great benefit to shippings interests generally. Vessels anchor off this station before going to sea, and frequently observe the cautionary signals here when not observed in Savannah.

Eight cautionary signals and four cautionary off-shore signals were displayed during the year at this station.

The sergeant remarks as follows in reference to some of these displays:

July 3 and 4.—Only one vessel left port during the display, and one schooner driven into harbor.

September 7 to 13.—The cautionary signal attracted much attention in this section, and was of incalculable benefit to shipping. The storm that raged during that period was the most severe since 1874. Three lives were lost near the station and a number between Savannah and here.

September 13 to 14.—The steamer Savannah passed out as the signal was being raised, the steamer Wyoming following close after; the former came to anchor opposite the station as soon as the signal was observed. No sailing vessel passed out during the display. Numerous disasters are reported along the coast; also the loss of several lives.

October 21 to 23.—Signal of much benefit to shipping.

November 19.—No vessel left during the display.

November 27 and 28.—A number of sailing vessels came to anchor opposite station during morning of 27th, and remained during the display.

December 9 and 10.—Pilot-boats and small sailing-vessels dragged anchors, and were compelled to take refuge up the river. Tybee telegraph cable broken.

UMATILLA, OREGON.

[*Official number*, 147.]

Latitude	45° 55′
Longitude	119° 21′
Elevation of barometer above mean sea-level	461.00 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.173
Mean temperature for the year ending June 30, 1879	52°.6
Amount of rain-fall for the year ending June 30, 1879	11.04

Established July 15, 1877.

Office in a small frame building at the western end of village.

Private J. B. Wells has been continuously in charge, without any assistant. The station was inspected in October, 1878. The office was reported as having been found in a neat and clean condition; records, neat and correct; observer, well posted in his duties. River observations have been taken, and mailed weekly to Maj. G. L. Gillespie, Engineer Corps, U. S. A., Portland, Oreg.; also to Lieut. C. F. Powell, Engineer Corps, U. S. A., in charge of the construction of the locks at the Cascades, since June 4, 1879.

Weekly reports of the daily observations of barometer and thermometer have been mailed to Mr. Thomas Downe, consulting engineer, Northern Pacific Railroad, at Walla Walla, Wash.; also to Mr. H. Theilson, chief engineer Oregon Railroad and Steam Navigation Company, same place. Navigation on the Columbia River closed December 24, and opened February 25. Highest water, 22 feet 2 inches, was recorded June 17; lowest, 0 feet 0 inches, from January 5 to 18.

Extracts from the observer's semi-annual reports:

The farmers who come here to trade, and citizens of the town generally, are becoming more interested in the service.

PUBLICATIONS.

Number of Forms 22 issued during the year ending June 30, 1879	12
Total	12

VICKSBURG, MISSISSIPPI.

[*Official number*, 61.]

Latitude	32° 23′
Longitude	90° 54′
Elevation of barometer above mean sea-level	243.46 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	*30.097
Mean temperature for the year ending June 30, 1879	*65°.8
Amount of rain-fall for the year ending June 30, 1879	54.69 inches.

Established September 10, 1871.

Office in third story, corner of Washington and Crawford streets.

Sergeant J. A. Cody has continued in charge except when he was prostrated by sun-stroke from July 20 to 27; by yellow fever from August 31 to October 9; and by having broken two of his ribs, from October 30 to November 26, 1878. Sergeant E. Van Dyk was ordered, September 3, to proceed from this office to Vicksburg, he having previously had an attack of yellow fever. He assumed charge of the station the 7th; on the 11th he was taken sick, but returned to duty the 19th; October 11 he was ordered to return to this office. Private J. F. Tenney, assistant, was attacked with yellow fever August 31, and died September 4. Mr. J. D. Tenney took observations August 31 and November 1; Mr. A. M. Searle, from November 2 to 26. Two assistants have been ordered to, and one relieved from, the station; the latter was transferred to Fort Macon, N. C.

The station was inspected in December, 1878, and April, 1879. On both occasions the office was found in good order; records correct; duties satisfactorily performed.

* Means for September, 1878, computed for 15 days only; means for October, 1878, computed for 29 days only. Observers sick with yellow fever.

Extracts from the observer's semi-annual reports:

The interest taken in the reports continues to increase. The classes deriving the greatest amount of benefit are the members of the Cotton Exchange, cotton planters, river men, and merchants generally. I have been called on by physicians and scientific men for meteorological data for the purpose of comparison with reports of preceding years to enable them to determine the extent the yellow fever is attributable to the different atmospheric changes.

A temporary river gauge was erected at Ryan's Mill, May 21, in consequence of the receding river which left the regular gauge covered with mud. The zero is placed at the same water-level as that of the old gauge.

Highest water in the river 39 feet to 6 inches on February 17, 1879.
Lowest water in the river 14 feet 9 inches, on June 4 and 5, 1879.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	2,204
Number of Local Reports issued during the year ending June 30, 1879	310
Number of Forms 22 issued during the year ending June 30, 1879	17
Number of Forms 26 issued during the year ending June 30, 1879	1,242
Total	3,773

VIRGINIA CITY, MONTANA.

[*Official number*, 77.]

Latitude	45° 20′
Longitude	112° 03′
Elevation of barometer above mean sea-level	5,479.96 (†) feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.714
Mean temperature for the year ending June 30, 1879	42°.1
Amount of rain-fall for the year ending June 30, 1879	17.19 inches.

Established November 25, 1871.

Office in Thompson's Building, corner of Wallace and Jackson streets.

Sergeant E. McGovern has continued in charge, and without an assistant.

The station has not been inspected during the year.

During the sickness of Sergeant McGovern, last September, the observations were taken by A. B. Knight, civilian.

Extracts from the observer's semi-annual reports:

Reports from other stations are not received. The only reports issued are local, and confined to the monthly means and comparisons, which are published in The Madisonian, a weekly paper issued in this city.

The eclipse of the sun on July 29 was observed at this station, assisted by sixteen citizens. On account of getting Washington time but once, our numerous records were not as accurate as they would have been had the telegraph facilities been as good as at other points where observations were taken. Yet some of our work was very successful, especially one of our corona sketches, which, according to the opinion of experts, could not be excelled. Many business men closed their stores during the eclipse in order to give me their time and services, and, aside from this, several of the citizens went to a personal expense in supplying our station with the necessary apparatus for observing the eclipse. We made four sketching frames, two swinging frames for telescopes, one photometer box and several minor articles. The entire cost was $50, and $10 of it was paid by myself.

PUBLICATIONS.

Number of Forms 22 issued during the year ending June 30, 1879	12
Total	12

VISALIA, CALIFORNIA.

[*Official number*, 142.]

Latitude	36° 20′
Longitude	119° 16′
Elevation of barometer above mean sea-level	348.15 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.008
Mean temperature for the year ending June 30, 1879	62°.5
Amount of rain-fall for the year ending June 30, 1879	3.95 inches.

Established July 1, 1877.

Office in second floor of Palace Hotel, corner Court and Mill streets, until May 28, when it was moved to second floor of the Town Hall, corner Church and Acequia streets. The altitude of the barometer remains the same.

Sergeant E. Lloyd remained in charge until December 26, when he was relieved by Private J. T. Cochran. During the absence of Private Cochran at The Presidio, Cal., for re-enlistment, G. W. Stewart, civilian, attended to the duties of the office from May 18 to 21.

The station was inspected in November, 1878. The office-rooms were found neatly kept; records generally neat and correct; observer attentive to his duties and conducting himself properly.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	1,872
Number of Local Reports issued during the year ending June 30, 1879	80
Number of Forms 22 issued during the year ending June 30, 1879	34
Total	1,986

WASHINGTON, DISTRICT OF COLUMBIA.

[*Official number*, 19.]

Latitude	38° 53′
Longitude	77° 1′
Elevation of barometer above mean sea-level	105.56 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.039
Mean temperature for the year ending June 30, 1879	54°.8
Amount of rain-fall for the year ending June 30, 1879	47.55 inches.

Established November 1, 1870.

Office 1719 and 1721 G street, N. W.

Sergeant James B. Newlin has continued in charge of the station-work throughout the year, and creditably discharged the various duties connected therewith. The comparison of the data upon the different forms with the originals, as forwarded from the Signal Service stations, the correction of errors made by the respective observers, the issuing of circulars and instructions to the observers, the translation of the cipher telegraphic reports, three times daily, from each station, &c., has kept the force of men on duty in the station department constantly employed. Eight sergeants have been ordered to, and eight relieved from, duty in same, the latter for change of station. Eighteen assistants have been ordered to, and twelve transferred from, the same; of the latter, two to Fort Whipple for instruction, one discharged the service, and the remainder to other stations.

Lieutenant James A. Swift, Signal Corps, U. S. A., continued in charge of the telegraph department until December 5. From December 6 to February 3, Sergeant J. H. Robinson was in charge. Since February 4, Lieutenant W. E. Birkhimer, Third Artillery, and acting signal

officer, has had charge. Special river reports were received from Harper's Ferry, and notice given of approaching rises in the Potomac, July 30, September 14 and 15, October 25, November 22, 23, 24, 27, 28, and 29, December 11, 1878, January 9, 10, 11, and 30, and February 2 and 3, 1879. The highest recorded depth of the Potomac occurred December 11, 1878, when the water rose to 12 feet above low-water mark at Harper's Ferry. The lowest water, 3 feet 4 inches, occurred on July 30, 1878.

During the year, four hundred and seventy-two post-offices and three persons were supplied with the Farmers' Bulletin.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1879	134,847
Number of Bulletins (manifold) issued during the year ending June 30, 1879	11,943
Number of Maps issued during the year ending June 30, 1879	108,157
Number of Local Reports issued during the year ending June 30, 1879	1,297
Number of Forms 15 (*manifold*) issued during the year ending June 30, 1879	12,382
Number of Forms 22 issued during the year ending June 30, 1879	190
Total	268,816

WILMINGTON, NORTH CAROLINA.

[*Official number*, 20.]

Latitude	34° 11'
Longitude	78° 10'
Elevation of barometer above mean sea-level	73.50 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.067
Mean temperature for the year ending June 30, 1879	62°.00
Amount of rain-fall for the year ending June 30, 1879	50.90 inches.

Established January 1, 1871.

Office on fourth floor, Bank of New Hanover building, corner of Front and Princess streets.

Sergeant D. C. Ralston was in charge until January 24, when he was relieved by Sergeant J. M. Watson. One assistant has continued on duty.

The station was inspected in December, 1878. The office was found in good order; the work satisfactorily performed; records correct.

Extracts from the observer's semi-annual reports:

The interest in the service remains unabated. All classes of citizens express the greatest satisfaction in the weather reports, especially the shipping interest, who pay the greatest attention to the warnings given by the display of cautionary signals of approaching storms.

The telegraph line is freely used between Smithville and here, by captains of vessels, pilots, and tugboats, and is a great convenience to them in the prompt moving of their vessels up and down the river.

The advantages resulting from the display of cautionary signals here are very small, owing to the fact that Smithville, properly speaking, is the port for this place, and a storm has little or no effect on a vessel when she is at the city proper.

Thirty-seven cautionary signals and twenty-two cautionary off-shore signals were displayed during the year at the station.

The sergeant remarks as follows in reference to some of these displays:

December 9 *to* 11.—Considerable damage done to property in the city. Sheds covering cotton blown down.

December 21 *and* 22.—Norwegian bark Success blown on the shoals in the river; had to discharge a portion of her cargo in order to get off. Two large flats sunk. Warning generally heeded.

January 9 *and* 10.—No serious damage done. Several tin roofs loosened by the force of the gale.

March 30 *to April* 1.—British bark Magnet, becoming unmanageable from the force of the gale, collided with steamer Waccamaw, slightly damaging each other.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	4,957
Number of Forms 15 (manifold) issued during the year ending June 30, 1879	91
Number of Forms 22 issued during the year ending June 30, 1879	60
Total	5,108

WINNEMUCCA, NEVADA.

[*Official number*, 139.]

Latitude	41° 00′
Longitude	117° 41′
Elevation of barometer above mean sea-level	4,335.30 feet.
Mean barometer for the year ending June 30, 1879	30.018
Mean temperature for the year ending June 30, 1879	49°.7
Amount of rain-fall for the year ending June 30, 1879	7.93 inches.

Established July 1, 1877.

Office on second floor, Central Pacific Hotel building.

Corporal John Healy continued in charge until June 8, when he was relieved by Sergeant E. F. Kubel and ordered to Fort Whipple, Va.

The station was inspected in September, 1878, and the office found neat and clean; records generally correct; observer attentive to his duties.

Extracts from the observer's semi-annual reports:

The people's interest in the service is on the increase, for the reason that constantly accumulating meteorological data make the office records and publications more valuable.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	1,442
Number of Local Reports issued during the year ending June 30, 1879	270
Number of Forms 22 issued during the year ending June 30, 1879	28
Total	1,740

WOOD'S HOLL, MASSACHUSETTS.

[*Official number*, 60.]

Latitude	41° 33′
Longitude	70° 40′
Elevation of barometer above mean sea-level	35.00 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	29.982
Mean temperature for the year ending June 30, 1879	49°.1
Amount of rain-fall for the year ending June 30, 1879	41.75 inches.

Established January 1, 1873.

Office, previous to November 30, in the Bearse Building, on Main street; since that date on first floor of Capt. E. T. Fish's building, near government beach.

Private J. D. Sumet has continued in charge without an assistant.

The station was inspected during July, 1878, and March, 1879; office found in excellent order; records properly kept; observer well spoken of.

Extracts from the observer's semi-annual reports:

A great many vessels plying between Boston and New York are continually passing this point, and it is not unusual to see forty or fifty anchor off Hallans Shoals and Tarpaulin Point, during the display of cautionary signals. With a view of facilitating the display of signals, Captain E. T. Fish has erected a small 25-foot flag-staff, upon which the signals are displayed immediately upon receipt of orders, and are duplicated at Nobsque, by George Nickerson, light-house keeper. By this method the signals are usually hoisted in from ten to fifteen minutes.

The interest in the service, particularly by men of science, is ever increasing.

Forty-one cautionary signals and twenty-two cautionary off-shore signals were displayed during the year at this station.

The sergeant remarks as follows in reference to some of these displays:

July 26 *and* 27.—An Italian bark was wrecked at Nantucket. No lives lost.

October 11 *and* 13.—Trees and chimneys were blown down. Guano factory partially unroofed, damage $1,500. Numerous wrecks reported from adjoining ports; at Vineyard Haven twenty-one wrecks and twelve lives lost; the gale said to be the severest known for years.

November 22 *to* 24.—Storm accompanied by heavy rain.

December 1 *and* 2.—Steamer Island Home remained in harbor during the display. Telegraph lines blown down.

December 10 *to* 12.—Steamer Island Home left port while signal was flying and had to put back. Maximum velocity during display of signal 50 miles per hour.

PUBLICATIONS.

Number of Forms 22 issued during the year ending June 30, 1879	23
Total	23

YANKTON, DAKOTA.

[*Official number*, 95.]

Latitude	42° 45
Longitude	97° 30
Elevation of barometer above mean sea-level	1,275.00 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.001
Mean temperature for the year ending June 30, 1879	47°.1
Amount of rain-fall for the year ending June 30, 1879	20.02 inches

Established April 1, 1873.

Office in No. 68 Capitol street, corner of Fourth.

Sergeant C. A. Shaw remained in charge until February 1, 1879, when he was relieved by Sergeant P. J. Huneke and ordered to Fort Whipple, Va. The work of the station has been attended to without an assistant.

The station was inspected during August, 1878, and June, 1879, and office found in good order; records correct and up to date.

Highest water, 12 feet 6 inches, occurred June 26; lowest, 2 feet 9 inches, December 12 and 13.

Extracts from the observer's semi-annual reports:

The press is furnished daily with the maximum and minimum temperature, rain-fall, and the stage of the river, which of late they have regularly published.

The interest of the Yankton public in the workings of the service has been very limited, but appears to be on the increase.

The river opened on March 8, 1879; more or less full of floating ice up to the 19th, gorged by ice on the 20th, frozen over again on the 21st, and reopened on the 23d of March.

PUBLICATIONS.

Number of Forms 22 issued during the year ending June 30, 1879	12
Total	12

ATKA, ALASKA.

Latitude	52° 10′ 30
Longitude	174° 0′ 30′

Established May 4, 1879; observations commenced May 7, 1879.

Private L. M. Turner arrived at Atka Island *en route* to Attou May 4, 1879. On the 6th, the instruments were temporarily put up for the purpose of taking observations, viz, standard thermometer, maximum thermometer, minimum thermometer, hygrometer, rain-gauge, and wind-vane.

On May 7 he began taking observations at 1.06, 5.31, 7, 10.06 a. m., and 2, 4.31, 9 p. m., local time.

FORT SAINT MICHAEL'S, ALASKA.

[*Official number*, 119.]

Latitude	63° 48′
Longitude	161° 0′
Elevation of barometer above mean sea-level	30 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	*29.734
Mean temperature for the year ending June 30, 1879	*26°.7
Amount of rain-fall for the year ending June 30, 1879	*14.23 inches.

Established June 26, 1874; observations commenced June 28, 1874.
Office, southernmost building of Alaska Commercial Company.
Private E. W. Nelson has continued in charge.
Extracts from the observer's reports:

The year has been a remarkable one in many respects. On July 8 a remarkably heavy shower of rain occurred at about 11 a. m., the water appearing to fall in a solid sheet. It lasted only about five minutes, and in that time nearly an inch of water fell, overflowing creeks and flooding the tents of the fur-traders. The solar eclipse of July 29 was preceded on the 28th by a considerable snow fall on the coast hills, extending down to within 250 feet of the water-line. The latter part of the summer (1878) was cold and raw, and it was expected that winter would bring more pleasant weather. On November 11 the bay was frozen over and the natives crossed on the ice for the first time during the year. The first of December was the coldest part of the winter, but in the latter part of the month the temperature rose considerably above freezing, while fierce gales, rising often to terrific force, with numerous driving rain-showers, swept the country for days. The ground was quickly bared of snow, and water collected upon the ice on lakes and rivers; this weather continued into January. All the ice along the shore was driven off and the natives were seal-hunting in their boats on the first. February and March were cold but pleasant. In April a change for the worse took place, and May was one of the most inclement months the observer had ever witnessed. It was cold and raw, and the wind swept over the country, accompanied, at intervals, with spiteful showers of rain or snow. The sun was scarcely observed, and though the high winds carried the sea-ice away early in the spring, yet the cold, cloudy weather kept the ice from breaking in the Yukon until long after its usual time. Vegetation is retarded at least two weeks, and water-fowl are much less numerous than usual. The hill-sides are still (June 25) dotted with snow banks, and distant mountains appear half covered with their winter mantle.

UNALASHKA, ALASKA.

[*Official number*, 186.]

Latitude	53° 25′
Longitude	166° 40′

Established August 18, 1878; observations commenced August 22, 1878.

The station was opened by Private Lucien M. Turner. Seven observations of the thermometer, hygrometer, direction and velocity of wind, state of weather, clouds, rain-fall, and maximum and minimum thermometers have been taken, daily, four of which were synchronous with 7.35 a. m., 12 m., 4.35 p. m., and 11 p. m., Washington mean time, the others at 7 a. m., 2 p. m., and 9 p. m., local time.

The situation of Unalashka is at the foot of high hills and low mountains, so that the summits of these elevations obscure the sun after 2 p. m. in winter and 4 p. m. in summer. Sunset observations are not taken. The character of the clouds (for the sky is rarely fair and less often clear) is such as to prevent any excepting the more sombre hues, leaden, pale

*Mean for 11 months only, the reports for June, 1879, not having been received.

blue, dark blue, and the various intergradations of those colors to be seen.

Observations were discontinued April 28, Private Turner having departed for the Island of Atton (via Atka) to open a station, as instructed from this office. There having been no person who could be entrusted with the taking of the observations, the station was necessarily closed.

Private L. M. Turner, in July and August, in accordance with instructions received previous to his departure for Alaska, visited the stations designated for the purpose of carrying out special instructions for establishing stations of observation at several points in the territory and adjacent islands. At Fort Alexander, latitude 58° 57′, longitude 158° 18′, he secured the services of Mr. John W. Clark, established a station, and commenced regular observations. Nushagak is the local name of the natives, which is usually adopted by the Americans and generally acknowledged.

The station at Saint Paul's Island was found in the greatest confusion. The records which had been left there after the death of Private E. J. Gill of the Signal Corps, U. S. A., were mouse-eaten, soiled, and otherwise injured, showing great neglect on the part of the persons in whose charge they had been left. Everything was straightened up as well as could be done under the circumstances, and it is now believed that under the charge of Mr. H. W. McIntyre, who was employed as observer, and into whose charge they were given, they will have better care. A barometer and maximum and minimum thermometers were left at this station, a full set of thermometers (excepting maximum and minimum) being already there. The station is now fully equipped for taking complete observations, which were then commenced, and at the date of last report from there, October 15, were regularly taken.

At each of the two other stations sufficient forms, a standard thermometer, and complete hygrometer were left.

FLYING-STATION AT SLOOP POINT, NORTH CAROLINA.

[*Official number*, 232.]

Established May 27, 1878.

Office in small building owned by Mr. D. McMillan.

Private N. G. Brewer continued in charge until November 14, 1878, when he was relieved by Corporal C. C. Corbin, and transferred to New River Inlet, N. C.

The station was inspected in December 1878, and found in good order.

There are no meteorological instruments at this station.

Extracts from the observer's semi-annual reports:

Persons taking most interest in the service are the farmers and vessel men, who are always anxious to know the indications and the whereabouts of storm centers, and who are only too glad to work accordingly. This information I get from stations on the coast where such reports are received from office of Chief Signal-Officer.

When out on repair trips, the wreck knapsack is carried, carefully packed with a full supply of all necessary material for reporting any disasters and wrecks along my part of the sea-coast line.

FLYING-STATION AT LIFE-SAVING STATION No. 5, FALSE CAPE, NORTH CAROLINA.

[*Official number*, 219.]

Established March 20, 1878.

Office in United States life-saving station. Preivous to January 1 it was known as No. 3.

Private W. Bolton remained in charge until April 1, when he was relieved by Private R. H. Paxton, and ordered to Cape Henry, Va.

The object of this station is, first, to keep in repair the sea-coast telegraph lines from Cape Henry to Kittyhawk; second, in case of wrecks to proceed to and open station at scenes of same; to promptly communicate all the particulars to this office; to notify the life-saving stations, and to render all possible assistance.

Extracts from the observer's semi-annual reports:

The service is rapidly advancing in public favor as its usefulness becomes better understood. There is a class of people, peculiar to the coast, who were at first strongly prejudiced against the service, namely, those who obtained a livelihood mostly from the spoils of wrecks, and therefore lost a considerable income by the establishment of the Signal Service.

The telephone line, recently constructed between Cape Henry and Kittyhawk, by the Signal Service, promises good results. Cape Henry, Kittyhawk, and all intermediate life-saving stations are in telephonic communication with each other. The keepers of the life-saving stations take a lively interest in the service, especially in the working of the telephone line, and when they are cognizant of trouble, they always send a man out to repair the fault.

This station has been very useful to the Life-Saving Service, who take a great interest in its operations. The following-named vessels have been stranded and received assistance since station was established:

March 25.—The Austrian brigantine Nipoli, in ballast, from Fleetwood, England, to Baltimore, ran ashore two miles north of this station at 3 a. m., and was saved by prompt reports from this station.

May 25.—A small sloop came ashore, which has been saved for the owners, who live at Hampton, Va.

November 23.—The Swedish bark Franklin ran ashore six miles north of this station, and was cautioned about her dangerous position. She got off without damage on morning of 24th.

April 23.—An unknown schooner ran aground on shoal near station, but got off shortly after. Condition of section this date good.

At 12.25 a. m. on March 3, 1879, the bark Admiral ran aground one mile south of this station. A wreck station was opened at once, and all particulars reported to the Chief Signal-Officer. The wrecking companies were duly notified and promptly came to the scene of disaster, but their efforts to save the vessel were futile.

FLYING-STATION AT LIFE-SAVING STATION No. 23, LITTLE EGG HARBOR, NEW JERSEY.

[*Official number*, 222.]

Established as a repair station on the sea coast telegraph lines January 20, 1879.

Office in life-saving station No. 23.

Private J. D. Marx continued in charge from the opening of station until May 29, when he was relieved by Private Joseph H. Fox.

In addition to keeping that section of the telegraph line in repair, the man in charge is obliged, in case of wrecks, to at once place himself in communication with them, to render all aid in his power, and to promptly report the particulars to this office.

Sunset observations only are taken, which are forwarded to this office by telegraph, daily, when the observer is not absent on repair duty. A daily journal is kept.

UNITED STATES TELEGRAPH LINES—TEXAS DIVISION.

Table showing stations on the United States telegraph line, Texas division, from which reports have been received during the year ending June 30, 1879.

Name of station.	Reports commenced.	Reports discontinued.	Number of reports by telegraph (daily).	Character of reports received by mail on Form 4 (weekly).
Boerne, Tex	(*)	.....	1	Complete observations taken three times a day.
Brackettville, Tex	(*)	.....	1	Do.
Brownsville, Tex	(*)	.....	4	Do.
Castroville, Tex	(*)	.....	1	Do.
Coleman City, Tex	(*)	.....	1	Do.
Concho, Tex	(*)	.....	1	Do.
Decatur, Tex	(*)	.....	1	Do.
Denison, Tex	(*)	.....	4	Complete observations taken seven times a day.
Eagle Pass, Tex	(*)	.....	4	Complete observations taken three times a day.
Edinburg, Tex	(*)	.....	1	Observations of thermometer, hygrometer, direction of wind and state of weather, clouds and rain-fall taken three times a day.
Fort Davis, Tex	(*)	.....	4	Complete observations taken three times a day.
Fort Griffin, Tex	(*)	.....	4	Do.
Fort McKavett, Tex	(*)	.....	1	Do.
Fort Sill, Ind. T	(*)	.....	4	Do.
Fredericksburg, Tex	(*)	.....	1	Do.
Graham, Tex	(*)	.....	1	Do.
Henrietta, Tex	(*)	.....	1	Do.
Jacksborough, Tex	(*)	.....	1	Do.
Laredo, Tex	(*)	.....	1	Do.
Mason, Tex	(*)	.....	4	Do.
Pilot Point, Tex	(*)	.....	1	Do.
Rio Grande City, Tex	(*)	.....	1	Do.
San Antonio, Tex	(*)	.....	4	Complete observations taken seven times a day.
Stockton, Tex	(*)	.....	4	Complete observations taken three times a day.
Uvalde, Tex	(*)	.....	1	Do.

* Reporting at date of last annual report, June 30, 1878.

Report of stations on the United States military telegraph line, Texas division, compiled from the annual report of Lieut. C. A. Tingle, second United States Artillery, acting signal officer in charge, and from data on file in the office of the Chief Signal Officer.

BOERNE, TEXAS.

[*Official number*, 207.]

Latitude ..... 29° 48′
Longitude ..... 98° 39′
Elevation of barometer above mean sea-level ..... 1,333(?) feet.
Amount of rain-fall for the year ending June 30, 1879 ..... 21.11 inches.

Established May 6, 1876; observations commenced August 27, 1876.

Office in Texas House, Main street.

Mr. Eugene Lane, civilian, has been in charge during the year, except when temporarily on duty at San Antonio, from July 1 to 18.

This station maintains in repair forty miles of wire.

Number of messages during the year.—Sent paid, 466; sent collect, 88; received paid, 386; received collect, 82; sent free, 414; received free, 74; total, 1,510.

Receipts.—This line, $171.04; other lines, $127.93; total, $298.97. Free business, $58.56.

The station has combination telegraph instruments, and full set of meteorological instruments and repair tools.

A daily sunset observation is forwarded by telegraph.

The station has not been inspected.

No observations were taken from July 1 to 18, 1878, owing to the absence of Mr. Lane.

BRACKETTVILLE, TEXAS.

[*Official number*, 204.]

Latitude	29° 17′
Longitude	100° 51′
Elevation of barometer above mean sea-level	1,026.00(?) feet.
Amount of rain-fall for the year ending June 30, 1879	21.21 inches.

Established September 1, 1875; observations commenced May 2, 1876.

Office in post-office building.

Private R. J. Somers was in charge until February 4, 1879, when he was relieved by private J. A. Gleason.

This station maintains in repair forty-eight miles of wire.

Number of messages during the year.—Sent paid, 2,254; sent collect, 452; received paid, 1,646; received collect, 540; sent free, 2,481; received free, 1,795; total, 9,168.

Receipts.—This line, $828.48; other lines, $311.63. Total, $1,140.11. Free business, $913.35.

The station is supplied with a complete set of meteorological and telegraph instruments and repair tools.

A daily sunset observation is forwarded by telegraph.

The station has not been inspected.

BROWNSVILLE, TEXAS.

[*Official number*, 174.]

Latitude	26° 00′
Longitude	97° 30′
Elevation of barometer above mean sea-level	43.40 feet.
Amount of rain-fall for the year ending June 30, 1879	29.51 inches.

Established August 25, 1875; observations began September 14, 1875.

Office in second story of F. Yturrias's building, adjoining custom-house.

Corporal H. C. Wineland was in charge until August 1, 1879, when he was relieved by Private Jerome Williams.

This station maintains in repair twenty-five miles of wire.

Number of messages during the year.—Sent paid, 2,319; sent collect, 518; received paid, 2,747; received collect, 589; sent free, 2,391; received free, 1,416; total 9,980.

Receipts.—This line, $1,117.84; other lines, $73.44; total, $1,191.28. Free business, $684.55.

The station is supplied with a complete set of meteorological and telegraph instruments and repair tools.

Meteorological observations are taken tri-daily and, with a daily sunset observation, are forwarded by telegraph.

The station has not been inspected.

CAMBRIDGE, TEXAS.

[*Official number*, 150.]

Latitude	33° 42′
Longitude	98° 00′
Elevation of barometer above mean sea-level	915.00 (?) feet.

Established June 17, 1875; closed January 5, 1878; reopened June 1, 1878. Observations commenced January 22, 1876; discontinued January 5, 1878.

Mr. W. M. Weddington, civilian, has been in charge during the year.

This station maintains in repair four miles of wire.

Number of messages during the year.—Sent paid, 337; sent collect, 49; received paid, 213; received collect, 111; sent free, 2; received free, 2; total 714.

Receipts.—This line, $173.99; other lines, $79.75; total, $253.74. Free business, $0.61.

There are no meteorological instruments at this station.

The station was inspected October 1, 1878, and found in good condition.

CASTROVILLE, TEXAS.

[*Official number*, 149.]

Latitude	29° 25′
Longitude	98° 50′
Elevation of barometer above mean sea-level	686.00 (?) feet.
Amount of rain-fall for the year ending June 30, 1879	11.67 inches.

Established September 29, 1875; observations commenced January 22, 1876.

Office in second story of Vance House.

Private Thomas Jones has been in charge during the year.

This station maintains in repair forty miles of wire.

Number of messages during the year.—Sent paid, 800; sent collect, 207; received paid, 773; received collect, 168; sent free, 463; received free, 98; total, 2,509.

Receipts.—This line, $254.54; other lines, $85.70; total, $340.24. Free business, $62.77.

The station is supplied with a complete set of meteorological and telegraph instruments and repair tools.

A daily sunset observation is forwarded by telegraph.

The station has not been inspected.

COLEMAN CITY, TEXAS.

[*Official number*, 151.]

Latitude	31° 55
Longitude	99° 10′
Elevation of barometer above mean sea-level	1,727.00 (?) feet.
Amount of rain-fall for the year ending June 30, 1879	29.16 inches.

Established April 1, 1877; observations commenced July 1, 1877.

Office on Commercial avenue.

Private J. A. Perkins was in charge until May 31, 1879, when he was relieved by Private G. S. Livingston.

This station maintains in repair ninety miles of wire.

Number of messages during the year.—Sent paid, 434; sent collect, 139; received paid, 337; received collect, 148; sent free, 394; received free, 13; total, 1,665.

Receipts.—This line, $176.93; other lines, $254.94; total, $431.87. Free business, $38.41.

The station has combination telegraph instruments and full set of meteorological instruments and repair tools.

A daily sunset observation is forwarded by telegraph.

The station has not been inspected.

FORT CONCHO, TEXAS.

[*Official number*, 152.]

Latitude	31° 22′
Longitude	100° 20′
Elevation of barometer above mean sea-level	1,750.00 (?) feet.
Amount of rain-fall for the year ending June 30, 1879	26.95 inches.

Established October 10, 1875; observations commenced March 19, 1877.

Corporal W. J. Cundall was in charge until March 4, 1879, when he was relieved by private E. G. Prince. Private F. Mangels was on duty as assistant until October 10, 1878, when he was relieved for drunkenness and neglect of duty, and succeeded by Private Morris McCarty, who remained until January 29, 1879. Corporal J. M. Kistler was on duty as repairman from February 4 to March 25, 1879.

This station maintains in repair one hundred miles of wire.

Number of messages during the year.—Sent paid, 2,069; sent collect, 356; received paid, 1,339; received collect, 458; sent free, 1,646; received free, 1,174; total, 7,042.

Receipts.—This line, $726.08; other lines, $388.57; total, $1,114.65. Free business, $741.13.

The station is supplied with a complete set of meteorological and telegraph instruments and repair tools.

A daily sunset observation is forwarded by telegraph.

The station has not been inspected.

DAVIS (FORT DAVIS), TEXAS.

[*Official number*, 163.]

Latitude	30° 30′
Longitude	103° 45′
Elevation of barometer above mean sea-level	5,203.00 (?) feet.
Amount of rain-fall for the year ending June 30, 1879	15.39 inches.

Established December 24, 1877; observations commenced April 3, 1878.

Office, east of Fort Davis.

E. M. Dunbar, civilian, was in charge until March 15, 1879; Private A. Coleman from March 15 to June 30, 1879. Corporal J. M. Kistler was on duty as repair-man from September 10, 1878, to February 4, 1879.

This station maintains in repair eighty-one miles of wire.

Number of messages during the year.—Sent paid, 758; sent collect, 159; received paid, 614; received collect, 210; sent free, 1,848; received free, 710; total, 4,299.

Receipts.—This line, $379.22; other lines, $108.29; total, $487.51. Free business, $761.46.

The station is supplied with a complete set of meteorological and telegraph instruments and repair tools.

Meteorological observations are taken tri-daily, and, with a daily sunset observation, are forwarded by telegraph. Since April 6, 1879, four additional observations have been taken.

The station has not been inspected.

DECATUR, TEXAS.

[*Official number*, 153.]

Latitude	33° 10′
Longitude	97° 30′

Elevation of barometer above mean sea-level ..... 1,160.00 feet.
Amount of rain-fall for the year ending June 30, 1879 ..... 26.92 inches.

Established February 1, 1876; observations commenced April 1, 1877.

Office, southwest corner of public square.

W. E. Garver, civilian, was on duty until August 1, 1878; G. W. Thompson, civilian, from August 1 to September 1, 1878; J. F. Marshall, civilian, from September 1 to November 20, 1878; W. P. Bradley, civilian, from November 20, 1878, to June 3, 1879; C. C. Yokum, civilian, from June 3 to date.

This station maintains in repair forty miles of wire.

Number of messages during the year.—Sent paid, 437; sent collect, 185; received paid, 406; received collect, 148; sent free, 263; received free, 2; total 1,441.

Receipts.—This line, $184.80; other lines, $176.65; total, $361.45. Free business, $36.32.

The station is supplied with a complete set of meteorological and telegraph instruments and repair tools.

A daily sunset observation is forwarded by telegraph. The station was inspected June 24, 1879, and found in fair condition. Excellent care is taken of all public property.

DENISON, TEXAS.

[*Official number*, 154.]

Latitude ..... 33° 50′
Longitude ..... 96° 40′
Elevation of barometer above mean sea-level ..... 767.40 feet
Mean barometer (reduced to sea-level) for the year ending June 30, 1879 ..... 30.014
Mean temperature for the year ending June 30, 1879 ..... 63°.7
Amount of rain-fall for the year ending June 30, 1879 ..... 30.79 inches.

Established December 16, 1874; observations commenced September 1, 1875.

Office in Munson's building, corner of Gandy street and Rusk avenue.

Sergeant H. Frey has been in charge during the year. Corporal R. R. Geraghty was on duty as chief clerk to the officer in charge until September 26, 1878; from September 26 to date, Sergeant Will Stromberger, who had been on duty as assistant from July 1; Sergeant James O'Dowd, as operator, until October 17, 1878, when he was relieved by Sergeant W. T. Blythe; Private A. Coleman, as clerk, from October 14, 1878, to March 15, 1879; A. Zintgraff, civilian, from July 1 to November 8, 1878; A. Ashton, civilian, from November 8 to date. Corporal J. M. Kistler, as repair-man, from July 29 to September 10, 1878.

This station maintains in repair twenty miles of wire.

Number of messages during the year.—Sent paid, 2,263; sent collect, 1,118; received paid, 3,514; received collect, 934; sent free, 498; received free, 17,476; total, 25,803.

Receipts.—$1,059.56. Free business, $287.45.

The station is supplied with a complete set of meteorological and telegraph instruments and repair tools.

Meteorological observations are taken seven times daily, three of which and a sunset observation are forwarded by telegraph.

There has been no formal inspection at this station, it being the headquarters of the officer in charge of the division.

EAGLE PASS, TEXAS.

[*Official number*, 155.]

Latitude ..... 28° 40′
Longitude ..... 100° 15
Elevation of barometer above mean sea-level ..... 710.00 (?) feet.
Amount of rain-fall for the year ending June 30, 1879 ..... 24.20 inches.

Established January 19, 1875; observations commenced November 26, 1875.

Office, northern part of town.

Private E. G. Prince was in charge until August 1, 1878; Private Frederick Belford from August 1, 1878, to April 28, 1879, and from June 1 to June 30; Private O. S. Golladay from April 28 to June 1; Private T. B. Bowlus assistant from July 1, 1878, to May 19, 1879.

This station maintains in repair seventy-three miles of wire.

Number of messages during the year.—Sent paid, 2,172; sent collect, 553; received paid, 1,793; received collect, 502; sent free, 2,066; received free, 929; total, 8,015.

Receipts.—This line, $899.96; other lines, $256.44; total, $1,156.40. Free business, $745.94.

The station is supplied with a complete set of meteorological and telegraph instruments and repair tools.

Meteorological observations are taken tri-daily, and, with a daily sunset observation, are forwarded by telegraph.

The station has not been inspected.

EAGLE SPRINGS, TEXAS.

E. M. Dunbar, civilian, has been in charge since the opening, April 1.

This station maintains in repair one hundred and thirty-six miles of wire, and has no telegraph nor meteorological instruments.

The station has not been inspected.

EDINBURG, TEXAS.

[*Official number*, 156.]

Latitude ..... 26° 03′
Longitude ..... 98° 03′
Elevation of barometer above mean sea-level ..... ? feet.
Amount of rain-fall for the year ending June 30, 1879 ..... 24.02 inches.

Established September 12, 1875; observations commenced May 27, 1877.

Private Jerome Williams was in charge until August 1, 1878, when he was relieved by W. H. Taylor, civilian. On account of sickness of the observer no observations were taken from August 4 to 9, inclusive. Private J. C. Galloway arrived on the 9th and took charge of station and remained until the recovery of Mr. Taylor, February 10, 1879, when he was ordered to Santa Maria.

This station maintains in repair forty miles of wire.

Number of messages during the year.—Sent paid, 355; sent collect, 108; received paid, 302; received collect, 55; sent free, 266; received free, 136; total, 1,222.

Receipts.—This line, $124.77; other lines, $39.52; total, $164.29. Free business, $261.67.

The station is supplied with a complete set of telegraph instruments and repair tools, and a limited number of meteorological instruments.

A daily sunset observation is forwarded by telegraph.
The station has not been inspected.

FREDERICKSBURG, TEXAS.

[*Official number*, 157.]

Latitude	30° 20′
Longitude	98° 40′
Elevation of barometer above mean sea-level	1,614.00 (?) feet.
Amount of rain-fall for the year ending June 30, 1879	17.85 inches.

Established March 14, 1876; observations commenced April 1, 1877.
Office, second story of Nimitz Hotel.
Private C. F. Tansill has been in charge.
This station maintains in repair forty miles of wire.
Number of messages during the year.—Sent paid, 851; sent collect, 260; received paid, 737; received collect, 260; sent free, 480; received free, 111; total, 2,699.
Receipts.—This line, $341.88; other lines, $151.18; total, $493.06. Free business, $64.48.
The station is supplied with a complete set of meteorological and telegraph instruments and repair tools.
A daily sunset observation is forwarded by telegraph.
The station has not been inspected.

GRAHAM, TEXAS.

[*Official number*, 183.]

Latitude	33° 01′
Longitude	98° 27′
Elevation of barometer above mean sea-level	1,040.00 (?) feet.
Amount of rain-fall for the year ending June 30, 1879	24.07 inches.

Established June 16, 1876; observations commenced March 4, 1877.
Office, corner of Elm and Third streets, on east side.
Floyd Shock, civilian, was in charge until January 29, 1879, when he was relieved by Private Morris McCarty.
The station maintains in repair thirty-four miles of wire.
Number of messages during the year.—Sent paid, 306; sent collect, 123; received paid, 230; received collect, 80; sent free, 397; received free, 11; total, 1,147.
Receipts.—This line, $100.56; other lines, $126.44; total, $227.00. Free business, $33.31.
The station is supplied with a complete set of meteorological and telegraph instruments and repair tools.
A daily sunset observation is forwarded by telegraph.
The station has not been inspected.

GRIFFIN (FORT GRIFFIN), TEXAS.

[*Official number*, 158.]

Latitude	32° 53′
Longitude	99° 21′
Elevation of barometer above mean sea-level	1,270.00 (?) feet.
Amount of rain-fall for the year ending June 30, 1879	28.79 inches.

Established July 1, 1875; observations commenced January 22, 1876.
Corporal J. C. Rickli was in charge until January 7, 1879, when he was relieved by Sergeant J. T. Bradley.

This station maintains in repair forty miles of wire.

Number of messages during the year.—Sent paid, 978; sent collect, 390; received paid, 731; received collect, 338; sent free, 1,707; received free, 218; total, 4,362.

Receipts.—This line, $399.99; other lines, $505.54; total, $905.53. Free business, $360.42.

The station has combination telegraph instruments, full set of meteorological instruments and repair tools.

Meteorological observations are taken tri-daily, and, with a daily sunset observation, are forwarded by telegraph. Weekly reports are forwarded by mail.

The station has not been inspected.

HENRIETTA, TEXAS.

[*Official number*, 196.]

Latitude	33° 42′
Longitude	98° 00′
Elevation of barometer above mean sea-level	915.00 (?) feet.

Established February 1, 1877. Observations commenced February 13, 1878; discontinued May 25, 1878; recommenced February 9, 1879.

Office, second story of S. M. Satterfield's store, on Bridge street.

J. J. Mullen, civilian, was in charge until December 12, 1878; W. W. McConihe, civilian, from December 12, 1878, to February 19, 1879; Private John McCann from February 19 to date. G. W. Stanton, civilian, was on duty from April 1 to 29.

This station maintains in repair forty miles of wire.

Number of messages during the year.—Sent paid, 848; sent collect, 204; received paid, 594; received collect, 238; sent free, 367; received free, 13; total, 2,264.

Receipts.—This line $343.39; other lines, $295.65; total, $639.04. Free business, $53.62.

The station is supplied with a complete set of meteorological and telegraph instruments and repair tools.

A daily sunset observation is forwarded by telegraph.

The station was inspected in October, 1878, and found in poor condition. It was again inspected in June, 1879, and found in good condition; books neatly kept and records carefully filed.

JACKSBOROUGH, TEXAS.

[*Official number*, 159.]

Latitude	33° 10′
Longitude	98° 00′
Elevation of barometer above mean sea-level	1,119.23 (?) feet.
Amount of rain-fall for the year ending June 30, 1879	24.89 inches.

Office, northwest corner of Public Square. Established May 8, 1875; observations commenced November 8, 1876.

Corporal P. M. Wilson was in charge until September 1, 1878; W. P. Bradley, civilian, from September 22, 1778, to March 20, 1879, and J. F. Marshall, civilian, from March 20 to date.

This station maintains in repair fifty miles of wire.

Number of messages during the year.—Sent paid, 522; sent collect, 169; received paid, 440; received collect, 181; sent free, 1,069; received free, 455; total, 2,836.

Receipts.—This line, $225.97; other lines, $153.23; total, $379.20. Free business, $266.20.

This station is supplied with a complete set of meteorological and telegraph instruments and repair tools.

A daily sunset observation is forwarded by telegraph.

The station was inspected June 27, 1879, and found in good condition, the records neatly filed, and retained papers properly preserved.

LAREDO, TEXAS.

[*Official number*, 160.]

Latitude	27° 32′
Longitude	99° 26′
Elevation of barometer above mean sea-level	325.00 (?) feet.
Amount of rain-fall for the year ending June 30, 1879	20.83 inches.

Established December 16, 1875; observations commenced August 6, 1876.

Office on east side of Market Plaza.

Sergeant John McGlone was in charge until March 4, 1879, when he was relieved by Private H. Marsh. Private W. L. Miller has been on duty as assistant during the year.

This station maintains in repair one hundred miles of wire.

Number of messages during the year.—Sent paid, 3,608; sent collect, 690; received paid, 2,964; received collect, 677; sent free, 1,341; received free, 1,003; total, 10,283.

Receipts.—This line, $1,409.18; other lines, $929.66; total, $2,338.84. Free business, $453.28.

The station is supplied with a complete set of meteorological and telegraph instruments and repair tools.

A daily sunset observation is forwarded by telegraph.

The station has not been inspected.

LIVE OAK, TEXAS.

[*Official number*, 228.]

Established as a repair station November 25, 1878, and closed April 28, 1879.

Private R. J. Somers was in charge until February 4, 1879, when he was relieved by Private O. S. Golladay.

This station maintained in repair fifty-five miles of wire.

No meteorological observations were taken.

MASON, TEXAS.

[*Official number*, 202.]

Latitude	30° 42′
Longitude	99° 02′
Elevation of barometer above mean sea-level	1,800.00 (?) feet.
Amount of rain-fall for the year ending June 30, 1879	21.01 inches.

Established February 7, 1876; observations commenced February 8, 1876.

Office on Main street.

Private James A. Gleason was in charge until October 9, 1878; Sergeant James O'Dowd from October 17, 1878, to January 29, 1879, and Private R. J. Somers from February 4 to date.

This station maintains in repair forty miles of wire.

Number of messages during the year.—Sent paid, 496; sent collect, 119; received paid, 333; received collect 145; sent free, 1,420; received free, 25; total, 2,538.

Receipts.—This line, $194.77; other lines, $156.17; total, $350.94. Free business, $144.44.

The station has combination telegraph instruments and full set of meteorological instruments and repair tools.

Meteorological observations are taken tri-daily, and, with a sunset observation, are forwarded by telegraph.

The station has not been inspected.

McKAVETT (FORT McKAVETT), TEXAS.

[*Official number*, 161.]

Latitude	30° 48′
Longitude	99° 58′
Elevation of barometer above mean sea-level	2,050.00 (?) feet.
Amount of rain-fall for the year ending June 30, 1879	19.21 inches.

Established October 19, 1875; observations commenced January 22, 1876.

Private H. Marsh was in charge until January 7, 1879, when he was relieved by Corporal J. C. Rickli.

This station maintains in repair forty miles of wire.

Number of messages during the year.—Sent paid, 469; sent collect, 102; received paid, 333; received collect, 143; sent free, 1,018; received free, 551; total, 2,616.

Receipts.—This line, $185.67; other lines, $80.20; total, $265.67. Free business, $271.83.

The station is supplied with a complete set of meteorological and telegraph instruments and repair tools.

A daily sunset observation is forwarded by telegraph.

The station has not been inspected.

PILOT POINT, TEXAS.

[*Official number*, 162.]

Latitude	33° 20′
Longitude	96° 50′
Elevation of barometer above mean sea-level	800.00 (?) feet.
Amount of rain-fall during the year ending June 30, 1879	12.66 inches.

Established June 18, 1875; observations commenced August 5, 1877.

Office in second story of building at the northwest corner of public square in the northwestern part of the town.

Private E. F. Reeves has been in charge during the year.

This station maintains in repair forty miles of wire.

Number of messages during the year.—Sent paid, 303; sent collect, 99; received paid, 228; received collect, 82; sent free, 357; received free, 3; total, 1,072.

Receipts.—This line, $106.76; other lines, $148.91; total, $255.67. Free business, $30.31.

The station is supplied with a complete set of meteorological and telegraph instruments and repair tools.

A daily sunset observation is forwarded by telegraph.

The station was inspected May 4, 1879, and found in fair condition.

RIO GRANDE CITY, TEXAS.

[*Official number*, 164.]

Latitude	26° 22′
Longitude	98° 45′
Elevation of barometer above mean sea-level	205.00 (?) feet.
Amount of rain-fall for the year ending June 30, 1879	19.11 inches.

Established May 28, 1875; observations commenced March 12, 1876.

Corporal Fred Belford was in charge until August 1, 1878, when he was relieved by Corporal H. C. Wineland. Private J. C. Galloway was on duty as assistant from November 20, 1878, to January 6, 1879.

This station maintains in repair one hundred miles of wire.

Number of messages during the year.—Sent paid, 1,637; sent collect, 473; received paid, 1,601; received collect, 424; sent free, 1,939; received free, 1,371; total, 7,445.

Receipts.—This line, $710.25; other lines, $489.57; total, $1,199.82. Free business, $589.90.

The station is supplied with a complete set of meteorological and telegraph instruments and repair tools.

A daily sunset observation is forwarded by telegraph.

The station has not been inspected.

SALAMONENA, TEXAS.

W. W. McConihe, civilian, was in charge from the opening, July 12, until its close, December 12, 1878.

This station maintained in repair fifty-five miles of wire.

Number of messages during the year.—Sent paid, 70; sent collect, 10; received paid, 40; received collect, 22; sent free, 69; received free, 47; total, 258.

Receipts.—This line, $30.46; other lines, $13.81; total, $44.27. Free, $22.14.

No meteorological observations were taken.

SAN ANTONIO, TEXAS.

[*Official number*, 197.]

Latitude	29° 28′
Longitude	98° 22′
Elevation of barometer above mean sea-level	564.00 (?) feet.
Amount of rain-fall for the year ending June 30, 1879	32.12 inches.

Established September 22, 1875; observations commenced August 13, 1876.

Office in building on Main street.

Sergeant J. T. Bradley was in charge until January 7, 1879, when he was relieved by Corporal T. W. Milburn, who had been on duty as assistant. Private H. Marsh was assistant from January 7 to March 4, 1879; Corporal W. J. Cundall from March 4 to date; W. W. McConihe, civilian, was employed from July 1 to July 12, 1878, and Mrs. Anna Milburn from February 1 to March 3, 1879.

This station maintains in repair thirty miles of wire.

Number of messages during the year.—Sent paid, 7,458; sent collect, 2,895; received paid, 10,402; received collect, 2,773; sent free, 10,822; received free, 10,467; total, 44,817.

Receipts.—This line, $2,889.74; other lines, $18.02; total, $2,907.76. Free business, $2,627.12.

The station is supplied with a complete set of meteorological and telegraph instruments and repair tools.

Meteorological observations are taken seven times daily, three of which and a sunset observation are forwarded by telegraph.

The station has not been inspected.

SANTA MARIA, TEXAS.

[*Official number*, 221.]

Established as a repair station April 25, 1878.

C. F. Pierce, civilian, was in charge until February 7, 1878, when he was relieved by Private J. C. Galloway.

This station maintains in repair twenty-six miles of wire.

Number of messages during the year.—Sent paid, 547; sent collect, 104; received paid, 322; received collect, 140; sent free, 582; received free, 438; total, 2,133.

Receipts.—This line, $206; other lines, $26.76; total, $232.76. Free business, $164.68.

The station has a set of telegraph instruments and repair tools.

A sunset observation is taken and telegraphed daily.

The station has not been inspected.

SILL (FORT SILL), INDIAN TERRITORY.

[*Official number*, 165.]

Latitude	34° 40′
Longitude	98° 30′
Elevation of barometer above mean sea-level	1,100.00 (?) feet.
Amount of rain-fall for the year ending June 30, 1878	34.44 inches.

Established June 23, 1875; observations commenced September 9, 1875.

Private John McCann was in charge until February 19, 1879; W. W. McConihe, civilian, from February 19 to April 15; Sergeant John McGlone from April 15 to date.

This station maintains in repair forty miles of wire.

Number of messages during the year.—Sent paid, 547; sent collect, 117; received paid, 372; received collect, 177; sent free, 1,661; received free, 317; total, 3,191.

Receipts.—This line, $196.17; other lines, $452.80; total, $648.97. Free business, $442.70.

The station is supplied with a complete set of meteorological and telegraph instruments and repair tools. Meteorological observations are taken tri-daily, and with a sunset observation are forwarded by telegraph.

The station was inspected during September, 1878, and found in good condition. The records were neatly kept and the telegraphic and meteorological work satisfactorily performed.

STOCKTON (FORT STOCKTON), TEXAS.

[*Official Number*, 166.]

Latitude	30° 50′
Longitude	102° 50′
Elevation of barometer above mean sea-level	2,000.00 (?) feet.
Amount of rain-fall for the year ending June 30, 1878	8.38 inches.

Established February 26, 1876; observations commenced November 1, 1876.

Office on the plaza, about half a mile from Fort Stockton.

Private C. A. Ray was in charge to October 29, 1878; Private E. G. Prince from October 29 to March 4; Private D. P. Boyd from March 4 to May 2; and Private J. H. Henry from May 2 to June 30. Corporal J. M. Kistler was on duty as repairman from March 25 to June 30, 1879.

This station maintains in repair fifty miles of wire.

Number of messages during the year.—Sent paid, 1,182; sent collect, 155; received paid, 701; received collect, 294; sent free, 2,180; received free, 788; total, 5,300.

Receipts.—This line, $443.69; other lines, $73.67; total, $517.36. Free business, $630.29.

The station is supplied with a complete set of meteorological and telegraph instruments and repair-tools.

Meteorological observations are taken tri-daily, and with a daily sunset observation are forwarded by telegraph.

The station has not been inspected.

UVALDE, TEXAS.

[*Official number*, 167.]

Latitude	29° 13′
Longitude	99° 40′
Elevation of barometer above mean sea-level	809.00 (?) feet.
Amount of rain-fall for the year ending June 30, 1879	24.64 inches.

Established September 6, 1875; observations commenced May 20, 1877.

Private William Norrington has been in charge during the year.

The station maintains in repair forty miles of wire.

Number of messages during the year.—Sent paid, 1,003; sent collect, 236; received paid, 667; received collect, 213; sent free, 531; received free, 118; total, 2,768.

Receipts.—This line, $382.79; other lines, $111.51; total, $494.30. Free business, $67.26.

The station is supplied with a complete set of meteorological and telegraph instruments and repair-tools.

A daily sunset observation is forwarded by telegraph.

The station has not been inspected.

NEW MEXICAN DIVISION.

Table showing stations on the United States telegraph lines, New Mexico division, from which reports have been received during the year ending June 30, 1879.

Name of station.	Reports commenced.	Report discontinued.	Number of reports by telegraph (daily).	Character of reports received by mail on Form 4 (weekly).
Albuquerque, N. Mex.	(*)	.....	1	Observations of thermometer, hygrometer, direction of wind and state of weather, clouds and rain-fall, taken once a day.
Bernalillo, N. Mex.	June 1, 1879	.....	1	
El Paso, Tex.	(*)	.....	4	Complete observations taken three times a day.
Fort Bayard, N. Mex.	(*)	.....	1	
Fort Craig, N. Mex.	(*)	June 27, 1879	.....	
La Mesilla, N. Mex.	(*)	.....	4	Complete observations taken seven times a day.
Las Cruces, N. Mex	(*)	.....	1	
Los Lunas, N. Mex.	(*)	.....	1	
Santa Fé, N. Mex.	(*)	.....	4	Complete observations taken seven times a day.
Silver City, N. Mex	(*)	.....	4	Complete observations taken three times a day.

*Reporting at date of last Annual Report, June 30, 1878.

Report of stations on the United States military telegraph line, New Mexico division, compiled from the annual report of Lieut. James Allen, Third United States Cavalry, acting signal officer and officer in charge, and from data on file in the office of the Chief Signal Officer.

ALBUQUERQUE, NEW MEXICO.

[*Official number*, 209.]

Latitude ..... 35° 2′
Longitude ..... 106° 40′
Elevation of barometer above mean sea-level ..... 5,026.00 (?) feet.
Amount of rain-fall for the year ending June 30, 1879 ..... *2.70 inches.

Established July 1, 1876; observations commenced October 1, 1878.

Office, south side of plaza, or public square, in center of city.

Sergeant J. M. Watson was in charge until September 24, 1878; Sergeant S. W. Naylor, from September 24 to March 1, 1879; Private T. A. Donahoe, from March 1 to 28; Private R. G. Linthicum, from that date to close of year.

Number of messages during the year.—Sent paid, 1,086; sent collect, 347; received paid, 1,051; received collect, 395; sent D. H., 485; received D. H., 252; total, 3,616.

Receipts.—This line, $534,65; other lines, $281.28; total, $815.93.

The station is supplied with a complete set of telegraph instruments and repair tools, and certain meteorological instruments. From October 1 to November 25, 1878, one meteorological observation was forwarded by telegraph daily, but since the latter date this observation, the only one taken, has been forwarded by mail.

A sunset observation is forwarded by telegraph daily.

The repair section of this station extends to Alameda, nine miles north, and Isleta, twelve miles south.

*Nine months only.

The office has been twice inspected during the year, and reported upon, as follows:

"The office is neat and clean; reports and books satisfactory and up to date."

ALEMAN, NEW MEXICO.

Latitude ..... 33° 1′
Longitude ..... 107° 0′

Established May 1, 1879, as a repair station.

Private C. L. Stevens in charge.

It is supplied with a complete set of telegraph instruments and repair-tools.

None but service messages are sent and received.

The repair section extends to Paraje, thirty-nine miles north, and Leasburg, thirty-one and five-tenth miles south.

BAYARD (FORT BAYARD), NEW MEXICO.

[*Official number*, 170.]

Latitude ..... 32° 46′
Longitude ..... 108° 10′

Established February 16, 1876; observations commenced June 12, 1876; meteorological records and instruments transferred to Silver City May 15, 1878; continued as a repair station.

Private Frederick W. Mallory, Company D, Fifteenth Infantry, was in charge to September 27, 1878; W. D. McChesney, from September 27, 1878, to February 20, 1879; C. V. Hugo, civilian, from February 20 to date.

Number of messages during the year.—Sent paid, 500; sent collect, 177; received paid, 440; received collect, 226; sent D. H., 1,066; received D. H., 641; total, 3,050.

Receipts.—This line, $209.69; other lines, $174.64; total, $384.33.

The station is supplied with a complete set of telegraph instruments and repair tools. For purposes of repair it is attached to Silver City.

A daily sunset observation is forwarded by telegraph.

The station has been twice inspected during the year. It is in good condition, reports and books neatly kept, and the conduct of the operator is satisfactory.

BELEN, NEW MEXICO.

[*Official number*, ——.]

Latitude ..... 35° 1′
Longitude ..... 106° 45′

Established June 1, 1876.

The station is under the charge of Mr. John Becker, and is maintained without expense to the line.

BERNALILLO, NEW MEXICO.

Latitude ..... 35° 21′ (?)
Longitude ..... 106° 31′ (?)

Established June 1, 1879.

Robert Reeder, civilian, in charge.

Number of messages since establishment.—Sent paid, 57; sent collect, 6; received paid, 30; received collect, 8; sent D. H., 7; received D. H., 10; total, 118.

Receipts.—This line, $21.40; other lines, $17.09; total, $38.49.

The station is supplied with a complete set of telegraph intruments and repair tools.

A sunset observation is forwarded daily by telegraph.

The station has not been inspected.

CRAIG (FORT CRAIG), NEW MEXICO.

[*Official number.* 180.]

Latitude	33° 42′
Longitude	107° 8′
Amount of rain-fall for the year ending June 30, 1879	*2.96 inches.

Established as a repair station; observations commenced May 21, 1877; station moved to Socorro, N. Mex., June 27, 1879.

Office, east side of the garrison.

Private R. J. White was in charge until September 26, 1878; Sergeant James M. Watson, to December 13; Private W. T. Miles, to March 6, 1879; Private Robert Reeder, to May 11; Sergeant N. D. Lane, to date, with an enlisted man of the Fifteenth Infantry as repairman.

Number of messages during the year.—Sent paid, 502; sent collect, 178; received paid, 406; received collect, 201; sent D. H., 1,635; received D. H., 611; total, 3,533.

Receipts.—This line, $237.22; other lines, $57.13; total, $294.35.

This station is supplied with a complete set of meteorological and telegraph instruments and repair tools. Full meteorological observations have been taken; tri-daily and sunset observations forwarded by telegraph.

The repair section of this station extends to Alamilla, forty-six miles north, and to Round Mountain, twenty-six miles south.

The military post at Fort Craig having been abandoned, orders were issued June 27 to close this office, move instruments and property to Socorro, N. Mex., thirty-two miles north, and there open a telegraph and observation office July 1.

The station has been inspected twice during the year, and reported upon as follows:

The office records have not been regularly kept since the establishment of the station. There have been many changes, and frequently the observers have been out on the line to make repairs, and the regularity observed at other stations is not possible here. The office was in good condition, and the records regularly and properly kept. All telegraphic and meteorological books were up to date.

CUMMINGS (FORT CUMMINGS), NEW MEXICO.

[*Official number*, 214.]

Latitude	32° 18′
Longitude	107° 32′

Established as a repair station; closed July 1; re-established March 1.

S. J. Lyons, civilian, in charge, whose services are gratuitous.

None but official messages are sent and received. The station has been of great utility in connection with the operations of scouting parties of troops. No inspection has been made.

*Eleven months and twenty-six days only.

EL PASO, TEXAS.

[*Official number*, 195.]

Latitude ..... 31° 46′
Longitude ..... 106° 32′
Amount of rain-fall for the year ending June 30, 1879 ..... 8.99 inches.

Established November 5, 1877; observations commenced April 13, 1878.

Private Robert Reeder was in charge March 8, 1879, when he was relieved by Sergeant S. W. Naylor.

Number of messages during the year.—Sent paid, 1,060; sent collect, 400; received paid, 1,050; received collect, 502; sent D. H., 1,811; received D. H., 680; total, 5,503.

Receipts.—This line, $589.14; other lines, $675.58; total, $1,264.72.

The station is supplied with a complete set of meteorological and telegraph instruments and repair tools. Full meteorological observations are taken tri-daily, which, with that of the sunset, are forwarded by telegraph. A new instrument shelter of a good pattern has been supplied during the year.

The repair section extends to Scott's ranch, twenty-five miles northwest, and to a point fifteen miles east of old Fort Quitman, a distance of one hundred miles. Great difficulty is experienced in keeping it in repair, owing to scarcity of water, forage, and subsistence, insecurity of travel, and limited force allowed the line.

The station has been twice inspected during the year. The elevation of the mercury in the cistern of barometer above sea-level has not yet been determined. Sergeant Naylor's conduct is satisfactory. The office records are in good shape—clean and up to date.

LA MESILLA, NEW MEXICO.

[*Official number*, 181.]

Latitude ..... 32° 17′
Longitude ..... 106° 48′
Amount of rain-fall for the year ending June 30, 1879 ..... 6.52 inches.

Station established July 16, 1876; observations commenced May 25, 1877.

Corporal M. Hoover in charge to September 27, 1878; Private R. J. White, to June 12, 1879; Private J. G. Frankenburg, thence to date. Private W. T. Miles reported for duty as an assistant, March 13, 1879. An enlisted man of the Fifteenth Infantry is on duty as repairman.

Number of messages during the year.—Sent paid, 817; sent collect, 428; received paid, 981; received collect, 306; sent D. H., 900; received D. H., 552; total, 3,984.

Receipts.—This line, $342.62; other lines, $176.05; total, $518.67.

The station is supplied with a complete set of meteorological and telegraph instruments and repair tools. Full meteorological observations are taken. Tri-daily and sunset reports are forwarded by telegraph. The office is commodious and conveniently situated for business, and is used as a general relay office for all business with the Texas division.

A galvanometer is at this office, and tests are made daily.

The station has been inspected twice during the year.

No rent is paid for the use of the office, which is furnished by citizens. The station records are properly kept, and up to date.

The repair section of the station extends to Leasburg, 20 miles north, El Paso, 52 miles southeast, and to Fort Cummings, 57 miles northwest.

LAS CRUCES, NEW MEXICO TERRITORY.

[*Official number*, 216.]

Latitude ..... 32° 17′
Longitude ..... 106° 46′

Established October 10, 1877.

G. W. Adams, civilian, was in charge until September 30, 1878; Private Thomas A. Donahoe to February 24, 1879; Private W. D. McChesney thence to date.

Number of messages during the year.—Sent paid, 2,698; sent collect, 416; received paid, 1,554; received collect, 411; sent D. H., 365; received D. H., 178; total, 5,622.

Receipts.—This line, $659.82; other lines, $239.34; total, $899.16.

The station is supplied with a complete set of telegraph instruments and repair tools.

A sunset observation is forwarded daily by telegraph.

The office has been twice inspected during the year. The office is in good condition; all the records properly kept and up to date, and the property well cared for. The office is furnished by the citizens, from whom the line has received substantial support and assistance. Until October 1, 1878, they paid a salary to the operator in excess of his receipts.

LOS LUNAS, NEW MEXICO TERRITORY.

[*Official number*, 217.]

Latitude ..... 34° 53′
Longitude ..... 106° 45′

Established as a repair-station December 20, 1876.

W. M. Smith, civilian, is in charge; an enlisted man of the Fifteenth Infantry is on duty as repairman.

Number of messages during the year.—Sent paid, 1,400; sent collect, 192; received paid, 930; received collect, 424; sent D. H., 634; received D. H., 196; total, 3,776.

Receipts.—This line, $654.49; other lines, $347.83; total, $1,002.32.

The station is supplied with a complete set of telegraph instruments and repair tools. A sunset observation is forwarded by telegraph daily. A branch office, which is under charge of John Becker, civilian, and is maintained without expense to the line, is in operation at Belen, ten miles south of this station.

The repair section of this station extends to Isleta, six miles north, and to Allamilla, thirty-seven miles south.

There have been two inspections during the year.

No rent is paid for use of the office, and it is well located.

The office records are properly kept, neat, clean, and up to date.

SANTA FÉ, NEW MEXICO TERRITORY.

[*Official number*, 69.]

Latitude ..... 35° 41′
Longitude ..... 106° 10′
Elevation of barometer above mean sea-level ..... 6,851.00 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879 ..... 29.836
Mean temperature for the year ending June 30, 1879 ..... 50°.2
Amount of rain-fall for the year ending June 30, 1879 ..... 15.79 inches.

Established November 20, 1871.

Office, first floor Johnson's building, east side of Main Plaza.

Sergeant Max Frost, observer and clerk to officer in charge, on duty throughout the year; Private Edwin Guthrie, observer and operator since May, 1879, assistant. Mr. Sinnott was on duty as chief operator and manager until October 1; W. G. Adams, civilian, chief operator and manager since October 1. Private R. G. Linthicum was assistant from September 10 to March 25; Private J. G. Frankenberg from March 28 to June 5, 1879; John McGoldrick, civilian, repairman; as enlisted man of the Fifteenth Infantry, as messenger.

The station is supplied with a complete set of meteorological and telegraph instruments and repair tools. Full observations are forwarded tri-daily, in addition to the sunset observation, by telegraph.

Number of messages during the year.—Sent paid, 3,236; sent collect, 1,185; received paid, 3,719; received collect, 994; sent D. H., 2,425; received D. H., 4,230; total, 15,789.

Receipts.—This line, $1,442.06; other lines, $42.18; sundries, $3; total, $1,487.24.

The office has not been formally inspected, being under the immediate supervision of the officer in charge and his headquarters.

Extracts from the observer's semi-annual reports:

Several barometers, aneroid, and a number of thermometers have been compared with the instruments at this office for railroad and military surveying parties.

The interest manifested by citizens and travelers in the service has increased materially. Tourists, travelers, and emigrants have frequently called at the office for information as to climate and meterological matter generally, and much satisfaction has been expressed by such parties upon receiving the information sought. A new instrument-shelter of improved pattern is being built, and will be ready in a few days.

Telegraphic communication, both east and west, has been more secure and constant than at any previous period.

Not any bulletins are published.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1879	90
Number of Forms 22 issued during the year ending June 30, 1879	20
Total	110

SILVER CITY, NEW MEXICO TERRITORY.

[*Official number*, 194.]

Latitude	32° 48′
Longitude	108° 15′
Elevation of barometer above mean sea-level	6,896.25 (†) feet.
Amount of rain-fall for the year ending June 30, 1879	20.77 inches.

Established May 15, 1878; observations commenced May 17, 1878.

Office southeast corner Main and Yankee streets.

Sergeant W. T. Blythe was in charge until October 1, 1878, when he was relieved by Corporal M. Hoover. Private W. D. McChesney, assistant until September 27; Private H. E. Higgins thence to date. An enlisted man of the Fifteenth Infantry is repairman.

Number of messages during the year.—Sent paid, 2,460; sent collect, 807; received paid, 2,004; received collect, 1,080; sent D. H., 1,514; received D. H., 511; total, 8,376.

Receipts.—This line, $1,253.43; other lines, $783.99; press reports, $129.40; total, $2,166.82.

The station is supplied with a complete set of meteorological and tel-

egraph instruments and repair tools. With the exception of from July 1 to November 1, and from June 1 to June 30, when full observations were taken and reported, but three observations have been taken daily; these and that of the sunset forwarded by telegraph daily.

The repair section extends to Fort Cummings, fifty-two miles southeast, and to Ralston, fifty-seven miles southwest.

The office has been twice inspected during the year.

Silver City is situated nine miles from Fort Bayard.

Corporal Hoover performs his duties in a highly satisfactory manner. The amount of work is more than one man can do for any length of time.

The office is in good condition, and the records neat, in correct form, and up to date.

SOCORRO, NEW MEXICO TERRITORY.

[*Official number*, 218.]

Latitude..... 34° 5′
Longitude..... 106° 55′

Established January 1, 1877; ordered to be made a station of the first class July 1, 1879.

ARIZONA DIVISION.

Table showing stations on the United States telegraph line in Arizona and California from which reports have been received during the year ending June 30, 1879.

Name of station.	Reports commenced.	Reports discontinued.	Number of reports by telegraph (daily).	Character of reports received by mail on Form 4 (weekly).
Burkes, Ariz.....	(*)	.....	1	Observations of thermometer, hygrometer, direction of wind and state of weather, clouds and rain-fall taken three times a day.
Campo, Cal	(*)	.....	1	Complete observations taken three times a day.
Florence, Ariz	(*)	.....	1	Complete observations taken three times a day.
Fort Apache, Ariz.	(*)	.....	4	Complete observations, excepting barometric, taken three times a day.
Fort Grant, Ariz...	(*)	.....	4	Complete observations taken three times a day.
Fort Verde, Ariz...	(*)	.....	1	Complete observations, excepting barometric, taken three times a day.
Phœnix, Ariz	(*)	.....	1	Complete observations taken three times a day.
Prescott, Ariz.....	(*)	.....	4	Complete observations taken seven times a day.
San Diego, Cal	(*)	.....	4	Complete observations taken three times a day.
Tucson, Ariz	(*)	.....	4	Complete observations taken three times a day.
Wickenburg, Ariz .	(*)	.....	1	Partial observations are taken three times a day.
Yuma, Ariz	(*)	.....	4	Complete observations taken three times a day.

*Reporting at date of last Annual Report, June 30, 1878.

Report of stations on United States telegraph line, division of Arizona and California, compiled from the annual report of First Lieut. Charles

A. Booth, First United States Infantry, acting signal-officer in charge, and from data on file in the office of the Chief Signal-Officer:

APACHE (FORT APACHE), ARIZONA TERRITORY.

[*Official number*, 192.]

Latitude	33° 47′ 18″
Longitude	109° 57′ 52″
Elevation of barometer above mean sea-level	5,000.00 (?) feet

Established October 9, 1877; observations commenced June 28, 1878.

Private John J. Falvey has remained in charge.

Number of messages during the year.—Sent paid, 719; sent collect, 140; received paid, 411; received collect, 232; sent D. H., 1,676; received D. H., 787; total, 3,965. Free business, $799.07.

Receipts.—This line, $462.55; other lines, $114,17; total, $576.72.

The station is supplied with a complete set of meteorological and telegraph instruments and repair tools.

Meteorological observations are taken tri-daily and forwarded by telegraph.

The station was inspected in October, 1878, and found in good condition.

Communication by mail with this station has been very irregular and uncertain, and many of the reports have been lost in transit.

The station is located among the mountains and almost inaccessible for teams. The wagons are frequently overturned several times in reaching it, making it very difficult to supply the requisite instruments and material. It has been attempted to supply the station with record books by mail, but they have never arrived, the mail being brought on horseback over two hundred miles; they are probably thrown out. The country over which the telegraph line runs is mountainous and rocky.

APACHE PASS (FORT BOWIE), ARIZONA TERRITORY.

[*Official number*, 211.]

Latitude	32° 8′
Longitude	109° 30′

Established May 4, 1877.

Office in one-story adobe building.

Sergeant William Baber is in charge, having relieved Private Thomas Gibson, February 6, 1879.

Number of messages during the year.—Sent paid, 802; sent collect, 134; received paid, 521; received collect, 182; sent D. H., 789; received D. H., 791; total, 3,219. Free business, $372.16.

Receipts.—This line, $301.84; other lines, $91.74; total, $393.58.

The station is supplied with a complete set of telegraph instruments and repair tools, but nometeorological instruments. Certain instruments are now en route, and meteorological observations will be commenced upon their receipt.

The station was inspected in September, 1878, and found in good condition.

BURKES, ARIZONA TERRITORY.

[*Official number*, 191.]

Latitude	32° 55′
Longitude	113° 20′
Amount of rain-fall for the year ending June 30, 1879	4.66 inches.

Established and observations commenced December 5, 1877.

Office in an adobe building.

Private Wenzel Manderfeld was in charge from July 1 to October 1, 1878, when he was relieved by Private E. J. Falconer and ordered to Yuma, Ariz. The latter had been assigned to duty as assistant July 27, 1878.

Number of messages during the year.—Sent paid, 546; sent collect, 184; received paid, 362; received collect, 98; sent D. H., 214; received D. H., 39; total, 1,443. Free business, $120.68.

Receipts.—This line, $184.37; other lines, $72.76; total, $257.13.

The station is supplied with a complete set of telegraph instruments, repair tools, and certain meteorological instruments. Observations of thermometer, hygrometer, direction of wind, state of weather, clouds, and rain-fall, are taken tri-daily. Sunset observations are forwarded by telegraph daily.

The most important duty is to keep the line in repair from Stanwix to Gila Bend, Ariz.

The station was inspected in September, 1878, and found in good order.

CAMPO, CALIFORNIA.

[*Official number*, 171.]

Latitude	32° 22′
Longitude	116° 8′
Elevation of barometer above mean sea-level	2,500.00 (?) feet.
Amount of rainfall for the year ending June 30, 1879	10.59 inches.

Established January, 1874; commenced observations September 28, 1875.

Office in a separate building, owned by Gaskill Bros.

Sergeant Martin L. Hearne was in charge up to June 25, 1879, when he was relieved by Sergeant W. U. Simons, and transferred to San Diego, Cal.

Number of messages during the year.—Sent paid, 117; sent collect, 28; received paid, 87; received collect, 35; sent D. H., 3; received D. H., 0; sent free, 3; total, 270. Free business, $87.53.

Receipts.—This line, $55.50; other lines, $5.42; total, $60.92.

This station is supplied with a complete set of meteorological and telegraph instruments and repair tools.

Meteorological observations are taken tri-daily. Sunset observations are forwarded daily by telegraph.

This station was inspected in August, 1878, and found in good condition. It is in close proximity to the Mexican border, and obviates the necessity of having a permanent garrison here to protect residents from horse-thieves and border ruffians.

Extract from the observer's journal:

The month of May has been one of the driest known for a long time, as well as one of the coldest. Old people who have lived in this valley for twenty years or more say they never saw such cold weather in May. Ice formed several times more than one-quarter of an inch, and once half an inch, in thickness. It was accompanied by what is termed a "black frost," killing everything. Where it fell, the growing grain turned red, tender leaves fell from the trees, and young corn looked as though it had been scalded.

Not a drop of rain has fallen, and the springs and ponds are all drying up. In the Potrura, where there usually is an abundance of water, the springs are nearly dry, and where water used to be plentiful, at a depth of two and three feet, it is hard to find it at a depth of twelve and fourteen feet. I have noticed, also, the absence of dew; none or very little has fallen. Usually the dews are very copious, and answer the place of rain.

CORRILLA STATION (FORT LOWELL), ARIZONA TERRITORY.

[*Official number*, 173.]

Established March 6, 1875; closed June 11, 1877; re-established September 12, 1878.

Private O. W. White has been in charge.

Number of messages during year.—Sent paid, 77; sent collect, 24; received paid, 99; received collect, 30; sent free, 402; received free, 406; total, 1,038. Free business, $337.66.

Receipts.—This line, $26.37; other lines, $34.15; total, $60.52.

The station is supplied with a complete set of telegraph instruments and repair tools. No meteorological observations are taken. It was inspected in September and found in good condition.

FILLIBUSTER, ARIZONA TERRITORY.

Station discontinued July 17, 1878, and Private W. J. Dailey, repairman, transferred to Wickenburg, Ariz.

FLORENCE, ARIZONA TERRITORY.

[*Official number*, 172.]

Latitude	33° 2′ 32″
Longitude	111° 17′ 14″
Elevation of barometer above mean sea-level	1,550 (?) feet.
Amount of rain-fall for the year ending June 30, 1879	13.42 inches.

Established November 12, 1874; observations commenced November 9, 1875.

Office, ground floor of J. Guindam & Co.'s block, Main street, having been moved from the one-story adobe building, corner Main and Howard streets, September 25.

Lance Corporal William E. Guild has continued in charge. Private John Dolan, Company I, Sixth Cavalry, repairman, was relieved for drunkenness June 29, 1879, by Private John W. Gagen, Company I, Sixth Cavalry. Private Levi Pitts was on duty as assistant until August 14, 1878; Private R. F. Strain from August 14 until December 9, 1878; Private T. T. Moore thence to May 3, 1879, when he was transferred to Tucson.

Number of messages during year.—Sent paid, 2,463; sent collect, 611; received paid, 2,015; received collect, 687; sent D. H., 478; received D. H., 114; total, 6,368. Free business, $140.19.

Receipts.—This line, $941.40; other lines, $1,124.93; total, $2,066.33.

The station is supplied with a complete set of meteorological and telegraph instruments and repair tools.

Meteorological observations are taken tri-daily. Sunset observations are forwarded daily by telegraph.

This station was inspected in September, 1878, and found in good condition, but poorly located, having no northern exposure for the instruments. Another location was secured and the office removed thereto.

Extract from the observer's semi-annual reports:

The citizens of this place manifest great interest in the maintenance of a meteorological station, and such data as temperature, humidity and velocity of wind are almost daily sought for.

GOODWIN (FORT THOMAS), ARIZONA TERRITORY.

[*Official number*, 212.]

Latitude	32° 4′ 14″
Longitude	110° 5′ 37″

Established September 22, 1877.

Office in a tent at the close of the year.

Private J. T. Fitzgerald is in charge, having relieved Private O. W. White July 27, 1878.

Number of messages during the year.—Sent paid, 1,520; sent collect, 233; received paid, 1,014; received collect, 329; sent free, 384; received free, 288; total, 3,768. Free business, $642.59.

Receipts.—This line, $688.77; other lines, $290.57; total, $979.34.

The station is supplied with a complete set of telegraph instruments and repair tools. It was inspected in September, at which time the office was located, with the post-office, in the post-trader's building. Since that time the operator has been ordered out, and for several months the office has been in a tent. Material has been purchased and the labor promised to put up a suitable office. Most of the telegraphic work performed is official and free business; messages for which payment is received come from San Carlos.

GRANT (FORT GRANT), ARIZONA TERRITORY.

[*Official number*, 182.]

Latitude	32° 25′
Longitude	109° 56′
Elevation of barometer above mean sea-level	4,823.00 (?) feet
Amount of rain-fall for the year ending June 30, 1879	17.74 inches

Established November 9, 1875; observations commenced July 14, 1877.

Private Fred. C. Kelly is in charge, having relieved Private W. H. Agey, October 20, 1878. Private R. C. Lord, Company H, Twelfth Infantry, has been on duty, as repairman, since December 1, 1878.

Number of messages during the year.—Sent paid, 673; sent collect, 188; received paid, 623; received collect, 213; sent D. H., 1,259; received D. H., 1,270; total, 4,226. Free business, $830.17.

Receipts.—This line, $271.08; other lines, $147.57; total, $418.65.

The station is supplied with a complete set of meteorological and telegraph instruments and repair tools.

Meteorological observations are taken tri-daily and forwarded by telegraph.

All the business of branch line to Forts Apache and Thomas is repeated at this station. It was inspected in September, 1878, and found in good condition.

The copies of reports and returns are incomplete up to the time Private Agey took charge. All the books and records are complete since that time, and have been neatly and correctly kept.

Extracts from the observer's semi-annual reports:

The amount of work accomplished in and through this office has required the constant attention of two operators. The average number of messages transmitted monthly number from fifteen hundred to two thousand; this includes the private and public business of this station, and the private and public telegrams relayed to and from Forts Thomas and Apache and the San Carlos Indian Reservation; the excess in the number of telegrams handled having been caused by the forces in the field, which were removed from Fort Grant to Fort Apache, through the late trouble

with the Apache Indians, and the late unpleasantness at the San Carlos Indian Reservation.

The section of line from Fort Grant east to Fort Bowie, west to Tres Alamus, and north to Fort Thomas, is, and has been, kept in excellent condition, very few repairs having been made.

The rain-fall has been unusually large. Stockmen and ranchers are very much benefited accordingly.

MARICOPA, ARIZONA TERRITORY.

[*Official number*, 206.]

Latitude	33° 11′
Longitude	112° 4′

Established November, 1873; observations commenced October 25, 1875; station closed March 14, 1878; re-established at Maricopa Wells February —; removed to Maricopa May 1, 1879, the terminus of the Southern Pacific Railroad.

Private Levi Pitts, in charge, died February 23, 1879, of pluro-pneumonia. Private F. J. Davis, Company I, Sixth Cavalry, deserted the latter part of March, 1879, when the office was closed for want of operators. Since May 1 Corporal and Lance Sergeant William Story has been in charge; Private Peter Carroll, Company I, Sixth Cavalry, repairman.

Number of messages during the year.—Sent paid, 744; sent collect, 451; received paid, 870; received collect, 226; sent D. H., 184; received D. H., 80; total, 2,555. Free business, $59.01.

Receipts.—This line, $288.06; other lines, $12.92; total, $300.98.

The station is supplied with a complete set of telegraph instruments and repair tools.

The station has not been inspected during the year. It has been of excellent service in breaking up a band of robbers who had been robbing the mails prior to that time, when crossing the Maricopa desert.

PHOENIX, ARIZONA TERRITORY.

[*Official number*, 175.]

Latitude	33° 18′
Longitude	112° 0′ 15″
Elevation of barometer above mean sea-level	1,800.00 (?) feet.
Amount of rain-fall for the year ending June 30, 1879	6.25 inches.

Established in November, 1873; closed about April 20, 1877; reopened May 9, 1877; observations commenced February 6, 1876.

Office in adobe building corner of Center and Washington streets.

Lance Corporal J. J. Nanry was in charge until March 13, 1879; Private W. J. Dailey from March 13 to June 13, 1879, and Sergeant S. E. Patton from June 13 to date. Private Dailey continues on duty as assistant. Private Levi Pitts was assistant from August 14 to December 9, 1878. E. Jungerman is operator and civilian employé.

Number of messages during the year.—Sent paid, 3,421; collect, 647; received paid, 2,384; received collect, 1,314; sent D. H., 272; received D. H., 281; total, 8,319. Free business, $212.87.

Receipts.—This line, $1,537.56; other lines, $1,421.43; sundry, $36.70; total, $2,995.69.

The station is supplied with a complete set of meteorological and telegraph instruments and repair tools.

Meteorological observations are taken tri-daily and forwarded by mail. A daily sunset observation is forwarded by telegraph.

The station was inspected in October, 1878, and found in fair condition. Great improvements have since been made in the arrangement of batteries and for the better exposure of meteorological instruments.

A very large amount of official and free business to and from Prescott is repeated through this office, and it is made a relay station when any difficulty occurs on the line, which makes it necessary to have three operators here. When crowded with business, the line is divided into three sections at this point, and all are worked at the same time, which greatly facilitates the dispatch of messages. The commercial business has been small but is steadily increasing. The surrounding country is rapidly developing into farms.

PRESCOTT, ARIZONA TERRITORY.

[*Official number*, 176.]

Latitude	34° 29′ 6″
Longitude	112° 30′ 30″
Elevation of barometer above mean sea-level	5,700.00 (?) feet.
Amount of rain-fall for the year ending June 30, 1879	11.31 inches.

Established November 19, 1873; observations commenced November 28, 1875.

Private Dusouchet was in charge until August 1, 1878; Sergeant John Kabernagle from August 1, 1878, to February 6, 1879; Private I. R. Eirt from February 6 to May 17, 1879; and Sergeant John J. Nanry from May 17 to date. Private James E. Hayes is assistant; Mr. J. S. Hunter, operator and civilian employé; Private B. G. Rodgers, Company K, Sixth Cavalry, repairman.

Number of messages during the year.—Sent paid, 2,819; sent collect, 1,020; received paid, 3,271; received collect, 991; sent D. H., 4,252; received D. H., 3,142; total, 15,497. Free business, $3,129.13.

Receipts.—This line, $1,561.94; other lines, $3,268.61; sundries, $304.02; total, $5,134.57.

The station is supplied with a complete set of meteorological and telegraph instruments and repair tools.

Meteorological observations are taken tri-daily and forwarded by telegraph.

The station was inspected in October, 1878, and found in fair condition. The office was found to be very small and the exposure for the instruments poor. A new instrument shelter was at once supplied, and the office has since been enlarged and improved.

A local line has been erected for the convenience of the commanding general and officers, and the officers supplied with telephones and call-bells.

The amount of official telegraphing is very great and the operator is continually brought in contact with officers of department headquarters. The meteorological office is in charge of Sergeant J. Kabernagle. His meteorological records are correctly kept.

SAN DIEGO, CALIFORNIA.

[*Official number*, 75.]

Latitude	32° 44′ 41″
Longitude	117° 8′ 0″
Elevation of barometer above mean sea-level	67.10 feet.
Mean barometer (reduced to sea-level) for the year ending June 30, 1879	30.024
Mean temperature for the year ending June 30, 1879	60°.1
Amount of rain-fall for the year ending June 30, 1879	7.88 inches.

Established November 1, 1871.

Office second floor, corner of Fifth and D streets.

Sergeant M. M. Sickler was in charge until April 3, 1879; Sergeant W. U. Simons from that date until June 23, when he was relieved by Sergeant Martin L. Hearne, who also acts as chief clerk to the officer in charge. Sergeant S. E. Patten was on duty, as chief clerk to the officer in charge, until June 23, when he was transferred to Phœnix. J. M. Ramos, civilian, was in charge of the operating room until November 10, 1878; Corporal and Lance Sergeant William Story from November 10, 1878, to May 1, 1879; Private Thomas Gibson, May 18, 1878, to date. Private J. H. McKenna is assistant and clerk to officer in charge; J. Godfrey Decatur civilian assistant since November 10.

The station was inspected in August and November, 1878. On both occasions the office was found in a neat and clean condition; records correctly and neatly kept; observer reported as sober, quiet and industrious, and closely attending to his duties.

Number of messages during year.—Sent paid, 3,254; sent collect, 1,068; received paid, 4,024; received collect, 1,200; sent D. H., 1,305; received D. H., 688; total, 11,539. Free business, $698.85. On business connected with the government and maintenance of the line: Number of words sent, 56,284; number of words received, 87,258; total, 143,542.

Receipts.—This line, $2,462.69; sundries, $259.81; total, $2,722.50.

The station is supplied with a complete set of meteorological and telegraph instruments, and repair tools.

Eight meteorological observations are taken daily, four of which are forwarded by telegraph.

The telegraphic reports of all the other stations on this division are collected and consolidated at this office, including monthly means. Local reports, bulletins and Forms 22 are furnished to, and published by, the San Diego Daily Union and San Diego Daily News, together with reports of stations in the Territory and on the coast.

The office is regularly visited by the meteorological committee of the San Diego Society of Natural History.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	2,478
Number of Local Reports issued during the year ending June 30, 1879	677
Number of Forms 22 issued during the year ending June 30, 1879	22
Total	3,187

TRES ALAMOS, ARIZONA TERRITORY.

[*Official number*, 213.]

Latitude	32° 9′
Longitude	110° 15′

Established June 11, 1877.

Office in one-story adobe building, adjoining the post-office.

Private M. A. Cunningham is in charge, having relieved Private Newton Phelps November 22. Private H. A. Kremp, Company M, Sixth Cavalry, is repairman.

Number of messages during the year.—Sent paid, 223; sent collect, 76; received paid, 140; received collect, 42; sent D. H., 45; received D. H., 21; total, 547. Free business, $22.15.

Receipts.—This line, $78.48; other lines, $21.69; total, $100.17.

The station is supplied with a complete set of telegraph instruments and repair tools.

No meteorological observations are taken. It was inspected in September, 1878.

The office is furnished free of expense to the United States. The station has been regarded as a repair station, the repairmen attending to what little business might offer. No official and little commercial business is done, but the office might become of importance in case of Indian or Mexican raids on the settlers in this valley.

TUCSON, ARIZONA TERRITORY.

[*Official number*, 178.]

Latitude	32° 14′
Longitude	110° 56′
Elevation of barometer above mean sea-level	2,542.00 (?) feet.
Amount of rain-fall during the year ending June 30, 1878	16.32 inches.

Established December 2, 1873; observations commenced October 30, 1875.

Office moved from corner Main and Congress streets to corner of Myer and Congress streets July 30, 1878, and again, on June 30, 1879, to south side of Ott street, two doors west of Myer street.

Corporal and Lance Sergeant George V. Phillips in charge. Private Fred. C. Kelly was on duty as assistant until October 20, when he was relieved by Private William H. Agey. Private George Wilt, Company M, Sixth Cavalry, repairman.

Number of messages during the year.—Sent paid, 5,643; sent collect, 1,954; received paid, 6,105; received collect, 2,059; sent D. H., 1,438; received D. H., 924; total, 18,123. Free business, $581.57.

Receipts.—This line, $2,791.87; other lines, $4,893.26; sundries, $104.10; total, $7,789.23.

The station is supplied with a complete set of meteorological and telegraph instruments (including a Milliken repeater) and repair tools.

Full meteorological observations are taken at this station. Tri-daily and sunset reports are forwarded by telegraph.

The station was inspected in September, 1878, and found in good condition.

VERDE (FORT VERDE), ARIZONA TERRITORY.

[*Official number*, 179.]

Latitude	34° 23′ 42″
Longitude	111° 53′ 5″
Elevation of barometer above mean sea-level	3,500.00 (?) feet.
Amount of rain-fall for the year ending June 30, 1879	7.72 inches.

Established November 9, 1874; observations commenced February 17, 1876.

Private I. R. Birt was in charge until February 6, 1879; Sergeant John Kabernagle from February 6 to April 3; Corporal Dudley Brooks from April 3 to date.

Number of messages during the year.—Sent paid, 376; sent collect, 56; received paid, 206; received collect, 70; sent D. H., 659; received D. H., 568; total, 1,935. Free business, $305.68.

Receipts.—This line, $150.43; other lines, $58.41; total, $208.84.

The station is supplied with a complete set of meteorological and telegraph instruments and repair tools.

Meteorological observations (with the exception of those with the barometer, two of which instruments have been broken during the year), are taken tri-daily and forwarded weekly by mail. A daily sunset observation is forwarded by telegraph.

The station was inspected in October, 1878, and found in good condition.

The records are neatly and correctly kept.

This section of line has been recently repaired and a number of new, sawed pine poles put in.

WICKENBURG, ARIZONA TERRITORY.

[*Official number*, 168.]

Latitude	33° 58′
Longitude	112° 42′
Amount of rain-fall for the year ending June 30, 1879	7.73 inches.

Established January 6, 1874; observations commenced November 13, 1875.

Office in one-story frame building.

Private E. J. Falconer was in charge until July 17; Private W. J. Dailey, July 17 to May 19; Private I. R. Birt, May 19 to date. Private Patrick Barry, Company K, Sixth Cavalry, repairman.

Number of messages during the year.—Sent paid, 593; sent collect, 127; received paid, 460; received collect, 126; sent D. H., 7; received D. H., 6; total, 1,319. Free business, $93.30.

Receipts.—This line, $244.54; other lines, $203.77; total, $448.31.

The station is supplied with a complete set of meteorological and telegraph instruments, and repair tools.

Meteorological observations are taken and forwarded weekly by mail, and a daily sunset observation by telegraph.

The station was inspected in October, 1878, and found in good order.

There is no official and but little commercial business done here, it being used mainly as a repair station.

Private Dailey is a fair operator, sober, industrious, and attentive to duty, and his records are neatly and correctly kept.

Extract from the observer's semi-annual report:

On May 22, 1879, the station was temporarily closed, and the observer left for Phœnix, in compliance with orders.

YUMA, ARIZONA TERRITORY.

[*Official number*, 169.]

Latitude	32° 43′ 32″
Longitude	114° 36′ 9″
Elevation of barometer above mean sea-level	155.00 (?) feet.
Amount of rain-fall for the year ending June 30, 1879	5.10 inches.

Established November 18, 1873; observations commenced October 4, 1875.

Corporal and Lance Sergeant William Story was in charge until October 20, 1878; Sergeant William Baber thence to February 6, 1879; Private Thomas Gibson, February 6, to May 3, 1879; Private Wenzel Manderfeld thence to date. Private Manderfeld had relieved Private M. A. Cunningham as assistant October 1, 1878.

Number of messages during year.—Sent paid, 1,537; sent collect, 1,488; received paid, 2,161; received collect, 446; sent D. H., 2,278; received D. H., 913; total, 8,823. Free business, $737.16.

Receipts.—This line, $584.92; other lines, $208.12; total, $793.04.

The station is supplied with a complete set of meteorological and telegraph instruments and repair tools. Complete meteorological observations are taken tri-daily, and sunset reports are forwarded by telegraph.

The station was inspected in September, 1878, and found in good condition.

Extract from the observer's semi-annual reports:

A report of the rain-fall, direction of wind, wet and dry bulb, continues to be furnished monthly to the chief engineer Central Pacific Railroad in tabulated form.

NORTHWESTERN DIVISION.

Table showing stations on the United States telegraph line, northwestern division, from which reports have been received during the year ending June 30, 1879, with the kind of reports sent, whether complete or limited.

Name of station.	Reports commenced.	Reports discontinued.	Number of reports by telegraph (daily).	Character of reports received by mail on Form 4 (weekly).
Bismarck, Dak	(*)	.....	3	Complete observations taken seven times a day.
Deadwood, Dak	Nov. 1, 1878	.....	3	Do.
Buford, Dak	Jan. 13, 1879	.....	3	Complete observations taken tri-daily.
Ellis, Mont	Feb. 1, 1879	.....	1	No meteorological observations taken.
Keogh, Mont	Jan. 13, 1879	.....	3	Complete observations taken tri-daily.
Meade, Dak	Feb. 25, 1879	.....	1	No meteorological observations taken.
Stevenson, Dak	Dec. 26, 1878	.....	3	Complete observations taken tri-daily.

* Reporting at date of last annual report, June 30, 1878.

Report of stations on United States telegraph line northwest division, compiled from the annual report of First Lieut. George S. Grimes, Second United States Artillery, acting signal-officer in charge, and from data on file in the office of the Chief Signal-Officer:

BISMARCK, DAKOTA TERRITORY.

[*Official number*, 104.]

Latitude ..... 46° 48′
Longitude ..... 100° 38′
Elevation of barometer above mean sea-level ..... 1,704.3 feet.
Mean temperature for the year ending June 30, 1879 ..... 29.991
Mean temperature for the year ending June 30, 1879 ..... 41.05
Amount of rain-fall for the year ending June 30, 1879 ..... 19.66 inches.

Established September 15, 1874.

Office, corner First and Meigs streets.

Private D. T. Flannery was in charge of the station until October 30, 1878, when he was relieved by Sergeant C. Cramer.

Complete meteorological observations are taken daily, four of which are forwarded by telegraph.

The repair section extends thirty-five miles to Turtle Creek.

The station was inspected in August, 1878, and May, 1879, and the duties of the office were reported as having been satisfactorily performed. Since November 19, 1878, the station has been under the immediate charge of the officer in charge northwest division.

Extracts from the observer's semi-annual reports:

A loop connecting this office with the Northwestern Telegraph line has been built since last report, and reports from stations on the United States telegraph line in this

division are concentrated here and transmitted direct to Saint Paul *en route* to Washington.

Bulletins of the stage of water at stations above on the Missouri have been issued during the spring and summer, and the breaking of the ice also reported, all of which information is eagerly sought for by steamboat-men.

Weather reports have been regularly furnished for each issue of the weekly paper, which also publishes a monthly report. Special items have been prepared by the observer, which have led to a solicitation for more. Considering the newness of the country, a full share of interest is taken in the service by the people.

The observer was called upon to produce the records of the office in court, and they were accepted in evidence.

The interest at present taken in the office cannot be great. The observer is frequently consulted, but the country is yet but sparsely populated, and it is believed that the office will be most useful to emigrants and prospectors in furnishing them with particulars of the climate, such as amount of rain, temperature, opening of seasons, &c.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1879	40
Number of Local Reports issued during the year ending June 30, 1879	284
Number of Forms 22 issued during the year ending June 30, 1879	41
Total	365

BOZEMAN (FORT ELLIS), MONTANA TERRITORY.

[*Official number*, —.]

Latitude	45° 22′
Longitude	111° 1′

Established as a repair station February 1, 1879.

Private F. C. Buell in charge.

Number of messages since opening station.—Sent paid, 152; sent collect, 52; received paid, 182; received collect, 43; sent free, 239; received free, 263; total, 931.

Receipts.—This line, $56.89; other lines, $131.68; total, $188.57.

The station is supplied with a complete set of telegraph instruments and repair tools.

A daily sunset observation is forwarded by telegraph.

The repair section extends to Stillwater, ninety miles east.

BUFORD (FORT BUFORD), DAKOTA TERRITORY.

[*Official number*, 203.]

Latitude	48° 03′
Longitude	103° 58′
Elevation of barometer above mean sea-level	1,905(?) feet.
Amount of rain-fall for the year ending June 30, 1879	*12.30 inches.

Established October 23, 1878; observations commenced January 13, 1879.

Mr. N. T. Collett opened the station. He was relieved from charge December 30, 1828, by Private B. W. Stockman, but remained on duty as assistant until May 5, 1879.

Number of messages since opening station.—Sent paid, 166; sent collect, 85; received paid, 115; received collect, 35; sent free, 173; received free, 141; total, 715.

Receipts.—This line, $55.74; other lines, $83.13; sundries, $0.28; total, $139.15.

(*From January 13, 1879, only)

The station is supplied with a complete set of telegraph instruments and repair tools.

Complete observations are taken tri-daily and forwarded by telegraph. A daily sunset observation is forwarded with the midnight telegraph report.

The repair section of this station extends to Knife River, eighty miles east, and to Morgan and O'Brien's Ranch, sixty-six miles west.

The first steamboat of the season arrived April 19.

COULSON, MONTANA TERRITORY.

Established January 21, 1879, as a repair station.

It is about forty-three miles west of Custer and fifty-one miles east from Stillwater.

It is in charge of Musician V. Wickersham, Company C, Eleventh United States Infantry.

The station is supplied with a complete set of meteorological and telegraph instruments and repair tools.

CUSTER (FORT CUSTER), MONTANA TERRITORY.

[*Official number*, 200.]

Longitude	45° 48′
Latitude	107° 38′

Established December 5, 1878.

Mr. E. P. Delano opened the station and was relieved, June 11, by Private D. C. Ralston.

Number of messages since opening station.—Sent paid, 94; sent collect, 28; received paid, 121; received collect, 26; sent free, 380; received free, 301; total, 950.

Receipts.—This line, $36.44; other lines, $166.25; sundries, $1.97; total, $204.66.

The station is supplied with a complete set of telegraph instruments and repair tools.

No meteorological reports, except the sunset observations, had been made up to June 30.

The repair section of this station extends to Rosebud, ninety-two miles east, and to Stillwater, ninety-four miles west.

DEADWOOD, DAKOTA TERRITORY.

Established November 18, 1878, with Sergeant D. M. Kennedy in charge, who was relieved, March 25, 1879, by Sergeant James O'Dowd. Private D. C. Ralston reported for duty February 21, 1879; he was relieved April 23, 1879, by Private R. L. Ratchford; the latter was transferred June 4, 1879, to the repair station at Little Missouri.

Number of messages since opening station.—Sent paid, 172; sent collect, 83; received paid, 141; received collect, 41; sent D. H., 117; received D. H., 158; total, 711.

Receipts.—This line, $120.96; other lines, $74.10; sundries, $0.42; total, $195.48.

The station is supplied with a complete set of telegraph instruments and repair tools.

Complete meteorological observations are taken seven times daily, three of which are forwarded by telegraph. A daily sunset observation is taken and forwarded with the midnight telegraphic report.

The repair section extends to Little Missouri, a distance of sixty-five miles.

Since November 19, 1878, the station has been under the immediate orders of the officer in charge of the Northwest Division.

FERRY POINT, MONTANA TERRITORY.

Established January 3, 1879, as a repair station.

Sergeant Hunt, Company D, Fifth United States Infantry, was in charge until April 21, 1879; Corporal Boyles, Company K, Fifth United States Infantry, from April 21 until May 10, 1879; Corporal Coulter, Company B, second United States Cavalry, from May 10 until June 10, 1879; and Corporal Dimelt, Company D, Fifth United States Infantry, from June 10, 1879, to date.

The station is forty miles west of the repair station, at Morgan & O'Brien's Ranch, and about forty-eight miles east of Keogh.

The station is supplied with telegraph instruments and repair tools.

HUNTER'S SPRINGS, MONTANA TERRITORY.

Established March 31, 1879, as a repair station. Private W. E. Milner, Company C, Eleventh United States Infantry, is in charge.

Number of messages since opening station.—Sent paid, 6; sent collect, 0; received paid, 1; received collect, 1; sent free, 9; received free, 8; total, 25.

Receipts.—This line, $3.57; other lines, $8.60; total, $12.17.

The station is supplied with telegraph instruments and repair tools.

No meteorological observations are taken.

The repair section extends to Stillwater, fifty-five miles east, and to Fort Ellis, forty-three miles west.

KEOGH (FORT KEOGH), MONTANA TERRITORY.

[*Official number*, 202.]

Latitude	46° 17′
Longitude	105° 55′
Elevation of barometer above mean sea-level	2,536 (?) feet.
Amount of rain-fall for the year ending June 30, 1879	*11.41 inches.

Established November 18, 1878; observations commenced January 13, 1879.

Mr. W. C. Larcey was relieved from charge November 30, 1878, but has continued on duty as assistant. Private A. H. Bell has had charge since November 30. Sergeant D. M. Kennedy was ordered to this station March 20, 1879; but while *en route* was attacked and wounded by Indians, and is still in hospital at Fort Keogh under treatment.

Number of messages since opening station.—Sent paid, 556; sent collect, 102; received paid, 211; received collect, 256; sent free, 366; received free, 195; total, 1,686,

Receipts.—This line, $142.63; other lines, $365.90; sundries, $0.37; total, $508.90.

This station is supplied with a complete set of telegraph instruments and repair tools.

Complete meteorological observations are taken tri-daily, and trans-

* From January 13, 1879, only.

mitted by telegraph. A daily sunset observation is forwarded with the midnight telegraphic report.

The repair section extends to Morgan & O'Brien's Ranch, ninety-eight miles east; to Rosebud, thirty-three miles west; and to Powder River, sixty-two miles south.

Extracts from the observer's semi-annual reports:

Commercial business is increasing daily. Valuable information concerning hostile Indians in the vicinity of repair stations and elsewhere has been received from time to time, whereby military movements were greatly facilitated.

A river gauge was constructed in the Yellowstone, about two miles east of this station, for the benefit of navigation; the rise and fall being reported daily at Bismarck, Dak.

KNIFE RIVER, DAKOTA TERRITORY.

Established January 30, 1879, as a repair station.

Private D. I. Mercier in charge.

The station is supplied with telegraph instruments and repair tools.

No meteorological observations are taken at the date of this report.

The repair station extends seventy miles east to Fort Stevenson and about eighty miles to Fort Buford.

LITTLE MISSOURI, MONTANA TERRITORY.

Established as a repair station April 30; 1879.

Private J. T. Rudy in charge. On June 4, 1879, Private Rudy was admitted to the hospital at Fort Meade, where he is now under medical treatment, and Private R. L. Ratchford assumed charge, remaining to date. No meteorological observations are taken. Privates F. Dickerty, Company C, and E. Fair and F. Thomas, Company E, Seventh Cavalry, are on duty as repairmen and guard.

The station is supplied with a complete set of telegraph instruments and repair tools.

MEADE (FORT MEADE), DAKOTA TERRITORY.

Latitude (approximate)	44° 22′ 30″
Longitude (approximate)	103° 26′ 20″

Established February 19, 1879, with Private A. A. Stoneburner in charge. It is the terminus of the branch line from Keogh southward through Deadwood.

Number of messages since opening station.—Sent paid, 46; sent collect, 8; received paid, 29; received collect, 9; sent free, 74; received free, 61; total, 227.

Receipts.—This line, $25.85; other lines, $62.97; total, $88.82.

The station is supplied with a complete set of telegraph instruments and repair tools.

A daily sunset observation is forwarded by telegraph.

The repair section extends to Deadwood, twenty miles distant.

MORGAN AND O'BRIEN'S RANCH, DAKOTA TERRITORY.

Established May 31, 1879, as a repair station, with Private C. G. Raymond in charge and Prviate J. A. Funstan, Sixth Infantry, assistant.

It is about sixty-six miles west of Buford; about ninety-eight miles east of Keogh, and forty miles from Ferry Point, the next repair station west.

The station is supplied with telegraph instruments and repair tools.
No meteorological observations are taken.

POWDER RIVER, MONTANA TERRITORY.

Established November 1, 1878, as a repair station, with Private L. Hohman, Company E, Fifth Infantry, in charge. Private L. Smith, Company C, and J. Broderick, Company H, Fifth Infantry, are on duty as guard.

The station is supplied with telegraph instruments and repair tools.
No meteorological observations are taken.

It is sixty-five miles southeast to Keogh, and about sixty-six miles from Little Missouri, the next repair station south.

ROSEBUD, MONTANA TERRITORY.

Established February 3, 1879, as repair station, with Private J. W. Can, Company F, Eleventh Infantry, in charge.

The station is supplied with telegraph instruments and repair tools.
No meteorological observations are taken.

It is situated about thirty-three miles west of Keogh, about ninety-two miles east of Custer, and about sixty-five miles from Terry's Landing, the next repair station west.

STEVENSON (FORT STEVENSON), DAKOTA TERRITORY.

[*Official number*, 201.]

Latitude	47° 36′
Longitude	101° 23′
Amount of rain-fall for the year ending June 30, 1879	*13.70 inches.

Established September 19, 1878; commenced observations December 26, 1878.

Mr. Isaac Baum in charge, was relieved November 30, 1879, by Private N. C. Smith.

Number of messages since opening station.—Sent paid, 55; sent collect, 17; received paid, 47; received collect, 23; sent free, 248; received free, 172; total, 562.

Receipts.—This line, $21.82; other lines, $10.11; total, $31.93.

The station is supplied with a complete set of telegraph instruments and repair tools.

Complete meteorological observations are taken tri-daily, and forwarded by telegraph. A daily sunset observation is added to the midnight telegraphic report.

The repair section extends to Turtle Creek, thirty-six miles east, and to Knife River, seventy miles west.

STILLWATER, MONTANA TERRITORY.

Latitude	45° 36′
Longitude	109° 21′

It is situated one-fourth of a mile from the Yellowstone River, north side, and one and a half miles west of Keiser Creek.

Established February 21, 1879, as a repair station, with Private W. P. Carr in charge.

* From December 26, 1878, only.

Number of messages since opening station.—Sent paid, 44; sent collect, 6; received paid, 22; received collect, 19; sent free, 96; received free, 91; total, 278.

Receipts.—This line, $18.24; other lines, $30.69; total, $48.93.

The station is supplied with telegraph instruments and repair tools.

No meteorological observations are taken.

It is about ninety miles west of Custer and ninety-four miles east of Ellis; fifty-one miles west from Coulson and fifty-five miles east of Hunter's Springs.

TERRY'S LANDING, MONTANA TERRITORY.

Established December 28, 1878, as a repair station, with Private G. J. Walters, Company I, Second Cavalry, in charge.

It is about thirty miles east of Custer and about sixty-five miles west of Rosebud.

The station is supplied with a complete set of telegraph instruments and repair tools.

No meteorological observations are taken.

SUNSET STATIONS.

Table showing the location of the sunset stations, Signal Service, United States Army, with the names of the observers and the dates of their establishment.

Station.	Observer.	Date established.
Austin, Nev	L. A. Weller	July 1, 1877
Central City, Nebr	George Bockes	July 1, 1877
* Des Moines, Iowa		July 1, 1877
Deep Creek, Utah	E. R. Ferguson	July 1, 1877
Elmira, N. Y	A. J. Carpenter	July 1, 1877
Emporia, Kans	L. T. Heritage	April 5, 1879
Eugene City, Oreg	J. Kemble Peters	July 1, 1877
Fillmore City, Utah	Andrew Henry, P. M	July 1, 1877
Fort Fetterman, Wyo	W. H. Murphy, P. M	July 1, 1877
Hamilton, Nev	H. Carpenter, P. M	July 1, 1877
Hat Creek, Wyo	Jno. H. Bowman	July 1, 1877
Kit Carson, Colo	V. Weisse	July 1, 1877
Lytton, British Columbia	W. H. Wright	July 1, 1877
Monterey, Cal	Felipe Gomez, P. M	July 1, 1877
New Westminster, British Columbia	Adolphus Peele	July 1, 1879
Pembroke, Ont	W. A. Moffat	April 5, 1877
Santa Barbara, Cal	G. P. Tebbetts	July 1, 1877
Sault de Ste. Marie, Mich	Chas. Ripley, Ass't P. M	July 1, 1877
Sidney, Nebr	A. E. Annis	July 1, 1877
St. George, Utah	John Pymm	July 1, 1877
St. Mary's, Wyo	M. R. McDonald	July 1, 1877
Trinidad, Colo	E. O. Hornbeck	July 1, 1877
Victoria, Vancouver's Island, British Columbia	John Smith	July 1, 1877
Wadena, Minn	C. J. Stuart	July 1, 1877
Waterville, Kans	Mrs. Clara B. Phillips	July 1, 1877
Yreka, Cal	C. H. Pyle	July 1, 1877

* Discontinued as sunset station, and established as station of the first class August 1, 1878.

Observations of the character of the sunset are taken each day at sunset, telegraphed to the nearest regular Signal Service station, and embodied in the next telegraphic report from that station to this office.

Sunset observations are also made daily, and forwarded weekly by mail from the following stations in New Jersey: Somerville, New Brunswick, Belvidere, Flemington, Elizabeth, Freehold.

DISPLAY STATIONS.

Table showing the location of the cautionary and cautionary off-shore signal display stations under the direction of the office of the Chief Signal-Officer, the names of the displaymen, the date on which each was established, the number of cautionary and cautionary off-shore signals displayed, the number reported justified and the number reported not justified, from July 1 to June 30, except in cases where they were established subsequent to July 1, 1878.

SECTION NO. 1, ON OR NEAR LAKE MICHIGAN.

Station.	Date of establishment.	Name of displayman.	Cautionary signals.			
			Number ordered displayed.	Number reported justified.	Number reported not justified.	Number not reported upon.
Green Bay, Wis	Sept. 16, 1877	David Soper	44	23	20	1
Horn's Pier	Mar. 15, 1878	W. H. Horn	43	30	12	1
*Kenosha, Wis	Sept. 16, 1877	H. R. Simmons	.....	.....	.....	.....
Kewaunee, Wis	Sept. 16, 1877	A. D. Laughlin, P. M.	44	22	21	1
Manitowoc, Wis	Sept. 16, 1877	W. W. De Lano	45	29	13	3
Menomonee, Mich	Sept. 16, 1877	N. Gram	44	31	12	1
Racine, Wis	Sept. 16, 1877	G. W. Scanlon	41	34	7	.....
Sheboygan, Wis	Sept. 16, 1877	J. L. Mallery	46	27	17	2
Sturgeon Bay, Wis	Sept. 16, 1877	J. B. Scott	43	23	20	.....

* No reports.

Section No. 1 is under the charge of the sergeant at Milwaukee, Wis., through whom all signal orders are sent.

SECTION NO. 3, ON OR NEAR LAKE MICHIGAN.

Frankfort, Mich	July 20, 1878	C. S. Collier	37	27	10	.....
Ludington, Mich	Jan. 20, 1878	H. F. Alexander	61	45	16	.....
*Muskegon, Mich	Feb. 15, 1879	Lafayette Freeman	.....	.....	.....	.....
Northport, Mich	July 20, 1878	William Gill, P. M.	37	21	15	1
Pentwater, Mich	July 20, 1878	M. A. Rice	41	28	13	.....
South Haven, Mich	Aug. 10, 1878	J. S. Donahue	42	17	24	1
St. Joseph, Mich	Aug. 10, 1878	J. H. King	41	25	16	.....
Traverse City, Mich	July 20, 1878	S. C. Fuller, P. M.	35	15	20	.....

* No report since May 24, 1879.

Section No. 3 is under the charge of the sergeant at Detroit, Mich., through whom all signal orders are sent.

Ludington, which had previously received its orders direct from the office of the Chief Signal Office, was included in this section upon its establishment, July 20, 1878. During the suspension of navigation signals are ordered for this station direct from the office of the Chief Signal-Officer.

SECTION NO. 4, ON OR NEAR LAKE HURON.

Bay City, Mich	Aug. 1, 1878	F. S. Hogan	31	21	10	.....
East Tawas, Mich	Aug. 1, 1878	E. C. French	30	17	10	3
Forester, Mich	Aug. 1, 1878	F. T. Smith	31	24	7	.....
Port Austin, Mich	Aug. 1, 1878	Philip Winsor	28	20	6	2
Rogers City, Mich	Aug. 1, 1878	Henry Clothier	30	25	5	.....
Monroe, Mich	Aug. 1, 1878	J. J. Hubbell	35	30	5	.....

Section No. 4 is under the charge of the sergeant at Detroit, Mich., through whom all signal orders are sent.

Monroe, Mich., was originally a station of section 5, but was transferred therefrom August 13, 1878.

Table showing the location of the cautionary and cautionary off-shore signal display stations, &c.—Continued.

SECTION NO. 5, ON LAKE ERIE.

Station.	Date of establishment.	Name of displayman.	Cautionary signals.			
			Number ordered displayed.	Number reported justified.	Number reported not justified.	Number not reported upon.
Ashtabula, Ohio	Aug. 1, 1878	W. O. Nettleton	36	24	12	.....
Dunkirk, New York	Aug. 1, 1878	S. T. Blakeney	38	17	21	.....
Fairport, Ohio	Aug. 28, 1878	A. P. Sanford	38	24	14	.....

Section No. 5 is under the charge of the sergeant at Cleveland, Ohio, through whom all signal orders are sent.

Fairport, Ohio, was originally established at Painesville, Ohio, but was transferred August 28, 1878, owing to better facilities for displaying signal at this point.

SECTION NO. 6, ON LAKE ONTARIO.

Cape Vincent, N. Y.	Aug. 1, 1878	C. C. Brown	28	21	6	1

Section No. 6 is under the charge of the sergeant at Oswego, N. Y., through whom all signal orders are sent. This section originally consisted of Charlotte and Cape Vincent, N. Y., and was under the supervision of the sergeant at Rochester, N. Y., but on July 13, 1878, Charlotte was dropped from this section and continued as a repeating station of Rochester, N. Y., while the charge of the section was transferred to Oswego.

SECTION No. 7, ON THE NEW ENGLAND COAST.

Station.	Date of establishment.	Name of displayman.	Cautionary signals.				Cautionary off-shore signals.					Remarks.
			Number ordered displayed.	Number reported justified.	Number reported not justified.	Number not reported upon.	Number reported ordered displayed.	Number reported fully justified.	Number reported justified as to direction.	Number reported justified as to velocity.	Number reported not justified.	
Belfast, Me	August 20, 1878	W. J. Rideout	36	23	13		21	14	2	1	3	
Booth's Bay, Me	August 20, 1878	John O'Brien	38	33	3	2	21	17	1	3		
Deer Isle, Me	April 1, 1879	F. H. Gross	7	5	2		5	2	2	1		
Portsmouth, N. H	August 20, 1878	G. H. Nutter	38	25	13		21	15	5		1	
Rockland, Me	June 1, 1879	W. J. Rideout	2	1	1							
Millbridge, Me	August 20, 1878	George R. Smith										No signals displayed.

Section No. 7 is under the charge of the sergeant at Portland, Me., through whom all signal orders are sent.
Station at Belfast, Me, was discontinued and Rockland, Me., opened June 1, 1879.
Millbridge and Deer Isle, Me., were designated as stations of this section to be opened August 20, 1878, but were indefinitely suspended by order of August 19, 1878. The display of signals was commenced at Deer Isle on April 1, 1879.

SECTION No. 8, ON THE NEW ENGLAND COAST.

Chatham, Mass	August 15, 1878	C. S. Nickerson	39	33	6	22	17	2	3			
Fall River, Mass	October 18, 1878	W. G. Bennett	31	20	11	19	12	2	1	2	2	
Gloucester, Mass	September 25, 1878	Edward McQuinn	36	30	6	22	18	2	1	1		
Highland Light, Mass	August 15, 1878	Isaac M. Small	36	29	7	23	17	4	1	1		
Hyannis, Mass	August 15, 1878	E. F. Lothrop	39	35	4	22	16	2	2	2		
Marblehead, Mass	August 15, 1878	Frank Dodge	39	24	15	22	13	8	1			
New Bedford, Mass	August 15, 1878	G. A. Gifford	39	27	12	22	8	9		5		
Newburyport, Mass	August 15, 1878	W. H. Bayley	40	24	16	22	12	4	1	5		

Section No. 8 is under the charge of the sergeant at Boston, Mass., through whom all signal orders are sent.
Signals were suspended at Fall River, Mass., on May 12, 1879.

List of display stations not in sections, but which receive their orders from a designated station or direct from the office of the Chief Signal-Officer.

Station.	Date of establishment.	Name of displayman.	Designated station from which orders are received.	Cautionary signals.				Cautionary off-shore signals.				
				Number ordered displayed.	Number reported justified.	Number reported not justified.	Number not reported upon.	Number reported ordered displayed.	Number reported fully justified.	Number reported justified as to direction.	Number reported justified as to velocity.	Number reported not justified.
Charlotte, N. Y.	August 1, 1878	A. J. Mulligan	Rochester, N. Y.	27	16	10	1					
City Island, N. Y.	February 1, 1879	H. B. Roberts	New York, N. Y.	20	19	1		16	15			1
Lewes, Del.	February 25, 1878	C. M. Marshall	Office Chief Signal-Officer	60	40	20		45	33	12		
Mackinac City, Mich.	October 4, 1878	J. F. Stimpson	do	24	15	9						
New Buffalo, Mich.	August 15, 1878	W. Thurston	Chicago, Ill.	21	16	4	1					
Pensacola, Fla.	November 10, 1878	James Brown, jr.	Mobile, Ala.	4	2	2		6	4	1	1	
Port Eads, La.	October 10, 1878	A. W. Wire	Office Chief Signal-Officer, through the sergeant at New Orleans, La.	5	5			6	6			1
Stonington, Conn.	October 10, 1878	S. O. Pendleton	New London, Conn.	37	22	15		23	15	6	1	1
Tybee Island, Ga.	February 15, 1879	H. J. Valleau	Savannah, Ga.					1	1			
Watch Hill, R. I.	August 15, 1878	C. D. Harvey	New London, Conn.	2			2					

The station at Mackinac City was originally established at Mackinac, but was transferred to Mackinac City October 4, 1878.
New Buffalo was discontinued as a display station February 15, 1879.
Tybee Island was originally a station of the first class, but was discontinued as such and designated a display station February 15, 1879.
Watch Hill was discontinued as a display station on September 15, 1878, on account of the telegraph office at that point having been closed for the season.

The following is the record of the display stations for the year ending June 30, 1879.

ASHTABULA HARBOR, OHIO.

Established August 1, 1878.

Displayman, Mr. W. O. Nettleton.

Signals are displayed from a staff placed against the southwest corner of Mr. Nettleton's store, which stands about sixty-five feet above, and about two hundred yards from, the lake. The view of the signals from the lake is unobstructed, except from the west, where it is cut off by a high bluff. Vessels coming from that direction can see the signals when within about three miles of the harbor entrance, giving them ample time to run in if they should desire to do so.

The Western Union Telegraph office is in Mr. Nettleton's store.

The station was inspected June 4, 1879, and found in satisfactory condition.

BAY CITY, MICHIGAN.

Established August 1, 1878.

Displayman, Mr. F. S. Hogan.

Signals are displayed from a staff placed on the roof of a three-story building near the bridge. The situation is a good one, as the signals can be seen from all parts of the river nearly up to Saginaw and the anchorage ground in the bay.

The station was inspected September 21, 1878, and June 13, 1879, and found in satisfactory condition.

BELFAST, MAINE.

Established August 20, 1878.

Displayman, Mr. W. J. Rideout.

Signals were displayed from a staff on the roof of a warehouse, on the dock at the foot of Main street, occupied by Messrs. Tomms and Osborn. This situation was not a good one. The signal could be seen from all parts of the harbor, but was too low to be seen by vessels passing down the river. At the establishment of this station, Capt. C. N. Wording acted as displayman, but was relieved at his own request February 15, 1879, by Mr. W. J. Rideout.

This station was inspected September 11, 1878, April 8, 1879, and May 16, 1879. It was reported that little interest had been taken in the service, and that trouble had been experienced in displaying signals at night by reason of Messrs. Tomms and Osborn refusing to allow Mr. Rideout to enter their building at night for that purpose.

The station was transferred to Rockland, Me., June 1.

BOOTH BAY, MAINE.

Established August 20, 1878.

Displayman, Mr. John O'Brien.

Signals are displayed from a staff on a hill about a quarter of a mile southeast of the telegraph office. The top of the staff is about two hundred and twenty-five feet above low water. The signal is visible from all parts of the harbor, and from some distance out at sea.

The station was inspected September 14, 1878, and May 13, 1879.

CAPE VINCENT, NEW YORK.

Established August 1, 1878.

Displayman, Mr. C. C. Brown.

Signals are displayed from a staff about twenty-five feet from the telegraph office, on the R. W. and O. wharf, and are visible to all vessels passing into and out of Lake Ontario; those using the American channel passing within three-quarters of a mile of the wharf.

The station was inspected May 30, 1879, and found in satisfactory condition.

CHARLOTTE, NEW YORK.

Established August 1, 1878.

Displayman, Mr. A. J. Mulligan.

Signals are displayed from a staff thirty-five feet high, on the roof of a two-story building used as a custom-house and post-office. The building is forty-five feet high, making the height of the signal above ground seventy-five feet. The signal may be seen from all parts of the harbor, and at the lake shore, which is half a mile distant. When the station was first established Mr. G. W. Allen was employed as displayman, but was soon after succeeded by Mr. A. J. Mulligan.

The station was inspected September 4, 1878, and May 31, 1879, and found in satisfactory condition.

CHATHAM, MASSACHUSETTS.

Established, August 15, 1878.

Display man, Mr. C. S. Nickerson.

Signals are displayed from a staff sixty feet in height, situated on a hill about seventy-five yards from the post-office and telegraph office. The view of the signal is unobstructed from all directions for several miles. Vessels bound between New York and Boston usually pass within sight of the signal.

The station was inspected on September 19, 1878, and May 6, 1879, and found in satisfactory condition.

CITY ISLAND, NEW YORK.

Established February 1, 1879.

Displayman, Mr. H. B. Roberts.

The station was inspected March 1, 1879, and at that time a proper staff had not yet been erected for the display of signals. Mr. Roberts was reported as taking great interest in the service. The records had been well kept. The property was in good order.

DEER ISLE, MAINE.

Established August 20, 1878.

Displayman, Mr. F. H. Gross.

Signals are displayed from a staff about one hundred feet high, which stands near the head of the harbor and but a few yards from the beach.

The harbor is a long, narrow strip of water, surrounded by high hills. The signal can only be seen for a few minutes by passing vessels.

The station was inspected May 15, 1879, and found in satisfactory condition.

DUNKIRK, NEW YORK.

Established August 1, 1878.

Displayman, Mr. S. T. Blakeney.

Signals are displayed from a staff on the roof of the opera house, which is one block from the lake and about two blocks from the steamboat landing. The building is one of the most prominent in the town, and the signal can be seen for several miles from the lake in all directions.

The station was inspected September 2, 1878, and June 3, 1879, and found in satisfactory condition.

EAST TAWAS, MICHIGAN.

Established August 1, 1878.

The display of signals at this point is under the charge of Miss Estella C. French. Signals are displayed from a staff about eighty feet high, near the end of the wharf, and are visible from all parts of Tawas Bay and for some distance out on Saginaw Bay. At the establishment of this station Mr. Wilmot was placed in charge, but was superseded by Mr. E. C. Hargrave, who acted as displayman until December 1, 1878, when Miss Estella C. French was designated.

The station was inspected September 20, 1878, and June 12, and found in satisfactory condition.

FAIRPORT, OHIO.

Established August 28, 1878.

Displayman, Mr. A. P. Sanford.

Signals are displayed from a staff on the west end of the roof of a warehouse near the entrance to the harbor, and about one hundred yards from the lake. Signals can be seen from all directions on the lake, and several miles out.

The station was inspected August 31, 1878, and June 5, and found in satisfactory condition.

FALL RIVER, MASSACHUSETTS.

Established October 18, 1878.

Displayman, Mr. W. G. Bennett.

Signals are displayed from a staff on the tower of a five-story building. The top of the staff is about two hundred and fifty feet above tide water. The signal is visible for at least ten miles in the direction of Newport, farther from the westward, and by vessels bound out from Providence. Mr. Bennett is a prominent druggist, whose store is in the building from which signals are displayed. The station was inspected May 2, and found in satisfatory condition.

Mr. Bennett being unwilling to wait for the "good night" signal, and as another competent person could not be found to take charge of the duty, the display of signals was discontinued at this station May 12, 1879.

FORESTER, MICHIGAN.

Established August 1, 1878.

Displayman, Mr. F. T. Smith.

Signals are displayed from a staff on the roof of a large flouring mill

near the end of the wharf, and one hundred and fifty yards from the telegraph office.

The top of the staff is about ninety feet above the water, and as the shore here runs nearly north and south, the signal is very prominent.

The station was inspected September 16, 1878, and June 10, 1879, and found in satisfactory condition.

FRANKFORT, MICHIGAN.

Established July 20, 1870.

Displayman, Mr. C. S. Collier.

Signals are displayed from a staff which stands a few yards from and in front of the telegraph office on Main stre et. The signal may be seen from all parts of the harbor, and from the lake in all directions except the northwest, where the view is obstructed by a high bluff.

The station was inspected September 30, 1878, and June 23, 1879, and found in satisfactory condition.

GLOUCESTER, MASSACHUSETTS.

Established September 25, 1878.

Diplayman, Mr. Edward McQuinn.

Signals are displayed from a staff on the roof of the custom-house, and are visible for several miles seaward. Mr. McQuin reports that the display of signals at this place has been of great benefit to the fishermen, and that since the establishment of the station they have been guided to a great extent by them.

The station was inspected May 9, and found in satisfactory condition.

GREEN BAY, WISCONSIN.

Established September 16, 1877.

Displayman, Mr. David Soper.

Signals are displayed from a staff on the roof the elevator of the Chicago and Northwestern Railroad in Fort Howard, across the river from Green Bay.

The signals are visible for miles in every direction.

Mr. Soper reports that the signals are growing in favor with vessel-men; very few captains being willing to go out when the signal is up.

The station was not inspected during the year.

HIGHLAND LIGHT, MASSACHUSETTS.

Established August 15, 1878.

Displayman, Mr. Isaac M. Small.

Signals are displayed from a staff a few feet from the north end of the telegraph office, which is fifty yards from the edge of the cliff and three hundred yards from the light-house. Signals can be seen from a great distance in all directions, except the south; they are also plainly visible from all arts of the harbor at Provincetown. It is estimated that fifty thousand vessels pass this station each year, and as there is a good harbor, easy of access, at Provincetown, the display of signals must be of great benefit to shipping.

This station was inspected September 18, 1878, and May 7, 1879, and found in satisfactory condition.

HORN'S PIER, WISCONSIN.

Established March 15, 1878.
Displayman, Mr. W. H. Horn.
Signals are displayed from a staff which stands near the corner of Mr. Horn's store, about one hundred yards from the lake.
The signals are visible from the lake in all directions and for some distance out.
This station has not been inspected during the year.

HYANNIS, MASSACHUSETTS.

Established August 15, 1878.
Displayman, Mr. E. F. Lothrop.
Signals are displayed from a staff near the light-house, about one and a half miles southwest of the telegraph office and in the center of the town.
The station was inspected September 20, 1878, and May 6, 1879, and found in satisfactory condition.

KENOSHA, WISCONSIN.

Established September 16, 1877.
Displayman, Mr. H. R. Simmons.
Signals are displayed from a staff on the building of the Northwestern Telegraph Company.
The station was inspected October 10, 1878, and found in a satisfactory condition.

KEWAUNEE, WISCONSIN.

Established September 16, 1877.
Displayman, Mr. A. D. Laughlin, P. M.
Signals are displayed from a staff which stands in front of the post-office and about two blocks from the wharf. Signals are visible from all parts of the wharves and the lake.
This station has not been inspected during the year.

LEWES, DELAWARE.

Established February 25, 1878.
Displayman, Mr. C. M. Marshall.
This station has been in charge of Mr. Marshall during the past year, and has not been inspected. Signals are ordered displayed at this station direct from the central office.

LUDINGTON, MICHIGAN.

Established January 20, 1878.
Displayman, H. F. Alexander.
Signals are displayed from a staff that stands near the corner of Mr. Alexander's store; they are visible from all parts of the harbor and from the lake in all directions for several miles out.
The station was inspected October 3, 1878, and June 19, 1879, and found in a satisfactory condition.

MACKINAC CITY, MICHIGAN.

Established October 4, 1878.

Displayman, Mr. J. F. Stimpson.

The flags are displayed from a staff which consists of a large pine tree, from which the branches have been cut, and a pine staff about twenty feet long fastened to the top. The top of the staff is about ninety feet above the ground, thus bringing the flag above the surrounding trees, and making it visible from all parts of the straits. The lantern, when signals are displayed at night, is placed on a platform on the top of Mr. Stimpson's barn, which stands a short distance from the staff. The elevation of the lantern is sufficient to make the light visible to all passing vessels. The station was inspected June 16, 1879, and found in a satisfactory condition.

MANITOWOC, WISCONSIN.

Established September 16, 1877.

Displayman, Mr. W. W. De Lano.

Signals are displayed from a staff on the roof of a building, at the end nearest the river, of the Eighth-street bridge. Signals can be seen from all parts of the harbor, and from the lake for a long distance out.

At the establishment of this station Mr. C. Anderson acted as displayman, but was afterwards superseded by Mr. De Lano. The station was inspected October 10, 1878, and found in a satisfactory condition.

MARBLEHEAD, MASSACHUSETTS.

Established August 15, 1878.

Displayman, Mr. Frank Dodge.

Signals are displayed from a staff that stands a few yards north of Abbot Hall, which is on a hill overlooking the town. As the top of the staff is one hundred and twenty-seven feet above the ground, the signal can be seen for several miles from all directions.

The fishing grounds are within sight of the signal, and Mr. Dodge states that a display of the "off-shore" signal is invariably followed by a return of the fishing fleet to port.

The station was inspected September 17, 1878, and May 8, 1879. The records were found complete and properly kept; the flags and lanterns in good condition.

MENOMONEE, MICHIGAN.

Established September 16, 1878.

Displayman, Mr. N. Gram.

Signals are displayed from a staff on the top of the engine-house, which stands a few yards from the beach, and may be seen from all points of the harbor. This station has not been inspected during the year.

MILLBRIDGE, MAINE.

This was designated as a display station of section, seven, to be opened August 20, 1878, but was indefinitely suspended as such by order of August 19, 1878.

MONROE, MICHIGAN.

Established August 1, 1878.

Displayman, Mr. J. J. Hubbell.

Signals are displayed from a staff on the roof of a four-story house in the central part of the town; the building is about a mile from the lake. The signal is visible for several miles out on the lake, and must be seen by all vessels passing, except those that keep close to the north shore.

The station was inspected September 13, 1878, and June 7, 1879. The property was found in good order.

MUSKEGON, MICHIGAN.

Established February 15, 1879.

Displayman, Mr. Lafayette Freeman.

Signals are displayed from a staff on the roof of the Mason building, one of the most prominent in the town. Signals can be seen from all parts of the harbor and from Lake Michigan for some distance.

The inspector reports that the display of signals at this station has been of great benefit to vessels, particularly those engaged in the lumber trade. "The service seems to be very popular, and vessel masters hesitate to leave port when signals are up." The station was inspected June 25, 1879, and found in a satisfactory condition.

NEW BEDFORD, MASSACHUSETTS.

Established August 15, 1878.

Displayman, Mr. G. A. Gifford.

Signals are displayed from a staff on the end of the building in which Mr. Gifford's office is situated, and is on the dock near the foot of School street. The view of the signal is unobstructed from all parts of the harbor, and for several miles seaward.

The station was inspected September 21, 1878, and May 2, 1879, and found in a satisfactory condition.

The display of signals at this station has been reported as being of great interest to the shipping, and they have been generally heeded by vessel masters. The city papers publish all signal orders.

NEW BUFFALO, MICHIGAN.

Established August 15, 1878.

Displayman, Mr. W. Thurston.

Signals were displayed from a staff erected near the railroad depot, which may be seen from the lake. The station was inspected October 6, 1878. The flags and lanterns were found in good condition.

This station was discontinued February 15, 1879.

NEWBURYPORT, MASSACHUSETTS.

Established August 15, 1878.

Displayman, Mr. H. W. Bayley.

Signals are displayed from a staff on the top of the custom-house. It stands on the dock, and there is nothing to obstruct the view of the signals from the harbor or from the sea beyond. It is reported that the fishermen closely watch the signals, and as they can be plainly seen from their fishing ground, they generally run in when one is hoisted.

The station was inspected September 16, 1878, and May 9, 1879, and found in a satisfactory condition.

NORTHPORT, MICHIGAN.

Established July 20, 1878.

Displayman, Mr. W. Gill, P. M.

Signals are displayed from a staff in the rear of Mr. Gill's store. The telegraph office is but a short distance away. The view of the signal is unobstructed from all parts of the harbor, and may be distinctly seen with a glass from the opposite side of the bay.

The station was inspected September 29, 1878, and June 21, 1879, and found in a satisfactory condition.

PENSACOLA, FLORIDA.

Established November 10, 1878.

Displayman, Mr. James Brown, jr.

Signals are displayed from a staff in front of the custom-house, and in full view of the harbor.

The station was inspected March 17, 1879, and found in a satisfactory condition.

PENTWATER, MICHIGAN.

Established July 20, 1878.

Displayman, Mr. M. A. Rice.

Signals are displayed from a staff immediately in front of the telegraph office, about one hundred yards from the harbor, and can be seen from all parts thereof. A high bluff extends along the lake shore, in front of the town, and cuts off all view of the signals from passing vessels, except during the time they are going by the entrance to the harbor.

Mr. Rice reports that the display signals at this station are growing more and more popular.

The station was inspected October 4, 1878, and June 19, 1879, and found in a satisfactory condition.

PORT AUSTIN, MICHIGAN.

Established August 1, 1878.

Displayman, Mr. Philip Winsor.

Signals are displayed from a staff which stands a few yards from the store of Messrs. Carrington & Winsor. Signals may be easily seen by vessels bound in and out of the bay.

The station was inspected September 19, 1878, and June 11, 1879, and found in a satisfactory condition.

PORT EADS, LOUISIANA.

Established October 10, 1878.

Displayman, Mr. A. W. Wire.

Signals are displayed from a tower one hundred and ten feet above ground.

This station is one hundred and five miles below New Orleans, on the east bank of the South Pass of the Mississippi River, two miles from the bar, and three miles from the head of the Pass.

This station was inspected March 23, 1879, and found in a satisfactory condition.

PORTSMOUTH, NEW HAMPSHIRE.

Established August 20, 1878.

Displayman, Mr. G. H. Nutter.

Signals are displayed from a staff on the building next to the corner of Daniel and Market streets. The view of the signal is unobstructed from the harbor and its entrance, and at times may be seen from the Isle of Shoals.

The station was inspected September 14, 1878, and May 10, 1879, and found in a satisfactory condition.

RACINE, WISCONSIN.

Established September 16, 1877.

Displayman, Mr. G. W. Scanlon.

The signal is displayed from a staff on the roof of the warehouse of the Goodrich Steamboat Company, which is on the dock at the harbor entrance. The signal is visible from all parts of the harbor and for a long distance out on the lake.

The station was inspected October 9, 1878.

ROCKLAND, MAINE.

Established June 1, 1879.

Displayman, Mr. W. J. Rideout.

The display of signals was discontinued at Belfast, Me., and a station opened at this place on June 1. Mr. Rideout, who acted as displayman at Belfast, has continued to act in that capacity at this station.

The station has not been inspected during the year.

ROGERS CITY, MICHIGAN.

Established August 1, 1878.

Displayman, Mr. Henry Clothier.

Signals are displayed from a staff a few yards south of the telegraph office, which is about seventy-five yards from the wharf. The usual course of passing vessels is within five miles of this station. Owing to the background of pine trees, signals are not easily distinguished by the naked eye, but can be easily seen with a glass from the vessels.

The telegraph line along the eastern shore of Michigan, for a great part of the way, passes through pine timber, and is frequently broken by falling trees. Repairs are promptly made, but several orders for signals have been delayed on this account. The station was inspected September 25, 1878, and June 15, 1879, and found in a satisfactory condition.

SAINT JOSEPH, MICHIGAN.

Established August 10, 1878.

Displayman, Mr. J. H. King.

Signals are displayed from a staff situated on the roof of the Lake House, which stands on a high bluff near the lake. The view of the signal is unobstructed from all directions.

Mr. King reports that the warnings have been generally heeded by sailing vessels and fishing boats, and that they have been of great benefit to them.

The station was inspected October 6, 1878, and June 26, 1879, and found in a satisfactory condition.

SHEBOYGAN, WISCONSIN.

Established September 16, 1877.
Displayman, Mr. J. L. Mallery.
The station was inspected October 9, 1878, and found in a satisfactory condition.

SOUTH HAVEN, MICHIGAN.

Established August 10, 1878.
Displayman, Captain J. S. Donahue.
Signals are displayed from a staff, upon a high bluff, in the rear of the light-house, immediately at the entrance to the harbor, and are visible for miles on the lake. He reports that as the signals are generally justified, they are generally heeded, and are a great benefit to vessels, &c.
The station was inspected October 5, 1878, and June 26, 1879.

STONINGTON, CONNECTICUT.

Established August 10, 1878.
Displayman, Mr. S. O. Pendleton.
Signals are displayed from a staff in the northwest corner of the yard of the light-house, and can be seen for several miles from every direction. Mr. Pendleton has had a telegraph line put up between the light-house and the telegraph office, over half a mile distant. He states that coasters pay a great deal of attention to the signals, seldom leaving port and often coming in when one is displayed. The station was inspected April 30, 1879. The property was found in good order and the records well kept.

STURGEON BAY, WISCONSIN.

Established September 16, 1877.
Displayman, Mr. J. B. Scott.
Signals are displayed from a staff near Leonhardt Music Hall, and about a block east of the telegraph office, which is two blocks from the wharf.
The signals are visible from the harbor of refuge, at the Lake Michigan end of the canal, and also from Green Bay. The station has not been inspected during the year.

TRAVERSE CITY, MICHIGAN.

Established July 20, 1878.
Displayman, Mr. S. C. Fuller.
Signals are displayed from a staff on the roof of the post-office building, and can be seen from all parts of the bay. The telegraph office is in the same building.
The station was inspected September 29, 1878, and June 20, 1879.

TYBEE ISLAND, GEORGIA.

Displayman, Mr. H. J. Valleau.
This was originally a station of the first class, but was discontinued as such, and designated a display station February 15, 1879.

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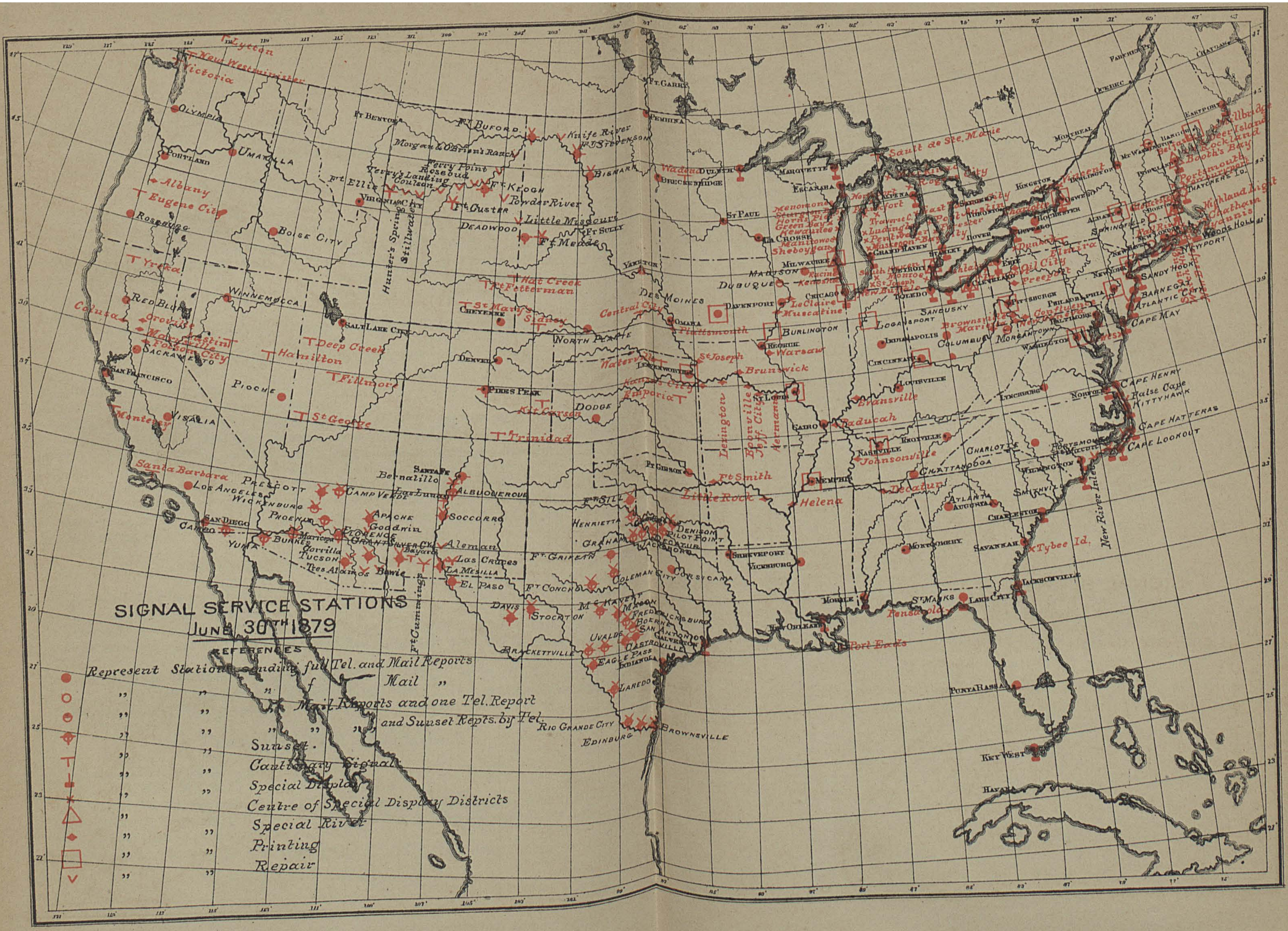

SIGNAL SERVICE STATIONS
JUNE 30TH 1879
REFERENCES
Represent Stations sending full Tel. and Mail Reports
" " Mail "
" " Mail Reports and one Tel. Report
" " and Sunset Repts. by Tel.
" " Sunset
" " Cautionary Signal
" " Special Display
" " Centre of Special Display Districts
" " Special River
" " Printing
" " Repair
Victoria
New Westminster
Olympia
Portland
Umatilla
Albany
Eugene City
Roseburg
Boise City
Yreka
Red Bluff
Winnemucca
Colusa
Oroville
Sacramento
San Francisco
Salt Lake City
Deep Creek
Hamilton
Fillmore
Pioche
St George
Visalia
Monterey
Santa Barbara
Los Angeles
San Diego
Prescott
Camp Verde
Wickenburg
Phoenix
Yuma
Tucson
Florence
Maricopa
Apache
Goodwin
Bowie
Santa Fe
Bernalillo
Albuquerque
Socorro
Aleman
Las Cruces
La Mesilla
El Paso
Ft Benton
Ft Buford
Knife River
Ft Stevenson
Bismarck
Ft Keogh
Powder River
Ft Custer
Deadwood
Little Missouri
Ft Sully
Ft Meade
Hat Creek
Ft Fetterman
St Mary's
Cheyenne
Sidney
North Platte
Denver
Pikes Peak
Kit Carson
Dodge
Trinidad
Pembina
Ft Garry
Duluth
Breckenridge
St Paul
La Crosse
Yankton
Des Moines
Omaha
Central City
Plattsmouth
St Joseph
Waterville
Leavenworth
Kansas City
Emporia
Ft Gibson
Ft Smith
Little Rock
Helena
Ft Sill
Henrietta
Graham
Denison
Pilot Point
Decatur
Jacksboro
Ft Griffin
Coleman City
Corsicana
Shreveport
Vicksburg
Ft Concho
Davis
Stockton
Mc Kavett
Mason
Fredericksburg
Boerne
San Antonio
Castroville
Uvalde
Brackettville
Eagle Pass
Indianola
Galveston
Laredo
Rio Grande City
Edinburg
Brownsville
Marquette
Escanaba
Sault de Ste Marie
Alpena
Milwaukee
Madison
Dubuque
Davenport
Le Claire
Muscatine
Burlington
Keokuk
Warsaw
Chicago
Grand Haven
Brunswick
St Louis
Cairo
Paducah
Evansville
Lexington
Boonville
Jeff City
Hermann
Memphis
Nashville
Johnsonville
Chattanooga
Decatur
Detroit
Toledo
Sandusky
Cleveland
Erie
Buffalo
Rochester
Oswego
Oil City
Pittsburgh
Brownsville
Confluence
Morgantown
Columbus
Cincinnati
Logansport
Indianapolis
Louisville
Knoxville
Lynchburg
Norfolk
Cape Henry
False Cape
Kittyhawk
Cape Hatteras
Cape Lookout
Portsmouth
Wilmington
Charlotte
Atlanta
Augusta
Smithville
Charleston
Savannah
Tybee Id.
New River Inlet
Montgomery
Mobile
New Orleans
Port Eads
Pensacola
St Marks
Lake City
Jacksonville
Punta Rassa
Key West
Havana
Washington
Baltimore
Philadelphia
Cape May
Atlantic City
Barnegat
Sandy Hook
New York
New Haven
New London
Newport
Woods Holl
Boston
Highland Light
Chatham
Portland
Portsmouth
Thatchers Id.
Rockland
Booth's Bay
Eastport
Burlington
Albany
Springfield
Kingston
Montreal
Quebec

Mr. H. J. Valleau has been in charge since that time. The station has not been inspected during the year.

WATCH HILL, RHODE ISLAND.

Established August 15, 1878.

Displayman, Mr. C. D. Harvey.

Signals are displayed from a staff on a knoll, a short distance to the east of the Larkin House, near the beach, and could be seen by all passing vessels several miles out.

It was discontinued as a display station September 15, 1878, on account of the telegraph office at that point having been closed for the season. Being only two and a half miles from Stonington, in full view of the signal displayed there, it was not reopened.

River Stations.

Table showing the location of the special river stations reporting to the Chief Signal-Officer, the names of the observers, the date at which each began reporting originally, and the highest and lowest water at each during the year ending June 30, 1879, with the dates thereof.

Stations.	Rivers.	Name of observer.	Commenced reporting.	Highest water.		Date of highest water.	Lowest water.		Date of lowest water.
				Feet.	Inches.		Feet.	Inches.	
1. Freeport, Pa	Allegheny	M. H. Alter	Apr. 17, 1873	23	0	December 11, 1878	0	4	September 1, 1878.
2. Hermann, Mo	Missouri	Edward Kehr	Apr. 24, 1873	15	4	June 29, 1879	—5	0†	December 21 and 22, 1878.
3. Jefferson City, Mo	Missouri	Louis C. Lohman	May 12, 1873	15	10	July 5 and 6, 1878	0	0§	December 16, 17, and 27, 1878.
4. Oil City, Pa	Allegheny	W. R. Stevenson, C. F.	Apr. 20, 1873	13	6	March 11, 1879	—0	3†	October 16, 17, and 18, 1878.
5. Brownsville, Pa	Monongahela	J. Allen Hubbs	June 6, 1873	15	2	November 23, 1878	—2	8†	September 28, 1878.
6. Evansville, Ind	Ohio	J. P. Elliott	Apr. 23, 1873	33	0	April 1, 1879	1	5	October 26, 27, 28, and 29, 1878.
7. Confluence, Pa	Youghiogheny	M. Tannehill	Apr. 23, 1873	10	0	January 28, 1879	—0	7†	October 9, 10, 11, 12, 13, 14, 15, 16, 17, and 18, 1878.
8. New Geneva, Pa	Monongahela	H. T. Davenport	Apr. 21, 1873	21	2	December 11, 1878	0	1	October 17, 18, 19, 20, and 21, 1878.
9. Lexington, Mo	Missouri	Z. S. Mitchell	Apr. 28, 1873	17	6	July 3, 1878	1	11	January 22 and 23, 1879.
10. Kansas City, Mo	Missouri	W. A. M. Vaughan	Apr. 21, 1873	19	10	July 2, 1878	3	2	March 1, 1879.
11. Brunswick, Mo	Missouri	G. D. Kennedy	May 1, 1873	12	3	June 30, 1879	—4	0†	December 20 and 22, 1878.
12. Little Rock, Ark	Arkansas	Albert Cohen	Apr. 21, 1873	14	4	February 3, 1879	1	5†	June 22, 23, and 24, 1879.
13. Plattsmouth, Nebr	Missouri	A. L. Child, M. D.	Apr. 20, 1873	13	3	July 1, 1878	2	10	December 12 and 13, 1878.
14. Marietta, Ohio	Ohio	J. H. Best	Apr. 19, 1873	32	1	December 13, 1878	2	8	October 21 and 22, 1878.
15. Saint Joseph, Mo	Missouri	Robert Gunn	May 8, 1873	17	3	July 2 and 3, 1878	0	4	December 22 and 23, 1878.
16. Warsaw, Ill	Mississippi	D. H. Cox	May 7, 1873	9	10	June 2, 1879	2	0	January 2, 3, and 4, 879.
17. Paducah, Ky	Ohio	John Bachmann	May 1, 1873	38	10	January 25, 1879	0	11	October 30 and 31, 1878.
18. Boonville, Mo	Missouri	Charles W. Hazell	Apr. 28, 1873	16	3	July 6, 1878	—1	3†	December 24, 1878.
19. Le Claire, Iowa	Mississippi	C. P. Disney	June 2, 1873	6	6	June 1, 1879	—0	6†	December 14, 1878.
20. Helena, Ark	Mississippi	J. B. Miles	Feb. 25, 1874	37	3	January 31, 1879	7	3	October 25, Nov. 3 and 4, 1878.
21. Decatur, Ala	Tennessee	O. C. Ludwig	Oct. 1, 1875	20	6	January 19, 1879	0	0	September 16 and 30, and from September 30, to October 11, 1878, inclusive.
22. Chattanooga, Tenn**	Tennessee	Charles E. Stivers	Sept. 17, 1875	38	0	January 15, 1879	0	11	September 14 and 15, 1878.
23. Johnsonville, Tenn*	Tennessee	W. H. Johnson	Oct. 1, 1875	18	11	March 1, 1879	0	6	June 28, 29, and 30, 1879.
24. Muscatine, Iowa	Mississippi	William Molis	Jan. 1, 1878	10	5	July 17, 1878	0	5	December 15, 1878.
25. Fort Smith, Ark	Arkansas	George H. Williams	Apr. 13, 1879	5	3	April 27, 1879	—3	7†	June 17, 18, 19, 20, 22, and 23, 1879.

* These data are for the period from March 1 to June 30, 1879; no reports prior to March 1, 1879, having been received.
** Changed to a station of the first class, January 8, 1879. † Below bench-mark. § Water at bench-mark.

Table showing the location of the special river stations on the Pacific slope reporting to the Chief Signal-Officer, the names of the observers, the date at which each began reporting originally, the highest and lowest water at each, and the period in which observations were taken during the year ending June 30, 1879.

Station.	Rivers.	Name of observer.	Commenced reporting.	Periods in which observations were taken.	Highest water.		Date of highest water.	Lowest water.		Date of lowest water.
					Feet.	Inches.		Feet.	Inches.	
1. Albany, Oreg.	Willamette	A. Monteith	Nov. 24, 1878	Nov. 24, 1878, to June 30, 1879.	22	7	Mar. 28, 1879	1	3	Jan. 6 and 7, 1879.
2. Colusa, Cal.	Sacramento	P. L. Washburn	Jan. 19, 1879	Jan. 19 to 25, 1879.	6	6	Jan. 25, 1879	0	0§	Jan. 19, 20, 21, 22, 23, and 24, 1879.
3. Eugene City, Oreg.	Willamette	J. Kemble Peters	Dec. 1, 1878	Dec. 1 to 15, and Feb. 15 to Mar. 15, 1879.	9	6	Feb. 2. 1879	1	0	Dec. 1, 1878.
4. Folsom City, Cal.	American	C. L. Ecklon	Dec. 15, 1878	Dec. 15, 1878, to Mar. 15, 1879.	24	0	Feb. 9, 1879	0	2	Dec. 15, 1878.
5. Marysville, Cal.	Yuba	E. J. Lockwood	Dec. 15, 1878	Dec. 15, 1878, to Mar. 15, 1879.	12	11	Mar. 6, 1879	0	0*	From Dec. 21, 1878, to Jan. 22, 1879, and Feb. 1, 2, 3, 4, 5, 6, 7, and 8, 1879.
6. Oroville, Cal.	Feather	R. W. Smith	Dec. 15, 1878	Dec. 15, 1878, to Mar. 15, 1879.	12	3	Mar. 6, 1879	0	1	Feb. 7 and 8, 1879.

*Water at bench-mark.

Observations are taken at these stations during the rainy season, and when the water approaches the danger-line reports of the depth of the same are telegraphed daily to certain designated stations on the lower waters of the rivers on which they are located, and continued until danger to property along the banks is passed. Mail reports are also forwarded weekly to this office.

WEST INDIAN STATIONS.

BRIDGETOWN, BARBADOES.

[*Official number*, 8.]

Latitude	13° 4′ 12″
Longitude	59° 37′ 00″
Elevation of barometer above mean sea-level	22.00 feet.

Observer, E. Racker.

Two observations were taken daily, at hours synchronous with 7.35 a. m. and 4.35 p. m., Washington mean time, and regularly telegraphed to this office, from August 19 to October 24.

HAVANA, CUBA.

[*Official number*, 100.]

Latitude	23° 9′ 24″
Longitude	82° 22′ 00″
Elevation of barometer above mean sea-level	21.6 feet.

Observer, Charles Hasselbrink.

Three observations have been taken daily, at hours synchronous with the United States telegraphic series, two of which, the 7.35 a. m. and 4.35 p. m. (Washington time), have been regularly telegraphed to this office during the year, and the three observations reported, weekly, by mail.

KINGSTON, JAMAICA.

[*Official number*, 4.]

Latitude	17° 58′ 00″
Longitude	76° 47′ 30″
Elevation of barometer above mean sea-level	30.2 feet.

Observer, Alexander Walker.

Two observations were taken daily, at hours simultaneous with 7.35 a. m. and 4.35 p. m., Washington mean time, and reported, weekly, by mail, to this office, up to February 8.

NAVASSA ISLAND.

[No official number.]

Latitude	18° 25′
Longitude	75° 3′
Elevation of barometer above mean sea-level	77.3 feet.

Observer, F. M. Everett.

Two observations have been taken daily, at hours simultaneous with 7.35 a. m. and 4.35 p. m., Washington mean time, and reported, by mail, to this office, since July 1, 1878.

POINT A PITRÉ, GUADELOUPE.

[*Official number*, 9.]

Latitude	16° 3′
Longitude	61° 30′
Elevation of barometer above mean sea-level	20.0 feet.

Observer, S. V. Bigard.

Two observations were taken daily, at hours simultaneous with 7.35 a. m. and 4.35 p. m., Washington mean time, and regularly telegraphed to this office, from September 25 to October 31.

SAINT THOMAS, W. I.

[*Official number*, 102.]

Latitude	18° 20′ 24″
Longitude	64° 55′ 45″
Elevation of barometer above mean sea-level	12.5 feet.

Observer, Mr. G. O. Gyllick.

Two observations were taken daily, at hours simultaneous with 7.35 a. m. and 4.35 p. m., Washington mean time, and regularly telegraphed to this office, from August 1 to October 31, and reported by mail up to October 31.

SANTIAGO DE CUBA, CUBA.

(*Official number*, 3.]

Latitude	19° 55′
Longitude	75° 50′
Elevation of barometer above mean sea-level	7.05 feet.

Observer, T. W. Beattie.

Two observations were taken daily, at hours simultaneous with 7.35 a. m. and 4.35 p. m., Washington mean time, and regularly telegraphed to this office, from August 1 to October 31. Reports have also been received by mail up to October 31.

BRITISH AMERICAN STATIONS.

SAINT JOHN'S, NEWFOUNDLAND.

[*Official number*, 10.]

Latitude	44° 17′
Longitude	66° 3′
Elevation of barometer above mean sea-level	150.0 feet.

The Hon. John Dulaney, Postmaster-General of Newfoundland, reports on Form 4, Signal Service, U. S. A., weekly, three observations, taken daily, two of which, the a. m. and p. m., are synchronous with the observations taken at 7.35 a. m. and 4.35 p. m., Washington mean time, and the other at 9.12 p. m., local time.

SAINT ANDREWS, N. B.

[*Official number*, 193.]

Latitude	45° 4′ 3″
Longitude	67° 3′ 0″
Elevation of barometer above mean sea-level	45.0 feet.

Three observations are taken daily, at hours simultaneous with the telegraphic series of the United States, and forwarded to this office by mail, weekly.

STAYNER, ONTARIO.

[*Official number*, 128.]

Latitude	44° 25′
Longitude	80° 15′
Elevation of barometer above mean sea-level	714.0 feet.

Two observations are taken daily, except Sunday, simultaneous with the a. m. and p. m. telegraphic series of the United States, and forwarded to this office by mail, weekly.

YORK FACTORY, HUDSON BAY TERRITORY.

[*Official number*, 11.]

Latitude	57° 2′
Longitude	95° 26′
Elevation of barometer above mean sea-level	45.0 feet.

Observers, J. Fortescue and W. Wood.

Four observations have been taken daily, three at 7 a. m., 2 p. m., and 9 p. m., local time, and one synchronous with 7.35 a. m., Washington mean time, and forwarded to this office by mail, on weekly forms. The last reports received from this station are dated May 31, 1879.

DOMINION OF CANADA.

Telegraphic reports have been regularly received during the year from the stations named below, after concentration at the Central Office of the Dominion Meteorological System in Toronto.

CHATHAM, NEW BRUNSWICK.

[*Official number*, 2.]

Latitude	47° 1′
Longitude	65° 30′
Elevation of barometer above mean sea-level	56.0 feet.

Three observations have been taken daily, at hours simultaneous with the United States telegraphic series, and regularly forwarded to this office, tri-daily by telegraph and weekly by mail.

FATHER POINT, QUEBEC.

[*Official number*, 5.]

Latitude	48° 31′ 25″
Longitude	68° 27′ 40″
Elevation of barometer above mean sea-level	20.0 feet.

Three observations have been taken daily, at hours simultaneous with the United States telegraphic series, and regularly forwarded to this office, tri-daily by telegraph and weekly by mail.

FORT GARRY, MANITOBA.

[*Official number*, 88.]

Latitude	49° 52′
Longitude	97° 0′
Elevation of barometer above mean sea-level	754.0 feet.

Three observations have been taken daily, at hours simultaneous with the United States telegraphic series, and regularly forwarded to this office tri-daily by telegraph and weekly by mail.

HALIFAX, NOVA SCOTIA.

[*Official number*, 89.]

Latitude	44° 39′ 20″
Longitude	63° 36′ 40″
Elevation of barometer above mean sea-level	122 feet.

Three observations have been taken daily, at hours simultaneous with the United States telegraphic series, and regularly forwarded to this office tri-daily by telegraph and weekly by mail.

KINGSTON, ONTARIO.

[*Official number*, 80.]

Latitude	44° 12′
Longitude	75° 41′
Elevation of barometer above mean sea-level	335.0 feet.

Three observations have been taken daily, at hours simultaneous with the United States telegraphic series, and regularly forwarded to this office tri-daily by telegraph and weekly by mail.

MONTREAL, QUEBEC.

[*Official number*, 56.]

Latitude	45° 31′ 0″
Longitude	73° 33′ 14″
Elevation of barometer above mean sea-level	182 feet.

Three observations have been taken daily, at hours simultaneous with the United States telegraphic series, and regularly forwarded to this office tri-daily by telegraph and weekly by mail.

PARRY SOUND, ONTARIO.

[*Official number*, 108.]

Latitude	45° 22′ 0″
Longitude	80° 12′ 45″
Elevation of barometer above mean sea-level	635.0 feet.

Three observations have been taken daily, at hours simultaneous with the United States telegraphic series, and regularly forwarded to this office tri-daily by telegraph and weekly by mail.

QUEBEC, QUEBEC.

[*Official number*, 57.]

Latitude	46° 48′
Longitude	71° 12′
Elevation of barometer above mean sea-level	293 feet.

Three observations have been taken daily, at hours simultaneous with the United States telegraphic series, and regularly forwarded to this office tri-daily by telegraph and weekly by mail.

ROCKLIFFE, ONTARIO.

[*Official number*, 7.]

Latitude	46° 10′
Longitude	77° 45′
Elevation of barometer above mean sea-level	418.0 feet.

The observations have been taken daily, at hours simultaneous with the United States telegraphic series, and regularly forwarded to this office tri-daily by telegraph and weekly by mail.

SAUGEEN, ONTARIO.

[*Official number*, 8.]

Latitude	44° 40′
Longitude	81° 40′
Elevation of barometer above mean sea-level	656.3 feet.

Three observations have been taken daily, at hours simultaneous with the United States telegraphic series, and regularly forwarded to this office tri-daily by telegraph and weekly by mail.

SYDNEY, CAPE BRETON.

[*Official number*, 6.]

Latitude	46° 12′
Longitude	60° 12′
Elevation of barometer above mean sea-level	27 feet.

Three observations have been taken daily, at hours simultaneous with the United States telegraphic series, and regularly forwarded to this office tri-daily by telegraph and weekly by mail.

TORONTO, ONTARIO.

[*Official number*, 58.]

Latitude	49° 39′ 4″
Longitude	79° 23′ 15″
Elevation of barometer above mean sea-level	350 feet.

Three observations have been taken daily, at hours simultaneous with the United States telegraphic series, and regularly forwarded to this office, tri-daily by telegraph and weekly by mail.

Mail reports only have been received from the following stations:

ROCKVILLE, ONTARIO.

[*Official number*, 126.]

Latitude	44° 34′
Longitude	75° 51′
Elevation of barometer above mean sea-level	278 feet.

Three observations are taken daily, at hours simultaneous with the a. m. and p. m. telegraphic series of the United States, and the other at 9 p. m., local time, and sent to this office by mail weekly.

CHARLOTTETOWN, PRINCE EDWARD ISLAND.

[*Official number*, 127.]

Latitude	46° 14′
Longitude	63° 10′
Elevation of barometer above mean sea-level	38 feet.

Three observations are taken daily, at hours simultaneous with the telegraphic series of the United States, and sent to this office by mail weekly.

PORT DOVER, ONTARIO.

[*Official number*, 79.]

Latitude	42° 47′
Longitude	80° 13′
Elevation of barometer above mean sea-level	635.0 feet.

Three observations are taken daily, at hours simultaneous with the telegraphic series of the United States, and sent to this office by mail weekly.

PORT STANLEY, ONTARIO.

[*Official number*, 78.]

Latitude	42° 40′ 00″
Longitude	81° 13′ 30″
Elevation of barometer above mean sea-level	592 feet.

Three observations have been taken daily, at hours simultaneous with the telegraphic series of the United States, and sent to this office by mail weekly.

PUBLICATIONS.

(*For year ending June* 30, 1879.)

Farmer's Bulletins	2,200,003
Manifold Bulletins	285,179
Maps	108,157
Local Reports	51,593
Forms 15 (manifold)	63,080
Forms 22	5,428
Forms 26	32,560
Weekly Chronicles	4,836
Monthly Weather Review	21,000
International Bulletins	150,015
Total	2,921,851

GENERAL SUMMARY.

UNITED STATES STATIONS.

Statement showing number of stations, Signal Service, U. S. A., in operation June 30, 1879.

Number of regular stations taking seven observations daily and making full reports three times a day by telegraph	99
Number of United States telegraph stations taking seven observations daily and making full reports three times a day by telegraph	11
Number of regular stations taking seven observations daily and making full reports once a day by telegraph	1
Number of regular stations taking seven observations daily and making sunset reports daily by telegraph	2
Number of United States telegraph stations taking three observations daily and reporting three times a day by telegraph	11
Number of regular stations taking seven observations daily and reporting by mail only	10
Number of regular stations taking six observations daily and sunset reports daily by telegraph	1
Number of United States telegraph stations taking three observations daily and reporting by mail weekly and sunset reports daily by telegraph	24
Number of United States telegraph stations taking one observation daily and reporting by mail weekly and sunset reports daily by telegraph	1
Number of United States telegraph stations taking sunset observations only, reporting monthly by mail and daily when the observer is not absent from the station on repair duty	

Number of United States repair stations at which no observations are taken	17
Number of printing stations taking sunset observations daily and reporting monthly by mail	3
Number of flying stations on coast taking sunset observations daily and reporting monthly by mail	4
Number of display stations	46
Number of special river stations	30
Number of sunset stations	25
	290
Number of regular stations discontinued during the year	1

WEST INDIAN STATIONS.

Number of stations reporting daily by telegraph and weekly by mail during the year	1
Number of stations reporting weekly by mail during the year	1
Number of stations reporting by mail and telegraph during a portion of the year	5
	7

CANADIAN AND BRITISH AMERICAN STATIONS.

Number of stations making full reports by mail and telegraph during the year	12
Number of stations making full reports by mail only	8
	20

It is found necessary to repeat in the annual reports of each succeeding year large portions of the annual reports of preceding years. The number of copies of the printed annual reports allowed to this office for distribution is small. The mode in which its duties are rendered is not yet fully understood by the public at large, and repetition is necessary that the readers may comprehend to some extent the office modes of operation.

A portion of the meteorological statistics for the year ending June 30, 1879, as had from the regular reporting stations and collated, are given in detail in papers nine to sixteen.

One hundred and seventy-nine stations, including those upon the telegraph lines in the interior, in charge of the Signal Corps, have been inspected during the year ending June 30, 1879. Paper 17 shows the name of each station inspected, with the date of inspection. A number of officers are kept continually on duty as inspectors, and arriving at the stations without previous notice given, critically examine and report upon all facts in relation to it.

The instructions under which inspectors act and the character of the reports made by them are exhibited in paper 18, herewith.

The average cost of maintaining each full station of observation during the year ending June 30, 1879, exclusive of the cost of telegraphing reports and the pay and maintenance of the enlisted men on duty at each, has been $389.90. A number of new stations have been established.

In the cost of each station, as here given, is included the cost of and rent of maintaining a suitable office or room at each place for the public use, with facilities for the necessary exposure of instruments and for the display of cautionary signals when such signals are required.

The duties of the enlisted men at each station were fully described in the last annual report, as follows:

At stations forwarding telegraphic reports they are required to take, put in cipher, and furnish, to be telegraphed tri-daily on each day, at different fixed times, the results of observations made at those times and embracing, in each case, the readings of the barometer, the ther

mometer, the wind velocity and direction, the rain-gauge, the relative humidity, the character, quality, and movement of upper and lower clouds, and the condition of the weather. These observations are taken at such hours, at the different stations, as to provide the three simultaneous observations taken daily at three fixed moments of physical time throughout the whole extent of the territory of the United States. These times, fixed since November 1, 1870, at the hours 7.35 a. m., 4.35 p. m., and 11 p. m., Washington mean time, were changed on November 1, 1879, to be at the hours 7 a. m., 3 p. m., and 11 p. m., Washington, mean time. The differences of time at the different stations cause it to happen that at some stations the observations are made in the earliest hours in the morning and at others in the latest of the night. The work thus practically extends, the differences of time at the different stations being taken into consideration, throughout the twenty-four hours. Each of these observations is required to be carefully recorded in writing, for future reference, at the time it is taken. Three other observations to be taken at the local times, 7 a. m., 2 p. m., and 9 p. m., at the different stations are made and recorded at each station. A seventh and especial observation is taken and recorded at noon on each day. If at this observation such instrumental changes are noted as to cause anxiety, the fact is to be telegraphed to the central office at Washington.

An eighth observation is required to be taken at the exact hour of sunset at each station. This observation, embracing the appearance of the western sky, the direction of the wind, the amount of cloudiness—the readings of the barometer, thermometer, and hygrometer, and amount of rain-fall since last preceding report, is reported with the midnight report.

At the stations at which cautionary signals are displayed an observer must be constantly on duty to receive the order and to show the signal, which may be ordered at any moment. At stations from which river reports are furnished, an observation and record of the depth and temperature of the water is made and reported at a fixed hour on each day. In cases of threatening storms or dangerous freshets, any station may be called upon to make hourly reports. In cases of violent storms, reports are sometimes required to be made hourly throughout the night.

The data thus gathered on the files at each station are to be consolidated, first weekly, on forms which, with copies of the telegraphic cipher reports, are to be sent weekly to the central office, then monthly, in the form of a careful digest, also to be forwarded. The thorough study of the work of the month is then to be condensed in the form of a monthly chart. Paper 19. None of these observations or records ought to be dispensed with; nor can they, with meteorological instruments as they now exist, be taken and recorded more economically. At stations where the population warrants it the duties of the enlisted men are increased by the receipt and record of data from other stations, to be exhibited upon written bulletins or furnished to the press for public use. In the great cities there are the further duties of the display, at the rooms of the boards of trade, chambers of commerce, and other similar places, of symbol maps on which the meteoric conditions are shown by symbols, changeable daily.

There are to be prepared and posted also by the enlisted men, at these stations, bulletins of the storm-warning orders as received from the central office, on which appear very frequently, in addition to the order, brief notes as to the force of the anticipated storm, the direction in which it may be moving, the names of places menaced, though storm-signals may not yet have been ordered at them, and other items of information,

all of which require to be carefully copied and posted with quick dispatch.

In cases of disasters occurring on the lakes or sea-coasts, full information concerning which is often in possession of the service, or in the instance of any matter of public interest coming within the scope of the duties of the service, the station force is required to exhibit bulletins containing in detail full reports.

The local offices of the Signal Service are always places of resort for inquiry on the part of those desiring to be informed what changes of weather have been particularly noticed, or are likely to affect the various industries in which the populations are engaged.

In the cities upon the sea-coast of the United States, or at the lake ports, the offices of the service are open for the comparison of instruments to obtain special instrumental readings; to make examinations of data, or to furnish whatever information may be practicable to captains of vessels or others concerned in shipping interests. At stations upon telegraphic lines in charge of or constructed by the service in pursuance and furtherance of its duties, the ordinary duties of telegraphing and the maintenance of the lines devolve upon the force there stationed, in addition to the duties of observation.

The cautionary signal flag is always, when flown officially, an invitation to mariners or others interested to visit the offices for information. The courtesies and duties of the office are not limited to the people of the United States alone, but are tendered freely to the people of any nation who may be within our borders.

The distribution of Farmers' Bulletins for the uses of agricultural populations has been frequently and is elsewhere described.

The forms exhibiting, condensed, the labor thus required of the Signal Service men stationed at separate stations, and the instructions under which the separate observations and reports are made, are herewith decribed. (Paper 20.)

In times of especial emergencies or danger of any kind threatening the separate States or the United States, the different stations make, by order and in cipher by telegraph, regular reports upon any subject under the attention of superior authorities.

The enlisted men in charge of stations are responsible for the care, cleanliness, and good-working of the instruments; the clearness of the records; the correctness and punctuality of the reports; display of signals or bulletins, and, in fine, for the conduct and good condition of the station itself. It has been considered necessary to make this description thus minute that it might be understood what duties are required of the non-commissioned officers and privates of the Signal Corps in addition to the military duties heretofore referred to, and that it may be comprehended that the force must consist of men of more than ordinary acquirements to be competent for such duties.

The sum of the pay and allowances of these soldiers comprehends every allowance which is permitted the soldier, to house, feed and clothe himself, to meet in full every expense of his maintenance wherever in the wide extent of the territories of the United States the vicissitudes of the service may call him. It must be borne in mind that as a soldier he can have no home, and that he must purchase anew, with every change of station, the little comforts which homes gather around them. The regular tour of duty permits service on each station for two years only. These soldiers are liable to all a soldier's duties. On the occurrence of serious disturbances, the armed detachments of the corps are, with its officers, in readiness, wherever they may be, for service at a

moment's warning. In the service upon the frontier, they are exposed in their duties of the construction, repair, and maintenance of telegraph lines, or whenever they may accompany expeditions, to the dangers of the field.

In times of dangerous pestilence these soldiers are by their duties more exposed than other forces of the Army. Other forces may be moved for sanitary reasons to places of comparative safety. The exigences of the service and the need that regular series of data should be had, by observations, on which to base precautions against existing epidemics for the time, and for the study of them thereafter, have required that the enlisted men of the service should remain faithfully at their posts during some of the worst visitations of disease which have devastated the country. As a rule they have done so without a murmur.

In the districts scourged by yellow fever in the year just passed Sergeants George H. Rohè, J. A. Cody, E. Van Dyk and W. U. Simons, and first-class privates F. M. Neal, D. T. Flannery and J. A. Barry, Signal Corps, U. S. A., remained bravely at their posts in the steady and faithful discharge of their allotted duties. The office files show no murmur of complaint on their part. It is a grateful duty to record such fidelity.

It has been considered that as the United States have, as above rehearsed in the case of the body of men constituting the Signal Corps, the military services of a force trained and competent to act as armed soldiers when there is need, there is in effect secured by the duties other than armed duties on which these men are employed, the benefits of all the special services rendered by the corps at stations of meteorological observations and report, at cautionary signal stations, at stations on telegraphic lines, at sea-coast stations and elsewhere, with little compensation to the men, or cost beyond that of any other merely military force, equal in number, to the public.

The work of a constant watchfulness for the whole territory of the United States, and a plan of observation and report extending by its different branches around the northern hemisphere, is had through the service in the Signal Corps of one hundred and fifty sergeants, thirty corporals, and two hundred and seventy privates.

It is needless with such facts in view, and after nineteen years of continuous service, to reiterate the advantages secured to the Signal Service by its military organization. Service under military organizations is that form of a permanent civil service of disciplined citizens in which the duties are compulsory for the term of the service, and a proper discharge of them can be enforced by punishment. The experience of centuries has proven that whenever tasks covering in their reach the extent of nations, and involving in their execution interests of life and property, are to be undertaken, men have sought, as if by instinct, for faithful co-operation and prompt action through the regular control and sure reward or punishment which attend the military system. The soldiers of the United States are simply its citizens, held under what ought to be wise rules and regulations to duties which they have voluntarily accepted.

The duties of an army in time of peace have been defined as properly limited in their exercise to those of a police for the nation. It is considered that those rendered by the Signal Service have demonstrated that the men carried upon its rolls have been able to perform these duties and others requiring a higher standard of attainment, and rendering a better equivalent for the necessary cost. They have not failed to be

ready to act armed upon any intimation that there was need of such readiness.

The duties of the force stationed at the office of the Chief Signal Officer, at the War Department, are many and onerous. In rendering these duties it ought to be borne in mind that they are continued day and night without cessation for holidays or days of rest. There is no single day of the year in which the work is suspended. It must of necessity and for this reason be performed by details of men who relieve each other at fixed times. The total force employed at this office numbers one hundred and nine enlisted men.

In estimating the numbers required to be present for duty, it is difficult to make a comparison between an establishment thus conducted and others in which the work is limited to certain hours of daylight only. This office is the center to which the daily and nightly, weekly and monthly contributions of all other offices or stations of the Signal Service scattered throughout the United States tend to be daily condensed, and finally elaborated and made of practical value. There are here concentrated, also, the reports from the six hundred and twenty-one places at which voluntary reports of daily observations are now made on this continent, and from the three hundred and twelve locations in foreign countries from which reports of daily simultaneous observations are had. From the great mass of data thus collected, and which enhances each year in value, are continuously elaborated the results which appear in the different issues of the office, whether in the form of forecasts telegraphed to the press throughout the country, of charts or bulletins distributed hence, of generalizations announced as apparent, of cautionary signal orders, or the weekly and monthly publications. No single report of any observation received at the office fails to receive attention or study.

It is at this office that are had the management and supervision of telegraphic lines, erected and now worked by the United States, upon the Indian frontier and in the States and Territories of the interior. The wires of the coast lines have here their terminal connection, and here concentrates the labor of the different coast stations. Upon this office devolves, and with each year to an increasing extent, the duty of transmission of many and important messages from superior authorities to and from distant posts and parts of the United States, for the safe delivery and proper guarding of which, by cipher, if need be, this office is responsible. The rooms of the telegraphic department are never closed or left without an operator. The brief narration possible in a report of this character can convey but little idea of the various and incessant labors incident to such an establishment.

A regular exchange of telegraphic reports now had for a number of years by comity of exchange with the chief meteorological office of the Dominion of Canada has been maintained. Meteorological reports of observations taken simultaneously, and furnished according to the form of this office, have been received tri-daily from twelve stations within the Dominion, and warnings have been regularly transmitted to the meteorological office of the Dominion at Toronto, as affording material on which to base the display of signals to be exhibited at ports of the Dominion at times of threatening danger. The telegraphic reports of observations received from twenty-six Signal Service stations of the United States have been furnished tri-daily to the agent of the Dominion office at Buffalo, New York. The relations thus maintained between the two services continue to be of service to both.

While this office has been prepared to co-operate in this manner with

any foreign office, and to the limit of its power, in the furnishing of material for study, by the use of its consolidated reports or by especial warnings, it is not authorized by law to co-operate with any institution or party for the publication or display of any forecasts, indications, or cautionary signals not emanating from this bureau, or so controlled by it as not to conflict or confuse those hence issued for the Territories of the United States, the lakes, rivers, or coasts in or bordering upon them.

In view of the increased appropriation made available by the action of the Congress at the last session, the series of telegraphic reports from stations in the West Indies, extending from Cuba, by Jamaica, to Barbadoes and the Windward Islands, have been partially resumed, two reports of observation being had on each day from each station during what is known as the hurricane season. Constantly recurring difficulties attend the collection of reports from these stations. The defective working of the telegraphic cables has frequently impaired the value of reports had from them by delay. It is difficult to secure the services of skilled observers or to obtain instrumental readings which at all accord with those at the regular stations. The crude reports are, however, at times useful.

The network of the Signal Service stations extends now on this continent to both the Atlantic and Pacific coasts, and over the intervening territory of the United States. The work of the stations has been rendered utilizable for the daily provision of meteoric changes to occur over this whole geographical extent, including the great interior plateau. While the stations are in some districts far too widely separated, the gaps are closing each year with steady progress. The service now has its stations located in continuous lines along the northern frontier of the United States from Maine to west of Lake Superior; along the Atlantic coast; along the southern or Gulf coast; along the southwestern boundary, separating the United States from Mexico, to the Pacific ocean; thence northerly along the Pacific coast to British North America, and at selected points throughout the whole interior within these boundary lines. A continuous telegraphic line to follow, with near proximity, the line by which the United States, bound on British North America, from the Pacific ocean to Lake Superior, mentioned in former reports as something to be hoped for and needed to properly complete the northern line of the circuit of stations, may be considered as now nearly completed by the lines this summer erected in the Northwest under appropriations by Congress. It is probable that before the conclusion of another year telegraphic communication will exist along the northern frontier of the United States from the Atlantic ocean to the Pacific. This line forming the the second transcontinental line carried by the labor of the Signal Corps across the continent. As other and new telegrapic lines extend within the boundary lines above referred to, they will make possible the establishment of other and much needed interior stations. The experience of years has reduced the matter of opening, equipping, and rapidly utilizing a station to a system.

The meteorological work of the United States keeps pace everywhere with the telegraphic construction. In the hands, and under the management, of a single corps, the two duties are necessarily co-extensive.

The following list exhibits the stations as clasified and located in States and Territories on June 30, 1879:

Alabama.—Decatur**, Mobile*, Montgomery*. *Alaska.*—Attu*, Fort Saint Michaels*, Atka*, Saint Paul's Island*, Unalashka*. *Arizona.*—Apache Pass§, Burkes*, Fort Apache*, Fort Goodwin§, Florence,* Fort Verde*, Phœnix*, Prescott*, Fort Grant*, Tres Alamos§, Tucson*, Wickenburg*, Yuma*. *Arkansas.*—Fort Smith**, Helena**, Little Rock** *British Columbia.*—Lytton†, New Westminster†, Victoria†. *California.*—Colusa**, Folsom City**, Marysville**, Orrville**, Los Angeles*, Red Bluff*, Sacramento*, San Diego,* San Francisco*, Visalia*, Campo*, Monterey†, Santa Barbara†, Yreka†. *Colorado.*—Denver*, Pike's Peak*, Kit Carson†, Trinidad†. *Connecticut.*—New Haven*, New London*, Stonington‡. *Dakota Territory.*—Bismarck*, Deadwood*, Fort Buford*, Fort Meade§, Knife River§, Pembina*, Yankton*, Fort Stevenson*. *Delaware.*—Lewes‡. *District of Columbia.*—Washington*. *Florida.*—Jacksonville*, Key West*, Pensacola‡, Punta Rassa*, Saint Marks* *Georgia.*—Atlanta*, Augusta*, Savannah*, Tybee Island‡. *Idaho Territory.*—Boise City*. *Illinois.*—Cairo*, Chicago*, Warsaw**. *Indiana.*—Evansville**, Logansport¶, Indianapolis*. *Indian Territory.*—Fort Gibson*, Fort Sill*. *Iowa.*—Burlington¶, Davenport*, Dubuque*, Keokuk*, Des Moines*, Le Claire**, Muscatine**. *Kansas.*—Dodge City*, Emporia†, Leavenworth*, Waterville†. *Kentucky.*—Louisville*, Paducah**. *Louisiana.*—New Orleans*, Port Eads‡, Shreveport*. *Maine.*—Bangor¶, Booth Bay‡, Deer Isle‡, Eastport*, Portland*, Rockland‡. *Maryland.*—Baltimore*. *Massachusetts.*—Boston*, Chatham‡, Highland Light‡, Hyannis‡, Gloucester‡, Marblehead‡, New Bedford‡, Newburyport‡, Springfield*, Thatcher's Island*, Wood's Holl*. *Michigan.*—Alpena*, Bay City‡, Detroit*, East Tawas‡, Escanaba*, Grand Haven*, Forester‡, Frankfort‡, Ludington‡, Marquette*, Menomonee‡, Mackinac City‡, Monroe‡, Muskegon‡, Northport‡. Pentwater‡, Port Huron*, Port Austin‡, Roger's City‡, Sault de Ste. Marie†, Saint Joseph‡, South Haven‡, Traverse City‡. *Minnesota.*—Breckenridge*, Duluth*, Saint Paul*, Wadena†. *Mississippi.*—Vicksburg*. *Missouri.*—Boonville**, Brunswick**, Hermann**, Jefferson City**, Kansas City**, Lexington**, Saint Joseph**, Saint Louis*. *Montana Territory.*—Fort Custer‖, Fort Keogh*, Fort Ellis§, Hunter's Springs§, Little Missouri§, Morgan and O'Brien's Ranch§, Stillwater§, Virginia City*. *Nebraska.*—North Platte*, Omaha*, Plattsmouth**, Central City†, Sidney†, *Nevada.*—Austin†, Hamilton†, Pioche*, Winnemucca*. *New Hampshire.*—Mount Washington*, Portsmouth‡. *New Jersey.*—Atlantic City*, Barnegat*, Cape May*, Little Egg Harbor‖, Sandy Hook*. *New York.*—Albany*, Buffalo*, Cape Vincent‡, Charlotte‡, City Island‡, Dunkirk‡, New York*, Rochester*, Oswego*, Elmira†. *New Mexico.*—Albuquerque*, Aleman§, Barnalillo§, Belen§, La Mesilla*, Los Lunas§, Las Cruces§, Santa Fé*, Silver City*, Fort Bayard§, Socoro*. *North Carolina.*—Cape Hatteras*, Cape Lookout*, Flying Station No. 5‖, Flying Station at Sloop Point‖, Fort Macon‡, Kittyhawk*, New River Inlet‖, Portsmouth*, Smithville*, Wilmington*. *Ohio.*—Cincinnati*, Cleveland*, Columbus*, Ashtabula Harbor‡, Fairport‡, Marietta**, Sandusky*, Toledo*. *Ontario, Canada.*—Pembroke†. *Oregon.*—Albany**, Eugene City**, Portland*, Roseburg*, Umatilla*. *Pennsylvania.*—Brownsville**, Confluence**, Freeport**, New Geneva**, Oil City**, Erie*, Philadelphia*, Pittsburgh*. *Rhode Island.*—Newport*. *South Carolina.*—Charleston*. *Tennessee.*—Chattanooga*, Johnsonville*, Knoxville*, Memphis*, Nashville*. *Texas.*—

* Stations of first class. † Sunset stations. ‡ Display stations only. § Repair stations. ‖ Telegraph and sunset stations. ¶ Printing stations. ** Special river stations.

Boerne*, Brackettville*, Brownsville*, Cambridge§, Castroville*, Coleman City*, Concho*, Corsicana*, Decatur*, Denison*, Eagle Pass*, Eagle Springs§, Edinburg*, El Paso*, Fort Davis*, Fort Griffin*, Fredericksburg*, Grierson's Springs§, Galveston*, Graham*, Henrietta*, Indianola*, Jacksboro*, Laredo*, Live Oak§, Mason*, McKavett*, Pilot Point*, Rio Grande City*, San Antonio*, Santa Maria§, Stockton*, Uvalde*. *Utah Territory.*—Deep Creek†, Fillmore City†, Salt Lake City*, Saint George†. *Vermont.*—Burlington*. *Virginia.*—Cape Henry*, Lynchburg*, Norfolk*. *West Virginia.*—Morgantown*. *Washington Territory.*—Olympia*. *Wisconsin.*—Green Bay‡, Horn's Pier‡, Kenosha‡, Kewaunee‡, Manitowoc‡, Milwaukee*, Madison*, La Crosse*, Racine‡, Sheboygan‡, Sturgeon Bay‡. *Wyoming Territory.*—Cheyenne*, Fort Fetterman†, Hat Creek†, Saint Mary's†.

Map 1 exhibits the location of stations and the extent of territory brought by them under constant observation for the purposes of study.

The territory of the United States is not yet covered with stations as it ought to be, and valuable opportunities for study, which must be made good hereafter, and at an increased expense, are lost. The field of labor has increased greatly each year, as it has been learned how labor may be turned to the best benefit of different classes of citizens. The amount estimated as necessary to be appropriated for this service for the ensuing year, the sum of three hundred and seventy-five thousand dollars, can be wisely expended. The whole working force of the corps, four hundred and fifty men, will be constantly employed, and, in instances, overworked. The services of citizens, in addition, will be needed as in preceding years.

The reports of observations had in ceaseless succession from the stations already established, while daily and primarily employed in the studies needed for the daily issuing of forecasts and the display of cautionary signals, form also the basis for future work, to be of equal value with that made possible by the first use of them, and constitute a record, to increase in worth hereafter with every year for which it is continued.

The data already secured are worth to the country and to the world, even if the service had up to this time rendered no other return, all it has cost to obtain it.

From the moment at which it is made, each of the reports becomes to some extent complementary to all other reports had elsewhere. It is not possible to break this connection, nor in the present state of meteorological science ought any good report to be dispensed with.

It will be found, with the lapse of years, such observations have settled, by facts, questions hitherto treated by theory only.

It is upon the data now accumulating upon the files of this office and there daily compared, compiled, and treated with an accuracy each year increased by experience, and becoming more rigid as the office is warned, sometimes by notable inaccuracies elsewhere occurring, that the future studies of the climatology and meteorology of this continent will be based. It seems not impossible that upon the results of systems of observations here first established will be founded such studies for the northern hemisphere. It is not to the discredit of the United States that a work set on foot by them should render such ends possible.

The permanence, regularity, and accuracy of reports to be had from the West Indies ought to be secured. No system providing warnings for the Gulf or Atlantic coasts can be considered as complete or reliable without the means of continued reports of observation, to be made from these stations. It seems to be established that the great cyclones originating within the tropics rarely, if ever, reach any coast of the United

States without such indications of their existence and of their line of movement as well-managed stations among these islands would detect and announce. The possibility of protection will be increased and extended to more northern coasts whenever telegraphic communication can be had with the Bermuda Islands.

The attention of the office has continued to be directed, as in preceding years, to the solution of the difficult question as to the best mode by which to compare, for the purposes of the necessary daily studies, the observations of atmospheric changes taking place upon the Pacific coast, near the sea-level, and upon the great elevated plateau of the interior, with the reports of observations had at the same time on the eastern slope of the Rocky Mountains, and extended to the Gulf and Atlantic coasts at the sea-level. Progress is made in this direction. It is found not difficult to extend several of the office charts from the Pacific to the Atlantic coasts at the time of each tri-daily report, with the lines of the charting in so far accurate as to afford valuable suggestions as to the changes approaching.

The spread of civilization over the great interior plateau west of the Mississippi each year renders more extended observations practicable in that region.

The field of study has been pushed in that direction as rapidly as the means at the disposal of the office have permitted. The barometrical readings made in this section still lose part of their value by the difficulty of reduction to the hypothetical readings at sea-level. There seems, however, reason to hope that the unreduced readings can be utilized for purposes to which the reduced only have been hitherto applied. It is, perhaps, by multiplying stations and continuing the comparison of observations had at them, the correct solutions of all problems will be most rapidly attained.

The studies made this year in the matter of the hypothetical reductions to sea-level give reason to hope that processes have suggested themselves by which the hypothetical barometric readings referred to may be arrived at with sufficient accuracy for any practical purposes of meteorological charting.

The increased knowledge had enables improvements to be made each year in the modes of digesting the masses of observations received upon the records, and suggests each year better methods of study to attain the accuracy of prediction which is constantly sought.

It is in consideration to equip the station upon the summit of Pike's Peak, at an elevation of 14,150 feet, with instruments for the study of solar observations, and in particular of those to be made at sunset, to trace, if possible, what connection there may be between conditions then observed and meteorological changes which follow. Instruments for this purpose are now in preparation. In this work the office has had, and still has, the zealous co-operation of its distinguished co-laborer, J. Norman Lockyear, F. R. S. These series of observations will become more valuable with each year. It is to be hoped facts leading to important improvements in meteorological study will be established.

The long-felt need of carefully studying the changes occurring upon the interior plateau led to the establishment, prior to the date of the last annual report, of a series of observations had at what are known as "sunset" stations. This series has been continued during the year just passed with good results. The circular (paper 21) sufficiently describes the duties of the employed observers at these stations and the character of the report to be had from them. Some of these observations are roughly spectroscopic, the sunset report being based in part on such

different appearances of the sun and of the effects produced by its rays as are caused by their passage through differently-conditioned atmospheric media. It is one of the advantages that the necessary observations are so little complicated in their character that they may be taken at and reported from any point reached by the telegraphic wires. It seems probable that a simple form of spectroscope may be utilized for observations of this sort. Experiments are now in progress by which it is hoped that a form of that instrument suitable for the use of enlisted men may be arrived at. The reports are found of value in often-recurring instances in which they furnish some indication of the atmospheric changes in progress at points from which it has been impossible to obtain the full report of observation.

It has been established that a certain accuracy of forecasting the local weather changes to occur, at the respective stations, within a period of twenty-four hours has been acquired by the sergeants of the Signal Corps charged with the making of the sunset reports. These sergeants have the use of meteorological intruments and access to a portion of the data which pass their own stations on their way from other stations to this office. This accuracy has reached, as computed from the records on file, a maximum percentage of eighty-two and six-tenths for the regions west of the Mississippi Valley, where the weather conditions are notably constant, and eighty-one and six-tenths for the region east of the western bounds of that valley.

There can be no reason that any intelligent farmer, supplied with the necessary simple instruments, habituated to similar observations, and furnished with data, either in figures or condensed by charts, should fail to attain an equal accuracy.

Since the date of the last annual report the instrument known as the Weather Case or Farmers' Weather Indicator, has been thoroughly tested by prolonged trial. Reference is made, later in this report, to this instrument, which has been prepared with a view to its use by farmers generally.

The usefulness for meteorological purposes of the seacoast stations of the Signal Service, in connection with the life-saving service, and located at the life-saving service stations, has continued to be demonstrated.

As explained in earlier reports, the observations taken at these stations have the advantage of being taken on the seacoast itself near the sea level, and from positions which permit the condition of the sea-swell to be reported. The stations have the further advantage of being directly connected with this office by the telegraphic lines under its control. Reports of any character can so be had at any hour they may be called for, or signals may be displayed to warn of danger.

The facilities afforded by these lines admit of conversations even being had, as they frequently are, in reference to meteorological changes or other matters as, for instance, of the precautions to be taken against coming storms by those engaged in the salvage of wrecked ships, or other action in cases of shipwreck. The reports of observations had upon the seacoast itself, or upon the ocean beach, differ frequently and markedly from those had from stations farther in the interior, and suggest the approach of weather conditions which, without such indications, might either have escaped attention, or could not have been observed in time.

The generalizations had from the reports received from these stations become each year of increasing value for the prediction of the weather conditions to be expected near our coasts. The reports themselves, published in the daily journals, and so known to those interested, either at

the several ports or in the interior, give reliable information as to the circumstances under which coasting voyages may be taken or are being made. The benefits to follow a seacoast service, with its stations properly prepared and equipped are such as cause it to be hoped that all the exposed and frequented coasts of the United States may early have the advantage of such protection.

It is considered to have been demonstrated that by the services of single seacoast stations there has been saved, at different times, property amounting in value to more than the cost of manning and maintaining all the stations from the dates at which they were first put in operation. Improving modes of communication promise as possible such close connection between the stations that it seems practicable to so arrange that there need be no points upon our coasts but to which aid can be immediately summoned and none but from which summons for aid can go, if need be, to naval stations, posts, and cities.

Since the date of the last annual report the use at the seacoast stations of telegraphic gongs connected by wire, after the manner of those used for fire-alarms, and intended to be operated from any point upon the coast at which telegraphic communication exists, or may be temporarily established for the purpose of calling the attention of any stations, has been continued. Gongs to be operated in this way are located in the offices at Norfolk, Cape May, Thatcher's Island, Kittyhawk, and the central office, in this city.

The stations on the telegraphic lines, constructed in pursuance of acts of Congress on the Indian and Mexican frontiers and in the Northwest for the better protection of frontier populations, together with those for the purpose of connecting military posts and stations, serve better each year, the ends for which, in part, the lines were first recommended—that of extending the fields of meteorological study over regions so sparsely settled as to be almost beyond the limits of civilization.

They have made possible the daily receipt of meteorological data from regions in which the collection of such data had been before considered impracticable. They have furnished for the office a daily knowledge of the atmospheric conditions existing along the whole course of the wires. The value of these reports, completing as they now do both the southern and the northern lines of the whole system of reports established for the territory of the United States, is very great. The lines make practicable also the receipt at the regular telegraphic stations of reports from regions in the interior of the country near them which, both at the North and at the South, have been but recently explored, and from which every reported observation is of value. The near completion of lines similarly constructed and managed for similar purposes in proximity to, and following the general direction of, our northwestern frontier, from the station at Bismarck toward stations in Idaho and on the Pacific, foreshadows the best results for the interests of this especial service, and for the protection and development of that portion of our territory.

The events of the past year have illustrated what might be the uses of such lines in Indian wars. They make safer the settlement of the country. They make possible the establishment of stations valuable for meteorological reports.

Telegraphic reports from the eastern Mexican coast (the western coast of the Mexican Gulf) are still to be desired for the proper protection of the shipping in the Gulf and of the Gulf coasts of the United States. Cyclones moving over the West Indies, and thence pursuing a course over the Gulf of Mexico, would doubtless often manifest themselves on or near the coast of Mexico in time to permit warnings to be thence given

to our own. The regularity of the telegraphic communication now had over the government lines upon the Mexican frontier and in the State of Texas has established the fact that reports collected in Mexico along or near the Mexican coasts, and transmitted over wires working with fair success, could be concentrated at this office with sufficient rapidity.

The organization by the Mexican Government, under Señor Mariano Barcena, of a system of meteorological reports from stations extended over a great portion of the Mexican territory, and carefully conducted, renders the results of that work more valuable for this purpose than in any preceding year. It is to be hoped that arrangements may be early made by which these reports can be received by telegraph. The notices for the display of cautionary signals issued from this office could reach Mexican ports as well as our own.

It is to be hoped that the sums appropriated for the service and the co-operation of the Mexican Government will permit reports to be had from these coasts within the coming year.

The international meteorological work, based upon plans suggested by this office, and carrying into practical effect a proposition adopted at a congress of persons charged with meteorological duties, assembled at Vienna in 1873, "that it is desirable, with a view to their exchange, that at least one uniform observation, of such character as to be suited for the preparation of synoptic charts, be taken and recorded daily and simultaneously at as many stations as practicable throughout the world," has continued to give increased and satisfactory results. This work has now completed the fourth year of its progress.

With the approval of the Secretary of War, and with the courteous co-operation of scientists and chiefs of meteorological services representing the different countries, a record of observations taken daily, simultaneously with the observations taken throughout the United States and the adjacent islands, has been exchanged semi-monthly. These reports are to cover Algiers, Australasia, Austria, Belgium, China, Costa Rica, Denmark, France, Germany, Great Britain, Greece, Greenland, Iceland, India, Italy, Japan, Malta, Morocco, Mauritius, Mexico, Natal, The Netherlands, Norway, Portugal, Russia, Sierra Leone, South America, Spain, Sweden, Switzerland, Tunis, Turkey, Dominion of Canada and the Provinces, the United States, the Azore, Faroe, Madeira, Philippine Islands and the West Indies.

In this connection the office has to acknowledge the cordial and valuable co-operation of the meteorological services of the different countries, represented as follows:

Algiers, Morocco and Tunis, by Generals Teissier and Maritz, Commandants Supérieur du Génie en Algérie; Austria, by Prof. Dr. Julius Hann, Director of the Imperial and Royal Central Meteorological Institute at Vienna; Belgium, by J. C. Houzeau, Director of the Royal Observatory at Brussels; Great Britain, by the Meteorological Council of England, Wm. Smith Chairman, and Robert H. Scott, esq., F. R. S., Secretary; London, Alexander Buchan, M. A., F. R. S., E. Secretary of the Scottish Meteorological Society, Edinburgh, and the respective observers; Costa Rica, by Señor Federico Maison, Director of the Central Office of Statistics and Meteorology; Denmark, by Capt. N. Hoffmeyer, Director of the Royal Danish Meteorological Institute at Copenhagen; France, by the Meteorological Council and the Central Meteorological Bureau of France, Herve Magnon, President, Prof. E. Mascart, Director, Paris, and the respective observers; Germany, by Prof. Dr. Geo. Neumayer, Director of the German Marine Observatory, Hamburg; Greece, by Prof. Dr. J. F. Julius Schmidt, Director of the

Royal Observatory at Athens; India, by H. F. Blanford, Meteorological Reporter to the Government of India; Italy, by His Excellency the Minister of Public Instruction, and the respective observers: Japan, by I. Arai, Director of the Imperial Meteorological Observatory at Tokei, and the Imperial University of Tokei: Mexico, by Señor Mariano Barcena, Director of the Central Meteorological Observatory in the City of Mexico, and the respective observers; Netherlands, by Professor Buys Ballot, Director of the Royal Meteorological Institute of the Netherlands at Utrecht; Norway, by Professor H. Mohn, Director of the Royal Norwegian Meteorological Institute at Christiania; Portugal, by J. C. de Brito Capello, Director of the Meteorological Observatory of the Infante Don Luiz at Lisbon, and the respective observers; Russia, by Professor H. Wild, Director of the Imperial Central Physical Observatory of Russia at St. Petersburg; Spain, by Antonio Aguilar, Director of the Royal Observatory at Madrid, and the respective observers; Sweden, by Prof. R. Rubenson, Director of the Royal Swedish Meteorological Institute at Stockholm, and by Dr. H. H. Hildebrandsson, Director of the Meteorological Division of the Upsala Observatory; Switzerland, by Prof. R. Wolf, Director of the Observatory at Zurich, and by Prof. E. Plantamour, Director of the Observatory at Geneva; Turkey, by A. Coumbary, Effendi, Director of the Central Observatory at Constantinople, and by Prof. C. V. A. Van Dyck, Superintendent of the Lee Observatory at Beirut; Canada, by Prof. G. T. Kingston, Director of the Magnetic Observatory at Toronto, and Superintendent of the Meteorological Office of the Dominion of Canada, and the respective observers; the United States Navy, by the Navy Department, through Commodore W. D. Whiting, U. S. N., Chief of the Bureau of Navigation; and by individual observers at other points.

A number of observations taken on vessels at sea to complement the simultaneous reports of this service, and at the request of this office, have been received on the form provided for the purpose. (Paper 22.) The vessels furnishing their reports belong to the commercial marines of different nations. The utility of the reports is evident in the study of storms approaching our coasts or which endanger vessels sailing from our ports.

The co-operation of the Navy of the United States in the taking of observations simultaneously and in accordance with the system adopted at this office wherever naval vessels of the United States may be, as established by the general order of the Secretary of the Navy, dated December, 25, 1876, has largely increased the data of this class. This co-operation has been skillfully rendered by the Navy Department and the United States Navy, through the commanders and officers of vessels, and the Chief of the Bureau of Navigation.

The people of the United States are thus the first nation whose Army and Navy co-operate, as all armies and navies should, under official orders, in the taking of simultaneous observations wherever the forces may be. This co-operation has now existed for nearly three years.

In view of the accomplished establishment of the system of simultaneous reports to be recorded and made at sea by the vessels of the naval and commercial marines of the United States and of other nations, and to provide for the extension of the system, carefully tested barometers of the best make have been prepared and kept located, as standards, at the ports of New York and San Francisco. These instruments have now been in use for reference; that at New York since 1877, that at San Francisco since December 1, 1878.

These barometers are publicly located and displayed to afford means

for comparison of the ships' barometers of the shipping of all nations The instruments, while carefully guarded, are easily accessible. Public notice is given of the location of them, and a sergeant of the Signal Corps attends daily to give information and to take charge of any ship's barometer which may be brought for comparison. (Paper 23.)

The standard barometer for the use of shipping in the Atlantic Ocean is located at the Maritime Exchange, in New York City; the standard barometer for the use of shipping in the Pacific Ocean is located at the Merchants' Exchange, in the city of San Francisco. During the year just past the uses of these instruments have become more and more appreciated, and frequent applications are made by the commanding officers of foreign vessels, as well as by the shipping of the United States, for the comparison with the standard of the barometers carried by their vessels. The sergeant in charge of the duty of comparison at New York states that not unfrequently barometers are brought to him for rectification which have neither been compared nor adjusted tince the time at which they had been placed upon the vessels by which they were carried, and that errors of half an inch in the reading are frequently found. The barometers are carefully put in good condition before they are returned to their owners. No charge is made under any circumstances for any part of the important work thus undertaken by the service.

The officers of the Signal Service located at the different cities and ports of the United States and upon the sea-coast offer every facility and aid in their power to the vessels of any nation.

With the plans for charting now adopted at this office, and with the reports now received here, it appears that the meteoric changes occurring over a great portion of the continents north of the equator can be charted with an accuracy sufficient to permit careful and valuable study. This charting, to be of the best attainable value, must be supplemented from the records of observations had on the seas. A ship at sea becomes one of the best of stations for a simultaneous system. The value of the record is enhanced by the change of the ship's location during each period of interval occurring between the separate simultaneous observations. Thus, a vessel making three simultaneous observations, daily, on any given route, answers, for the meteorological study extending over that route, the purpose of three separate stations. There is no sea-going vessel but which carries human life, and each ought to carry, by compulsion, if need be, meterological instruments. The smallest craft, in caring for its own safety, may use them enough to add to the value of the most extensive record. There is no nation without interest in the work proposed to be based upon exchanged simultaneous reports, and none has hitherto hesitated, when the subject has been properly presented, to aid in a duty which, so easily done as to require very little effort on the part of any person, has for its object a good to mankind. The work cannot, from its nature, be for the selfish good of any section.

A number of the great steamship companies, foreign and domestic, operating the principal commercial sea routes, give their powerful influence and aid.

The office has the co-operation of the Pacific Mail Steamship Company, through its agents, Williams, Blanchard & Co.; the White Star Line, through its agents, Ismay, Imrie & Co., Liverpool, and R. J. Curtis, New York; the Occidental and Oriental Steamship Company, through its president, George H. Bradbury; the North German Lloyd, through its agents, A. Schumacher & Co.; the American Steamship Company, through its president, H. D. Welsh; the Red Star Line, through its presi-

dent, James A. Wright; and the Allan Line, through its agents, A. Schumacher & Co.

The United States bear, in the cases of all maritime observers co-operating in this system, all expenses for forms, postages, &c., when so desired, and not infrequently, and, when necessary, loan the required instruments.

The number of observations made daily on separate vessels at sea is one hundred and twenty-two. (Paper 24.)

Research has already gone far enough to indicate the paths by which, if it cannot be directly predicted, it can at least be studied, to learn what sequences to follow conditions reported on or near the eastern coast of Asia, or on the Pacific, will be found on our western coasts.

Similar studies will have reference to our own southern and eastern coasts, and to the western coasts of the European continent. The time cannot be far distant when vessels leaving any Atlantic port may be informed whether any notable disturbance exists at sea and when it is likely to threaten the voyage.

The establishment of permanent ocean stations in lines traversing the ocean over or near the telegraphic cables, and in telegraphic communication with either continent, is not considered impracticable and has been referred to in preceding reports.

Since the date of the last annual report this matter has been especially illustrated in the instance of the cable-laying steamship Faraday, while engaged in laying an electric cable between France and the United States, and holding on to the cable, found herself in the course of a cyclone which passed directly over the vessel without causing her to lose her hold of the cable, and which was at once reported by telegraph through the cable from the vessel to the European continent, the report stating wind changes and velocity, and the barometric changes occurring as the different quadrants of the cyclone passed over the vessel. The practical demonstration seems complete.

There is reason to hope that a progress has been made which will eliminate from the study of practical international meteorology some of the difficulties hitherto encountered.

There are grounds to hope also that the atmospheric conditions and changes of condition can be charted with sufficient accuracy over any extent of the earth's surface. If the hope has fruition, meteorological barriers will, as against study, cease to exist.

On July 1, 1875, the daily issue of a printed bulletin, exhibiting the international simultaneous reports, was commenced at this office, and has been since maintained. A copy of this bulletin is furnished, without charge, to each co-operating observer. The results to be had from the reports thus collated are considered to be of especial importance. The bulletin combines, for the first time of which there is record, the labors of the nations in a work of this kind for their mutual benefit. There is needed only the assistance to be had from the naval forces of the different powers (that of the navies of the United States, of Portugal and of France being already given) to extend the plan of report upon the seas to bring more fully within the scope of study observations practically extending around the northern hemisphere.

A copy of the International Bulletin herewith (Paper 25) exhibits the character of the international reports, and that of the information had from each station. The chart accompanying this bulletin shows as nearly as practicable the location of the stations, and foreshadows the studies the reports had from them will make practicable. The number of stations reporting increases.

While the stations are crowded in some localities, each is useful—each serving to check the work of the other, and each aiding to close the gaps the failure of other stations might sometimes cause. The work is not likely to be abandoned by those in the different countries who have taken part in establishing it and who share its benefits. If it served no other purpose than to maintain, as it does, the pleasant co-operation of those charged with the meteorological duties of the different countries, it would be of value. It is hoped that by systems of observations thus extensive, generalizations may be had to permit the announcement of meteoric changes for periods longer in advance than have been hitherto practicable.

The average number of daily simultaneous observations now made in foreign countries is three hundred and fifty-seven. The total number of stations on land and on vessels at sea from which reports are entered in the bulletin regularly is five hundred and twenty-seven. The co-operation of the different nations secured by this plan of exchange has rendered the additional cost to the United States of the grand system of reports it makes possible but little more than that of the cost of the preparation, paper, and binding of the International Bulletin and the accompanying charts, a cost which would have to be met in great part for the proper preservation of the records themselves even if the bulletins were not distributed.

On July 1, 1878, it became possible to commence the issue, on that date, of a daily international weather map, charted daily and issued daily, each chart based upon the data appearing upon the International Bulletin of simultaneous reports of similar date. The charting extends around the world, and embraces for its area the whole northern hemisphere.

The daily issue of a chart of his kind, thus daily issued for the first time by the United States, was without a precedent in history. It exhibited the co-operation, for a single purpose, of the civilized powers of the world north of the equator.

The studies which such charts make possible, the improvements which will come to the charts as the work progresses and the area of the chart is better filled with reports of observations carefully elaborated, are appreciated by scientific men. The questions as to the translation of storms from continent to continent, and of the times and directions they may take in such movements; the movement of areas of high and low barometer; the conditions of temperature, pressure, and wind-direction existing around the earth at a fixed instant of time; the distribution and amount of rain-fall, and other studies, many and valuable, only suggested by this enumeration, may be by such studies settled. It seems not impossible that in the future questions of climatology, and perhaps others bearing upon the prediction of weather changes far in advance of the time at which these changes may happen, or queries as to the character of coming seasons even, may be answered by the researches these charts will make practicable.

The very great aid the material furnished in this elaborate form gives to the search for generalizations, or for data in the support of theories, has been before referred to. In frequent cases, little more than collation is necessary.

As a means of better combining the work and the interests of the several nations, of certainly securing that co-operation at sea which will enable the lines of the charting to be drawn as fully and as well over oceans as over continents, and which will give the world ultimately a knowledge as practical of the movement of areas of disturbance in the

midst of the seas as is now had of such movement on some continents, the undertaking is of much importance.

It is an advantage of the charting draughted from simultaneous reports that studies by normals, not possible in any other way, may be had. The normal pressure, temperature, &c., arrived at from observations taken at any one place, and the same and a fixed instant of time every day, become established as to that place and time with accuracy. Many causes of error are eliminated.

The intercomparison of these normals with the normals taken at other places simultaneously with the first and under the similar conditions that the normals to be found for those places are to be from observations taken at those places at a fixed time and on every day, gives results reliable and differing from those to be had by the use of normal readings arrived at in any other manner. Normals for the year, for the season, and for the month may be determined by such procedure. The comparison of such normals will show in the case of abnormal changes in any district or section whether and how these changes are compensated by compensating variations elsewhere. There are interesting studies as to what sequences there may be to follow such atmospheric variations occurring over any region or country—either in that region or country or elsewhere—and how and where the compensating variations occur, and with what concomitants or sequences of meteoric changes.

There is the hope to gain in this way or by studies such study will suggest information to affect the commercial and agricultural interests of the world.

By observations spoken of as simultaneous observations, there is meant, in the parlance of this office, observations actually taken simultaneously in reference to physical time. The readings for observations of this character, made at different stations, no matter how widely separated, are attempted to be so made that they will be in effect made together; that is, that the different observers at the different stations will each be at his separate instruments, reading them for the observation at the same moment that each and all of the other observers are at their separate instruments for the purpose of making the same observations.

In the case, for instance, of an observation or series of observations to be made at Tokio, San Francisco, New York, London, St. Petersburg, and Calcutta, the observers at each of the stations named—and the list might be prolonged indefinitely—are so instructed that at each station, and at the moment fixed for the observation, an observer would be found at the instruments taking the proper readings. So rigidly is this plan followed throughout the United States, that not only are the instruments required to be read at the different stations at that moment of physical time which has been fixed for all, but the instruments are required to be read in a certain and fixed order or sequence.

The observations are thus made, in fact, simultaneously, precisely as if—in a supposable case—the different sets of instruments, instead of being scattered over the surface of the earth, had been gathered in a single room, and the observers then directed to read the different sets together, and at once, at a fixed moment of time. Observations of this character have no resemblance to those made at similar hours named, by local or clock time, at the different stations. Observations taken at similar hours of the local or clock time, at different stations, are, in effect, taken at very different hours of physical time, the differences increasing with the number of degrees of longitude intervening between the different stations. Thus, observations taken at Washington and San Francisco at the similar hours, 7 a. m., 2 p. m., and 9 p. m. of local time

at the two cities, would in fact be taken at Washington three hours and two minutes before the same observations would be taken at San Francisco. Observations of this character might very properly be styled synchronous, for they are so as to local time; they are not in any way simultaneous. The distinction ought to be very carefully made. Much confusion has entered meteorological writings because this distinction has not been rigidly observed. In some of the earliest works having reference to practical meteorology, there is mention of chartings based upon observations taken "simultaneously" at different stations, at 3 p. m., or other hours fixed by local time. The use of the words "simultaneous" and "synchronous" as synonyms is not yet abandoned.

Before the introduction of the electric telegraph it was difficult to conceive of observations to be taken simultaneously, and to be concentrated with sufficient rapidity for use for any practical purpose. On the very limited fields it was then possible to consider, for study, observations taken at the same hour of local time presented themselves in appearance as taken simultaneously. It seems to have fallen to this office to first establish, for purposes of forecast, systems of observation based upon the fact that the observations were to be actually taken simultaneously, and to have first so arranged telegraphic circuits connecting the different stations that the observations taken simultaneously should move simultaneously by wire to a given center—the central office. It is by simultaneous observations only that a true synopsis of the atmosphere over any extent of the earth's surface can be given; the atmosphere being so photographed, as it were, before any changes in its condition can have been caused by motion. It is a peculiarity of such charting that it is unlimited as to its extent, and improves for any purposes of meteorological study the greater the extent given to it.

The comparison of charts covering the same surfaces and based upon simultaneous observations is easy, and when, for close study, the charts are made to follow each other in regular sequence, the observations being taken at times so fixed as to divide the daily twenty-four hours into equal periods of time, they offer advantages which it is not possible to arrive at by any other process. It is charts of this description which render a world-wide study possible, and with which will be attained in the future results, up to this time, only but faintly foreshadowed.

The work of this office is based almost wholly on observations of this description. The office series of simultaneous observations has run continuously from November, 1870. It is through observations of this character the concurrence of the nations has been invited for the preparation of the charts hoped to be extended until they cover the world.

Since the date of the last annual report additional international charts have been added to the series of charts. These charts are, like those before referred to, charts of the whole northern hemisphere, and are so made as to exhibit with close approximate correctness the geographical relations of the earth and water surfaces in that hemisphere to each other. They display, condensed by months, the means of barometric pressure, of wind-direction and force, the means of temperature, and the average course of movement of areas of low barometer for each month. These charts are based almost wholly upon the international exchange of reports taken simultaneously.

The wide circulation given these charts in the Monthly Review, to which they form now an accompaniment, offers this world-work to many readers. It completes for the present the series of charts, to form which the labors of the international service were at first undertaken, and opens easily to study a field of research very nearly co-extensive with

the northern hemisphere. A series of charts for the especial studies of storm-tracks are prepared as an established office series. On such charts are traced ocean storm-tracks, these tracks being charted primarily over this continent by the regular reports at this office and at sea and on other continents, by such meteorological reports as may be had from the sea and the distant continents, together with such other information as may be collected at this office up to the dates at which the several charts issue. The construction is continuous from month to month, a storm-track commencing in one month appearing on and being continued on the charts issued for the next succeeding month, the portion of the track continued in this latter month being located by such supplementary information as may have been collected up to the date of the last issue. Thus for each succeeding month.

Examples of these charts are found accompanying the issues of the Monthly Review, in their sequence.

A second meteorological congress was held at Rome, Italy, in April last. At this assembly the practical use of observations taken simultaneously, upon which use the system of this office has rested for studies and for charts for a number of years, was encouraged.

The collection of material for maps, to cover large portions of the earth's surface—interesting, by the gratuitous distribution of copies of the work of the office, to all who should, by forwarding data or material, become regular co-laborers in the office work, as has been long the usage in this country—was commended for general adoption. The daily and wide distribution of the International Bulletin and international charts is for this purpose.

The publications of the office, The Weather Review, were mentioned as models of work to be desired in Europe.

It was urged upon the United States to furnish full systems of reports from the stations on Pike's Peak and Mount Washington.

These evidences of appreciation are grateful. They go far to assure the friendly co-operation of the nations to perfect a world-wide meteorology.

The total number of daily reports, of all kinds, now received and filed at the office of the Chief Signal-Officer, is as follows: Number of daily service telegraphic reports, four hundred and forty-nine; number of international daily simultaneous reports, three hundred and twelve; number of reports from voluntary observers, four hundred and sixty-seven; number of reports received from the Medical Corps of the Army, one hundred and twenty-three; number of reports received from United States naval observers, thirty-one; making a total of one thousand three hundred and eighty-eight reports received regularly for discussion.

Paper 26 exhibits a list of the military posts from which meteorological reports have been regularly received at this office during the year.

A list of the voluntary observers who have furnished monthly meteorological reports to this office during the year ending June 30, 1879, is exhibited in paper 27.

As described in previous annual reports, the daily official deductions or forecasts issuing from the office of the Chief Signal-Officer and constituting the tri-daily Synopses and Indications (as they are styled), and the especial deductions, in pursuance of which the orders for the display of cautionary signals at stations are given when necessary, are based upon the regular reports of the service stations of observation, transmitted tri-daily to this office by telegraph, after passing over a system of telegraphic circuits so arranged as to at once concentrate the reports at this office, and to distribute in doing so certain numbers of them at des-

ignated cities and stations. Especial reports are demanded from any station, or number of stations, whenever additional information is required as to impending disturbances. The synopses are those of the meteoric conditions existing over and near the United States for each period of twenty-four hours terminating at the hour for each general report. The indications are announcements of the changes, considered from the study of the charts, in connection with such rules and generalizations as the experience of this office and the study of meteorologists seems to have determined to be indicated as to happen within the twenty-four hours then next ensuing. The study for each issue requires the draughting and examination of eight charts, these charts exhibiting chartographically the data furnished by the simultaneous reports of the stations heretofore referred to, and located in the United States, on the Atlantic and Pacific coasts, on the coasts of the Gulf of Mexico and of the lakes, in the western interior, and in the Dominion of Canada, Nova Scotia, Newfoundland, New Brunswick, and the West India Islands. The plans in use in this office for charting differ from any other. They are based upon the study of observations actually taken simultaneously. These charts are as follows: (Map 2.) (*a.*) A chart of barometric pressure reduced to the temperature of freezing and sea-level; of temperatures and of winds, together with the wind-directions and the velocities at the different stations; the amount, but not the nature, of the cloud formations at the different stations; the character of the precipitation, if any, curring at the time of the reports; and the amount of precipitation, if any, since the time of the last preceding report. This chart exhibits barometric pressures and the temperatures noted at stations in their relations to districts of territory and to each other, by a system of isobaric and isothermal lines inscribed. The isobars are chartered for inches and tenths of inches of barometric pressure; the isothermals for temperatures represented by the multiples of 10°. The wind-directions are shown by arrows at the different stations. (Map 3.) (*b.*) A chart of the relative humidities appearing to exist over territorial districts, with the temperatures at the different stations in relation to districts and to each other. The chart of humidities enables studies to be made in reference to territorial sections, the difficulties attending the study of observations of this character being obviated to a very considerable extent by the inter-correction of stations among themselves and by the great extent of the regions over which the readings are made simultaneously. In fields so great purely local conditions in part disappear, or affect very slightly the general result. This chart contains also the character and amount of the lower clouds, and the character, amount, and direction of motion of the upper clouds, when these are visible. On this chart are traced lines of equal relative humidity, and isothermals are also drawn, as described in chart *a.* (Map 4.) (*c.*) A chart of the cloud conditions prevailing over the United States, in which the character of the different varieties of clouds and their amount, as viewed from each station, are represented graphically by appropriate symbols. On this chart also appears the weather as reported at each station at the time of each report by symbols; the stations at which rain has fallen since the preceding report, as well as the direction of movement of the upper and lower clouds, and on it each morning there are entered the minimum temperatures noted during the preceding night at the separate stations at the local times synchronous with the hour of 11 p. m., Washington mean time, and lines of minimum temperature are traced to exhibit these temperatures in relation to districts of territory. On this map are entered also the maximum velocities of

the wind at particular stations when required to be specially reported in the intervals between the hours of regular report. The cloud-areas appearing on this map are surrounded by an outline charted to enable the extent and probable movement of these areas to be considered. There also appears on the copy of this chart, made at the hour of the midnight report, the appearance of the sunset at each station, as reported by the observer at that station, and as considered by him to indicate, when taken in connection with the appearance of the western sky at sunset, the character of the weather to be anticipated at that station for the twenty-four hours next ensuing. (Map 5.) (*d.*) a chart of normal pressures and variations from normal pressures for each eight hours. There have been computed during the past year, at this office, the means of the observed pressures recorded at each station, at each of the hours at which observations are made at that station, for the regular simultaneous telegraphic reports for each monthly period. The series of observations used in computing these means has been for as many years as was possible at each station. These mean pressures are the mean pressures computed from the actual readings had at each station, at the habitual hour of observation, for each of the tri-daily full telegraphic reports required to be made from that station, and obtained, as explained above, by reducing the readings then made to a uniform temperature—freezing—and correcting for instrumental error (variation from the standard) only. Mean pressures so obtained are styled in this office "normal pressures" for the station, for its local hour of the report and for the month. On this chart is entered at each station, with the symbol + or —, the value by which the actual reading reported from that station at the hour of any report is above or below the "normal pressure" for that station for the hour of that telegraphic report and for that month. These deviations from such normal pressures may be styled "departures" from the normal pressure; the comparison of these departures for each period of eight hours shows what changes have taken place in the atmospheric pressure at the different stations, in each period of eight hours, after eliminating the horary variations of pressure. On the chart are traced lines of "no variation" in normal pressures, being the lines along which the pressures are at the time practically normal, and also lines of "departure" from the normal pressure for each one-tenth of an inch of mercury, by which the actual readings as reported are found to be above or below the computed normal. Such lines are traced for each period of eight and of twenty-four hours. This method of noting barometric pressures enables those taken and reported simultaneously from any number of different stations to be considered for purposes of study in relation to each other without reference in each case to be local questions of altitude, horary variations of pressure, or other disturbing causes at the places at which they may be taken. This chart exhibits also the normal pressure for the month at the station, and the wind-direction as given at the hour of the daily report. (Map 6.) (*e.*) A chart of actual barometric variations. This chart exhibits the observed readings of the barometer at different stations, corrected for instrumental error [variation from the standard at Washington] and for temperature, the mercury reduced to the temperature of freezing, but not reduced to the hypothetical readings at sea-level. In this office, observed readings so treated are known as the "actual readings." On this chart are traced lines of "no variation," showing the lines along which no change in actual pressure has occurred for the periods of eight and twenty-four hours, respectively, preceding the hours of report, and also lines showing the lines of rises or falls of the actual readings of the barometer for each one-

tenth of an inch and for the same respective periods. This chart is valuable as exhibiting the nature and extent of actual barometric pressures, and the changes of such pressures, taking place at the different stations, and over the different territorial districts. (Map 7.) (*f.*) A chart of dew-point variations. On this chart there are entered the values of the changes of the dew-point at the several stations for the periods of eight and twenty-four hours preceding the hours of report; there are traced also lines along which there has been "no variation" in dew-point during such periods respectively, and lines showing the rises and falls for each five degrees in the dew-point for the same periods. (Map 8.) (*g.*) A chart of dew-points, vapor tensions, and actual humidity. On this chart are entered the values of the dew-point at the different stations, and lines of equal dew-point are traced for each ten degrees difference of the dew-point readings. At the extremities of these lines are noted the values of vapor tensions and actual humidity, corresponding to the given dew-point lines. The examination of the charts *f* and *g* enables the hygrometric conditions of the air and the changes in such conditions which have occurred within the periods of eight and twenty-four hours, respectively, to be considered in so far as these are indicated by the wet and dry-bulb psychrometers at the different stations.

During the past year there has been prepared in the map room of the office, and to be used in connection with the studies to be had from the maps above enumerated, a colored contoured map. This map exhibits, by colored surfaces of different colors—each colored surface being bounded by contour lines—the elevations of the different terrestrial surfaces on which the stations of the Signal Service are situated, and the map exhibits as a whole the relations as to elevation of all the surfaces within the United States, Mexico, and the Dominion of Canada, over which the work of the office extends. The direction of movement of atmospheric areas may, by the study of this map, be judged of to some extent by considering the contours of the earth's surfaces over which such areas are found charted, and towards which they are thought likely to move. The linear charting has been based upon data had from Gannett's linear contour map of 1877, and from Guyot's Wall Atlas of 1863. A chart embodying additional data is now in preparation.

Several series of computations have been made in the computing-room of the office to enable additional charts each to exhibit in the lines of its charting the condensed data in their relation to each other. The regular series of computations has been continued.

The number of separate graphic chartings made and examined in the study-room, for the purpose of the daily studies of the office, during the year ending June 30, 1879, has been eight thousand seven hundred and sixty. The charts prepared for the issues of the Monthly Review, and exhibiting each the data received for the month and discussed for the month, have varied from three to seven in number for each month, a total of fifty-four for the year. The increase in number has been due to the addition of International charts.

The data thus accumulating on the files of this office have afforded scope for generalization differing from and perhaps more extensive in number than any before had by any one nation.

The number of reports received daily and unceasingly have necessitated a constant labor to keep up, in the discussion of them, and in the record of the results of that discussion, to the dates at which the reports are recorded, in order to prevent an accumulation which, by its mass, might lessen their usefulness. The published daily study-charts of the office and the Monthly Review, with its charts of generalizations

are examples of this work—the study-charts exhibiting a study of the data telegraphically received on each day; the charts of the Monthly Review combining the results had from these data and those received from other sources for each month during the year. It has been thus in the power of the office to lay before scientists and the public, at the close of each day, if necessary, and at the close of each month and each year, a summary for the periods then terminating. The labor of referring to the individual records in figures, which, after a time, becomes almost impracticable, is thus rendered unnecessary on the part of those who receive these papers. The charts of the average direction and velocity of movement of areas of low barometer, charts of the average barometric pressures at the hours of tri-daily report, charts of wind-direction found most frequent at the different stations before rain-fall, charts of rain-frequencies for the different months, are examples of other studies of generalization. Studies of this character, and incidental to those which have in view the pre-announcement of storms or other meteoric changes, furnish results valuable for practical uses.

Information of this character has been so freely and so widely furnished that it is not always considered that by no other nation is information of a similar character furnished to nearly a similar extent, and that nine years ago it had not been contemplated in the United States as possible to furnish it to all.

It is by studies of this kind, and in this great field of research, that the hoped-for rules, each of which is to add its aid in the effort to attain precision of forecast and foreknowledge of climatology for the United States, are to be elaborated. It is by such rules and such knowledge, slowly but each year improving, the widest benefits of the service are to be sought. These will follow the practical use, by the people themselves, of the information gained through the work of the service, either in their attempts to have foreknowledge of coming changes from the study of their own instruments, or by supplementing that study by reference to the daily-published bulletins and reports of this office. There is hardly a class of the people, or an industry they practice, but to which good may, in this way, and from such studies, result. Enough has already been done to prove that it is possible.

The policy pursued by the office of diffusing as widely as possible, and in condensed form, the information in its possession, and that of extending the scope of its observations, enables it to benefit, in studies like these, by the labors of students everywhere. The results returned to the office, in the able suggestions made by distinguished scholars who have received its publications, and based upon deductions had from the charts and data so furnished, aid in forming the rules on which its duties rest. The list of correspondents to whom the publications of the office are furnished contains the names of many of the leading scholars and scientific men in different parts of the world. The instances are not infrequent in which the most interesting papers upon the subject of meteorology, read before the most distinguished and learned societies in the United States, have rested for their value almost wholly upon the studies of the data of observations and the charts prepared at and furnished from this office.

The search for generalizations or the support of theories becomes comparatively easy when the material is furnished in elaborate form, requiring little more than collation for either.

The Synopses and Indications have been furnished for the press at the regular hours, 1 o'clock a. m., 10.30 a. m., and 7.30 p. m., daily, and under the same rules as in preceding years. There has been no failure in the

delivery of any report during the year. The total number of statements thus issued for publication has been one thousand and ninety-five. These have been telegraphed at the moment of their issue to the principal cities, and have appeared in some form in almost every journal in the United States. A careful analysis of these statements of the office, made for the year terminating June 30, 1879, and a comparison with the meteoric conditions afterwards occurring within the twenty-four hours next ensuing, and within the district to which each forecast has had reference, has given a percentage of verifications as follows:

Reference is had to the district map:

Percentage of verification for each month of the year ending June 30, 1879.

	1878.						1879.					
	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.
New England	80.6	84.4	83.5	87.6	89.1	88.6	85.5	93.8	89.3	81.8	84.3	84.9
Middle States	77.8	87.6	85.9	88.4	90.8	87.0	86.0	94.1	90.5	87.2	85.6	86.0
South Atlantic States	83.5	89.5	89.2	87.3	91.3	85.5	88.6	92.3	91.6	82.0	80.4	79.8
Eastern Gulf States	89.8	91.9	83.4	87.2	88.2	90.1	87.0	92.7	90.7	85.5	76.6	80.4
Western Gulf States	88.7	91.2	89.5	89.1	90.4	88.6	83.5	90.9	87.8	81.9	76.7	81.4
Lower Lakes	84.9	86.7	81.9	85.3	91.0	87.1	87.0	94.1	91.2	83.2	84.7	88.6
Upper Lakes	83.1	87.6	83.3	87.4	89.7	88.4	88.1	92.5	89.6	81.8	87.1	86.8
Tennessee and Ohio Valley	81.6	82.3	85.8	86.8	92.4	85.5	86.3	95.8	89.4	84.4	84.2	84.9
Upper Mississippi Valley	84.3	86.8	84.2	89.4	92.4	85.2	85.6	92.1	88.1	81.5	84.1	83.3
Lower Missouri Valley	82.9	83.2	82.8	86.8	91.5	84.6	84.6	91.4	89.1	80.1	84.0	81.2
Total percentage of verifications	83.7	87.1	85.0	87.5	90.7	87.1	86.2	93.0	89.7	82.9	82.8	83.7
Percentage of verifications for the year (changes of barometric pressures, temperatures, wind-direction, and character of weather expected comprised)												86.6
Percentage of verifications for the year (forecasts of the character of the weather only)												90.7

The percentages of accuracy first above given are for statements comprising the predictions of the changes of barometric pressures, temperatures, wind-directions, as well as the character of weather to be expected in the districts to which they have reference. Such predictions are more difficult to make correctly than those relating to the future conditions of the weather alone, for in such forecasts it must be pre-announced for twenty-four hours for each district outlined upon the map, whether in that particular district the barometric pressures will increase or diminish; whether the temperatures will rise or fall; what in each district will be the wind-directions, and other statements far more difficult to make accurately than the general forecasts that the skies will be clear or cloudy, and with and without rain. The percentage of accuracy of forecasts limited to the pre-announcement of the character of the weather to be expected in the districts, exclusive of the other conditions above referred to, has been 90.7.

It has been possible to exhibit in this report, for the first time, the percentages of accuracy of verifications of indications announced for the Pacific coasts of the United States, as follows:

Percentage of verifications for the Pacific coast region for the months given.

	1879.				
	Feb.	March.	April.	May.	June.
Northern Pacific region	91.1	91.1	78.4	93.1	88.3
Central Pacific region	96.4	88.7	83.6	85.4	93.3
Southern Pacific region	83.9	87.5	90.5	93.1	95.0
Total percentage of verifications	90.5	89.1	84.2	90.5	92.2

These Indications are for the "weather" only, and, for the period made, the general percentage is 89.3.

There was need of much deliberation and practice before it was deemed wise to attempt the work of forecasts for the great extent of coasts bordering upon the Pacific Ocean. Tradition had held it to be impossible to accurately announce approaching changes for any coast fronting westward with sea-surfaces only beyond it. The stations upon the coast under consideration are yet few, the telegraphic communication difficult, the contours of the earth's surface broken by abrupt and great changes of elevation—the stations lying back from the coasts so difficult to reach as to be almost useless. It has been found, however, that the facilities for study now provided in the study-room of the office enable changes approaching from the seaward to be considered by their effects on land, and studies to be made as to what sequences at sea and upon the coast must follow conditions exhibited upon the charts as existing in the interior. The results of such studies are exhibited by the statement of verifications submitted above. This work is not without its reference to future work upon the oceans. Map 9 exhibits the districts into which this region has been divided for purposes of this study.

The attempt has been continued to utilize the statements of indications issued in bulletin form by adding, when possible, precise information as to the location of areas of disturbance or storm-centers, their expected direction of movement, and such other facts as might be stated fully on the bulletins to be displayed at board-of-trade rooms and other prominent points in cities, and be of utility both as amplifying the reports of indications furnished for the press, and also as capable of being issued from the central office at any hour it might be considered necessary so to issue them. The press reports are habitually furnished at fixed hours only. At these hours important and sometimes great atmospheric changes may seem to be only slightly indicated, when such changes afterward develop rapidly. It is sometimes not possible to pre-announce them in any other than the bulletin form. The popular faith in the announcements of the office, now in the ninth year of their issue, has not diminished. So far as can be judged from reports, notably more attention has been paid to the announcements among the farming population. There seems each year more confidence and a greater willingness to be guided by the statements of forecasts in the conduct of agricultural operations. The increase in the proportional amount of the wheat product this year has been commented upon by the local press, in some portions of the country, as to some extent due to the accuracy of the weather reports furnished the farmers daily.

This confidence of the people as a whole has not been sensibly lessened at any time by the errors and omissions which sometimes direct attention to the fact that in the present condition of science, and with a system of observation still too limited, premonitions having for their

scopé a territory so great as that of the whole United States, and embracing the coasts of two oceans, cannot always be correct for every part of a district.

The reports of forecasts are necessarily limited also to a certain number and few telegraphic words, the report for a district comprising several States being condensed into four or five lines, every word of which must be paid for.

It is not possible always to describe within this limit of description weather changes clearly indicated as to occur, but notice of which must be omitted for want of space. It would not be difficult to write for each State, and with benefit to the readers, a synopsis with the forecasts stated in numbers of words equal to the whole number now allowed for those relating to all the States of the Union.

The Indications are not always correctly understood by those who read them; the error of mistaking the announcement made for one district, as set forth on the District Map, as applying to a district differently located is frequent. Every effort is made to render the division of the country into districts for purposes of description properly understood.

The popular knowledge of the duties of the office, and its reasonable success in discharging them, is in no way better evidenced than by the criticisms to which it is subjected if errors occur in the work. It is not many years since the work itself was, at home and abroad, deemed impracticable. In more recent criticisms the work has been commented upon adversely and severely, because even occasional errors happen. It has seemed to be considered that it ought never to fail. There has been no work other than that of this office to cause such success to be popularly expected. Criticisms of this kind are, by the general accuracy they imply, a source of satisfaction.

The instruction of officers of the Signal Service to fit them for the various duties of the office has been continued. The especial duties in which the officers on duty are severally engaged, each in his sphere, and each of which duties contributes its share to the success of the whole, are such as necessarily prepare them for the course of especial study and practice, and fit them to take charge, in turn, of the separate divisions and sections into which the office-work is divided. A roster for duty becomes in this way possible, and provides at once for the permanent continuance of a work to be prosecuted both by day and at night, by providing for the relief of men wearied in the discharge of such parts of the duty as impose severe physical as well as mental strain by others fresh from duties less burdensome. It insures also the instant filling of vacancies in the cases of sickness or absence of any officer.

The studies to which reference has been hitherto made and the data condensed for generalization improve each year the material had in the office for study.

In the incessant work of the map-room, and in making the computations constantly called for in the course of office duty, important assistance is rendered by the competent and well-taught non-commissioned officers and soldiers on duty in the several divisions. In the matter of arriving at generalizations, it would be impossible often to handle the masses of data which must be considered without the faithful service of these men. While absolute accuracy cannot be expected in work so extensive as that required from this office, and the results of which are demanded for instant publication, there is attained an accuracy sufficient for every practical purpose, and one which each year increases in rigor.

The data which appear in the publications of this office are checked figure by figure five times before the printing. These are, whenever it is

practicable, accompanied by a chart, useful in itself, and by the charting the best check upon all the data which have served as its bases. Additional checks are adopted whenever experience has demonstrated a closer accuracy can be had.

The display of cautionary day and night signals, by flags by day and lights by night, has been made systematically, on occasions of supposed especial danger, at the following points, ports, and harbors located upon the lakes, the Atlantic, and the Gulf coasts:

Alpena, Mich.; Atlantic City, N. J.; Ashtabula, Ohio; Baltimore, Md.; Barnegat, N. J.; Bay City, Mich.; Booth Bay, Me.; Boston, Mass.; Buffalo, N. Y.; Cape Hatteras, N. C.; Cape Henry, Va.; Cape Lookout, N. C.; Cape May, N. J.; Cape Vincent, N. Y.; Charleston, S. C.; Charlotte, N. Y.; Chatham, Mass.; Chicago, Ill.; City Island, N. Y.; Cleveland, Ohio; Deer Island, Me.; Detroit, Mich.; Duluth, Minn.; Dunkirk, N. Y.; Eastport, Me.; East Tawas, Mich.; Erie, Pa.; Escanaba, Mich.; Fairport, Ohio; Fall River, Mass.; Forester, Mich.; Fort Macon, N. C.; Frankfort, Mich.; Galveston, Tex.; Gloucester, Mass.; Grand Haven, Mich.; Green Bay, Wis.; Highland Light, Mass.; Horn's Pier, Wis.; Hyannis, Mass.; Indianola, Tex.; Jacksonville, Fla.; Kenosha, Wis.; Kewaunee, Wis.; Key West, Fla.; Kittyhawk, N. C.; Lewes, Del.; Ludington, Mich.; Mackinac City, Mich.; Manitowoc, Wis.; Marblehead, Mass.; Marquette, Mich.; Menonomee, Mich.; Milwaukee, Wis.; Mobile, Ala.; Monroe, Mich.; Muskegon, Mich.; New Bedford, Mass.; Newburyport, Mass.; New Haven, Conn.; New London, Conn.; New Orleans, La.; Newport, R. I.; New York City; Norfolk, Va.; Northport, Mich.; Oswego, N. Y.; Pensacola, Fla.; Pentwater, Mich.; Port Austin, Mich.; Port Eads, La.; Port Huron, Mich.; Portland, Me.; Portsmouth, N. H.; Racine, Wis.; Rochester, N. Y.; Rockland, Me.; Rogers' City, Mich.; Saint Joseph, Mich.; St. Mark's, Fla.; Sandusky, Ohio; Sandy Hook, N. J.; Savannah, Ga.; Sheboygan, Wis.; Smithville, N. C.; South Haven, Mich.; Stonington, Conn.; Sturgeon Bay, Wis.; Thatcher's Island, Mass.; Toledo, Ohio; Traverse City, Mich.; Tybee Island, Ga.; Wilmington, N. C.; and Wood's Holl, Mass.

During the year ending June 30, 1879, two thousand five hundred and seventy-three signals have been ordered, counting each separate display at each port as a separate signal, in anticipation of ninety-six dangerous storms.

Of the number of cautionary signals displayed, seventy-nine and eight-tenths per cent. have been afterwards reported as justified by the occurrence of winds, &c.

Of the number of off-shore signals displayed, ninety-three and nine-tenths per cent. have been afterward reported as justified.

The following table exhibits the number of signals (cautionary and off-shore) ordered during each month, and the percentage of verifications for each month; also the total number of signals ordered during the

year, with the total number verified and annual percentage of verifications:

Month and year.	Cautionary signals.	Verified.	Per cent.	Cautionary off-shore signals.	Verified as to velocity.	Per cent.	Verified as to direction.	Per cent.	Total number of signals.	Total number verified.	Per cent.
1878.											
July	78	62	79.5	11	0	0.0	11	100.0	89	62	69.7
August	39	30	77.0	6	4	66.7	6	100.0	45	34	75.6
September	158	160	82.3	17	14	82.4	15	88.0	175	144	82.3
October	234	207	88.3	93	73	78.5	80	86.0	327	280	85.6
November	260	202	77.7	111	83	74.8	111	100.0	371	285	76.8
December	187	155	82.9	136	113	83.1	133	97.8	323	268	83.0
1879.											
January	167	140	83.8	132	118	89.4	127	96.2	299	258	86.3
February	143	135	94.4	110	98	89.1	109	99.1	253	233	92.1
March	199	157	78.9	81	72	88.9	69	85.2	280	229	81.8
April	192	128	66.7	96	80	83.3	92	95.8	288	208	72.2
May	178	110	61.8	42	17	40.5	30	71.4	220	127	57.7
June	117	103	88.0	15	9	60.0	15	100.0	132	112	84.8
Totals	1,952	1,559	79.87	850	681	80.1	798	93.9	2,802	2,240	79.94

Of the total number of cautionary and off-shore signals thus displayed, seventy-nine and nine-tenths per cent. have been afterward reported as justified by the occurrence of winds held to warrant them at the points where the signals were displayed, or within the radius of one hundred miles distant of these points, as set forth in the rules of the office. In the cases reported as failures of justification following the display, the winds did not attain, at the port or within the described radius, a violence held to justify the warning. The signal ordered by this office is always cautionary in its character, not announcing that a storm will come, but that the indications are sufficiently threatening to call for caution, both as to going to sea and for preparation for rough weather if vessels are about to sail.

It is one of the most difficult tasks which fall to the office to determine in advance over what ports to be selected, to the exclusion of others, an advancing storm-area will pass, and in such a manner as to be accompanied at these ports with a given wind-velocity. The direction of movement of storm-areas changes sometimes unexpectedly, and ports are then threatened at which, while the signal may be exhibited, it cannot be shown far enough in advance to avoid the coming danger. Within the same area the winds differ in force at different points. They differ also with different contours of the earth's surface. There is the danger that warnings unnecessarily given may delay the movements of shipping. A heavy responsibility is incurred if the warnings are not given when they ought to be. Time, increasing experience, and increasing facilities will insure improvement.

The storm of a storm-area with wind registering a wind-velocity of twenty-five miles per hour on land, indicating, as it frequently does, a wind-velocity of forty-five or fifty miles at a distance of ten or twenty miles from the land, is regarded as the lowest velocity justifying a signal.

There is no work of the office in which it has been felt necessary to

progress with more caution than in that relating to the display of cautionary signals. None had ever been shown in the United States when the duty of making such displays devolved upon this office, and it was in debate whether any had ever been shown with practical success elsewhere.

Two classes of signals, the cautionary signals and the cautionary off-shore signal, are in use on the coasts of the United States. The "cautionary signal," *i. e.*, a red flag with black square in the center, by day, or a red light by night, calls for caution in view of an approaching storm, and is so "cautionary" with reference to winds blowing from any direction. The cautionary off-shore signal, *i. e.*, a white flag with black square in the center, shown above a red flag with black square in the center, by day, or a white light shown above a red light by night, is "cautionary," with reference to winds expected to blow from a northern or western direction, or off-shore, at or near the place at which it may be displayed. This latter signal is displayed at and on the regular place and staff, and consists of *a white flag with a square black center* shown above a *red flag with a square black center* by day, or *a white light* shown above a *red light* by night. This signal is known as the "cautionary off-shore signal," and indicates, when shown, that while the storm disturbance is considered at the office of the Chief Signal Officer as not yet passed for the port or place at which the signal is displayed, and the winds may yet be high, and three may be danger, the winds are expected to blow from a northern or western direction or "off-shore," at or near the port or place where the signal may be.

The display of this signal will often follow and must be distinguished from the display of the usual "cautionary signal," *i. e.*, a square red flag with a square black center by day or a red light shown at night—which retains, when shown alone, its usual meaning. The display of either is always cautionary.

It is of important utility in the management of vessels and for the safety of them to be thus preadvised as to the direction in which coming winds will blow.

The plan for subordinate stations at which cautionary signals might be displayed (systems of these stations being managed as subordinate to and in connection with the signal-stations of the first class, established at the principal cities and ports of the United States, and immediately controlled from this office) has been continued in operation since the date of the last annual report. As described in that report, these subordinate stations are known as "display-stations." They are located at the smaller lake or sea ports, and are classed several together in sections. Each section is numbered as "Section one," "Section two," &c., and is under the immediate supervision of a sergeant of the Signal Corps, located at a named station at some neighboring principal port. The duties at display-stations are limited to the display, upon the receipt of the telegraphic order by day or at night, of the cautionary signals or cautionary off-shore signals.

Display-stations have been established on Lakes Erie, Ontario, Huron, and as follows: *Section three*, established July 20, controlled from Detroit, Mich., consists of stations at Ludington, Pentwater, Traverse City, Frankfort, Northport, Saint Joseph, South Haven and Muskegon, Mich. *Section four*, established August 1, controlled from Detroit, Mich., consists of Bay City, East Tawas, Forester, Port Austin, Roger's City, and Monroe, Mich. *Section five*, established August 1, controlled from Cleveland, Ohio, consists of Dunkirk, N. Y., Fairport and Ashtabula, Ohio. *Section six*, established August 1, controlled from Oswego, N. Y., con-

sists of Cape Vincent, N. Y. Signals ordered for Chicago, Ill., were repeated at New Buffalo, Mich., until February 15, when it was discontinued as a display-station. Signals ordered for Rochester, N. Y., are repeated at Charlotte. Cautionary signals are displayed at Mackinac City, Mich., when ordered direct from this office. On the sea-coast as follows: *Section seven*, established August 20, controlled from Portland, Me., consists of Millbridge, Deer Island, Rockland, and Booth's Bay, Me., and Portsmouth, N. H. The display of signals at Millbridge and Deer Island, Me., was discontinued August 19, but resumed at Deer Island, April 1. Belfast, Me., was originally in this section, but was discontinued June 1. *Section eight*, established August 15, controlled from Boston, Mass., consists of Chatham, Newburyport, New Bedford, Marblehead, Hyannis, Thatcher's Island, Gloucester, Highland Light and Fall River, Mass. The display of signals was suspended at Fall River, Mass., May 12. Signals ordered for New London, Conn., have been repeated at Stonington, Conn., since October 10, and were repeated at Watch Hill, R. I., from October 15, until September 15, when the telegraph office at that place was closed for the season. Signals ordered for New York City have been repeated at City Island, New York Harbor, since February 11. Signals are ordered for Lewes, Del., direct from this office, and for Port Eads, La., through the sergeant at New Orleans, La. Signals ordered for Mobile, Ala., have been repeated at Pensacola, Fla., since November 10. Tybee Island, originally a station of the first class, was discontinued as such and designated a display-station, February 15; since that time signals ordered at Savannah, Ga., have been repeated at that point. Of signals displayed at display-stations, the records show seventy per cent. considered verified at the stations themselves.

Before the organization of the display system signals were displayed at *forty-six* ports only; they are now displayed, when need be, at *one hundred and eleven* ports.

The warnings of the service have been doubled in utility by the adoption of the off-shore signal and the organization of the system of display-stations.

An additional safeguard is offered on the Lake coasts, where either full signal stations or display-stations exist, by the fact that whenever it is found necessary to display a warning signal of any character upon any station on those coasts, notice and warning of the fact is announced by telegraph at every other station along the lakes.

There are no other coasts so fully guarded by the display of storm-signals as are now those of the United States.

A completeness of work, which a few years ago seemed not to be attainable on the part of the office for many years, is, by the experience gained in those duties within the few years past, already accomplished.

If the duties of this office are done and its warnings exhibited at its warning stations as they ought to be, the record of disasters cannot fail to show, by the lessened number of them, the good effects of this watchful care. It is a pleasant thought that the protecting vigilance of the United States is offered in this regard and in all matters pertaining to this duty, equally to the shipping of every foreign people with the shipping of its own.

Compilations of statistics have been made to determine definitely and to the satisfaction of the office, what certain benefits to shipping have followed the displays of cautionary signals. A series of tables of disasters to shipping, compiled for a number of years, have seemed to show that the annual average of disasters occurring at or near points at which cautionary signals have been displayed has been lessened by a consid-

erable percentage for the years during which the displays have been had. The discrimination made by insurance companies against insurance risks, taken for the sea and lake ports and places which have no signal station exhibits, by the increased pecuniary consideration demanded for such risks, amounting in the aggregate to a very considerable sum, an evidence of appreciation of the value of them. The reports of the observers at stations give instances in which numerous vessels have remained in different ports in recognition of the warnings given. In these cases danger has been avoided. In other cases the displays of signals on dangerous coasts have been followed by the making to sea for an offing of all of the vessels in sight of the display. In other instances reported, vessels going to sea in disregard to the warnings have been driven back, have suffered injury, or have been lost. So far as can be judged at this office, a proper attention is paid to its warnings, particularly on the part of the coasting or smaller classes of vessels on the sea-coast, and by shipping generally on the lakes. Especially does this happen at those times of the year recognized by seamen as the stormy seasons. A series of statistics, collected for five years past, give the following results:

During the year ending June 30, 1879, six hundred and seven storm warnings for Canadian stations were telegraphed from this office to Prof. G. T. Kingston, at Toronto, Canada. The uses made of these warnings, or their results when displayed, have not been communicated to this office.

The plan of exhibiting as widely as possible in the agricultural districts throughout the United States the results of the daily office studies in the form of printed forecasts for the benefit of the agricultural populations, frequently described in former reports, has been continued in operation. The effort to cover so wide an extent of territory has made the labor great. The continuance of the work has seemed to be warranted by the favor with which it has been received. It has been considered due to the farming populations that they should have an opportunity to profit by whatever information could be given them. With the active co-operation of the Post-Office Department, with which there is an arrangement for this purpose, six thousand and forty-two printed Farmers' Bulletins, on which have appeared daily the reports of this office, have been distributed and displayed in frames daily at as many different cities, villages, and hamlets in different States. There are numerous and especial requests to increase this number. At 1 o'clock a. m. of each day, except Sunday, the midnight report of the office for the ensuing day has been telegraphed during the year ending June 30, 1879, to seventeen centers of distribution, located in the following-named cities: Albany, N. Y., 267; Bangor, Me., 166; Boston, Mass., 659; Buffalo, N. Y., 282; Burlington, Iowa, 187; Chicago, Ill., 613; Cincinnati, Ohio, 546; Des Moines, Iowa, 66; Detroit, Mich., 334; Leavenworth, Kans., 33; Logansport, Ind., 184; Memphis, Tenn., 20; Nashville, Tenn., 97; New York, N. Y., 712; Pittsburgh, Pa., 314; Philadelphia, Pa., 822; Saint Louis, Mo., 368; Washington, D. C., 472. In addition thereto, a miscellaneous issue of five hundred copies is made at the several printing stations above mentioned. At nine of these stations the bulletins are printed by civilian employés upon the office presses, and under the immediate supervision of the sergeants in charge. At the other eight stations the work is wholly done by enlisted men of the Signal Service.

The numbers placed after the names of the cities denote the number of hamlets, post-offices, or railway stations supplied from each city as a center.

These centers have been carefully chosen as in the midst of the denser

agricultural populations of the United States, and at points whence the facilities of communication would enable the surrounding districts to be most rapidly supplied.

During the past year a station of distribution has been established at San Francisco, Cal., for the farmers of the vicinity and of the farmers of the Sacramento and San Joaquin Valleys, and one also at Des Moines, Iowa.

The telegraphic report of forecast telegraphed from the central office at 1 a. m. of each day, and received at a center of distribution, is at once there printed on bulletin forms provided for that purpose. These are enveloped as rapidly as printed, addressed to each designated post-office within the district to be supplied, and which can be reached by the swiftest conveyance by the hour of 2 p. m. of the date, and are then placed in charge of the Post-Office Department under an arrangement by which each postmaster receiving a bulletin has the order of the Postmaster-General to display it instantly in a frame furnished by this office for that purpose, and to report, in writing, the fact and time of its receipt and its display, to the Chief Signal-Officer.

The bulletins have reached the different offices and have been displayed in each of the frames at the average hour of 11 a. m., averaging thus ten hours from the time the report has left the office of the Chief Signal-Officer until it has appeared bulletined in the midst of the farming populations, and accessible to them in the distant parts of the country.

The information given on these bulletins has a value in addition to the forecasts. Facts relating to the climatology of the different sections are condensed into brief notes, which are published with the telegraphed reports. For instance, each bulletin announces for the geographical district in which it is displayed, and in addition to the forecast for the day, what winds in each month have been found most likely and what least likely to be followed by rain at the stations within each district. The simple foot-note has its effect in increasing the gains and reducing the losses of harvesting. (Paper —.) These bulletins will improve for the uses for which they are intended as the experience of the office permits the information they exhibit to be supplemented with further data and other rules. With each year the popular knowledge of the uses of the bulletin and some increased interest in and study of meteorology render the farming communities better able to judge of its correctness and to benefit by its contents. It is contemplated, as the work of the office progresses, to add to the bulletin such brief instructions as may be developed in regard to its uses in connection with such local instruments as may be had for local use. Reference has been made in preceding reports to the economy of this work. Careful estimates have shown that if the total cost for each bulletin station at which the bulletin is displayed at each different post-office, hamlet, village, or city were computed to be twenty-seven cents per day, the sum so resulting would meet all the expenses caused by the Signal Service. A little saving of any one crop of grain to any interest made on any one day in the vicinity of each station, supposing nothing to be saved on any other day of the year at or near that station, would more than counterbalance the expenditure.

This distribution of the instruments known as the Weather Case, or Farmers' Weather Indicator, has been continued. Brief rules for use accompany each instrument. (Paper 28.) This instrument will supplement with local signs and with the local indications of the several instruments; it combines in simple form the general indications given in the bulletin reports. It will, it is hoped, enable agriculturists and others to

determine for themselves in advance something as to the character of the coming weather from local indications alone, when added means of information cannot be reached or may fail.

Whenever appropriations at the control of the office shall make it possible to publish, to accompany the Farmers' Bulletin, or in the columns of newspaper journals, graphic weather charts, simply drawn and so explained as to be comprehended as to their meaning by persons of ordinary education without special study, the use, it is to be hoped, of instruments of this character will be found very available. The use of the Weather Case alone at isolated places, where other reports or information other than that had from the readings and the use of the instrument itself cannot be had, will, with little practice, fill a want long felt among the agricultural populations, and often afford to them valuable results. It cannot fail to turn thought and study in a useful direction.

It is in contemplation, when the amounts of the appropriations for the service and its strength permits, to place such instruments, should experience warrant, both at the farmers' post-offices now reached by the Farmers' Bulletin and at others not reached by either the bulletin, the daily press, or the telegraph, for the uses of the farming population.

Since the date of the last annual report, a greater and more satisfactory extension of the plans by which the information carried on the files of the office is disseminated among the people of the United States generally, has become possible. A railway bulletin service established on the lines of railway which cover the country so closely with their network, has been set on foot in co-operation with this office. By an arrangement made between the different railway companies and the War Department, the companies receive at the time of the midnight report, and by telegraph, a copy of the office report then made. This is the most important report of the day, the report exhibiting the Synopses and Indications, which appear so generally published in the columns of the newspaper journals. The report received by the railway companies is at once distributed, under the direct supervision of the superintendents of the companies and of the railway telegraphs, to designated railway stations along the several railway lines. Thirty-six railway companies, with a total of one thousand two hundred and twelve railway stations, are now co-operating in this service. The report received at a railway station is, by standing order of the railway officers, immediately there bulletined by the railway agents on forms provided by this office, and check reports are made by the agents to this office, in order that the attention of the superintendents may be called to any delay or error in the work. This work is yet in its infancy, but promises to be of great utility. It is capable of indefinite extension, and will exhibit the forecasts of this office daily, in a few hours after their issue, to the traveling public and the vast numbers of farmers and others resident in the great extent of country through which the railway lines pass, and who could not be otherwise reached.

The railway companies rendering this service to the United States, without charge, are not rendering a gratuitous service. A benefit is returned to them in the full knowledge given the managers of the railway lines of the weather conditions prevailing upon them. A further benefit comes to the companies that they render everywhere to the masses of the people, in the midst of which the lines pass, a daily service recognized with gratitude. The companies which have entered into this co-operation with the service are as follows:

Chicago and Northwestern Railroad, Albert Keep, president, W. H. Stennett, superintendent, Chicago, Ill., 79 stations; Kansas City, Fort

Scott and Gulf Railroad, H. H. Hunnewell, president, H. C. Sprague, superintendent telegraph, Kansas City, Mo., 20 stations; Atchison and Nebraska Railroad, N. Thayer, president, W. H. Forman, superintendent telegraph, Atchison, Kans., 18 stations; Atchison, Topeka and Santa Fé Railroad, 32 stations; Atchison, Topeka and Santa Fé Railroad (Kansas City branch), 5 stations; Atchison, Topeka and Santa Fé Railroad (Pleasant Hill branch), 3 stations; Atchison, Topeka and Santa Fé Railroad (Wichita branch), 1 station; Atchison, Topeka and Santa Fé Railroad (Trinidad branch), Thomas Nickerson, president, and George B. Lake, division superintendent, Topeka, Kans., 2 stations; Saint Louis, Iron Mountain and Southern Railroad, Thomas Allen, president, and A. W. Soper, general superintendent, Saint Louis, Mo., 16 stations; Saint Louis and Southeastern Railroad, J. H. Wilson, president, and O. M. Shepard, assistant general superintendent, Evansville, Ind., 23 stations; Pittsburgh, Cincinnati and Saint Louis Railroad, Thomas A. Scott, president, and O. H. Booth, superintendent, Mansfield, Ohio, 35 stations; Kansas City and Council Bluffs Railroad, N. Thayer, president, and J. McCouniff, superintendent telegraph, Saint Joseph, Mo., 11 stations; Baltimore and Ohio Railroad (trans-Ohio division), John W. Garrett, president, and C. H. Hudson, superintendent, Chicago, Ill., 19 stations; Kansas City, Lawrence and Southern Railroad (late Leavenworth, Lawrence and Galveston Railroad), H. H. Hunnewell, president, and H. C. Sprague, superintendent telegraph, Kansas City, Mo., 19 stations.

This office furnishes the blank bulletins (Paper 29), the frames for displaying them, and the necessary forms, envelopes, and stamps for making regular reports of the receipt and display of the bulletins.

The river reports, giving the average depth of water in the different great rivers of the interior, and notices of the dangerous rises for the benefit of the river commerce and the populations in the river valleys, have been regularly made, telegraphed, bulletined in frames, and also published by the press at the different river ports and cities. River stations have been opened, during the year, on the principal California rivers.

The manner in which these reports are prepared and used, and the mode by which a "danger line," with water below which there is considered to be no danger, while every rise above it is dangerous, have been sufficiently explained in preceding annual reports.

The uses of the information published in reference to this danger line had in connection with the daily reports of this office have, on the occurrence of river floods, enabled those interested to judge of the probable limits of the rises of the water to be expected at the different places on the river-banks, and of the dangers to be anticipated. This knowledge has made possible many and necessary precautions for safety.

The data had at this office from stations making river reports permit a foreknowledge of changes likely to happen, and make it possible to give useful warnings of coming floods, ice floods, or of sudden and great rises of the river water-levels. The daily reports are useful also at times of low water, the information they then give permitting river shipping to be moved with intelligent foreknowledge of the probable depths of water to be found in the river channels at different points upon the river's course. These reports are especially useful to those for whom they are intended, as having an official character.

In instances which have attracted the attention of this office, the notices of the probable heights floods anticipated or then passing would attain, have been followed by preparations made to guard the levees

against danger. A brief examination of the charts of changes of the river levels accompanying this and preceding reports, shows that the river rises to occur at the different localities can be judged of frequently as to the time at which they will occur, and their extent, by the conditions existing at points sometimes far distant. Accumulating data render studies of this kind valuable. In connection with these studies the examination of the daily weather-charts, showing places at which precipitation has occurred or is likely to occur, and the amount of such precipitation, had with the study of the charts of the river basins, which enable it to be determined what rivers will be affected by precipitation, are found to be of value in furnishing correct prognostications. This subject has been referred to in preceding reports.

The Chief Signal-Officer has before expressed the opinion that with proper study of the river floods, and with stations properly placed, reporting at times of especial danger, it can be made almost impossible for a flood to follow a river course without notice given in advance of its coming at the localities threatened. Daily bulletins of river reports have been regularly displayed during the year at the following-named stations: Augusta, Ga.; Cairo, Ill.; Chattanooga, Tenn. (from January 8, 1879); Cincinnati, Ohio; Davenport, Iowa; Dubuque, Iowa; Keokuk, Iowa; La Crosse, Wis.; Leavenworth, Kans.; Louisville, Ky.; Memphis, Tenn.; Morgantown, W. Va.; Nashville, Tenn.; New Orleans, La.; Omaha, Nebr.; Pittsburgh, Pa.; Portland, Oreg. (from March 17, 1879); Red Bluff, Cal. (from December 15, 1878, to March 15, 1879); Shreveport, La.; Saint Louis, Mo.; Saint Paul, Minn.; Umatilla, Oreg.; Vicksburgh, Miss., and Yankton, Dak.

Systematic reports of river observations, carefully made and closely studied, are had daily by telegraph and weekly by mail, on established forms, from the stations above named. Reports of similar observations, made daily, are also had from special river stations, named in the record of stations. The observers are, in fact, a river guard. For the months in which floods more frequently happen, and at any time in any case of special danger, the reports are telegraphed. For those months of the year in which danger is not anticipated from floods, these reports are forwarded by mail.

Charts of the changes in the principal western rivers for the year ending June 30, 1879, and upon which stations reporting to this office have been established, are given in charts 10 to 21.

It will be noted that by the study of such charts, continued from year to year, those seasons in which floods are more likely to occur on any water-course can be predetermined, and it can be ascertained what amounts of precipitation, occurring in the different river-basins, and under what circumstances, will be followed by floods, and, approximately, what will be the extent of floods shown in this way to be anticipated. Whenever the facilities of the Signal Service are so far extended as to permit systematic observations to be had of any river-course and telegraphic warnings to be given in instances of danger, the serious loss of property or life caused by floods can be, and with comparative little expense, guarded against on any river throughout the United States. The occasions occur on the separate streams at long intervals only. The levee systems of the Mississippi and other great rivers can be in no way better guarded themselves, and made in their turn safeguards to the immense agricultural interests they are intended to protect, than by systems of river reports, which will warn of danger in time, and summon, if need be, the strength of the State to watch and strengthen these State constructions.

The system of river reports is now extended to the rivers of California and Oregon, as well as to the principal rivers east of the Rocky Mountains.

The daily reports of the surface and bottom water-temperatures at designated points upon the lakes and seacoasts have been continued throughout the year as in preceding years. These reports are furnished at the request of Prof. Spencer F. Baird, United States Commissioner of Fish and Fisheries, the object had in view being to determine the proper waters in which to place the different varieties of food-fishes. It is necessary for this purpose to ascertain the extremes and means for the year of the water temperatures in the different localities. This series of reports has now continued for six years. Statistics of this kind —the depth of the water in the different streams being, as it is, daily noted—form the basis of a systematic study of pisciculture, in which are considered, by students attached to the commission, both the amount of the water supplies in different channels or basins at the different seasons of the year, and the temperatures to be expected in each. There is no more ready way for furnishing cheap food for the people than by the culture of food-fishes, and every facility for the work within the control of this office is gladly furnished to this end. It is quite possible that the great fisheries on or near the Atlantic coasts, or on the fishing banks, could be materially aided by the pre-announcement of the barometric or other atmospheric changes approaching, were the office informed of the precise nature of the reports to be desired. It is anticipated that under the laws providing for the seacoast service of the Signal Service, it will, in the near future, be possible to furnish officially series of reports suitable for this purpose from observations taken at points on and near the coast at stations contemplated in existing laws.

The series of reports, being the announcement from day to day of such approaching changes of temperature as would be likely to cause the closing of canals by freezing, or, as in other cases, would open them, were continued during the days of closing canal navigation of the fall and winter of the past year. This series of reports has now been continued for seven years. The commerce moving upon the canals of the United States, as the closing of the canals draws near, is sometimes of greater value than at any other portion of the season. These water-routes are then thronged with hundreds of laden barges, each of which must move with reference to the danger of the closing of the routes by freezing. The market rates at the great cities are influenced by the probabilities that the merchandise or grain thus afloat will reach or fail to reach the points for which it is intended. These reports are received with satisfaction by the canal companies, and by the commercial associations of cities. They constitute, for the months of November, December, and January, one of the regular issues of the office.

The exhibition of symbol maps, on which the meteoric conditions are shown by symbols, changing for each report, at the rooms of boards of trade, chambers of commerce, and of commercial associations in the principal cities, and at places of public resort, for the benefit of shipping and other interests; the display of bulletins, the distribution of weather maps, and the employment of other methods for rapidly diffusing, for public use, the information had at this office, have been continued for the year ending June 30, 1879. The purpose had in view by this regular distribution has been to induce an effort on the part of those examining the different charts and papers to foretell to some extent the changing weather for themselves. The official reports of the office relate to districts, at special localities in which districts the local indications may

point to modified conditions. These local studies are useful also in many ways which space here would fail to describe. The expectation of the office has been well realized in this regard, and in many places there are among the citizens and business men careful students of the data daily symbolized, who use their own judgment to determine to what extent the conditions announced for the district will prevail at the places in which they may be, or consider approaching changes foreshadowed by the symbols upon the chart, but which are yet too remote to be announced as indicated. Investigations of this character ought to be encouraged.

The instruments prepared for local use (the weather case), and before referred to, will greatly aid such studies.

For a number of years past the attention of the office has been given to the subject of the preparation of a weather chart of such character as to appear printed in the newspaper journals throughout the United States. Charts of this character have been much sought for as aiding such studies as those just described above. The popular demand has been pressing. The office has fully appreciated the propriety of the demand and the value of the results to be had from the study of such charts could they be made to appear simultaneously in the different cities.

The work has been surrounded with unusual difficulties. The preparation of newspaper weather charts is not difficult, and such charts have long since appeared in some of the prominent European cities. The journals in which these charts have appeared have been located, however, in the city in which was the office at which the meteorological charts had been prepared. It was not of record that a weather chart, prepared at any central office in Europe or the United States, had been so arranged for that it could be telegraphed in such form as to appear in the lines of its charting simultaneously in the journals of different cities, each city widely separated from the others, and this telegraphing and printing so rapidly done that the map might accompany the printing at any city of the data for the day, from the study of which data the map itself had been charted at the central office in some other city. The duties of this office are of such a nature that all of the chart-telegraphing must be based upon plans which will enable all of the conditions thus stated to be filled. An attempt to transmit journal charts of this description to answer such a purpose was made at the time of the Centennial Exhibition of the United States, when a daily weather chart to accompany the daily weather report issued daily at that Exhibition was telegraphed each morning from the office of the Chief Signal-Officer at Washington to the station of the Signal-Service exhibit in the Government Building at the Exhibition at Philadelphia, and appeared each day as the official weather-chart issued in separate copies at the Exhibition and also in the columns of a daily journal there printed for daily issue.

These charts were transmitted by process of autographic telegraphy which could not be effective at great distances. They required special instruments. Within the year past the studies and experiments conducted at this office and having relation to this subject have resulted in such plans that it is now found not difficult to transmit to any city which can be reached by telegraph, and without the use of special telegraphic instruments, such data as will permit the charts prepared in the office to be exhibited in any city or cities to which the data are sent, in chartings precisely similar, of any size, and to appear printed in the columns

of the daily journals at the same time that the forecasts had at this office, from the study of the original chart, appear printed in the same journal.

The difficulty no longer exists as to the telegraphic transmission of the chart. On May 9, 1879, the issue, daily, of a chart so transmitted by telegraph, from Washington, was commenced in the Daily Graphic, a journal printed in New York, and this issue has been continued daily. The processes are not yet considered perfect. It is hoped to obtain more satisfactory results.

It is not necessary to dilate here upon the advantages to result from the power of transmitting to any number of places and to any distance at which telegraphing is possible, with the rapidity of a telegraphic dispatch, copies of the charting of the weather conditions over any extent of the earth's surface, the copies exactly similar and made at any central office at which the proper data have been concentrated. In this connection the Chief Signal-Officer makes special acknowledgment of the services of Lieut. H. H. C. Dunwoody, acting signal-officer and assistant, whose continued experiments have contributed much to the success attained.

The forms of the bulletins heretofore referred to as those published daily for the use of farmers, of the special bulletins issued for the use of seamen, for the river reports, for the canal reports, for railway bulletins, and for the varied interests which the information borne upon the bulletins is intended to benefit, change gradually with increasing knowledge and facilities. Each form has its object. The number of bulletins issued for each station is closely scrutinized and is reduced to the smallest number which can be wisely used.

The publication of the Monthly Weather Review and of the Weekly Weather Chronicle has been continued during the year. The monthly issues of the Review are given in the appendix. (Papers 30 to 41.)

The scope of the Monthly Review has become co-extensive with the number of reports received both by telegraph and mail, all of which are valuable for reference, and a study of which enters necessarily into the study for the preparation of each review. The collection of material for this paper permits also the study of especial storms, descriptions of or facts relating to which are given in the local journals of the region over which they pass, or in the shipping news communicated by vessels encountering them at sea. The charts which accompany each issue of the Review exhibit the uses made of meteorological data. Each of these charts is to some extent the reduction of data first chronicled on two hundred and forty separate study-charts for the month. It will be readily understood how much this monthly reduction simplifies the work of generalization for the year. The Review exemplifies also, to some extent, the consideration of the great mass of data before mentioned as entering upon the files at this office. Each issue of the Review contains, under the head of "Notes and Extracts," a brief summary of current meteorological intelligence, compiled from the publications received at this office, and by which the marked advances in meteorological science are readily brought to the notice of the numerous correspondents co-operating with the service. The section added in 1877, under the heading of "International Meteorology," has been greatly increased in extent and importance during the year just past. Additional charts, embracing the northern hemisphere, now accompany the Review and will be found referred to and described in the text of the Reviews under this heading. The wide circulation given this Review meets, in part, the popular wish expressed, here and in foreign countries, for generalization prepared at this office, while the receipt of a copy of the Review

by each one of the hundreds of the voluntary observers, now its correspondents, at points extending in their range around the earth, is accepted by them as at once a sufficient acknowledgement of, and compensation for, the labor of making their daily reports. It is an advantage of the chart issues of the Review that they are continued from month to month, and thus enable the meteoric conditions existing upon the earth's surface to be studied continuously and in a regular sequence.

The preparation of the matter for the publication of the "Synopses, Indications, and Facts," commenced in 1872, has been continued.

Thirty-three volumes of the bound Daily Bulletins, with accompanying charts, had been issued up to June 30, 1879, and other volumes are expected to follow as rapidly as they can be obtained from the printer.

These volumes, issued in sequence, one for each month, contain the records of all the tri-daily telegraphic reports received at the office from the dates at which such records commenced; the tri-daily charts, upon the study of which each report was on that day issued, together with a statement of the "facts" or meteoric conditions which subsequent reports have shown as actually existing during the time and in the district for which each forecast was made. It will be readily noticed that the maps in these volumes, at once condensing and checking the bulletins printed thereon, afford a meteorological record as compact as ought to be desired for especial researches, or for generalizations to be based upon continued series of meteorological observations. The volumes themselves are useful for purposes of exchange, and bring to the office publications sent in return exchange, fully equaling their value. They constitute a meteoric record more full, perhaps, than any other now issued.

It was estimated in the last annual report that by the publications of this office, which have been above referred to—by the cautionary signals displayed by day or at night on coasts or at ports in times of probable danger; by the announcement of probable changes of weather in the Synopses and Indications furnished thrice daily to the press; the Farmers' Bulletin exhibited at so many villages and hamlets in the interior; the river and canal reports made with reference to river and canal interests; the bulletins and data exhibited at all the great cities and ports; the symbol-maps displayed in boards of trade rooms, and rooms of chambers of commerce; the Weekly Chronicle and Monthly Weather Review furnished to agricultural societies, commercial associations, and correspondents of the office; the daily weather maps; the monthly charts; and, finally, the charts condensing the results of years of observation—the information emanating from this office was received in some form daily at not less than one-third of all the households of the United States.

To this wide diffusion there has been added since the date of that report, the increased circulation had by the twelve hundred railway-bulletin stations heretofore referred to.

As hitherto related in this report, while treating of the subject of international meteorology, the work of the office reaches later, by its publications, nearly every prominent establishment in the world. It is considered that it contributes to the world's work published material valuable now, to be more so in the future, and sufficient of itself to compensate for the whole cost of this service from its commencement.

The different reports of the office, of which mention has thus been made, continue to be favorably received in the communities for which they have been furnished. Their uses are acknowledged by commercial associations and other official bodies.

The regular daily publication of the reports of forecasts by the press, now continued for nine years without cost to the United States, is considered as an evidence of their usefulness and of the favor with which they are received by the communities for which they are intended.

The office continues to be in correspondence, in reference to its duties, with committees appointed for the purpose by the boards of trade and chambers of commerce of the principal cities in the Union, and also with a large number of agricultural societies.

Permanent committees, appointed by boards of trade, chambers of commerce, &c., have been in co-operation with this office since 1877. These committees inspect, in compliance with the request of the Chief Signal-Officer, the local offices of the service at the places in which the committees may be appointed, and report monthly to this office upon the condition and utility of the service in their vicinities. The boards in this way at once co-operate with this office and share the responsibility for its success.

The resolution upon which these committees were established, as adopted by a number of the prominent associations of the United States, is as follows:

Resolved, That the meteorological committee of the board of trade (or chamber of commerce) shall be a permanent committee, and that the names of the members, and any changes in membership, be, in each case, formally notified to the Chief Signal-Officer of the Army. The committee will confer with the Chief Signal-Officer and will bring before the board (or chamber) all matters requiring its action, as relating to, or needed for, the improvement of the Signal Service.

The organizations which have adopted this resolution are enumerated in Paper 42. There are rules for the government of these committees, together with the form of reports they are desired to furnish monthly.

The appointment of these committees affords at once a board of reference, to which questions of local interest may be referred for their views, and provides an authorized source from which this office may learn of its successes or failures, and be thus enabled to direct its efforts in the several localities. It furnishes also a local supervision by parties interested themselves through their personal interests in the successful discharge of the duties of the service, and who will strive, for this reason, to best advise how that success may be attained.

The services of these committees have been found to render important aid to the work of the office. The supervision had by them is very necessary, and has had a good effect. Their duties involve a responsibility which has been appreciated by the members of the committee.

A list of disasters upon the lakes, comprising those only which have resulted from stress of weather, during the year ending June 30, 1879, compiled by Sergeant William Finn, Signal Corps, U. S. A., in charge of the Milwaukee station, is given in Paper 43.

Sergeant H. J. Penrod, Signal Corps, U. S. A., furnishes a report upon the Waterborough, S. C., tornado, of February 16 and 20, 1879. (Paper 44.)

Paper 45 contains the names of places from which requests have been received for the establishment of signal stations, but at which stations had not been established June 30, 1879.

On the occasion of the transit of Mercury, May 6, 1878, a series of observations were made at the stations, and by observers and officers, of the Signal Service. The results were published, in tabular form, in the Monthly Weather Review of the office for May, 1878. A copy accompanies this report. (Paper 46.)

In the instrument room of the office one thousand one hundred and five meteorological instruments have been carefully compared with the official standards during the year ending June 30, 1879, and nine hundred and eighty-two have been issued during the same period. Experiments with different forms of self-registering apparatus have been continued systematically with the view of securing forms adapted to general use on station.

As in preceding years, attention has been especially directed to perfecting instruments to record, by electricity, at a distance; for instance, a meteorological instrument being located at the city of New York, to be so fitted with apparatus and electric wires attached that the action of the instrument at New York may be automatically registered on paper in Washington.

The regular weather reports have been received during the year over the wires of the Western Union, Northwestern and International Ocean Telegraph Companies. Seven hundred and twenty-four thousand five hundred and twenty-five cipher words of weather reports have been received at, and thirty-six thousand five hundred sent from this office during the year ending June 30, 1879. Seventeen thousand and ninety-eight telegraphic messages (exclusive of those sent and received by the sea-coast line), other than weather reports, were received, and nine thousand eight hundred and eighty sent in the same period. There were also received, during the same period, seven thousand four hundred and eighty-eight cipher words of special river reports.

The plans of working forms of telegraphic circuits, and the rapidity of telegraphic work by them assured to the service have been sufficiently referred to in preceding reports. They have given satisfactory results throughout the year past.

The average time elapsing from the time at which the readings of the instruments have been had at the two hundred and ninety separate stations scattered throughout the United States and Territories, to that at which the reports based on these readings have been telegraphed to the press and to the distributing stations, has been one hour and forty minutes.

It has been mentioned in preceding reports, but it is proper to again call attention to the fact, as one of the consequences resulting from the organization of this office, that, by the use of ciphers, improved with the experience of years, the facility with which constant practice has rendered practicable the telegraphic work necessary for the reports, and the understandings arrived at with telegraphic companies, the annual cost of the telegraphic communications of the office has been reduced by many thousand dollars. As an actual annual saving, this must be considered as a saving to the Treasury of the United States of an equal number of thousands of dollars. In the early days of the duty the telegraphic companies overestimated the labor required for the service, and the difficulties to be encountered by them in discharging it with the regularity and the vigor demanded. With the long experience of years the difficulties of this nature have vanished.

With the plans now for nine years tested on this continent there has been found no difficulty in collecting with sufficient rapidity meteorological data had over the widest extent of this continent's surface, and reaching from the Atlantic to the Pacific Ocean.

The application of similar plans for the telegraphic collection of data for any similar purpose whenever undertaken by any government or combination of governments upon the distant continents, as those of Europe, Asia, or Africa, cannot fail to be attended with similar results.

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WAR DEPARTMENT,

SIGNAL SERVICE, U. S. ARMY.

MAP SHOWING UNITED STATES MILITARY TELEGRAPH LINES, CONSTRUCTED AND OPERATED, UNDER DIRECTION OF THE CHIEF SIGNAL OFFICER, U. S. ARMY. JUNE 30, 1879.

The relations of the office with the telegraphic companies are now cordial everywhere. It has come to be recognized that when this office insists upon work at very economical rates, and sometimes upon unusual telegraphic facilities, it is compelled to do so by the plainest dictates of duty.

The duties of this office, as charged with the supervision of the telegraphic duties of the War Department, and especially responsible, when need be, for the prompt transmission and proper care of the messages of the President and Secretary of War, and other superior authorities, together with the recognized position of the Chief Signal-Officer, as the agent of the Secretary of War, in the control and management of the interior lines now constructed and worked upon the frontier, and connecting as well military posts and stations as the villages and hamlets of the advancing frontier populations, devolve upon the office many cares and the settlement of many and novel questions involving the relations of the United States and the different telegraph companies. In all these matters, the assistance and advice formerly given the office by the distinguished lawyers, then acting as special assistants to the Attorney-General, the Hon. William Whiting, at one time Solicitor of the War Department, and the Hon. Reverdy Johnson, formerly Attorney-General of the United States, both then acting as special assistants to the Attorney-General, have proven of the greatest advantage.

Few questions have arisen, or are likely to arise, which will fail to find their settlement in the lucid opinions and wise instructions prepared by these gentlemen.

With the increasing population of the country, the unusual progress of civilization in the interior west of the Mississippi, the multiplicity of the public business, and the habitually greater use of telegraphy in public affairs, render it more important that the dispatches of the superior civil and military authorities should certainly reach the persons to whom they are addressed, and be securely protected from inspection by improper persons. The gravest affairs may be complicated by the delay or the improper revelation of official telegraphic dispatches. The care of the office is always given to this protection when informed that it is desired.

The relations of the office with the different telegraphic companies enables it to secure, in time of need, a rapidity and a certainty of transmission of particular dispatches, which may especially need such action, perhaps not to be had by any other agency. The experience already had in the management of frontier lines, under the novel circumstances in which those existing upon the frontier have been placed, has afforded such suggestions as to plans of working them as to warrant the belief that, as facilities permit, they will compare favorably in the rapidity of their work with those existing wholly within the limits of civilized and settled regions.

The increasing use of the United States lines for commercial purposes, as they extend into the interior and upon the frontiers, into regions the development of which they greatly advance, place upon the wires many important messages entitled, as is matter passing through the mails of the United States, to official protection.

The sea-coast service of the Signal Service, in connection with the Life-Saving Service, has been referred to and described in preceding reports. The total length of the sea-coast lines constructed by this office is now six hundred and ten miles. There is left for this report little more than rehearsal. The coast lines are connected with this office by leased wires from Cape May, Lewes, and Norfolk. The tele-

graphic lines, reaching from Sandy Hook to Cape May, from Cape Henlopen to Chincoteague, and from Norfolk by the way of Cape Hatteras to Wilmington and the mouth of Cape Fear River, on the most frequented and in some places the most dangerous coasts of the United States, have been continued in operation. The stations upon these lines are occupied and the telegraphic lines are operated by enlisted men of the Signal Corps. (Map 22.)

The act of Congress requiring this service contemplates the establishment of signal stations at life-saving stations and light-houses at points along the coast in such manner that the coast and sea in their vicinity may be at once kept under observation, warning of approaching storms be given to vessels within signal distance, and information of disasters and other incidents occurring be rapidly conveyed to the chain of life-saving stations, to light-houses, ports from which aid may come in case of need, and to this office.

These lines and stations are on the sea-coast itself, and in positions whence they command a view of the sea, and where they can have knowledge of disasters to occur from shipwreck. The reports of the weather conditions and of the state of the sea had by them, and not attainable in any other way, are necessary. Vessels passing in view can be at once warned by signals of coming danger, or be communicated with by signals, and can be aided if in distress. The telegraphic wires connect each station with the War Department.

It is an advantage of telegraphic lines thus managed and worked by the force of the Signal Corps, that the breaking of the wires at inlets or in violent gales need not break the communication along the coast. In cases occurring during past years, messages have been transmitted for weeks together over extensive breaks of wire lines reaching past inlets by means of the usual day and night signals with flags and torches. Similar methods may be used in the instances of broken lines in the interior.

The enlisted men at these stations are taught to take and report meteorological observations, and, as signal men, are practiced in both the Army and Navy codes, in the usual semaphores, and in codes of permanent flag signals, to enable them to communicate with vessels of any nationality. The service has proven its usefulness in the cases of disasters to shipping and for the meteorological purposes for which it was established. It has been firmly established by its utility.

The sea-coast service stations in operation are located at Sandy Hook, Barnegat, Atlantic City, and Cape May, N. J.; Norfolk, Cape Henry, and Station No. 3, Va.; Kittyhawk, Cape Hatteras, Portsmouth, Cape Lookout, Fort Macon, New River, Sloop Point, Wilmington, and Smithville, N. C.

The constant changes occurring in the width of the numerous inlets, across which the line upon the coast is carried by cables between Cape Hatteras and Wilmington, the character of the outer beach, the only land upon which the lines could be placed, the destruction of portions of the lines and changes in the coast itself, caused by storms, have made the maintenance and operation of the line south of Cape Henry a work of difficulty.

It is not necessary to explain at length the importance of a service of this character on our sea-coasts. The reasons for its maintenance and the benefits to be expected from it are manifest. The commerce which approaches a coast on which a thorough sea-coast service exists, is spared disasters, in comparison with the cost of which the cost of the service is little.

The watch kept by the service and the prompt transmission of a few messages have, in time of danger, saved life and property.

It has been a source of complaint among the seafaring men on all those coasts on which storm-signals have been attempted to be displayed, that, while it might be learned by vessels lying in port and from the display of such signals, with reasonable certainty, whether or not a storm was so impending as to render it unsafe to risk exposure at sea, there was no plan of storm-signals devised or devisable by which it could be communicated to vessels themselves actually at sea, and in sight of the stations, beyond the mere fact that a storm was threatening, and from what direction it was to be expected. It was not possible to advise on what coasts it would be dangerous; whether or not any particular voyage might be continued in safety, or when and where shelter ought to be sought. The fortunate connection had by this office by means of telegraphic lines with all of its sea-coast stations has lessened these difficulties.

On February 4, 1878, an order was issued by which are announced the stations of the service prepared to hold communication by the international code of flag-signals with vessels of any nation at sea coming within the proper signal distance. It is so arranged that any question as to weather changes anticipated so signaled from the vessel to the shore station is immediately transmitted by telegraph to the central office, whence prompt reply is ordered.

This reply, on reaching the coast stations, is signaled by flags, if need be, to the inquiring vessel. It is possible thus to gain any needed information without landing a boat. It does not appear how a system of storm-warning or coast-signaling can be given a greater scope than is arrived at by this process. The instance may be imagined, for illustration, of a vessel sailing from New York for a southern port and making inquiries off the Capes of the Delaware whether it will be safe to pass Cape Hatteras, and advised from this office in reply to the inquiry transmitted to this office that a storm at the time is moving near Hatteras and to take shelter at the Delaware Breakwater until the disturbance shall have passed northward. In the occurrences of each year there have been instances in which steamers moving along the coast have conducted their voyages from port to port upon the answers to special inquiries addressed from the ports in which they might be to the office. There have been instances in which such special inquiries have been signaled from the vessel to the station telegraphed thence to the office and the telegraphic answer signaled again to the vessel. With proper appliances such plans of communication might be established along the extent of the coasts of the United States.

In the last annual report several disasters were described as occurring upon the Atlantic coast, and the action of those of the Signal Corps, occupying the stations upon the coast, was related at some length to illustrate by the different incidents the character of the especial service it was expected to render. Since the date of that report several severe storms have swept the same coasts. It is since that report, that the systems of display-stations established by this office has rendered it possible to exhibit warning signals at almost every navigable inlet. There have been no disasters of magnitude to record. The hope may be indulged that this decrease in the number of disasters has been in part due to the more extensive display of warning-signals referred to, and in part to the greater attention paid by shippers and seafaring men to the warnings.

A single illustration is given as exhibiting the duties of the service at sea-coast stations, more pleasant than those connected with disasters.

Among the signals to be displayed at these stations on occasions of need, is one of—"You are standing into danger," to be shown when vessels not sailing in safe courses are seen near the land. In the month of September the steamer Hampton, commanded by Captain Stark, was running down the coast, not in danger or likely to be, as the route was perfectly known to the commander. The steamer had, however, as seen from the shore, the appearance of running into danger on account of the nearness with which she approached the land. The captain, who well understood the signal duties at coast stations, was explaining them at some length to other officers who were with him, when, as they discovered a station on shore, they saw several flags rise fluttering above it.

With a telescope and the danger or distress signal circular, furnished at the different ports to vessels taking their clearances, the flags were quickly translated, "You are standing into danger."

The interrupted narrative of the captain receiving thus a prompt and satisfactory illustration, the steamer saluted the station, and recognizing the signal stood out to sea that she might not cause further and unnecessary anxiety to those on duty on shore.

There has been added to the sea-coast line during the year, as an auxiliary, a telephonic line, extending from life-saving station No. 12, where the signal station at Kittyhawk is located, to the signal station at Cape Henry, and connecting the intermediate life-saving stations, a distance of about sixty-two miles. The life-saving crews at the stations on the line soon acquired, under the instruction of a sergeant of the Signal Corps, a familiarity with the use of the telephone instrument that rendered communication comparatively easy between any of the stations on the sixty-two miles of wire. This communication has at times been very serviceable. When the bark Admiral was wrecked near Repair Station and life-saving station No. 5, March 3, 1879, a private of the Corps established a telephonic station opposite the wreck, and by this means warned the adjacent life-saving crews of the disaster. It has proved of value on other occasions. The line is in immediate charge of a sergeant of the Signal Corps, and is inspected by him monthly. It is examined also by the repairmen of the Signal Corps, who regularly patrol the shore in their care for the permanent line.

The cables at the following-named inlets have been lengthed during the year: At New Inlet, one hundred yards; at Ocracoke, two hundred and twenty yards; at Old Topsail Inlet, fifty yards; at Barnegat, ninety-eight yards. A new cable, three hundred feet in length, was laid across the Cape Fear River, at Wilmington.

The total number of messages received over the sea-coast line during the year ending June 30, 1879, was eight thousand two hundred and ninety-six; the total number sent in same period nine thousand five hundred and fifty-three, or a total of seventeen thousand eight hundred and forty-nine messages received and sent; which would have cost, at regular tariff rates, eleven thousand five hundred and forty-six dollars and ten cents.

The Chief Signal Officer urges, as in preceding years, the maintenance, proper equipment, extension, and rapid working of the sea coast lines and the sea-coast service. The temper of the nation can well be judged from the experience had in the instances of the Huron and Metropolis disasters. There is no thought on the part of the people of any parsimonious economy nor tolerance of delay in the impatience with which they demand, on occasions of disasters, that succor shall be given to

any imperiled life on the instant without consideration of cost. There is no question of the general joy with which every report of successful effort in this direction is received. There is no time for slow-paced messengers when disasters are announced.

Whatever the difficulties of maintaining these lines practically on the sea-coast itself, and where the beaches and lines upon them are sometimes swept away together by the surge, the lines must be maintained. The saving of a single ship or of a single life compensates the cost of repairs. The fields of usefulness are so wide that it would be criminal to turn from them.

If wooden lines fail, as they may on the coast, there is every reason to believe the iron lines will not. Orders are now issued to substitute as rapidly as possible iron for wooden supports. One hundred and fifty miles of "iron line" are now standing on the coasts. The records of the coming year will show whether the results expected from these lines are overestimated. The time is not far distant when the possession of a coast not covered by sea-coast telegraph, not guarded by a sea-coast storm-signal and signal service, and not supplied with the force and means of aid at life-saving stations, will be held as much an evidence of semi-barbarism as is now among civilized nations the holding of any national coast without a system of light house lights.

The description of the sea-coast service has been made minute in this and in preceding reports because it is desired to show that a force of trained soldiers doing a land duty on shore, displaying signals hoisted on land though answered from ships; watching, as sentinels, each his special "beat" of sea and shore; telegraphing messages by electric wires to summon aid, or telegraphing them by the same flag and torch signals they use in war when the lines are gone; erecting and keeping up their own wire lines of telegraph; displaying storm warnings by day or at night; making the regular meteorological observations, that the warnings may be ordered—in effect, a regular sentinel force to warn and to aid in any danger, all in strict military subordination to each other by their grades, and all to the central office, are a force of soldiers as usefully employed for purpose of peace, and as ready by training for war, as a force can be kept.

There is devolved upon this office by law the duty of providing all signals to be officially displayed as coast signals, or recognized as such on the coasts of the United States.

To carry into effect the provisions of this law, there was issued from this office in January, 1878, a partial code of danger or distress signals to be used and recognized anywhere on the coasts of the United States, where there may be sea-coast stations of the Signal Service, and by official co-operation of the Life-Saving Service, to be organized also at any life-saving station. Copies of this code are furnished gratuitously to every vessel, of whatever nationality, taking clearance at any of our principal ports, and to coasting as well as other vessels upon application to this office. It is the aim to permit no ship within the protection of the United States, within its ports or upon its coasts, to be in case of danger or distress without the means of communicating with the land or with the parties whose duty it may be to aid in the rescue. A further simple code of night signals is in preparation.

In pursuance of the acts of Congress authorizing the construction and operation of telegraphic lines in the interior and upon the frontier, for connecting military posts and stations, and for the protection of the population from Indian and other depredations, officers and enlisted men of the Signal Corps have been continued upon these duties. The

lines in Arizona, New Mexico, and upon the Texan frontier, hitherto provided for, are completed. The lines in the Northwest, for which provision is made, are pushed rapidly forward. The work of construction has been in large part done by working parties furnished by the active co-operation of department commanders. A total length of three thousand nine hundred and twenty-four miles of frontier line is now operated and maintained in the care of officers and enlisted men of the Signal Corps. (Map 22.)

The uses of the frontier telegraph lines passing through the Indian country, as employed in military operations against war parties of Indians in motion, as well as their uses in advancing the progress of civilization by the safety and sense of protection they give to settlers near the scattered hamlets or military posts, have been before referred to. A telegraph line well worked forms one of the most efficient of barriers against the raids of Indian war parties. The country on the frontier through which such lines pass has but few points at which water can be had. The posts occupied by the Army are scattered along the line at intervals of several hundreds of miles. The object in view, with Indian war parties, is to pass between the posts and settlements without disturbing any of them; and they very much dread to leave any danger in their rear, or to so alarm the country as to cause their retreat to be cut off in their return toward the region occupied by their tribe. The existence of the telegraph line enhances both these dangers. It is useless to break it as the parties pass toward the scene of their incursion, for this alarms both the posts of the settlements on both sides of the break, and brings repairmen and guards at once to the point of the break and upon their trail; nor does it stop communication between the posts, for messages may be sent circuitously by other wires perhaps covering hundreds of miles of distance around the point at which the line has been disabled. If the wire is not broken when the trail passes the line, the troops can of course be very readily called upon whenever or wherever the parties may be discovered. But even if the line is passed safely and the trail is not detected, the danger the electric wires cause is not ended.

Wherever the party may strike, if the blow falls near any settlement or station connected with the telegraphic network, the alarm becomes in a few hours general. The troops on the line they have just passed know there is a war-party in the field; other troops and other settlements can be aroused. The line of the Indian retreat, the points they must pass to reach water, are approximately known, and while the pursuit goes on in the field other forces can occupy the passes and points in advance of the flying tribe. There can be no constructions more important for holding a frontier or protecting the first steps of advancing civilization than the telegraph lines. In instances occurring in Texas, New Mexico, and Arizona the movement of troops and of material, directed by telegraph, upon alarm sent by telegraph from settlements upon the frontier system of lines, has been so timely as to have attained results which could not, without the rapid action made possible by the lines, have been hoped for. How much of life and property have been saved from attacks thus guarded against, which might else have been made on defenseless communities, can be conjectured only.

From each of the stations on the telegraph lines thus in charge of the Signal Corps, a daily meteorological report is had and used, the whole forming a valuable portion of the office data each day discussed. The lines thus doubly useful are economically and successfully conducted. The saving in the cost of reports and the sums received for commercial messages make the lines in part self-supporting.

The existence of the lines in the interior of Texas has long permitted warnings to be exhibited on the coast of that State where they were before impracticable. The lines in the Northwest will permit a series of reports not otherwise attainable, the study of which is of the first importance to a proper care for the commerce of the lakes and to other great interests east of the Mississippi.

Appropriations made by Congress have permitted work to be continued, and to be pressed with rapidity upon telegraphic lines extending westward in the vicinity of and covering the northwestern frontier. These lines mentioned as necessary in preceding reports of the Chief Signal-Officer are already so progressed that there is reasonable anticipation that telegraphic connection will be established with lines extending eastward from the Pacific coast within the coming year. The lines provided by this legislation are of the first importance for the protection and development of this frontier and of the regions through which the lines pass. There is no region in which the proportional increase of values, or the number of enterprises undertaken, have been greater during the year closing with the date of this report. .

Fewer difficulties than were anticipated have been encountered in the construction. It would be difficult, after the experience of the service in line constructions in Western Texas, parts of New Mexico, and Southern Arizona, to encounter any which would be held to render such constructions impracticable. The adoption of iron supports makes it possible to carry a line over any ground on which the supports can be made to stand.

The force of the Signal Service will not enable it to successfully occupy the lines already contemplated in existing legislation without additional details.

Arizona division.—First Lieut. C. A. Booth, acting signal-officer, has remained in immediate charge of the lines in this division, pursuant to Special Orders No. 46, A. G. O., February 28, 1878, and instructions from the Chief Signal-Officer. The total length of line now in operation in this division is nine hundred and thirty-four miles. There are seventeen stations, from twelve of which full meteorological reports are received, by telegraph. The lines have undergone general repairs twice during the year. The total receipts of the line during the year ending June 30, 1879, were twenty-five thousand seventy dollars and seventy-four cents, of which amount thirteen thousand three hundred and eighty-five dollars and three cents were receipts for this line, and eleven thousand six hundred and eighty-five dollars and seventy-one cents were received to be paid to other lines. The amount of official business not charged for the same period was, estimated at regular rates, nine thousand two hundred and forty-six dollar and fifty-four cents.

The following stations were in operation June 30, 1879: Campo, Cal.; Yuma, Ariz.; Burkes, Ariz.; Florence, Ariz.; Tucson, Ariz.; Fort Lowell, Ariz.; Tres Alemas, Ariz.; Fort Bowie, Ariz.; Fort Grant, Ariz.; Fort Thomas, Ariz.; Fort Apache, Ariz.; Phœnix, Ariz.; Wickenburg, Ariz.; Fort Verde, Ariz.; Prescott, Ariz.; San Diego, Cal.

No additional stations have been opened during the year. The lines in Arizona are maintained through a difficult country. The work of substituting iron for wooden supports has been commenced upon the lines in this division.

The following-named stations were inspected during the year: Campo, Cal., during August; Yuma, Ariz., September; Burkes, Ariz., September; Florence, Ariz., September; Tucson, Ariz., September; Fort Lowell, Ariz., September; Tres Alames, Ariz., September; Fort Bowie,

Ariz., September; Fort Grant, Ariz., September; Fort Thomas, Ariz., September; Fort Apache, Ariz., October; Phœnix, Ariz., October; Wickenburg, Ariz., October; Fort Verde, Ariz., October; Prescott, Ariz., October; San Diego, Cal., August.

New Mexico division.—First Lieut. James Allen, acting signal-officer, has been in charge of this division during the fiscal year ending June 30, 1879. The total length of line now in operation in this division, 486 miles.

The work of extending the line from El Paso, Tex., to connect with the lines of the Texas division, at a point 100 miles southeast of that place, was commenced November 1, 1878. The connection was made on February 5, 1879.

The line from La Mesilla through to Silver City and Fort Craig received thorough repair during the year. Minor repair trips have been made by operators, repair-men, and details of troops.

There are twelve stations upon this line, at six of which full meteorological observations are taken and telegraphed daily.

The following stations were in active operation June 30, 1879: Los Lunas, N. Mex.; Fort Craig, N. Mex.; Los Cruces, N. Mex.; La Mesilla, N. Mex.; Fort Bayard, N. Mex.; Silver City, N. Mex.; El Paso, Tex.; Albuquerque, N. Mex.; and Santa Fé.

The total receipts of the line during the year ending June 30, 1879, were nine thousand four hundred and thirty dollars and eight cents, of which amount five thousand nine hundred and ninety-seven dollars and seventy-three cents were receipts for this line, and three thousand four hundred and thirty-two dollars and thirty-five cents were received to be paid to other lines.

The amount of official business not charged for the same period was estimated at three thousand nine hundred and ninety-eight dollars and sixty-eight cents.

The following is the record of inspections made of stations on this line during the year by Lieutenant Allen: Los Lunas, N. Mex., during October, 1878, and April, 1879; Fort Craig, N. Mex., October, 1878, and May, 1879; Las Cruces, N. Mex., October, 1878, and May, 1879; La Mesilla, N. Mex., October, 1878, and April, 1879; Fort Bayard, N. Mex., December, 1878, and May, 1879; Silver City, N. Mex., December, 1878, and April, 1879; El Paso, Tex., November, 1878, and April, 1879.

Texas division.—First Lieut. George S. Grimes, acting signal-officer, was in charge of this division from July 1, 1878, to October 15, 1878, when Second Lieut. C. A. Tingle, acting signal-officer, relieved him, pursuant to Special Orders No. 215, Adjutant-General's Office, October 5, 1878, and instructions from the Chief Signal-Officer.

During the year the telegraphic line has been extended from Fort Davis westward ninety-one miles, connection being thus established with the lines of the New Mexican division. This extension was completed and communication established February 5, 1879. The lines in this division have been maintained in fair working condition during year. Interruptions are reported to have been due to—first, the burning of wooden supports by prairie fires; second, the malicious destruction of insulators and wires with fire-arms; third, the falling of wooden line supports, the decay of which is very rapid in this climate. These heads of interruptions have been cited to show the numerous difficulties under which lines crossing the prairies of the interior are maintained. The damage to the lines from the first of these causes named has been great. The remedy has been to cut down the grass immediately around the line supports just before it has become so dry as to burn readily. This

has entailed severe labor upon details from military posts in the cases where the services of enlisted men have been used, and is expensive where citizen labor has been employed. The substitution of iron for wooden supports on such portions of the line as are endangered by prairie fires is the only effective remedy for the first of the interruptions above named. The second of the above-noted causes of interruption will lessen in number when legal proceedings are taken against the offenders under the laws of the United States. The crime committed is a felony. A reward has been offered for the arrest of criminals.

The substitution of iron for wooden supports has progressed in this division as rapidly as the funds at the control of this office have permitted. Up to the date of June 30, 1879, thirty-one miles of line mounted wholly upon iron supports had been constructed in this division, and three thousand four hundred and fifty iron supports had been used for repair purposes upon the different lines in the division. The substitution of iron for wooden supports in all cases of repairs will gradually change the whole character of the line. The total length of line comprised in this division is one thousand five hundred and ninety miles, upon which there are twenty-eight stations, at twenty-five of which full meteorological observations are regularly taken and telegraphed.

The following-named stations were in active operation in the division June 30, 1879, viz: Denison, Pilot Point, Decatur, Jacksborough, Henrietta, Cambridge, Fort Sill, Graham, Fort Griffin, Coleman City, Fort Concho, Fort Davis, Fort Stockton, Fort McKavett, Mason, Fredericksburg, Boerne, San Antonio, Castroville, Uvalde, Brackettville, Eagle Pass, Eagle Springs, Laredo, Rio Grande City, Edinburg, Santa Maria, and Brownsville.

The following-named stations in the division were inspected during the year: Cambridge, October 1, 1878; Decatur, June 24, 1879; Henrietta, October, 1878; Jacksborough, June 27, 1879; Pilot Point, May 4, 1879; Fort Sill, September, 1878.

The aggregate cash receipts from telegraphic tolls on messages transmitted over the lines of this division for the year ending June 30, 1878, were twenty thousand seven hundred and seventy-one dollars, of which amount fifteen thousand one hundred and thirty-five dollars and two cents were receipts for this line, and five thousand six hundred and thirty-five dollars and ninety-eight cents were received to be paid to other lines. The amount of official business not charged, for the same period, was ten thousand seven hundred and seventy-four dollars and twenty cents.

Northwestern division.—In compliance with the act of Congress approved June 20, 1878, providing for the construction of a military telegraph line from Bismarck to Fort Ellis, via the Missouri and Yellowstone Rivers, connecting Fort Buford, Fort Keogh, and Fort Custer, and from Fort Sully to Fort Keogh, via Deadwood, the work of construction was commenced in August, under the supervision of Lieut. A. W. Greely, acting signal officer, superintendent of construction, assisted by details of enlisted men from various posts. The first line support was erected August 29. The line was opened for operation to Fort Keogh December 5, making a total distance of 646½ miles constructed in 114 working days. The line supports were, at the same time, erected for a distance of sixty miles of line between Fort Custer and Fort Ellis. December 38, Fort Meade was connected with Deadwood, twelve miles distant. Work on the section between Fort Custer and Fort Ellis, and thence to Bozeman—a distance of one hundred and eighty-eight miles—was commenced on November, 16, 1878, and was completed January 30, 1879.

On December 29 Lieut. George S. Grimes, acting signal officer, succeeded Lieut. A. W. Greely, assuming charge of the work of construction. This officer still remains in charge. The work of construction on the lines in this division was performed with unusual rapidity in the presence of great difficulties.

The following stations were in active operation November 30, 1879, viz: Bismarck, Fort Stevenson, Fort Buford, Fort Meade, and Deadwood, in Dakota, and Fort Keogh, Fort Custer, and Fort Ellis, in Montana; Coulson, Mont.; Ferry Point, Mont.; Hunter's Springs, Mont.; Knife River, Dak.; Little Missouri, Mont.; Morgan and O'Brien's Ranch, Dak.; Powder River, Mont.; Rosebud, Mont.; Stillwater, Mont.; Terry's Landing, Mont.

The lines were formally opened for commercial business March 15, 1879.

Very important and considerable extensions of the lines in this division have been ordered, and the work of construction and the distribution of material is in a forward state. The extensions completed, and for which the necessary material for their construction has been provided, will, when completed, place in telegraphic communication with the several headquarters every military post, with the exception of three, in Dakota and Montana, and many important settlements in these Territories.

From Helena, Mont., through which the projected extension of the military telegraph lines in this division will pass, to Fort Missoula is about two hundred miles. The country is well timbered, and a line can be built to that point at a moderate cost. The advantages of a telegraph line from Fort Missoula to the several military posts in Washington Territory and Oregon can hardly be overestimated.

Total length of line in this division June 30, 1879, nine hundred and twenty-one miles.

The aggregate cash receipts from telegraphic tolls on messages transmitted over the lines in this division, from 15th to June 30, 1879, was one thousand seven hundred and seventy-nine dollars and seventy-four cents, of which amount eight hundred and forty-eight dollars and seventy cents were receipts for this line, and nine hundred and thirty-one dollars and four cents were received to be paid to other lines.

The amount of free business not charged for the period was estimated at one thousand two hundred and ninety-two dollars and twenty cents.

Washington division.—On December 28, 1878, the work of constructing line in this division was commenced. The work, carried on in winter was retarded by rough roads, severe cold weather, and frequent snow-storms. The parties employed were distant from any depot of supplies, without shelter for animals, the forage procured with difficulty. The transportation almost unserviceable for line construction. As late as the month of March it was reported almost impossible to distribute line supports along the route. The work of settling the line supports commenced at Dayton on May 1, 1879. For part of the route it was necessary to cut through rock. The span necessary to cross Snake River is one thousand one hundred and eighty-four feet long. On June 25 the line was completed to Lapwai (Fort Lapwai), and on June 30 the office was formally established at that station. The citizens of the various towns through which the line passed have displayed interest in the progress and materially aided in its construction.

The length of the line from Dayton to Lapwai is sixty-eight miles. At Dayton there is telegraphic connection to the Pacific coast.

Under the provision of the act of Congress approved March 3, 1879, the lines in the Northwest have been extended from Fort Ellis to Fort Assinaboine, on Milk River, to Fort Missoula; from Fort Lincoln to Fort Bennett, on the Missouri River; and from Fort Bennett to Fort Meade, in Dakota Territory, a total distance of eight hundred and sixty-nine miles. It is hoped further to extend these lines to connect through Cœur d'Alene with the Pacific-coast system, now extending from Fort Lapwai westward, during the ensuing year. In the Texan division they have been extended from Fort Sill, Ind. T., via Forts Reno and Supply, to Fort Elliott, Tex., a distance of two hundred and seventy miles.

This rapid extension of all the lines has been made possible by the energetic assistance rendered by the local military authorities, by whom the transportation of material has been largely furnished. The troops at the several posts have performed most of the manual labor of constructing the line. Without such help the small appropriation available would not have furnished the desired telegraphic communication.

The Chief Signal-Officer proposes, in the next annual report, to make mention of all officers who have been commended for services in the construction of these lines. The list is not yet complete.

The difficulties surrounding the work of construction and the management of these lines have been before referred to. At the inception the undertaking was a new one; the appropriations small; the country difficult; a force had to be provided and organized to work the lines while the lines themselves were in construction; the laws controlling the duty were hardly understood; the service was subject to interferences not legal and to oppositions wholly unwise. It was not understood often that services of this kind must grow slowly.

It was not considered often that the difficulties of the construction, repair and operations of these lines, limited to a single wire, extended for hundreds of miles through wildernesses, in sparsely-settled territories, without railways, and threatened always by Indians or other hostile forces, are different from much greater and not at all to be compared with those of maintaining commercial lines, following railways, existing in the midst of settled civilization, and with every appurtenance at hand at many points, to move instantly by rail, along the lines, for their immediate restoration and repair, if they chance to be damaged. It is, however, from the anxious settlers in this wilderness and upon the distant frontiers that the most urgent appeals are forwarded, both that existing lines may be maintained and that additional lines may be constructed. It is here they are located by law, and it is for the commercial development as well as the protection of these regions that the lines are of the greatest importance. It is an absolute necessity for the especial duties of this office that these regions be penetrated.

The difficulties above referred to lessen. It is better understood in each ensuing year that systems of telegraphic lines to be worked at all must be worked as a unit. The laws of the United States and the orders which have so determined are more closely obeyed. Illegal and unauthorized interferences are less frequent. It is better comprehended that lines conveying, as they may, commercial or official business from one extreme of the United States to another, ought not by possibility to be interfered with in their working by any subordinate authority.

Tests of the accuracy and rapidity of the working of these lines, made for a comparison in these respects with other lines under different management, but in country similar in character, have given satisfactory results. The working of the lines improves steadily. When it shall have become possible, as it will with better knowledge of their useful-

ness, to station along the lines repair parties, sufficient in number and properly located, and to provide material at depots so distributed as to be always and easily accessible, there will be no reason why these lines should be disabled for other than very brief periods. It is impossible to protect absolutely from frequent brief interruptions any line constructed with a single wire. It is in view to double the wires as rapidly as the appropriation and powers of the office will permit.

The fact that the especial duties of this office require reports from all the lengths of all its lines three times daily in the regular discharge of its daily duties, affords opportunities for, and causes an inspection more regular and frequent, perhaps, than that had on any lines not under similar supervision.

The use of iron supports, succeeding as it has under the tests to which it has been this year subjected, by the practical uses of such supports in the lines actually constructed, has shown a great advance in line construction. It is difficult to estimate the importance to the United States and to the service of a mode and material for line construction capable of being put in use and lasting everywhere.

The tests made with the telephone at this office and on the sea-coast assure the fact that many posts and stations near main lines may have a telegraphic communication over those lines which has been hitherto impossible.

There are no constructions more economical, or returning, by their use, more fully their value to the people and the Army of the United States, than the electric lines now stretching among the frontier posts and settlements.

The office is again called upon to acknowledge the courteous and prompt aid with which the wishes of the Secretary of War have been met on the part of division, department, and district commanders, and the zeal with which the working parties of troops by them detailed have performed their duties.

In the different works of construction, important assistance has been rendered by Lieut. Gen. P. H. Sheridan, commanding Military Division of the Missouri; Brig. Gen. O. O. Howard, commanding Department of the Columbia; Brig. Gen. A. H. Terry, commanding Department of Dakota; Brig. Gen. E. O. C. Ord, commanding Department of Texas; Brevet Brig. Gen. Edward Hatch, commanding District of New Mexico; and Brevet Brig. Gen. O. B. Willcox, commanding Department of Arizona. The work would have failed in much of its success, but for this powerful aid.

The military results foreshadowed as to follow the construction and use of these interior lines are already in part attained. The reports of officers commanding campaigns, or employed in other operations, evidence at once the wisdom with which these added facilities for communication have been employed, and the success of operations to which the rapid communication so secured have, under their direction, contributed.

The legislation of Congress has evidenced the confidence of that body in the propriety of such works, by imposing upon the Corps more labor in the new line-construction than can, with its present limited force, be properly performed. The want of skilled enlisted men can be but poorly supplied by temporary details. The Chief Signal-Officer recommends an increase in the enlisted force of the Corps as a measure of economy.

In closing this report the Chief Signal-Officer again refers to the frequent rehearsal of facts hitherto stated in preceding reports upon the service. The annual reports of the succeeding years, rehearsing, as they

must, similar facts of organization and of service, become more closely repetitious of the preceding reports, to which are added, each year, such statements of progress as relate to the year present.

The Chief Signal-Officer anticipates the best results to the Signal Service from the legislation of 1878. There could hardly have been an act wiser for the interests of the service or more just to the members of it. The favorable action of Congress has removed difficulties which had hampered the progress of the duty for years. If its work is permitted to go on as it has been planned, and is fairly sustained, it can hardly fail in continued success. There ought to be just provision for the permanent employment and grades of the officers of the corps. It is recommended this be fixed by legislation. It is hoped there may be no failure in the appropriation for the service of the amounts estimated for this year. They have been estimated with careful economy.

The progress of the service through the years of duty past has been attended with steady and satisfactory success. There is no longer question as to the useful preannouncement of meteoric changes. The plans extend more broadly in each succeeding year, by which to aid in every interest of commerce and of agriculture. The popular confidence and support have been unchanging and considerate. A world-wide study has been developed, and aims to attain results not contemplated a few years ago as possible. The scope of practical usefulness increases with each year. The road grows broader and plainer as it leads towards success.

ALBERT J. MYER,
Brig. Gen. (Bvt. Assg'd), Chief Signal-Officer, U. S. A.

Hon. G. W. McCRARY,
Secretary of War.

PAPER 1.

COURSE AT FORT WHIPPLE, VIRGINIA.

(*Exclusive of the drills in the arms, with trains or for permanent construction.*)

OFFICERS.

The course of instruction for officers is both practical and theoretical. The theoretical portion comprises instruction in the following books, viz: The Manual of Signals, The International Code of Flag Signals, Official Danger and Distress Signals, Pope's Practical Telegraphy, Culley's Hand-book of Telegraphy, Loomis's Meteorology, Instructions to Observer Sergeants, the Cipher Manual. The supplementary course of reading comprises in the cases of officers permanently detailed for the full duties of the Signal Service, in addition to especial works from time to time designated: The Practical Uses of Meteorological Reports and Weather Maps, Smithsonian Directions for Meteorological Observations, Buchan's Handy Book of Meteorology, Piddington's Horn Book, Espy's Philosophy of Storms, Fitz Roy's Weather Book, Martin's Rotary Theory of Storms, Ley's Laws of the Winds, Espy's First Meteorological Report, Espy's Fourth Meteorological Report. The practical portion consists of wand practice, which is continued until the officer can read messages at the rate of ten words per minute; practice in the field with flag and torch in general service, homographic, chronosemic, and international codes of flag-signals and various kinds of ciphers, and practice with the heliograph in the General Service Code.

The ranges for practice are from a few hundred yards to eighteen miles in extent with flag and torch, and extreme long range of thirty-one miles with the heliograph.

The officers have practical instructions in telegraphy (General Service Code) until they can send and receive at the rate of ten words per minute, and are required to make drawings of the various telegraph instruments and electrical batteries in use in the Signal Service.

ENLISTED MEN.

Instruction No. 36.

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, D. C., April 16, 1878.

The following course of instructions is prescribed for enlisted men at the School of Instruction of the Signal Service at Fort Whipple, Va.

Sergeants ordered to Fort Whipple, Va., for change of station, misconduct, or any cause other than "review of theoretical course," will report to the instructor, for wand, for field, and for telegraph practice, and for such duties, as non-commissioned officers, in connection with the course of instruction, as may be necessary.

Sergeants ordered in from station for review of course, candidates for promotion, and recruits will be instructed in the following theoretical and practical course:

Signal Manual, page 15, from "A sign or signal," to page 96; and from "Description of equipments," page 189, to "Semaphore telegraph," page 195; from "Flags on halyards," page 198, to "Distance line," page 199; from "When Working at night," page 206, to "Candle bombs," page 207; from "Manual of the kit," page 258, to middle of page 273; from "Field telegraph train," page 378, to "General directions, &c," page 393; from "Permanent lines" to "General service," pages 399 to 466; International Code of Signals; Loomis' Meteorology, to page 193, omitting articles 125, 126, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, and 369; Official Danger or Distress Signals; Pope's Modern Practice of the Electric Telegraph, chapter I, to page 45; page 57 to page 64, article 103; chapter 6, page 73, to article 122, page 78; chapters 7 and 8; Culley's Hand-book of Practical Telegraphy, Part I, page 1, to article 49, page 18; Part III, page 45, to article 120, page 57; article 130, page 71, to Part IV, page 76; Instructions to Observer Sergeants, entire book; Cavalry Tactics, through school of the company, dismounted.

Practical course.—Wand practice daily for six weeks, or as much longer as necessary; field practice in the immediate vicinity of Fort Whipple, daily, during theoretical course; practical instruction with Marean repeater and telephone; cleaning and setting up batteries; use and construction of all Morse instruments; establishing terminal and intermediate stations; cutting in on line; use and construction of all instruments used on station; method of correcting barometer; finding of dew-point and relative humidity; observation of clouds; cleaning barometer; telegraph practice daily, standard, ten words; practical instruction in splicing cables; forms, records of office, &c.

All men to have four tours of guard duty as non-commissioned officers; twelve days' and four nights' "field-practice" in General Service Code, at long range; three days' practice in International Code at long range.

Men on guard duty will not be excused from recitations; nor will they be excused from telegraph practice at hours when not actually on post. Men on duty in the observatory will be excused from company duty as now provided.

Recruits to perform company duty for two months previous to being ordered for theoretical instruction. Instruction during this time not to interfere with military duty.

All enlisted men reporting for duty to be instructed in cavalry tactics, through "school of the company," dismounted.

Flag, torch, train, &c., drills, conducted as heretofore.

A schedule showing hourly occupation, from 9 a.m. to 9 p. m., of each man under instruction will be kept by the instructor.

Instruction hours.—Recitations will commence at 9.45 a. m. and continue until all classes have recited. Telegraph practice at such hours between 9 a. m. and 9 p. m. as instructor may direct, each man to have, when practicable, at least two hours' practice daily. Study hours from 9 a. m. until 9 p. m., the time being so divided that each man may have at least three hours for the preparation of his daily lesson. During recitation and study hours the men under instruction will be required to be present at instruction building. The sergeant, or such other enlisted man as may be designated, will have charge of the study-room, and will be responsible to the instructor for the presence and orderly behavior of the classes during study and recitation hours. Instruction on Saturdays will be discontinued.

ALBERT J. MYER,
Brigadier-General (brevet assigned),
Chief Signal-Officer of the Army.

PAPER 2.

Officers instructed during the year ending June 30, 1879.

Name.	Rank and corps.	Reported for instruction.	Relieved from instruction.	Remarks.
B. H. Gilman	First lieutenant Thirteenth Infantry.	Aug. 1, 1878	Jan. 22, 1879	Completed full course in signaling, telegraphy, and meteorology.
W. E. Birkhimer	Second lieutenant Third Artillery.	Aug. 1, 1878	Jan. 22, 1879	
H. T. Reed	Second lieutenant First Infantry.	Sept. 2, 1878	.....	Relieved from signal duty.
J. A. Swift	Second lieutenant Signal Corps, U. S. A.	Mar. 19, 1879	.....	Still under instruction.
L. E. Sebree	Second lieutenant Signal Corps, U. S. A.	Mar. 19, 1879	.....	Still under instruction.

PAPER 3.

Amount of field-practice had by each officer.

Name.	Rank and corps.	No. of days flag-practice was had.	No. of nights torch-practice was had.
B. H. Gilman	First lieutenant Thirteenth Infantry	27	6
W. E. Birkhimer	Second lieutenant Third Artillery	24	6
H. T. Reed	Second lieutenant First Infantry	14	6
J. A. Swift	Second lieutenant Signal Corps, U. S. A	22	8
L. E. Sebree	Second lieutenant Signal Corps, U. S. A	14	5

PAPER 4.

Enlisted men instructed for the position of assistant to non-commissioned officers in charge of stations from July 1, 1878, to June 30, 1879.

Name.	Placed under instruction for assistant.	Reported qualified as assistant.	Ordered on station.	Remarks.
Charles M. Newman	Mar. 16, 1878	July 20, 1878	Aug. 10, 1878	On duty as assistant at Galveston, Tex.
Benjamin A. Blundon	Mar. 16, 1878	Aug. 17, 1878	Aug. 10, 1878	On duty as assistant at Smithville, N. C.
Jeremiah D. Dinneen	Mar. 16, 1878	Aug. 17, 1878	Sept. 3, 1878	On duty as assistant at New York City.
David P. Boyd	Mar. 16, 1878	July 6, 1878	July 6, 1878	Discharged the service of the United States, May 31, 1879.
John Daly	Apr. 12, 1878	Aug. 17, 1878	Aug. 10, 1878	On duty as assistant at Milwaukee, Wis.
Rutherford H. Paxton	Apr. 12, 1878	Aug. 17, 1878	Aug. 10, 1878	In charge of station at False Cape, N. C.
Ossian Aldrich	Apr. 18, 1878	Aug. 17, 1878	Aug. 10, 1878	On duty as assistant at New York City.
Gustav Liebmann	Apr. 18, 1878	Aug. 31, 1878	Aug. 29, 1878	On duty as assistant at Philadelphia, Pa.
George S. Livingston	Apr. 18, 1878	Aug. 31, 1878	Sept. 5, 1878	On duty as telegraph operator at Coleman City, Tex.
George E. Kelley	Apr. 20, 1878	Aug. 31, 1878	Sept. 3, 1878	On duty as assistant at Albany, N. Y.
James K. Sweeney	May 8, 1878	.....	Aug. 29, 1878	On duty as assistant at Pike's Peak, Colo.
Victor Anderson	May 10, 1878	Sept. 14, 1878	Sept. 12, 1878	On duty as assistant at Milwaukee, Wis.
Robert H. Hereford	May 9, 1878	Sept. 14, 1878	Sept. 17, 1878	On duty as assistant at Portland, Me.
Edward E. Ellery	May 15, 1878	Sept. 14, 1878	Sept. 13, 1878	On duty as assistant at Sandy Hook, N. J.
Bernard Bunnemeyer	May 22, 1878	Sept. 14, 1878	Sept. 12, 1878	On duty as assistant at Chicago, Ill.
Lewis M. Pindell	May 23, 1878	Sept. 14, 1878	Sept. 18, 1878	On duty as assistant at Nashville, Tenn.
George M. Smith	May 24, 1878	Sept. 14, 1878	Sept. 28, 1878	On duty at office of Chief Signal Officer.

Enlisted men instructed for the position of assistant to non-commissioned officers, &c.—Cont'd.

Name.	Placed under instruction for assistant.	Reported qualified as assistant.	Ordered on station.	Remarks.
John H. Walter	May 24, 1878	Sept. 14, 1878	Sept. 27, 1878	On duty as assistant at Charleston, S. C.
John C. Ashton	June 20, 1878	Oct. 19, 1878	Oct. 21, 1878	On duty as assistant at Cape Lookout, N. C.
John C. Galloway	June 20, 1878	.....	Oct. 10, 1878	On duty as telegraph operator at Santa Maria, Tex.
Charles C. Buck	June 25, 1878	.....	Oct. 17, 1878	In charge of station at Bangor, Me.
James C. Bushby	June 25, 1878	.....	Oct. 14, 1878	On duty at Bismarck, Dak.
Thomas H. Wilson	June 25, 1878	.....	.....	Discharged the service of the United States, Sept. 20, 1878.
Edwin O. Cooke	June 25, 1878	Oct. 19, 1878	Oct. 23, 1878	Discharged the service of the United States, May 15, 1879.
John H. Null	June 26, 1878	.....	.....	Discharged the service of the United States, Oct. 25, 1878.
Morris McCarty	June 26, 1878	.....	Oct. 10, 1878	On duty as telegraph operator at Graham, Tex.
Joseph H. Fox	June 27, 1878	Nov. 2, 1878	Oct. 30, 1878	In charge of station at Little Egg Harbor, N. J.
James A. Barry	June 27, 1878	Nov. 23, 1878	Dec. 2, 1878	On duty as assistant at New Orleans, La.
Joseph M. Burlew	Aug. 31, 1878	Nov. 2, 1878	Oct. 30, 1878	On duty as assistant at Philadelphia, Pa.
William B. Hester	Aug. 31, 1878	Dec. 7, 1878	Dec. 13, 1878	On duty at office of Chief Signal Officer.
Napoleon C. Smith	Aug. 31, 1878	Nov. 2, 1878	Oct. 30, 1878	On duty as telegraph operator at Stevenson, Dak.
James M. Welch	Aug. 31, 1878	Nov. 2, 1878	Nov. 13, 1878	On duty as assistant at Saint Paul, Minn.
John G. Frankenberg	Aug. 31, 1878	Nov. 2, 1878	Oct. 31, 1878	On duty as telegraph operator at La Mesilla, Tex.
David W. Keleher	Sept. 10, 1878	.....	.....	Discharged the service of the United States, Oct. 1, 1878.
Charles Wilson	Sept. 10, 1878	Nov. 9, 1878	Nov. 18, 1878	On duty as assistant at Rochester, N. Y.
Theodore T. Moore	Sept. 10, 1878	Nov. 2, 1878	Nov. 1, 1878	On duty as telegraph operator at Tucson, Ariz.
Henry W. Hurley	Sept. 10, 1878	.....	.....	Discharged the service of the United States, Nov. 8, 1878.
Robert E. Lewis	Sept. 10, 1878	Nov. 23, 1878	Dec. 6, 1878	On duty as assistant at New London, Conn.
George E. Franklin	Sept. 10, 1878	Nov. 9, 1878	Nov. 26, 1878	On duty at office of Chief Signal Officer.
Brooke H. Weeks	Sept. 10, 1878	Nov. 9, 1878	Nov. 16, 1878	On duty as assistant at Saint Louis, Mo.
Raleigh T. Dabney	Sept. 17, 1878	Dec. 7, 1878	Dec. 6, 1878	On duty as assistant at Memphis, Tenn.
Francis K. Van Auken	Sept. 17, 1878	Dec. 28, 1878	Jan. 3, 1879	On duty as assistant at Vicksburg, Miss.
Richard L. Rotchford	Sept. 17, 1878	.....	Mar. 13, 1879	On duty as telegraph operator at Deadwood, Dak.
Sutphen Bailey	Sept. 17, 1878	.....	Mar. 6, 1879	On duty at office of Chief Signal Officer.
James Berry	Sept. 17, 1878	Dec. 14, 1878	Dec. 18, 1878	On duty as assistant at Cincinnati, Ohio.
Edwin Guthrie	Sept. 17, 1878	Dec. 14, 1878	Dec. 24, 1878	On duty as telegraph operator Santa Fé, N. M.
John T. Foy	Oct. 2, 1878	Dec. 21, 1878	Dec. 24, 1878	On duty as assistant at Savannah, Ga.
Francis A. Claveloux	Oct. 2, 1878	Dec. 21, 1878	Jan. 2, 1879	On duty at office of Chief Signal Officer.
Webster Vinson	Oct. 2, 1878	Jan. 4, 1879	Jan. 6, 1879	Do.
George W. Smith	Oct. 2, 1878	Dec. 21, 1878	Dec. 27, 1878	Do.
Otto B. Cole	Oct. 2, 1878	Dec. 21, 1878	Jan. 3, 1879	On duty as assistant at Baltimore, Md.
Albert L. Mathews	Oct. 2, 1878	Jan. 4, 1879	Jan. 9, 1879	On duty as assistant at Fort Macon, N. C.
Frank C. Buell	Oct. 7, 1878	Nov. 23, 1878	Nov. 21, 1878	On duty as telegraph operator at Fort Ellis, Mont.
Thomas J. Kenan	Oct. 7, 1878	Nov. 23, 1878	Nov. 21, 1878	In charge of station at Portsmouth, N. C.
Amos A. Stoneburner	Oct. 7, 1878	Nov. 23, 1878	Dec. 7, 1878	On duty as telegraph operator at Fort Meade, Dak.

Enlisted men instructed for the position of assistant to non-commissioned officers, &c.—Cont'd.

Name.	Placed under instructions for assistant.	Reported qualified as assistant.	Ordered on station.	Remarks.
Sherwood Wheaton	Oct. 7, 1878	Nov. 30, 1878	Dec. 9, 1878	On duty as assistant at Kittyhawk, N. C.
Alfred J. Henry	Oct. 7, 1878	Nov. 23, 1878	Nov. 26, 1878	On duty at Denison, Tex.
William T. Miles	Oct. 7, 1878	Nov. 30, 1878	Nov. 26, 1878	On duty as telegraph operator at La Mesilla, N. M.
James D. Thurston	Oct. 7, 1878	Nov. 30, 1878	Dec. 2, 1878	On duty at office of Chief Signal Officer.
James B. McLaughlin	Oct. 7, 1878	Nov. 9, 1878	Nov. 4, 1878	Do.
Charles D. Lyon	Oct. 26, 1878	Jan. 11, 1879	Jan. 20, 1879	On duty as assistant at Chicago, Ill.
Maurice Schlosser	Oct. 26, 1878	Feb. 8, 1879	.....	Discharged the service of the United States, February 25, 1879.
Charles B. Beardsley	Oct. 26, 1878	Jan. 18, 1879	Jan. 20, 1879	On duty as assistant at Saint Louis, Mo.
David I. Mercier	Oct. 26, 1878	Jan. 18, 1879	Jan. 10, 1879	On duty as telegraph operator at Knife River, Dak.
Robert P. Faunt Le Roy	Oct. 26, 1878	Jan. 18, 1879	Feb. 7, 1879	On duty at office of Chief Signal Officer.
John H. Berard	Oct. 26, 1878	Feb. 15, 1879	Feb. 13, 1879	Do.
William P. Carr	Oct. 26, 1878	.....	Jan. 10, 1879	On duty as repairman at Stillwater, Mont.
Charles M. Jameson	Oct. 26, 1878	Feb. 8, 1879	Feb. 13, 1879	On duty as assistant at Sandy Hook, N. J.
Stephen J. Delavan	Oct. 26, 1878	Feb. 22, 1879	Feb. 17, 1879	On duty as assistant at Shreveport, La.
George Kingsbury	Oct. 26, 1878	Feb. 22, 1879	Feb. 21, 1879	On duty as assistant at Cape Henry, Va.
Frank M. Cleaver	Oct. 26, 1878	.....	Jan. 23, 1879	On duty as assistant at Des Moines, Iowa.
Frank M. Tilghman	Oct. 26, 1878	Feb. 15, 1879	Feb. 19, 1879	On duty as assistant at Norfolk, Va.
Norman B. Conger	Oct. 26, 1878	Feb. 22, 1879	Feb. 19, 1879	On duty as assistant at Detroit, Mich.
John W. Byram	Nov. 11, 1878	Mar. 1, 1879	Mar. 7, 1879	On duty as assistant at Boston, Mass.
Millard F. Burrows	Nov. 11, 1878	Mar. 15, 1879	Apr. 17, 1879	On duty as assistant at Barnegat, N. J.
Oscar D. Stewart	Nov. 11, 1878	Mar. 15, 1879	Apr. 15, 1879	On duty as assistant at Norfolk, Va.
James C. Sprigg, jr.	Nov. 11, 1878	Mar. 1, 1879	Feb. 28, 1879	On duty at office of Chief Signal Officer.
Bury J. O'Brien	Nov. 11, 1878	Mar. 29, 1879	Apr. 1, 1879	Do.
Frank R. Gurley	Nov. 11, 1878	Mar. 29, 1879	May 1, 1879	On duty as assistant at Augusta, Ga.
Otway S. Golladay	Nov. 14, 1878	Jan. 25, 1879	Jan. 29, 1879	On duty as telegraph operator at Brackettville, Tex.
Edward M. Mattison	Nov. 16, 1878	Feb. 10, 1879	Feb. 12, 1879	On duty as assistant at Philadelphia, Pa.
James E. Hayes	Nov. 16, 1878	Feb. 1, 1879	Jan. 24, 1879	On duty as telegraph operator at Prescott, Ariz.
Jesse B. Low	Nov. 16, 1878	Feb. 1, 1879	Jan. 28, 1879	On duty at office of Chief Signal Officer.
John T. Rudy	Nov. 30, 1878	.....	Mar. 13, 1879	On duty as repairman at Little Missouri, Mont.
Lewis R. Ayres	Nov. 30, 1878	May 3, 1879	May 13, 1879	On duty at Dayton, Wash.
John Baker	Nov. 30, 1878	Mar. 29, 1879	Mar. 26, 1879	On duty at office of Chief Signal Officer.
Charles L. Bozzell	Nov. 30, 1878	Mar. 15, 1879	Mar. 11, 1879	Do.
Howard E. Higgins	Nov. 30, 1878	Apr. 19, 1879	Apr. 22, 1879	On duty as telegraph operator at Silver City, N. M.
Daniel Maloney	Nov. 30, 1878	.....	.....	Discharged the service of the United States, Dec. 19, 1879.
Charles O. Pierson	Nov. 30, 1878	Feb. 22, 1879	Mar. 11, 1879	On duty at office of Chief Signal Officer.
Jacob H. Henry	Dec. 30, 1878	Apr. 19, 1879	Apr. 22, 1879	On duty as telegraph operator at Stockton, Tex.
John M. Field	Dec. 30, 1878	Mar. 15, 1879	Apr. 12, 1879	On duty at office of Chief Signal Officer.
John S. Waters	Dec. 30, 1878	May 24, 1879	May 26, 1879	Do.
Charles G. Raymond	Dec. 30, 1878	.....	Mar. 13, 1879	On duty as repairman at Morgan and O'Brien's Ranche, Mont.

Enlisted men instructed for the position of assistant to non-commissioned officers, &c.—Cont'd.

Name.	Placed under instruction for assistant.	Reported qualified as assistant.	Ordered on station.	Remarks.
Henry W. Ford	Dec. 30, 1878	Apr. 5, 1879	May 2, 1879	On duty as assistant at New York City.
Aaron H. Kinnear	Jan. 6, 1879	May 10, 1879	May 13, 1879	On duty at office of Chief Signal Officer.
John A. Moran	Jan. 8, 1879	May 24, 1879	May 21, 1879	Do.
William D. Maxwell	Feb. 6, 1879	May 3, 1879	May 22, 1879	On duty as assistant at Atlantic City, N. J.
Thomas P. Pease	Feb. 6, 1879	.....	.....	Discharged the service of the United States, April 24, 1879.
Howard P. Brisbane	Feb. 6, 1879	May 10, 1879	May 31, 1879	On duty at office of Chief Signal Officer.
John Young	Mar. 3, 1879	May 24, 1879	May 21, 1879	Do.
William R. Boynton	Mar. 4, 1879	June 7, 1879	June 4, 1879	On duty as assistant at Toledo, Ohio.
Frederick J. Randolph	Mar. 4, 1879	June 7, 1879	May 31, 1879	On duty at office of Chief Signal Officer.
Elisha R. Brace	Mar. 4, 1879	May 31, 1879	June 3, 1879	Do.
John H. Righter	Mar. 4, 1879	June 21, 1879	June 21, 1879	Do.
Claude R. Zappone	Mar. 4, 1879	June 21, 1879	June 17, 1879	Do.
Colville P. Terrett	Mar. 6, 1879	.....	.....	Still under instruction.
Thomas H. Breen	Mar. 6, 1879	May 10, 1879	May 16, 1879	On duty at office of Chief Signal-Officer.
George N. Perry	Apr. 1, 1879	June 21, 1879	June 18, 1879	Do.
William S. Dulin	Apr. 1, 1879	.....	.....	Still under instruction.
Frank Ridgway	Apr. 1, 1879	.....	.....	Do.
Presley T. Jenkins	Apr. 1, 1879	.....	.....	Do.
Charles S. Wixom	Apr. 1, 1879	.....	.....	Do.
Gwyn R. Tompkins	Apr. 1, 1879	.....	.....	Do.
Horace M. Woodward	Apr. 1, 1879	.....	.....	Do.
Frank P. Chaffee	Apr. 30, 1879	.....	.....	Do.
Daniel J. Carroll	Apr. 30, 1879	.....	.....	Do.
George W. Taylor	Apr. 30, 1879	.....	.....	Do.
Frederic H. Clarke	Apr. 30, 1879	.....	.....	Do.
Thomas S. Outram	Apr. 30, 1879	.....	.....	Do.
Charles B. Tuch	May 31, 1879	.....	.....	Do.
Walter W. McConihe	May 31, 1879	.....	.....	Do.

PAPER 5.

Table showing the instruction of candidates for the grade of sergeant from July 1, 1878, *to June* 30, 1879.

Name.	Instruction commenced.	Date of promotion.	Remarks.
Joseph H. Bokel	Apr. 22, 1878	July 19, 1878	In charge of station at Cape Henry, Va.
Patrick Connor	Apr. 26, 1878	July 19, 1878	In charge of station at Des Moines, Iowa.
Andrew T. Sherwood	May 3, 1878	July 19, 1878	On duty as telegraph operator at Bismarck, Dak.
Winfield S. Jewell	May 23, 1878	July 19, 1878	In charge of station at Mount Washington, N. H.
William R. Stansbury	July 23, 1878	Nov. 1, 1878	In charge of station at Louisville, Ky.
Daniel P. Waters	Aug. 22, 1878	Nov. 1, 1878	In charge of station at Nashville, Tenn. Reduced to corporal April 3, 1879.
Julius H. Weber	Aug. 22, 1878	Nov. 1, 1878	In charge of station at Saint Louis, Mo.
Peter C. Guthrie	Aug. 22, 1878	Nov. 1, 1878	In charge of station at Savannah, Ga.
Harry Hall	Sept. 6, 1878	.....	In charge of station at Atlanta, Ga. Failed to pass examination.

PAPER 6.

Exhibiting the communications sent from and received at the office of the Chief Signal-Officer (exclusive of telegrams) from July 1, 1878, to June 30, 1879.

SENT.

Division of telegrams and reports for the benefit of commerce and agriculture.

To heads of departments and bureaus	294
To non-commissioned officers in charge of stations, in reference to their duties	10,374
In reply to applications for stations, and others similar	59
To telegraph companies in reference to transmission of weather reports and the erection of telegraph lines, &c	77
To boards of trade, chambers of commerce, agricultural societies, &c	73
To postmasters, in reference to weather bulletins	145
To foreign correspondents, relating to this division in general	79
To foreign correspondents, relating to simultaneous reports	768
To volunteer observers throughout the United States	927
General and special orders and circulars, with reference to this division	13,256
Miscellaneous	1,699
Total	27,751

Signal Division.

To heads of departments and bureaus	353
Relating to duties and discipline at Signal Service school of instruction, and post of Fort Whipple, Va	535
Relating to recruiting and enlistment	601
Answers to applications for enlistment in the Signal Corps, United States Army	713
General and special orders and circulars, with reference to this division	4,918
Miscellaneous	1,137
Total	8,257

Property Division.

To heads of departments and bureaus	1,074
To manufacturers and others, in reference to instruments, equipments, &c	2,239
To non-commissioned officers in charge of stations, and other enlisted men, in reference to property and money accounts	12,916
In reference to quarterly returns of officers	2,392
Miscellaneous	6,192
Total	24,813
Aggregate	60,821

RECEIVED.

Division of telegrams and reports for the benefit of commerce and agriculture.

From heads of departments and bureaus	298
Applications for the establishment of new stations	64
From telegraph companies, in reference to the transmission of weather reports and the construction of telegraph lines, &c	584
From non-commissioned officers in charge of stations, in reference to their duties	12,054
From boards of trade, chambers of commerce, and agricultural societies	194
From foreign correspondents, relating to simultaneous weather reports	6,228
From volunteer observers throughout the United States, relating to observations and reports	4,528
From foreign correspondents, relating to this division in general	15
Reports relative to instruction of non-commissioned officers and assistants	634
Mailed reports from non-commissioned officers in charge of stations	326,761
From United States naval vessels and stations (received through the Navy Department)	821

Meteorological charts, abstracts of journals, forms, &c., received from non-commissioned officers in charge of stations, railroad-stations, &c.	109,192
From commercial steamship companies	823
Reports from postmasters throughout the United States, in reference to weather bulletins received and posted by them	159,692
Miscellaneous	2,790
Total	624,678

Signal Division.

From heads of departments and bureaus	349
Relating to duties and discipline at Signal Service school of instruction and post of Fort Whipple, Va	616
Relating to instructions in signaling at Fort Whipple, Va., and in different military departments	196
Relating to recruiting and enlistment	470
Applications for enlistment in the Signal Corps, United States Army	1,294
Miscellaneous	518
Total	3,443

Property Division.

From heads of departments and bureaus	1,185
From manufacturers and others, relating to instruments, equipments, &c	847
From officers, concerning property, quarterly returns, &c	1,904
From non-commissioned officers in charge of stations, and other enlisted men, relating to property and money accounts	47,018
Regarding property transferred to stations	4,038
Miscellaneous	3,097
Total	58,089
Aggregate	686,210
Aggregate sent	60,821
Aggregate received	686,210
Aggregate sent and received	747,031

Table showing the number of cipher words and messages sent and received by telegraph at the central office, Washington, D. C., from July 1, 1878, to June 30, 1879.

Cipher-words of weather reports sent	46,053
Telegraphic messages other than weather reports sent	9,880
Cipher-words of weather reports received	732,821
Cipher-words of special river reports received	7,488
Telegraphic messages other than weather reports received	17,098

PAPER 7.

Table showing meteorological data furnished from the records of the office of the Chief Signal-Officer of the Army, upon request of the applicants named, during the fiscal year ending June 30, 1879.

Capt. M. R. Brown, Corps of Engineers, U. S. A., Port Eads, South Pass, La., furnished weekly, from July 1, 1878, to June 30, 1879, with record of river observations at New Orleans, Vicksburg, Nashville, Cincinnati, Pittsburgh, Louisville, Cairo, Yankton, Leavenworth, Little Rock, Shreveport, Keokuk, and Saint Louis.

Mr. W. P. Speakman, Lock No. 4, Washington County, Pennsylvania, furnished monthly, from July, 1878, to June 30, 1879, with record of stages of water in the Monongahela River at Pittsburgh, Pa.

Messrs. W. B. Dana & Co., proprietors of the Commercial and Financial Chronicle, New York City, furnished monthly, from July, 1878, to June, 1879, with record of total monthly rainfall, monthly maximum, minimum, and mean temperatures, and any important facts in regard to storms, drought, and frost, for each month, at Norfolk, Wil-

mington (N. C.), Charleston, Augusta, Savannah, Montgomery, Mobile, Jacksonville, Saint Mark's, New Orleans, Vicksburg, Shreveport, Memphis, Nashville, Galveston, Indianola, and Corsicana.

Mr. E. M. Hunt, corresponding secretary of the New Jersey State board of health, Metuchin, N. J., furnished monthly with record of meteorological observations taken at Signal Service station, Cape May, N. J.

Prof. G. T. Kingston, superintendent of meteorological service, Dominion of Canada, Toronto, Canada, furnished monthly, from July, 1878, to June, 1879, with tables of barometric and thermometric means, deduced from the telegraphic series of observations taken at each of the stations of the Signal Service, United States Army.

Dr. Smith Townshend, health officer of the District of Columbia, Washington, D. C., furnished daily, from July 28, 1878, with record of local meteorological observations taken at Washington, D. C.

Maj. C. B. Comstock, Corps of Engineers, United States Army, Detroit, Mich., furnished weekly, from October 7, 1878, with record of stages of water in the Mississippi River and its tributaries, from observations taken at Cairo, Cincinnati, Davenport, Dubuque, Keokuk, La Crosse, Leavenworth, Louisville, Memphis, New Orleans, Omaha, Pittsburgh, Shreveport, Saint Louis, Saint Paul, Vicksburg, Yankton, Booneville, Brunswick, Evansville, Helena, Hermann, Jefferson City, Kansas City, Le Claire, Lexington, Little Rock, Paducah, Plattsmouth, Saint Joseph, and Warsaw.

Messrs. Gieske & Niemann, Baltimore, Md., furnished July 5, 1878, with record of amount of rainfall during month of June, 1878, at Louisville, Nashville, and Cincinnati.

Mr. Edgar Schroeder, New York City, furnished July 6, 1878, with table showing barometric and thermometric readings at 7 a. m., 2 p. m., and 9 p. m., daily, at Boston, New York City, and Cape May, from June 8 to June 29, 1878, inclusive.

Mr. Rufus W. Peckman, attorney at law, Albany, N. Y., furnished July 10, 1878, with "all data collected at office of Chief Signal Officer bearing upon the railroad disaster at Ashtabula, Ohio."

Mr. Edward C. David, surveyor-general, Cheyenne, Wyo., furnished July 11, 1878, with tables showing monthly mean temperatures from June 30, 1877, to June 30, 1878, and daily mean temperatures for January and February, 1878, at Cheyenne, Wyo.

Morton P. Henry, esq., Philadelphia, Pa., furnished July 16, 1878, with statement showing direction and velocity of wind and state of weather at Cape May, N. J., at 4.43, 9, and 11.08 p. m., March 3, and 7 a. m. March 4, 1878; also copy of anemometer record sheet of that station covering the period from 12 m., March 3, to 12 m., March 4, 1878; also, on April 19, 1879, with record of direction of wind at Cape May, on March 3, 1879.

Knickerbocker Ice Company, New York City, furnished July 18, 1878, with record of weekly mean temperatures at New York City, from June 2, 1877, to June 22, 1878, inclusive.

Prof. Spencer F. Baird, United States Commissioner of Fish and Fisheries, Smithsonian Institution, Washington, D. C., furnished July 26, 1878, with record of observations of temperature of the water at Mobile, Jacksonville, Savannah, Charleston, Baltimore, Norfolk, New York City, New London, Wood's Holl, Eastport, Portland (Me.), and Wilmington (N. C.), during March and May, 1877; at Key West, during March, May, and June, 1877; at Saint Mark's, during March, 1877; Punta Rassa, during March and April, 1877, and February, 1878, and Galveston during March, April and May, 1877.

Mr. Joseph Lines, Commercial Exchange, Philadelphia, Pa., furnished July 26, 1878, with record of mean relative humidity during the year 1877, at Atlantic City and Cape May, N. J.

W. C. Watts & Co., Liverpool, England, furnished July 30, 1878, with record of monthly mean temperatures at stations in the cotton-growing States for December, 1877, and January and February, 1878.

Prof. George H. Cook, State geologist, New Brunswick, N. J., furnished July 31, 1878, with record of monthly rainfall and daily maximum and minimum and monthly mean temperatures at Atlantic City, Barnegat, Cape May, Long Branch, Peck's Beach, Squan Beach, and Sandy Hook, N. J., Baltimore, Md., Philadelphia, Pa., and New York City, from date of establishment of stations to and including June, 1878; also, on February 5, 1879, with same data from stations mentioned above, and volunteer stations at Jersey City, Freehold, Atco, Moorestown, Trenton, South Orange, Newark, Vineland, Linden, New Brunswick, East Orange, and Atlantic City, N. J., White Plains, and Carmel, N. Y., and Dover, Del., from July to December, 1878, inclusive.

Messrs. Whitney & Dutch, Chicago, Ill., furnished August 1, 1878, with record of minimum temperatures and of frosts observed at and in the vicinity of New Orleans, La., during months of January, February, March, and April, of years 1871 to 1878, inclusive.

Messrs. Parker & Countryman, Albany, N. Y., furnished August 10, 1878, with record of direction and velocity of wind at Erie, Pa., and Cleveland, Ohio, on December 29, 1876.

Capt. W. H. Nash, commissary of subsistence, U. S. A., Cheyenne, Wyo., furnished

August 15, 1878, with a record of monthly and annual rainfall at Denver, Colo., and Cheyenne, Wyo., from January 1, 1873, to July 31, 1878.

Mr. William H. Hall, State engineer, Sacramento, Cal., furnished August 27, 1878, with a record of monthly and annual rainfall at San Diego and San Francisco, for the years 1871 to 1878, and at Red Bluff, Sacramento, and Visalia, for the years 1877 and 1878.

Mr. Frank J. Bramhall, editor Southern Guide, Abingdon, Va., furnished September 6, 1878, with statement showing monthly maximum, minimum, and mean temperatures and total monthly rainfall at Wytheville, Va., from February, 1873, to July, 1876, inclusive.

Mr. David Cranmer, War Department, Washington, D. C., furnished September 6, 1878, with statement showing total monthly amount of rainfall and number of days on which rain fell during the months of September and October, 1875, 1876, and 1877, at Washington, D. C.

Mr. J. W. Osborne, Washington, D. C., furnished September 16, 1878, with record of maximum velocity of wind during the storm of August 10, 1878, also January 17, 1879, with statement showing velocity of wind and state of weather at Washington, D. C., on October 17 and 23, 1878.

Mr. H. Steelman, Philadelphia, Pa., furnished September 16, 1878, with statement of direction and force of wind and state of the weather at each observation, at Philadelphia, from September 27 to October 4, 1877, inclusive.

Curtis Tilton, esq., attorney at law, Philadelphia, Pa., furnished September 23, 1878, with a statement of observations taken at Cape May, N. J., on the 3d and 4th of March, 1878.

Rear-Admiral Daniel Ammen, U. S. N., furnished September 27 1878, with record of heaviest rainfalls occurring at Washington from 1873 to 1877, inclusive, and from January to August, 1878, inclusive.

Mr. A. M. Wellington, engineering department, Atlantic and Great Western Railroad, Cleveland, Ohio, furnished September 30, 1878, with the average monthly temperature at Nashville, Tenn., during the years 1874, 1875, 1876, and 1877.

Charles Negley, attorney at law, Baltimore, Md., furnished October 2, 1878, with copies of the original records for April 13 and 14, 1877, of the stations of the Signal Service, United States Army, at Norfolk, Va., Cape Hatteras, N. C., Kittyhawk, N. C., Cape Henry, Va., Wilmington, N. C., Charleston, S. C., and Savannah and Tybee Island, Ga.

F. Hawn, chairman of the committee on meteorology, State horticultural society, Leavenworth, Kans., furnished October 2, 1878, with record of average rainfall for several years, monthly amount of rainfall and comparison with the average for several years during the spring and summer months in the years 1873 to 1878 at Leavenworth, Saint Louis, and Yankton; also, on March 20, 1879, with record of highest, lowest, and range of barometer, highest, lowest, and range of temperature, with the mean for each month, each season, and for the year, and the mean of maximum and minimum relative humidity, amount of precipitation, and prevailing direction of wind for each month, together with the highest velocity and yearly movement in miles, during the year 1878; also, the comparative temperatures and precipitation of previous years at Leavenworth, Kans.

General G. A. Karwiese, Louisville, Ky., furnished September 24, 1878, with a statement showing mean monthly temperature, monthly amount of rainfall and date, time of commencement and ending, and amount of heaviest rainfalls during the years 1873 to 1877, and to include August, 1878, at Washington, D. C.

Elijah S. Pierce, Hartford, Conn., furnished October 4, 1878, with table showing mean monthly temperature and monthly rainfall at Breckinridge, Minn., and Bismarck, Dak., from dates at which those stations were opened.

John Balsiger, esq., Highland, Ill., furnished October 5, 1878, with mean barometer for the month of October for seven years at Saint Louis, Mo.; also, a table of rain and dry winds for each month in the year in the Upper Mississippi Valley.

William H. Cook, Carlisle, Pa., furnished October 5, 1878, with monthly mean of barometer at Philadelphia for seven years, from September, 1871, to September, 1878.

G. T. Patterson, jr., New York City, furnished October 5, 1878, with statement showing the total movement of and maximum velocity of wind, in miles per hour, for the year 1877, at Buffalo, N. Y., Oswego, N. Y., Cleveland, O., Chicago, Ill., and San Francisco, Cal.

John S. Hittell, editor Alta California, San Francisco, Cal., furnished October 7, 1878, with statement showing the mean monthly humidity at San Diego, Cal., from July, 1877, to June, 1878, inclusive; also, on January 28, 1879 (through Hon. J. M. Killinger, M. C.), with statement showing monthly mean relative humidity at Signal Service stations at Boston, New York, Chicago, New Orleans, Jacksonville, Saint Louis, Saint Paul, Denver, and Portland (Oreg.), from January, 1874, to December, 1878, inclusive; and from Fort Bayard, N. M., September, 1877, to March, 1878; Pioche, Nev., August, 1877, to December, 1878; Olympia, Wash., July, 1877, to November, 1878;

and Fort Saint Michaels, Alaska, from August, 1877, to June, 1878; also, on March 25, 1879, with statement showing mean relative humidity for each month of the year 1878, at Signal Service stations at Wilmington, N. C., Santa Fé, N. M., Denver, Col., Virginia City, Mont., Portland, Roseburg, and Umatilla, Oreg., Boise City, Idaho, and Olympia, Wash.; and at volunteer stations at Asheville, Lenoir, Forest Hill, Greenville, and Fayetteville, N. C., McMinnville, Tenn., Georgetown and South Pueblo, Colo., and Walla Walla, Wash.

Mr. N. D. Cross, secretary Central City Insurance Company, Selma, Ala., furnished October 8, 1878, with table showing total monthly movement of wind at Montgomery, Ala., from October, 1872, to September, 1878, inclusive.

Dr. Henry F. Lyster, Michigan State board of health, Detroit, Mich., furnished October 10, 1878, with table showing mean temperature, prevailing direction and total movement of wind, amount of precipitation, and number of days on which rain or snow fell for each month from September, 1871, to September, 1878, inclusive, at Detroit, Mich.; also, on October 30, 1878, with same data from observations taken at Detroit and Grand Haven, from September, 1871, to September, 1878, and Port Huron from August, 1874, to September, 1878, inclusive.

Mr. B. A. Hayes, Executive Mansion, Washington, D. C., furnished October 10, 1878, with table showing the wet and dry winds for the lower lake region, and mean barometer for each month in the year at or near Fremont, Ohio.

S. C. Loomis, Washington, D. C., furnished October 12, 1878, with statement showing temperature of the air at New York City, at 12.12 p. m. (local time), and at Washington, D. C., at 12 m., from July 20 to August 8, 1878, inclusive.

Theodore Weston, architect Equitable Assurance Society, New York City, furnished October 12, 1878, with statement showing the monthly amount of rainfall (in inches and hundredths) at New York City, from January, 1871, to September, 1878, inclusive.

N. M. Lowe, Boston, Mass., furnished October 17, 1878, with statement of monthly and yearly mean relative humidity at New York City, from July, 1873, to September, 1878, inclusive.

Prof. E. T. Nelson, Delaware, Ohio, furnished October 19, 1878, with statement showing the time of commencement and ending and amount of rainfall (in inches and hundredths) at Cincinnati, Cleveland, Columbus, Sandusky, and Toledo, Ohio, from September 10 to 13, 1878, inclusive.

Dr. J. W. Caldwell, Clarksville, Tenn., furnished November 2, 1878, with statement showing the number of thunder-storms reported at Memphis, Vicksburg, Louisville, and Atlanta during the months of June, July, August, and September, 1876, 1877, and 1878.

Prof. Elias Loomis, New Haven, Conn., furnished October 22, 1878, with statement showing original reading of barometer and attached and exposed thermometers, barometer corrected for instrumental error only, and barometer reduced to sea-level at each of the seven daily observations taken at Colorado Springs, Colo., from November 12, 1873, to January 31, 1875, inclusive.

Mr. H. de Pombiroy, Saint Louis, Mo., furnished November 5, 1878, with records of earliest frosts reported by the stations of the Signal Service at New Orleans, La., and Memphis, Tenn., in years 1871 to 1878, inclusive.

W. W. Daniells, University of Wisconsin, Madison, Wis., furnished November 6, 1878, with statement showing barometer readings and velocity of wind at Signal Service station, Dubuque, Iowa, on May 23, 1878.

E. E. Ryan & Co., insurance agents, Chicago, Ill., furnished November 7, 1878, with statement showing maximum yearly and mean hourly velocity of wind at Signal Service station, Baltimore, Md, in years 1875, 1876, and 1877, giving dates on which maximum velocity occurred during each year; also, on November 11, 1878, with total monthly movement and maximum hourly velocity of wind during each month in years 1875, 1876, and 1877, at office of Chief Signal Officer, Washington, D. C.

Mr. M. Meigs, Rock Island, Ill., furnished November 13, 1878, with a statement showing the readings of the river-gauge at La Crosse, Wis., for months of August, September, and October, 1878.

Messrs. A. M. Lapham & Co., Springfield, Mo., furnished November 14, 1878, with statement showing elevation of barometers at the different stations of the Signal Service.

Mr. Henry Gannett, United States Geographical and Geological Survey of the Territories, Washington, D. C., furnished November 19, 1878, with statement showing original readings of barometer, attached and exposed thermometers at 7 a. m., 2. p. m., and 9 p. m., local time, at Virginia City, Mont., during months of August, September, and October, 1878; also, on November 25, 1878, with table showing constant corrections for reducing the barometric readings to sea-level, used during the years 1875 and 1876 at Salt Lake City, Utah, and Virginia City, Mont.; also, on January 16, 1879, with statement showing original readings of barometer and attached and exposed thermometers at the Signal Service stations at Cheyenne and Salt Lake City, during August, September, and October, 1878.

Dr. C. C. Lathrop, secretary Colorado State Medical Society, Denver, Col., furnished November 23, 1878, with statement showing mean monthly relative humidity during the year 1876, at the station of observation of the Signal Service at Cheyenne, Wyo., and mean monthly relative humidity and total monthly movement of wind during the years 1876 and 1877, and total monthly rainfall and prevailing direction of wind from July to December, 1877, inclusive, at Santa Fé, N. M.; also, on January 2, 1879, with statement showing mean monthly relative humidity at the station of observation of the Signal Service, United States Army, at Cheyenne, Wyo., during the year 1876, mean monthly relative humidity and total movement (monthly) of wind during the years 1876 and 1877, and maximum, minimum, and mean monthly temperature, prevailing direction of wind, and total monthly amount of rainfall from July to December, 1877, at Santa Fé, N. M.

General Shields, collector of customs, Galveston, Texas, furnished November 25, 1878, with statement showing the monthly amount of rainfall in inches and hundredths, at Brownsville, Tex., from December, 1875; Corsicana, Tex., from October, 1874; Denison, Tex., from July, 1875; Galveston, Tex., from September, 1871; and Indianola, Tex., from May, 1872, to October, 1878, inclusive.

G. C. Wilkins, superintendent Western Union Telegraph Company, furnished November 29, 1878, with direction and character of the wind at Washington, D. C., on Friday, April 30, 1875.

Col. W. J. Davie, State commissioner of agriculture, Frankfort, Ky., furnished November 29, 1878, with table showing mean daily barometer, maximum, minimum, and mean daily temperature, mean daily relative humidity, prevailing direction of wind, rainfall, and character of day from November 1, 1877, to November 20, 1878, at Louisville, Ky.

Dr. H. H. Purnell, Memphis, Tenn., furnished November 30, 1878, with copies of the meteorological record from Signal Service stations covering period from June 1 to November 16, 1878.

Mr. G. W. Barnes, San Diego, Cal., furnished December 3, 1878, with statement showing daily maximum and minimum temperature, reading of exposed thermometer, relative humidity, velocity and direction of wind at 2 p. m. (local time), and total daily movement of wind at Red Bluff and Visalia, Cal., from September 8 to 15, 1878, inclusive.

Mr. Howard Seipt, Philadelphia, Pa., furnished December 7, 1878, with statement showing mean monthly temperature at Philadelphia from January, 1871, at Omaha from October, 1871, and at North Platte from October, 1874; monthly amount of rainfall at Philadelphia from November, 1871, at Omaha from September, 1871, and at North Platte from October, 1874, and monthly maximum and minimum temperature at Philadelphia from April 1873, at Omaha from April 1873, and at North Platte from October, 1874; all to include the month of October, 1878.

C. W. Verder, esq., secretary Scott County Agricultural Society, Davenport, Iowa, furnished December 9, 1878, with meteorological summaries (months and seasons) for year ending November 30, 1878.

Messrs. Elliott and S. Sidney Smith, New York City, furnished December 12, 1878, with authenticated copy of anemometer record sheet of Signal Service station, New York City, covering the period from 12 m. March 8, to 12 m. March 9, 1877.

Mr. George H. Morgan, secretary of the Merchants' Exchange, Saint Louis, Mo., furnished December 13, 1878, with a record of the daily range of stage of water in the Mississippi River, with temperature of the air at 7 a. m., 2 p. m., and 9 p. m., and daily amount of rainfall at Saint Louis, Mo., from January 1, 1878, to November 30, 1878, inclusive; also, on January 9, 1879, with same data as above for month of December, 1878, and meteorological summary for the year 1878.

Mr. ——— Fisher, depot quartermaster's office, Washington, D. C., furnished December 24, 1878, with mean daily barometer and thermometer at Washington, D. C., from December 6, to December 23, 1878.

Mr. F. H. Kingsbury, assistant general freight agent, Pittsburgh, Cincinnati and Saint Louis Railroad, Columbus, Ohio, furnished December 21, 1878, with transcript from original record of observations taken at Signal Service stations at Columbus, Ohio, Pittsburgh, Pa., and Indianapolis, Ind., on September 9, 10, 11, and 12, 1878.

Messrs. Donnelly and Gassette, Chicago, Ills., furnished January 2, 1879, with meteorological summary for the twelve months ending November 30, 1878.

Lieut. George M. Wheeler, Corps of Engineers, U. S. A., furnished January 11, 1879, with table of barometer, dry and wet bulb thermometers, and relative humidity at Los Angeles, Cal., from August 2, 1878, to December 9, 1878, at 7 a. m., 2 p. m., and 9 p. m., local time; also, January 25, 1879, with tri-daily observations of barometer, and attached and exposed thermometers, and relative humidity at Sacramento, Cal., from August 1 to December 9, 1878; Red Bluff, Cal., from August 2 to December 6, 1878; Silver City, N. M., from August 20 to October 31, 1878; Winnemucca, Nev., from August 1 to September 15, 1878; and Santa Fé, N. M., from July 26 to December 7, 1878; also on March 7, 1879, with readings of barometer, attached, dry and wet bulb

thermometers, barometer corrected for temperature, and relative humidity (at 7 a. m., 2 p. m., and 9 p. m. each day) at Portland, Oreg., from August 10 to November 16, 1878, and Winnemucca, Nev., from November 17 to December 11, 1878; also, on May 26, 1879, with readings of barometer, attached, dry and wet bulb thermometers, taken at Winnemucca, Nev., on December 16, 17, 18, and 19, 1878, at the three daily local observations.

Mr. Thomas Ingersoll, New York City, furnished January 14, 1879, with direction of the wind at Barnegat, N. J., on April 7, 1878, at 12 m.

Secretary of state of the State of Minnesota, furnished January 14, 1879, with meteorological summary of observations taken at Saint Paul, Minn., during the year 1878.

Jesse Johnston, esq., Brooklyn, N. Y., furnished January 16, 1879, with reading of exposed thermometer on March 25, 1878, at 7 a. m., at New York City; also, on May 31, 1879, with record of temperature at New York City at 4.47 p. m., local time, on January 14, 1879.

Dr. L. A. Falligant, United States Yellow Fever Commission, Washington, D. C., furnished January 17, 1879, with statement showing maximum, minimum, and mean temperatures, range of temperature, mean relative humidity, amount of rainfall, and prevailing direction of wind for each day during months of June, July, August, September, and October, 1876 and 1878, at Savannah, Ga.

Mr. S. Lartigue, Saint Louis, Mo., furnished January 22, 1879, with lowest temperature reported from any Signal Service station during the winter of 1878-'79.

P. H. Adams, esq., trace and claim agent, Piedmont Air Line, Richmond, Va., furnished January 22, 1879, with statement showing state of weather and amount of rainfall, at Nashville, Tenn., from December 18, 1877, to January 9, 1878, and Augusta, Ga., from December 14 to December 26, 1877.

J. P. Carson, esq., New York City, furnished January 22, 1879, with statement showing original reading of barometer, and attached and exposed thermometers at each of the seven daily observations at Atlanta, Ga., on November 23, November 25 to 30, December 1 to 7, and December 10 and 11, 1878.

J. M. Trowbridge, city engineer, Kansas City, Mo., furnished January 24, 1879, with statement showing monthly amount of rainfall from September, 1871, to December, 1878, inclusive; also, greatest amount of rainfall in one storm, with time of commencement and ending, and greatest amount of rainfall in one week at Leavenworth, Kans.

Charles H. Steelman, esq., secretary Vessel Owners' and Captains' Association, furnished January 25, 1879, with statement showing hourly velocity of wind from 2 to 12 p. m., October 4, 1877, and direction of wind on same date at 2, 4.42, 9, and 11.07 p. m., at Philadelphia; also, on March 31, 1879, with statement showing direction and velocity of wind at Philadelphia from 1.45 p. m. to midnight of October 4, 1877.

Secretary of Michigan State Board of Health, Lansing, Mich., furnished monthly from January, 1879, with record of meteorological observations taken at Alpena, Mich.

T. W. Hammond, esq., treasurer Worcester and Nashua, Railroad, Worcester, Mass., furnished February 1, 1879, with certified statement showing time of commencement and ending and amount of precipitation on March 25 and 26, 1876, and the direction and velocity of wind on March 26, 1876 (at 7 a. m., 2 p. m., and 9 p. m.), at volunteer stations at North Billerica, Mendon, Waltham, Worcester, and Westborough, Mass.

Verplanck Colvin, superintendent Adirondack Survey, Albany, N. Y., furnished February 13, 1879, with statement showing original readings of barometer, barometer corrected for temperature and instrumental error, barometer reduced to sea-level, and readings of attached, exposed, and dry and wet bulb thermometers, at 7 a. m., 2 p. m., and 9 p. m. each day, at Signal Service stations at Burlington, Vt., and Albany and Oswego, N. Y., from June 1 to December 31, 1878; also, on March 8, 1879, with statement showing original readings of barometer, barometer corrected for temperature and instrumental error, barometer reduced to sea-level, attached, exposed, and dry and wet bulb thermometers and direction of wind, at hours synchronous with 7.35 a. m., 4.35 p. m., and 11 p. m., Washington mean time, each day, at Burlington, Vt., and Albany and Oswego, N. Y., from June 1 to December 31, 1878.

Loudon, Berry & Orton, Philadelphia, furnished February 15, 1879, with statement showing total movement of wind during each month of the year 1878, at Signal Service stations at Washington, Buffalo, Philadelphia, Boston, Chicago, Saint Louis, Leavenworth, Denver, Salt Lake City, San Francisco, Portland (Oreg.), New Orleans, Galveston, and Charleston.

Dr. J. P. Burd, Philadelphia, furnished February 17, 1879, with mean monthly temperature and relative humidity at Atlantic City and Cape May, N. J., during years 1874 to 1878, inclusive.

Gen. Nelson A. Miles, president Army Equipment Board, Washington, D. C., furnished February 18, 1879, with table showing maximum, minimum, and mean temperature during first ten days in July, 1878, and January, 1879, at Signal Service stations

at Bismarck, Pembina, Boston, Eastport, Port Huron, Saint Paul, Virginia City, Portland (Oreg.), Salt Lake City, Cheyenne, Key West, New Orleans, Galveston, Brownsville, Rio Grande City, San Antonio, Fort Craig, Prescott, Tucson, and Yuma.

Dr. George S. Pelzer, city register, Charleston, S. C., furnished February 19, 1879, with meteorological summary of observations taken during year 1878 at Charleston, S. C.

John F. Hedrick, esq., Georgetown, D. C., furnished February 20, 1879, with statement showing barometer reduced to sea-level, dry and wet bulb thermometers, and direction and velocity of the wind at 7.35 a. m., 12 m., 4.35 and 11 p. m., at Washington, D. C., from June 4 to August 5, 1876.

Dr. W. H. Ford, chairman of committee on yellow fever epidemic, Saint Louis Medical Society, Saint Louis, Mo., furnished February 28, 1879, with statement showing number of fair and cloudy days in each week, mean weekly barometer, mean weekly relative humidity, mean weekly temperature, average daily movement of wind, total weekly rainfall, and number of thunder-storms at Signal Service stations at New Orleans, Vicksburg, Memphis, Cairo, Louisville, Galveston, Mobile, Charleston, Norfolk, and Philadelphia, for each week from June 28 to November 7, 1874, June 27 to November 6, 1875, June 25 to November 4, 1876, July 1 to November 3, 1877, and June 30 to November 2, 1878; also, on March 19, 1879, with record of number of fair and cloudy days, mean weekly barometer, mean relative humidity, mean temperature, average daily movement of wind, total rainfall, and number of thunder-storms recorded at Memphis, Tenn., from September 1 to November 2, 1878.

Horace Loomis, esq., assistant engineer department of public works, New York City, furnished March 3, 1879, with statement showing amount of precipitation during each year, from 1871 to 1878, at Signal Service stations at Albany, N. Y., Burlington, Vt., Lynchburg, Va., Augusta, Ga., and Montgomery, Ala.

J. W. Kellett, Rutherford, N. J., furnished March 6, 1879, with statement showing the total and average monthly and annual amount of rainfall at New York City during the years 1871 to 1878, inclusive.

Dr. W. H. Geddings, Aiken, S. C., furnished March 6, 1879, with statement showing maximum, minimum, and mean monthly temperature and mean monthly relative humidity at Augusta, Ga., during the years 1877 and 1878.

Cyrus Thomas, esq., agent United States Entomological Commission, Carbondale, Ill., furnished March 11, 1879, with statement showing readings of exposed thermometer and direction and velocity of the wind at 7 a. m., 2 p. m., and 9 p. m. each day, daily maximum and minimum temperatures at Cheyenne, Wyo., Virginia City, Mont., North Platte, Neb., and Bismarck and Yankton, Dak., during months of June, July, and August, 1877.

Charles A. Richardson, attorney-at-law, Brooklyn, N. Y., furnished March 15, 1879, with statement showing direction and velocity of wind at New York City at each of the seven daily observations on July 13, 1877.

Simon F. Mackie, Lloyd's agent, New York City, furnished March 19, 1879, with record of direction and velocity of wind at Boston, Wood's Holl, New London, New Haven, Newport, New York, Sandy Hook, Barnegat, Atlantic City, Cape May, Philadelphia, and Baltimore, at hours synchronous with 7.35 a. m., 4.35 p. m., and 11 p. m. Washington mean time from December 30, 1878, to January 6, 1879, inclusive; also total movement of wind for each twenty-four hours during the same period at each station.

S. J. Gilmore, esq., land commissioner Kansas Pacific Railroad, Dodge City, Kans., furnished March 20, 1879, with statement showing amount of precipitation at Dodge City, Kans., for each month in the year 1878.

Dr. J. M. Benedict, Salt Lake City, Utah, furnished March 24, 1879, with statement showing monthly and annual mean barometer, temperature, the prevailing direction of wind, amount of precipitation and average number of rainy days for each month of the years 1875, 1876, 1877, and 1878; also mean barometer and temperature for the four years.

Dr. J. C. Rosser, White Earth, Minn., furnished March 28, 1879, with statement showing mean monthly and annual barometer and temperature and amount of precipitation at Signal Service stations at La Crosse, Wis., Breckenridge, Duluth, and Saint Paul, Minn., and Bismarck, Dak., during years 1875, 1876, 1877, and 1878.

Major Thomas P. Morgan, chief of police, Washington, D. C., furnished March 29, 1879, with memorandum giving character of weather at Washington, D. C., during night of March 10-11, 1879.

D. P. Hatch, esq., Pittsburg, Pa., furnished April 4, 1879, with statement showing amount of precipitation at Santa Fé, N. M., and Tucson, Florence, and Camp Verde, Ariz., during the years 1877 and 1878.

Davis and Snyder, Nebraska Land Agency, Omaha, Neb., furnished April 11, 1879, with statement showing mean monthly and annual temperature and amount of precipitation at Leavenworth, Omaha, North Platte, and Yankton, from 1872 to 1878 inclusive.

Robert A. Caskie, esq., Rocheport, Mo., furnished April 12, 1879, with statement

showing amount of snow-fall at Denver, Pike's Peak, Salt Lake City, and Santa Fé during the months of December, 1878, and January and February, 1879.

O. E. Cromwell, esq., Seawanhaka Yacht Club, New York City, furnished April 14, 1879, with statement showing total number of miles traveled by the wind, with average daily and hourly velocity for each month from May to December, 1878, at San Francisco, Cal.

John R. Proctor, assistant director, Kentucky Geological Survey, Frankfort, Ky., furnished April 14, 1879, with statement showing mean temperature and prevailing direction and average velocity of wind at Cairo, Ill., for June, July, August, and September, 1878, with prevailing direction for each day from August 1 to 12, 1878, and mean temperature at Memphis, Tenn., for June, July, August, and September, 1878; also, on May 21, 1879, with statement showing mean monthly barometer and total amount of precipitation at Cairo, Ill., during the months of July, August, and September, 1878.

Thomas J. Long, assistant engineer, department of docks, New York City, furnished April 15, 1879, with statement showing highest velocity of wind at New York City for each year from 1874 to 1878, inclusive, together with the dates, direction, and pressure in pounds per square foot.

C. R. Kirk, esq., New York City, furnished April 22, 1879, with copies of anemometer record sheets of New York station from 12 m., July 5, to 12 m., July 7, 1877.

Dr. C. H. Wilkinson, Saint Mary's Infirmary, Galveston, Tex., furnished April 24, 1879, with statement showing the mean monthly temperature and relative humidity, with number of rainy days for each month in the years 1876, 1877, and 1878 at Galveston, Jacksonville, Saint Paul, and Denver.

G. K. Gilbert, esq , Washington, D. C., furnished April 25, 1879, with barometer readings (corrected for temperature), dry-bulb thermometer, and relative humidity at local observations from August 5 to December 10, 1878, at Salt Lake City.

President Indiana State Board of Agriculture, Indianapolis, Ind., furnished May 2, 1879, with tables showing mean daily and monthly pressure and temperature, total amount of precipitation, prevailing direction and monthly velocity of wind, and mean relative humidity for each month of the year 1878 at Indianapolis, Ind.

Eugster & Co., New Orleans, La., furnished May 2, 1879, with statement showing dates on which navigation was suspended and resumed at Cincinnati, Ohio, and Evansville, Ind., during the winter of 1878 and 1879.

George S. Koontz, general agent, Baltimore and Ohio Railroad, Washington, D. C., furnished May 6, 1879, with statement showing direction and velocity of wind at Washington and Baltimore at 4.35, 9, and 11 p. m., April 5, 1879.

H. P. Gatchell, Atlanta, Ga., furnished May 10, 1879, with statement showing readings of dry and wet bulb thermometers and the relative humidity at Atlanta, Ga., at 7 a. m., 2 p. m., and 9 p. m., each day from January 1 to April 30, 1879.

A. S. Cushman, Berne, Switzerland, furnished May 20, 1879, with statement showing maximum, minimum, and mean temperatures, mean humidity, total amount of precipitation, prevailing direction and highest velocity of wind for each month from October, 1874, to April, 1879, inclusive, at Corsicana, Tex.

Thomas C. Clarke, esq., American Society of Civil Engineers, New York City, furnished May 21, 1879, with highest velocities of wind registered at New York City during the years 1876, 1877, and 1878, with corresponding pressures per square foot.

Hon. H. H. Wells, district attorney, Washington, D. C., furnished May 31, 1879, with record of state of weather on nights of March 18 and 19, 1879, at Washington, D. C.

Lieut. Col. C. S. Stewart, senior member board of engineers for Pacific coast, San Francisco, Cal., furnished May 28, 1879, with record of number of times the wind, blowing from the south, southwest, west, northwest, and north, reached a velocity of twenty miles and over per hour at the Signal Service stations of observation at San Francisco and Red Bluff, Cal., Roseburg and Portland, Oreg., and Olympia, Wash., from date of establishment of stations to April 30, 1879.

Mr. William Sturgis, jr., Cheyenne, Wyo., furnished May 31, 1879, with record of highest, lowest, and mean monthly summer and winter temperatures and the amount of precipitation for each month of the years 1876, 1877, and 1878, at Denver, Col.

Mr. A. H. Huber, postmaster, Westminster, Md., furnished May 31, 1879, with dates of heavy frosts occurring in that vicinity in May, 1878.

Mr. Charles O. Brown, editor of The Spectator, Rochester, Mich., furnished June 9, 1879, with table showing monthly and annual amount of precipitation at Port Huron, Grand Haven, and Detroit, Mich., from August, 1874, to May, 1879, inclusive.

Mr. T. S. Sozinsky, Philadelphia, Pa., furnished June 19, 1879, with tables showing relative humidity and amount of precipitation at Atlantic City and Cape May, N. J., for each month—from December, 1873, at the former and from July, 1873, at the latter—until May, 1879, inclusive.

Mr. C. H. McLeod, McGill College Observatory, Montreal, Canada, furnished June 24, 1879, with tables showing monthly mean temperature at New York City and Philadelphia for the months of August and September in the years 1871 to 1878, inclusive.

Messrs. Butler, Stillman, and Hubbard, New York City, furnished June 24, 1879, with transcript from original record of observations taken at 7 a. m., 2 p. m., and 9 p. m., July 7, 1878, at New York City.

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List of publications received during the fiscal year ending June 30, 1879.

Transactions of the Connecticut Academy of Sciences. Vol. 3, part 2. 1878.

First Annual Report of the United States Entomological Commission for the year 1877, relating to the Rocky Mountain locust.

Meteorological Charts of the North Pacific Ocean, from the equator to latitude 45° north, and from the American coast to the 180th meridian; giving information regarding winds, calms, fog, rain, squalls, weather, barometer, and temperature of the air and of sea-water at the surface, all for every five degrees square and for each month. Published by the Hydrographic Office. Commodore R. H. Wyman, U. S. N. Washington, 1878.

Transactions of the Medical Association of the State of Alabama. The report of the State board of health, thirty-first session, 1878.

Annals of the Astronomical Observatory of Harvard College. Vol. 9. Observations made under the direction of the late Joseph Winlock. Leipzig, 1878.

Register of the Commissioned, Warrant, and Volunteer Officers of the Navy of the United States, including Officers of the Marine Corps and others, to July 1, 1878.

Report of the Committee to collect Information Relative to the Meteor of December 24, 1873. Philosophical Society of Washington.

Variola; its Causes, Nature, and Prophylaxis, and the Dangers of Vaccination. By C. Sprinzig, M. D. Saint Louis, 1878.

The Solar Eclipse of July 29, 1878. Chicago Astronomical Society.

Statutes of the United States of America, passed at the second session of the Forty-fifth Congress, 1877–'78, and Recent Treaties and Postal Conventions. Washington, 1878.

Ordnance Memoranda No. 21. Ammunition, Fuses, Primers, Military Pyrotechny, &c., proposed under the direction of Brig. Gen. S. V. Benét and Lieut. F. Heath. Revised and corrected by the Ordnance Board. Washington, 1878.

Observations and Orbits of the Satellites of Mars, with data for Ephemerides in 1879. By Asaph Hall. Washington, 1878.

Circular of Information of the Bureau of Education. No. 1, 1878. "The training of teachers in Germany." Washington, 1878.

Revised Statutes of the United States, passed at the first session of the Forty-third Congress, 1873–'74, second edition. Washington, 1878.

Annual Report of the Board of Regents of the Smithsonian Institution, showing the Operations, Expenditures, and Condition of the Institution for the year 1877. Washington, 1878.

Transactions of the Medical Society of the State of Pennsylvania at its Twenty-eighth Annual Session, held at Pittsburgh, May, 1878. Vol. 12. Part 1.

On the Use of the Barometer on Surveys and Reconnaissances, being a Compendium, without plates, of No. 15 of the Professional Papers of the Corps of Engineers. By Lieut. Col. R. S. Williamson. Washington, 1878.

Reports upon the Specimens obtained from Borings made in 1874, between the Mississippi River and Lake Borgne, at the site proposed for an outlet for flood-waters. By Eugene W. Hilgard and Dr. F. V. Hopkins. Washington, 1878.

Fifth Annual Report of the Commission of Agriculture of the State of Georgia for the year 1878.

The Farmer's Scientific Manual, prepared under the direction of Thomas P. Jones, Commissioner of Agriculture of the State of Georgia. Atlanta, 1878.

Proceedings of the Medical Society of the County of Kings, November, 1878. Brooklyn, 1878.

Remarks on the Dudley Observatory Observations of the Transit of Mercury, May 6, 1878. By Lewis Boss.

Report of the Fire Marshal to the Common Council of the City of Chicago for the year 1877.

Report of the Managers of the Philadelphia Maritime Exchange for the year ending April 1, 1878.

Annual Report of the General of the Army to the Secretary of War for the year 1878.

Meteorological Tables and Climatology of Vermont, with map showing the rain-fall; also, suggestions and directions about foretelling storms. By Hiram A. Cutting, Montpelier, Vermont, 1877.
Annual Report of the Judge-Advocate-General to the Secretary of War for the year 1878.
Annual Report of the Commissioner of Pensions to the Secretary of the Interior for the year 1878.
Annual Report of the Inspector-General of the Army to the Secretary of War for the year 1878.
Annual Report of the Board of Health of the District of Columbia, 1877.
Sixth Annual Report of the President and Directors of the Savannah Cotton Exchange, November 1, 1878.
History of the Wallingford Disaster. By John B. Kendrick. Hartford, 1878.
The American Ephemeris and Nautical Almanac for the year 1879.
Annual Report of the Chief of Ordnance to the Secretary of War for the fiscal year ending June 30, 1878.
List of Publications of the Smithsonian Institution. July, 1877.
List of Foreign Correspondents of the Smithsonian Institution, corrected to January, 1878.
Proposed Constitution and By-Laws of the Army Mutual Aid Association.
Second Annual Report of the State Bureau of Agriculture, Horticulture, and Statistics, prepared by Winston J. Davie, M. A., Commissioner. Frankfort, Ky., 1879.
Annual Report of the Light-House Board to the Secretary of the Treasury for the fiscal year ending June 30, 1878.
Annual Report of the Quartermaster-General to the Secretary of War for the fiscal year ending June 30, 1878.
Annual Statement of the Trade and Commerce of Saint Louis for the year 1878.
On the Determination of the True Rain-fall by Elevated Gauges. By Francis E. Nipher, of Saint Louis, Mo.
Annual Report of the Director of the Dudley Observatory for 1878.
Annual Report of the Surgeon-General, United States Army, 1878.
Annual Report of the Comptroller of the Currency to the Third Session of the Forty-fifth Congress of the United States. December 2, 1878.
Report of Edward McPherson, Chief of the Bureau of Engraving and Printing, Treasury Department, for the year ending June 30, 1878.
Annual Report of the Board of Visitors of the United States Military Academy for the year 1878.
Report of a Board of Officers to decide upon a Pattern of Ambulance Wagon for Army Use. Washington, 1878.
Fourteenth Annual Report of Rutgers Scientific School. New Brunswick, N. J., 1878.
Annual Report of the Directors of Harvard College Observatory, 1878.
Third Annual Report of the Johns Hopkins University, 1878.
Second Annual Report of the State Board of Health of Colorado for the year 1877.
Annual Report of the Health Officer of the District of Columbia for the year 1878.
Thirteenth Annual Report of the Cincinnati Chamber of Commerce and Merchants' Exchange for the year ending August 31, 1878.
Annual Report of the Postmaster-General of the United States for the year ending June 30, 1878.
Astronomical and Meteorological Observations made at the United States Naval Observatory during the year 1875. Washington, 1878.
Cases decided in the Court of Claims at the December term, 1877, and the decisions of the Supreme Court in the Appealed Cases from October, 1877, to May, 1878. Vol. XIII. Washington, 1879.
List of Light-Houses, Lighted Beacons, and Floating Lights on the Atlantic, Gulf, and Pacific Coasts of the United States, corrected to January 1, 1879.
The Wisconsin Tornadoes of May 23, 1878. By W. W. Daniells.
The Meteorologist, March, 1879.
Report of the Observations of the Total Solar Eclipse July 29, 1878, made at Fort Worth, Texas. Edited by Leonard Waldo. Cambridge, 1879.
Second Annual Report of the Omaha Board of Trade for the year 1878.
Report of the Board of Health of New Jersey, 1878.
Ninth Annual Report of the Trade and Commerce of the City of Peoria for the year ending December 31, 1878.
Ninteenth Annual Report of the Trade and Commerce of the City of Toledo for the year ending December 31, 1877.
Register of the Department of the Interior, containing a list of persons employed in the department appointed by the President and by the Secretary of the Interior, corrected to January 1, 1879.
Transactions of the Wisconsin Academy of Sciences, Arts, and Letters. Vol. IV. 1876–'77. Madison, Wis., 1878.

Twenty-fourth Annual Report of the Baltimore Corn and Flour Exchange for the year 1878.

Report upon the United States Geographical Surveys West of the 100th Meridian, in charge of First Lieut. Geo. M. Wheeler, U. S. A. Vol. 6. Botany. Washington, 1878.

Twelfth Annual Report of the Health Department to the Honorable Common Council of the City of Cincinnati for the year 1878.

Studies in Relation to the Production of Pain by Weather. By J. T. Everett. Chicago, 1879.

Report of the New York State Survey for the year 1878. James T. Gardner, Director. Albany, 1879.

Statutes of the United States of America, passed at the third session of the Forty-fifth Congress, 1878–'79.

Annual Report upon Explorations and Surveys in the Department of the Platte. By W. S. Staunton. Washington, 1878.

An Address on Meteorology, delivered at a meeting of the New Hampshire Board of Agriculture, January 8, 1879. By Samuel D. Lord. Manchester, 1879.

Forests and Forestry. A letter addressed to Verplanck Colvin, esq., Superintendent of the Adirondack Surveys, on the importance of forests, their management in Germany, with a short review of the historical development of forestry. By S. V. Dorrieu. New York, 1879.

Twenty-first Annual Report of the Corporation of the Chamber of Commerce of the State of New York, for the year 1878–'79.

Quarantine: Its Sanitary and Political Aspect in relation to the spread of Epidemic Diseases. By J. C. Le Hardy, M. D., of Savannah.

Report on Magnetic Observations in Missouri, summer of 1878. By Francis E. Nipher.

Seventh Annual Report of the Secretary of State of the State of Michigan, relating to Registry and Return of Births, Marriages, and Deaths for the year 1873. Lansing, 1879.

Reports upon the Survey of the Boundary between the Territory of the United States and the Possessions of Great Britain from the Lake of the Woods to the Summit of the Rocky Mountains. Washington, 1878.

Proceedings of the American Association for the Advancement of Science. Twenty-seventh meeting, held at Saint Louis, Mo., August, 1878.

The Meteorology of the Bombay Presidency. By Charles Chambers, F. R. S., with diagrams and maps. London, 1878.

On the Distribution of Rain over the British Isles during the year 1877. Compiled by G. J. Symons. London, 1878.

On the Great Hurricane, the Tracks of American Storms, and the Ordinary Winds of the North Atlantic in August, 1873. By Capt. H. Toynbee. London, 1877.

Quarterly Weather Report of the Meteorological Office. Part III, July-September. Part IV, October-December, 1875. London, 1878.

Hourly readings from the self-recording instruments at the seven observatories in connection with the Meteorological Office, London. October, 1877, to December, 1878.

Proposed theory of the progressive movement of barometric depressions or storms; being a continuation of the paper read before the society on July 5, 1875. By Robert Tennent.

Meteorological observations at stations of the second order for the year 1877. London, 1878.

(Official No. 32). The Meteorology of the North Atlantic during August, 1873. By Capt. Henry Toynbee. Illustrated by daily charts showing the rise and progress of the hurricane which did so much damage in Nova Scotia and its neighborhood on the 25th of August, as well as the normal state of wind and weather in that month. London, 1878.

Report on the Meteorology of India in 1876. By Henry F. Blandford. Calcutta, 1878.

Papers and Proceedings and Report of the Royal Society of Tasmania for 1876. Tasmania, 1877.

Indian Meteorological Memoirs; being occasional discussions and compilations of meteorological data relating to India and the neighboring countries. By Henry F. Blandford. Vol. I, Part II. Calcutta, 1878.

Report on the Administration of the Meteorological Department of the Government of India, 1876–'77.

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PAPER 9.

Monthly and annual mean pressure, reduced to sea-level (observations taken at 7 a. m., 2 and 9 p. m., local time)—July, 1878, to June, 1879, inclusive.

[The daily means are obtained by dividing the sum of the 7 a. m., 2 p. m., and twice the 9 p. m., observations by four; the monthly means by dividing the sum of the daily means by the number of days.]

Stations.	1878.						1879.						Annual mean.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Albany, N. Y	29.905	29.867	30.116	29.986	29.923	29.926	29.983	30.031	30.101	29.912	30.052	29.937	29.978
Alpena, Mich	29.924	29.838	30.004	29.919	a29.955	b29.927	29.998	30.070	30.043	29.991	30.023	29.940	29.969
Atlanta, Ga	.....	.....	.....	c30.076	30.029	b30.113	30.169	30.119	30.086	29.965	29.988	29.980	30.058
Atlantic City, N. J	29.969	29.925	30.131	30.034	29.979	30.017	30.051	30.103	30.122	29.947	30.102	29.988	30.031
Augusta, Ga	29.988	29.956	30.082	30.103	30.077	30.150	30.193	30.151	30.131	30.018	30.043	30.042	30.078
Baltimore, Md	29.953	29.916	30.133	30.052	30.003	30.059	30.107	30.120	30.127	29.964	30.095	30.006	30.045
Barnegat, N. J	29.969	29.929	30.139	30.039	29.970	30.004	30.037	30.066	30.092	29.918	30.080	29.979	30.019
Bismarck, Dak	29.951	29.989	29.992	29.946	30.004	30.077	30.007	30.062	30.001	29.961	29.998	29.903	29.991
Boise City, Idaho	29.917	d29.999	30.105	30.210	30.237	30.311	30.214	30.147	30.103	30.059	30.070	30.030	30.117
Boston, Mass	29.923	29.905	30.162	30.002	29.914	29.924	29.925	30.000	30.089	29.866	30.054	29.940	29.975
Breckenridge, Minn	29.857	29.831	29.889	29.860	29.996	30.139	30.127	30.179	30.036	29.955	29.901	29.794	29.964
Buffalo, N. Y	29.913	29.851	30.058	29.976	29.950	29.930	30.022	30.043	30.060	29.952	30.025	29.940	29.977
Burlington, Vt	29.903	29.861	30.134	29.995	29.936	29.925	29.962	30.030	30.068	29.879	30.001	29.871	29.964
Cairo, Ill	29.969	29.924	30.022	30.044	30.072	30.188	30.254	30.200	30.149	30.026	30.018	30.027	30.074
Cape Hatteras, N. C	30.028	29.961	30.106	30.065	30.043	30.097	30.125	30.115	30.126	30.023	30.082	30.066	30.070
Cape Henry, Va	29.994	b29.950	30.106	30.053	29.999	30.008	30.105	30.088	30.107	29.975	30.082	30.024	30.041
Cape Lookout, N. C	30.023	29.959	30.093	30.064	30.038	30.099	30.145	30.114	30.121	30.011	30.069	30.058	30.066
Cape May, N. J	29.984	29.941	30.143	30.054	29.993	30.035	30.073	30.090	30.099	29.915	30.050	29.970	30.029
Charleston, S. C	30.046	30.003	30.101	30.120	30.103	30.161	30.220	30.124	30.135	30.021	30.035	30.038	30.093
Charlotte, N. C	.....	.....	.....	.....	e30.009	30.055	30.107	30.080	30.059	29.936	29.999	29.974	30.027
Chattanooga, Tenn	.....	.....	.....	.....	.....	.....	f30.180	30.167	30.124	29.996	30.011	30.006	30.081
Cheyenne, Wyo	30.049	30.094	30.023	b29.976	29.998	29.947	29.896	29.876	29.957	29.925	29.947	29.961	29.971
Chicago, Ill	29.923	29.855	30.003	29.967	30.003	30.048	30.117	30.083	30.044	29.976	29.999	29.955	29.998
Cincinnati, Ohio	29.901	29.867	30.067	30.084	30.056	30.119	30.194	30.149	30.117	30.003	30.029	29.995	30.048
Cleveland, Ohio	29.935	29.883	30.077	30.030	30.015	30.034	30.121	30.103	30.083	29.987	30.047	29.978	30.024
Columbus, Ohio	g29.896	29.857	30.059	30.041	30.007	30.054	30.136	30.097	30.077	29.961	30.007	29.958	30.012
Concho, Tex	h29.612	29.617	29.674	29.741	29.811	29.943	29.917	29.832	29.968	29.658	29.586	(i)	.....
Corsicana, Tex	29.929	29.920	30.014	30.042	30.062	30.182	30.187	30.125	30.057	29.939	29.922	29.928	30.026
Davenport, Iowa	29.938	29.895	30.026	30.000	30.043	30.138	30.174	30.117	30.079	29.984	29.956	29.935	30.024
Denison, Tex	29.908	29.909	30.010	30.035	30.053	30.193	30.191	30.117	30.038	29.922	29.893	29.900	30.014
Denver, Colo	30.051	b30.092	30.048	30.010	30.047	30.021	29.956	29.936	29.984	29.940	29.942	29.957	29.999
Des Moines, Iowa	.....	j29.865	29.960	29.961	30.029	b30.169	30.175	30.110	30.063	29.959	d29.902	29.887	30.007

a Twenty-four days only. *b* Thirty days only. *c* Observations commenced Oct. 3, 1878. *d* Twenty-nine days only. *e* Observations commenced Nov. 1, 1878. *f* Observations commenced Jan. 8 1879. *g* Observations commenced July 1, 1878. *h* Twenty-five days only. *i* Local observations discontinued May 31, 1879. *j* Stations opened Aug. 1, 1878.

Monthly and annual mean pressure, reduced to sea-level, &c.—Continued.

Stations.	1878.						1879.						Annual mean.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Detroit, Mich	29.923	29.856	30.039	29.980	29.989	29.990	30.073	30.062	30.054	29.968	30.022	29.949	29.992
Dodge City, Kans	29.525	29.538	29.596	29.658	29.756	29.956	29.901	29.807	29.733	29.571	29.492	29.473	29.667
Dubuque, Iowa	29.925	29.867	29.998	29.963	30.032	30.111	30.149	30.129	30.064	29.984	29.958	29.917	30.008
Duluth, Minn	29.916	29.836	29.944	29.864	30.007	30.060	30.050	30.127	30.012	30.029	30.007	29.898	29.979
Eastport, Me	29.878	29.865	30.145	29.968	29.829	29.840	29.805	29.890	30.047	29.783	30.009	29.894	29.913
Erie, Pa	29.915	29.855	30.057	29.991	29.969	29.957	30.059	30.064	30.067	29.974	30.036	29.959	29.992
Escanaba, Mich	29.949	29.855	29.996	29.905	30.006	29.997	30.037	30.098	30.040	30.033	30.033	29.947	29.992
Fort Gibson, Ind. T	29.911	29.905	30.004	30.015	30.031	30.189	30.185	30.122	30.046	29.937	29.908	29.914	30.014
Galveston, Tex	29.956	29.943	30.020	30.061	30.075	30.159	30.198	30.136	30.112	29.982	29.977	29.971	30.049
Grand Haven, Mich	29.939	29.860	30.021	29.959	30.006	29.993	30.071	30.068	30.067	29.997	30.006	29.954	29.995
Indianapolis, Ind	29.912	29.876	30.050	30.028	30.010	30.082	30.151	30.012	30.073	29.969	29.951	29.954	30.014
Indianola, Tex	29.948	29.937	30.018	30.058	30.076	30.172	30.198	30.136	30.102	29.979	29.972	29.968	30.047
Jacksonville, Fla	29.990	29.989	30.011	30.072	30.079	30.158	30.217	30.150	30.158	30.043	30.035	30.045	30.079
Keokuk, Iowa	29.876	29.846	29.982	29.968	30.009	30.123	30.160	30.093	30.056	29.942	29.902	29.888	29.987
Key West, Fla	29.979	29.999	29.910	29.979	30.042	30.129	30.187	30.110	30.141	30.052	29.994	30.020	30.045
Kittyhawk, N. C	30.013	29.941	30.108	30.067	30.029	30.075	30.114	30.111	30.113	29.991	30.074	30.040	30.056
Knoxville, Tenn	29.965	29.932	30.097	30.121	30.076	30.156	30.213	30.172	30.129	30.011	30.031	30.014	30.076
La Crosse, Wis	29.924	29.849	29.965	29.917	30.016	30.082	30.110	30.102	30.029	29.974	29.944	29.900	29.984
Laredo, Tex	29.805	29.782	29.865	29.901	29.943	30.021	30.042	29.998	29.909	a29.966	.....	.....	.....
Lead City, Dak	30.142	30.183	30.114	b30.038	.....	.....	.....	.....	.....	.....	.....	.....	.....
Leavenworth, Kans	29.876	29.861	29.958	29.972	30.020	30.198	30.189	30.106	30.053	29.974	29.864	29.871	29.995
Los Angeles, Cal	29.858	29.867	29.911	29.945	30.027	30.062	30.110	30.073	30.078	30.014	30.018	29.915	29.990
Louisville, Ky	29.912	29.889	30.071	30.064	30.039	30.109	30.189	30.144	30.101	29.987	29.997	29.987	30.041
Lynchburg, Va	29.911	29.915	30.112	30.076	30.009	30.069	30.118	c30.083	30.089	29.939	30.047	29.999	30.031
Madison, Wis	.....	.....	.....	d29.930	30.019	30.061	30.104	30.088	30.037	29.969	29.959	29.915	.....
Marquette, Mich	29.926	29.826	29.958	29.859	29.980	29.959	29.977	30.073	29.997	30.017	30.002	29.910	29.957
Mason, Tex	.....	.....	.....	.....	.....	.....	.....	.....	.....	c30.002	29.972	29.966	.....
Memphis, Tenn	29.964	29.944	30.074	30.091	30.067	30.182	30.233	30.179	30.134	30.007	30.007	30.002	30.074
Milwaukee, Wis	29.940	29.867	30.009	29.943	30.006	30.039	30.092	30.083	30.044	29.990	29.997	29.946	29.996
Mobile, Ala	29.980	29.981	30.057	30.096	30.090	30.181	30.240	30.165	30.166	30.033	30.012	30.007	30.084
Montgomery, Ala	29.975	29.962	30.053	30.107	30.086	30.176	30.232	30.174	30.159	30.024	30.026	30.023	30.083
Morgantown, W. Va	29.924	29.879	30.087	30.045	30.005	30.048	30.112	30.074	30.069	29.941	30.018	29.975	30.005
Mount Washington, N. H	30.226	30.178	30.338	30.089	29.798	29.631	29.603	29.653	29.864	29.782	30.181	30.138	29.957
Nashville, Tenn	29.958	29.929	30.090	30.105	30.064	30.167	30.222	30.175	30.132	30.006	30.011	30.006	30.072
New Haven, Conn	29.952	29.920	30.156	30.021	29.950	29.965	29.992	30.037	30.098	29.894	30.074	29.956	30.001
New London, Conn	29.958	29.934	30.173	30.033	29.950	29.970	29.984	30.037	30.107	29.896	30.085	29.968	30.008
New Orleans, La	29.959	29.956	30.025	30.072	30.059	30.155	30.215	30.143	30.136	30.006	29.997	29.987	30.059
Newport, R. I	29.949	29.917	30.160	30.012	29.929	29.948	29.960	30.022	30.090	29.878	30.083	29.963	29.993
New York, N. Y	29.971	29.937	30.162	30.047	29.976	29.996	30.055	30.084	30.112	29.928	30.093	29.976	30.026

Norfolk, Va	*30.003*	*29.943*	*30.129*	*30.084*	*30.033*	*30.077*	*30.120*	*30.111*	*30.113*	*29.976*	*30.080*	*30.028*	*30.058*
North Platte, Nebr	*29.483*	*29.516*	*29.593*	*29.640*	*29.756*	*29.925*	*29.844*	*29.821*	*29.715*	*29.553*	*29.471*	*29.433*	*29.646*
Olympia, Wash	*29.971*	*29.989*	*29.986*	*30.091*	*30.080*	*30.218*	*30.045*	*29.966*	*29.871*	*30.030*	*29.998*	*30.050*	*30.025*
Omaha, Nebr	*29.829*	*29.820*	*29.909*	*29.913*	*29.988*	*30.160*	*30.139*	*30.071*	*30.017*	*29.892*	*29.808*	*29.804*	*29.946*
Oswego, N. Y	*29.933*	*29.878*	*30.102*	*30.000*	*29.955*	*29.934*	*30.017*	*30.059*	*30.090*	*29.948*	*30.051*	*29.957*	*29.994*
Pembina, Dak	29.869	29.862	29.909	29.854	29.981	30.125	30.100	30.226	30.036	30.000	29.973	29.767	29.975
Philadelphia, Pa	29.968	29.935	30.153	30.053	29.991	30.018	30.069	30.087	30.108	29.935	30.084	29.984	30.032
Pike's Peak, Colo	30.280	30.312	30.121	29.987	29.945	29.711	29.744	29.767	29.925	29.899	30.030	30.130	29.988
Pioche, Nev	29.828	29.898	29.857	29.892	29.891	29.853	29.807	29.841	29.832	29.769	[f]29.729	.....	.....
Pittsburgh, Pa	29.907	29.864	30.076	30.034	29.997	30.037	30.118	30.088	30.085	29.959	30.034	29.967	30.014
Port Huron, Mich	29.916	29.844	30.028	29.964	29.972	29.958	30.040	30.049	30.048	29.968	30.019	29.945	29.979
Portland, Me	29.896	29.879	30.153	29.978	29.878	29.875	29.873	29.961	30.068	29.832	30.017	29.917	29.944
Portland, Oreg	30.043	30.043	30.067	30.185	30.161	30.300	30.173	30.090	29.971	30.109	30.080	30.106	30.111
Punta Rassa, Fla	30.000	30.214	29.915	30.027	30.073	30.163	30.220	30.132	30.169	30.071	30.004	30.022	30.067
Red Bluff, Cal	29.790	29.788	29.911	29.998	30.104	30.158	30.161	30.101	30.038	30.007	30.021	29.829	29.992
Rochester, N. Y	29.903	29.851	30.070	29.974	29.943	29.933	30.011	30.040	30.075	29.914	30.030	29.944	29.976
Roseburg, Oreg	30.007	30.002	30.047	30.172	30.159	30.259	30.186	30.127	30.005	30.101	30.097	30.105	30.106
Sacramento, Cal	29.832	29.829	29.922	29.987	30.096	30.130	30.155	30.105	30.087	30.025	30.048	29.814	30.013
Salt Lake City, Utah	29.900	29.956	29.975	30.055	30.081	30.091	30.021	30.009	29.970	29.907	29.883	29.896	29.979
San Diego, Cal	29.899	29.915	29.956	29.982	30.066	30.090	30.135	30.101	30.111	30.051	30.043	29.942	30.024
Sandusky, Ohio	29.948	29.894	30.069	30.024	30.020	30.046	30.126	30.102	30.084	29.994	30.045	29.975	30.027
Sandy Hook, N. J	29.967	29.920	30.152	30.032	29.966	29.992	30.027	30.062	30.091	29.906	30.074	29.975	30.014
San Francisco, Cal	29.903	29.899	29.973	30.008	30.102	30.118	30.157	30.126	30.103	30.059	30.096	29.913	30.038
Santa Fé, N. Mex	29.911	29.928	29.896	29.881	29.823	29.770	29.782	29.772	29.810	29.770	29.837	29.847	29.836
Savannah, Ga	30.010	29.978	30.061	30.094	30.084	30.151	30.206	30.151	30.150	30.036	30.052	30.056	30.086
Shreveport, La	29.953	29.920	30.044	30.073	30.068	30.179	30.203	30.140	30.096	29.969	29.974	29.979	30.051
Smithville, N. C	30.056	29.988	30.113	30.099	30.093	30.135	30.186	30.150	30.151	30.045	30.083	30.080	30.098
Springfield, Mass	29.870	29.849	30.148	30.007	29.934	29.943	29.969	30.032	30.100	29.896	30.053	29.945	29.979
Saint Louis, Mo	29.938	29.917	30.061	30.047	30.048	30.174	30.212	30.163	30.111	29.996	29.974	29.961	30.050
Saint Mark's, Fla	29.981	29.985	30.011	30.073	30.079	30.162	30.224	30.147	30.157	30.043	30.027	30.036	30.077
Saint Michael's, Alaska	29.778	29.695	29.707	29.659	29.278	29.763	29.642	30.179	29.751	29.677	29.945	.....	[g]29.734
Saint Paul, Minn	29.875	29.811	29.905	29.854	29.977	30.052	30.064	30.082	29.987	29.930	29.898	29.876	29.943
Thatcher's Island, Mass	29.923	29.903	30.168	30.006	29.908	29.916	29.915	29.997	30.122	29.864	30.059	29.951	29.978
Toledo, Ohio	29.913	[h]29.859	30.038	29.989	29.988	30.000	30.086	30.060	30.036	29.965	30.018	29.949	29.992
Tybee Island, Ga	30.000	29.966	30.041	30.074	30.066	30.147	30.214	[i]30.133	.....	.....	.....	.....	.....
Umatilla, Oreg	29.986	29.993	30.098	30.237	30.290	30.535	30.335	30.222	30.088	30.142	30.115	30.030	30.173
Vicksburg, Miss	29.990	29.975	[j]30.065	[j]30.104	30.121	30.219	30.253	30.196	30.156	30.035	30.027	30.021	30.097
Virginia City, Mont	29.745	29.808	29.771	29.734	29.777	29.785	29.646	29.613	29.651	29.672	29.671	29.691	29.714
Visalia, Cal	29.826	29.834	29.941	30.019	30.136	30.161	30.165	30.112	30.083	30.007	30.015	29.801	30.008
Washington, D. C	29.975	29.938	30.146	30.073	30.015	30.059	30.110	30.113	30.000	29.958	30.084	29.997	30.039
Wilmington, N. C	30.020	29.956	30.091	30.073	30.057	30.109	30.154	30.123	30.111	30.011	30.056	30.049	30.067
Winnemucca, Nev	29.931	29.957	30.009	30.093	30.116	30.134	30.051	30.040	29.998	29.966	29.967	29.956	30.018
Wood's Holl, Mass	29.951	29.916	30.162	30.006	29.920	29.934	29.936	29.990	30.077	29.861	30.078	29.953	29.982
Yankton, Dak	29.876	29.879	29.958	29.959	30.074	30.263	30.222	30.178	30.101	29.974	29.875	29.844	30.001

a Five days only. *b* Station discontinued October 31, 1878. *c* Twenty-seven days only. *d* Station opened September 29, 1878. *e* Local observations commenced April 3, 1879. *f* Nineteen days only. *g* For 11 months only; reports for June, 1879, not yet received. *h* Thirty days only. *i* Station closed February 15, 1879. *j* Twenty-nine days only.

PAPER 10.

Monthly and annual mean temperature, July, 1878, to June, 1879, inclusive.—The daily means are obtained by dividing the sum of the 7 a. m., 2 p. m., and twice the 9 p. m. observations by four; the monthly means by dividing the sum of the daily means by the number of days.

Stations.	1878.						1879.						Annual mean.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
	°	°	°	°	°	°	°	°	°	°	°	°	°
Albany, N. Y	73.5	69.9	63.3	52.9	38.4	28.2	18.6	20.2	30.6	41.9	60.9	65.8	47.0
Alpena, Mich	69.7	67.9	59.6	47.6	*a* 35.5	*b* 23.0	20.6	14.0	25.0	36.2	51.7	59.9	42.6
Atlanta, Ga	.....	.....	.....	*c* 59.8	53.6	*b* 41.2	44.4	44.3	57.6	59.8	70.8	75.6	.....
Atlantic City, N. J	72.5	71.8	68.5	57.6	44.6	32.7	28.5	29.8	39.2	45.5	58.6	65.4	51.2
Augusta, Ga	84.5	83.1	74.8	64.8	54.3	43.6	47.6	47.9	60.1	62.5	73.4	79.3	64.7
Baltimore, Md	80.8	76.0	69.3	58.7	47.3	35.4	32.2	32.8	43.8	52.4	65.6	73.7	55.7
Barnegat, N. J	71.2	71.1	67.6	57.2	43.8	32.9	28.2	29.1	38.7	44.2	57.6	64.9	50.5
Bismarck, Dak	73.6	72.1	54.7	39.8	36.4	14.1	8.8	6.2	24.2	47.1	55.7	65.1	41.5
Boise City, Idaho	76.0	*d* 77.3	60.5	47.9	41.7	29.9	26.1	39.7	47.2	54.8	56.4	65.4	51.9
Boston, Mass	72.4	68.1	62.9	55.3	39.9	29.6	24.5	24.5	33.8	42.4	59.4	64.2	48.1
Breckenridge, Minn	70.7	68.7	54.7	39.9	32.8	10.6	5.2	3.0	24.5	46.0	55.5	65.8	39.8
Buffalo, N. Y	73.6	71.1	63.5	52.2	38.9	25.9	21.1	20.3	31.3	38.9	55.7	63.3	46.3
Burlington, Vt	73.2	69.2	63.2	53.1	37.4	24.7	16.6	16.1	28.4	39.7	61.1	62.8	45.5
Cairo, Ill	82.7	81.2	70.6	59.0	50.1	33.2	35.0	38.8	52.5	59.2	72.0	75.1	59.1
Cape Hatteras, N. C	79.1	78.2	75.3	65.3	55.0	44.8	41.6	41.8	46.9	56.1	64.7	72.2	60.1
Cape Henry, Va	79.8	*b* 77.9	73.4	62.3	51.9	40.3	37.9	38.2	47.9	53.9	64.3	73.1	58.4
Cape Lookout, N. C	81.3	80.1	76.4	65.7	55.8	45.4	43.8	43.6	52.2	58.2	67.4	74.3	62.0
Cape May, N. J	75.6	73.7	70.2	60.0	47.5	36.4	29.8	32.1	42.0	47.5	61.0	69.4	53.8
Charleston, S. C	82.9	83.1	77.2	67.5	57.9	49.2	50.3	49.6	60.2	63.8	72.7	79.6	66.5
Charlotte, N. C	.....	.....	.....	*e* 57.4	49.8	38.3	41.5	40.9	54.8	59 1	68.7	74.9	.....
Chattanooga, Tenn	.....	.....	.....	.....	.....	.....	*f* 44.9	39.8	54.1	58.3	70.8	75.5	.....
Cheyenne, Wyo	70.2	68.3	52.4	*b* 42.4	36.7	20.0	*b* 24.3	31.5	39.3	44.3	56.3	64.1	45.8
Chicago, Ill	75.1	74.1	66.3	52.4	43.4	24.2	22.0	27.5	39.4	47.1	57.8	64.8	49.5
Cincinnati, Ohio	81.5	77.5	68.0	56.6	47.8	31.4	31.0	34.0	45.8	54.0	68.2	73.5	55.9
Cleveland, Ohio	74.3	71.7	65.1	53.3	41.6	25.0	23.2	23.9	36.1	44.2	59.2	66.6	48.8
Columbus, Ohio	*g* 79.3	74.6	65.6	53.0	43.2	26.8	25.8	29.2	41.9	51.6	65.7	72.1	52.4
Concho, Tex	*h* 82.3	82.0	71.3	64.1	53.6	38.8	43.5	48.2	63.4	69.0	78.1	(*i*)	.....
Corsicana, Tex	83.1	84.3	75.5	67.7	57.2	43.8	46.2	50.4	65.6	66.4	76.2	81.7	66.5
Davenport, Iowa	78.4	74.4	65.3	51.9	42.4	20.4	18.3	25.6	39.6	51.0	64.1	69.9	50.1
Deadwood, Dak	.....	.....	.....	.....	*j* 36.7	18.6	21.8	24.4	34.8	45 5	53.8	61.3	.....
Denison, Tex	82.5	82.5	73.5	64.4	56.1	38.5	41.0	45.6	61.4	64.0	74.4	80.0	63.7
Denver, Colo	74.0	*b* 72.7	58.7	49.7	41.1	21.6	23.7	35.4	46.2	50.4	62.0	68.6	50.3
Des Moines, Iowa	.....	*k* 78.0	68.1	50.4	42.2	*b* 19.9	18.7	25.2	39.9	51.2	*d* 64.2	70.1	48.0
Detroit, Mich	73.9	71.6	64.4	51.7	39.4	23.6	21.6	23.2	34.4	44.9	59.2	65.8	47.8
Dodge City, Kans	80.0	79.0	67.9	54.0	43.4	23.8	23.9	32.5	47.7	57.0	68.9	76.0	54.5

Dubuque, Iowa	76.4	73.9	64.0	50.2	40.0	20.2	18.1	23.4	37.8	50.5	63.1	68.9	48.8
Duluth, Minn	70.8	70.5	57.3	42.8	36.7	17.7	14.3	11.2	27.1	39.3	48.5	59.9	41.3
Eastport, Me	61.3	60.7	56.5	50.5	37.0	26.3	19.3	21.6	29.9	37.5	47.2	53.2	41.7
Erie, Pa	75.3	73.0	65.5	54.7	42.4	29.0	25.1	24.3	35.9	43.0	58.6	65.6	49.4
Escanaba, Mich	71.1	67.6	58.4	44.5	35.9	20.5	16.8	12.9	25.2	36.7	50.6	60.7	41.7
Fort Gibson, Ind. T	81.9	80.4	71.5	60.8	52.1	32.6	34.3	39.7	56.4	62.2	72.4	78.4	60.2
Galveston, Tex	84.7	83.8	78.5	73.6	62.2	51.5	51.2	55.6	66.8	70.6	77.4	81.4	69.4
Grand Haven, Mich	73.0	70.4	62.9	51.2	41.6	27.5	25.1	23.5	35.8	44.0	58.0	64.0	48.1
Indianapolis, Ind	79.6	75.7	67.1	54.2	45.2	27.0	26.9	30.4	42.7	53.1	66.7	71.4	53.3
Indianola, Tex	84.5	84.3	80.1	73.9	63.2	51.4	52.4	56.2	68.6	72.1	78.6	81.8	70.6
Jacksonville, Fla	83.4	82.8	77.9	69.4	61.6	52.7	53.8	54.9	64.6	67.5	74.0	79.6	68.5
Keokuk, Iowa	81.8	78.1	68.5	54.7	44.1	23.3	21.8	29.9	42.8	52.9	67.4	72.5	53.1
Key West, Fla	84.9	85.3	82.6	78.6	73.7	68.1	66.6	68.7	73.0	75.0	78.6	80.9	75.9
Kittyhawk, N. C	78.7	77.7	74.2	62.9	51.8	41.8	38.9	39.2	48.9	55.5	62.1	72.1	58.6
Knoxville, Tenn	80.5	77.3	68.9	56.2	48.2	34.1	37.2	37.8	51.9	56.7	69.2	73.9	57.7
La Crosse, Wis	74.8	73.8	62.5	48.9	40.4	22.1	18.6	19.7	36.5	50.5	61.8	69.2	48.2
Laredo, Tex	84.3	*d* 85.5	*l* 81.0	75.4	64.6	50.5	56.2	59.1	73.6	(*m*)	.....	.....	.....
Lead City, Dak	67.7	65.8	49.1	*n* 39.6	.....	.....	.....	.....	.....	.....	.....	.....	.....
Leavenworth, Kans	80.3	78.9	67.8	55.2	45.7	23.3	23.6	32.9	46.4	55.4	69.0	73.3	54.3
Los Angeles, Cal	67.0	68.2	65.5	62.1	57.5	53.0	51.1	54.8	57.7	58.2	61.8	65.8	60.2
Louisville, Ky	81.8	78.7	69.0	57.1	47.6	31.5	32.1	35.4	48.8	55.6	69.5	74.1	56.8
Lynchburg, Va	83.0	78.1	70.6	59.0	49.0	36.3	36.7	*l* 38.3	51.3	56.9	68.6	75.7	58.6
Madison, Wis	.....	.....	.....	*o* 49.6	40.2	22.1	19.7	22.0	36.7	48.2	60.7	67.4	.....
Marquette, Mich	70.2	68.7	59.4	46.6	38.4	23.1	21.2	15.9	28.4	39.3	50.4	61.1	43.6
Mason, Tex	.....	.....	.....	.....	.....	.....	.....	.....	.....	*p* 67.3	77.7	82.2	.....
Memphis, Tenn	83.7	82.1	72.0	61.3	52.0	37.0	38.7	42.0	56.1	61.5	72.7	77.0	61.3
Milwaukee, Wis	72.7	71.1	63.4	49.6	41.0	21.6	21.6	23.7	35.8	43.9	53.8	62.0	46.7
Mobile, Ala	84.5	82.7	77.8	68.4	58.1	47.6	49.0	51.7	62.0	66.0	74.6	79.7	66.8
Montgomery, Ala	85.0	82.0	76.8	64.9	56.4	44.7	48.3	49.4	60.8	64.3	74.4	79.3	65.5
Morgantown, W. Va	78.9	74.3	66.9	54.2	43.5	31.4	33.9	35.3	45.0	51.4	64.8	69.9	54.1
Mount Washington, N. H	50.4	47.0	43.5	33.3	17.1	6.5	2.1	— 0.7	13.7	17.5	37.5	42.8	25.9
Nashville, Tenn	82.8	80.6	70.3	59.6	49.7	35.0	57.4	39.1	53.1	58.9	72.5	77.2	59.7
New Haven, Conn	75.1	72.0	65.6	57.0	42.9	34.4	27.5	27.6	37.7	46.2	61.4	69.3	51.4
New London, Conn	72.3	69.5	65.0	56.6	42.6	33.1	26.6	26.7	36.7	44.3	57.7	65.8	49.7
New Orleans, La	84.1	83.5	78.7	70.6	60.8	51.2	53.1	55.8	64.7	67.9	76.5	80.9	69.0
Newport, R. I	70.7	69.2	64.9	56.9	43.3	33.6	28.0	28.3	36.6	43.6	56.3	63.5	49.6
New York, N. Y	74.7	71.8	67.0	58.0	44.0	33.3	27.3	27.6	38.4	46.1	60.5	69.2	51.5
Norfolk, Va	81.9	78.3	72.6	60.9	50.5	39.2	37.5	38.9	49.3	56.3	65.7	75.9	58.9
North Platte, Nebr	75.8	74.5	60.3	47.8	38.8	20.5	22.2	19.6	40.9	51.4	62.1	70.0	48.7
Olympia, Wash	61.0	62.5	54.4	47.4	44.2	29.6	36.2	40.2	44.8	48.6	52.4	57.8	49.1
Omaha, Nebr	79.1	77.9	64.3	52.5	44.0	21.8	21.8	27.1	41.6	54.2	67.0	72.7	52.0
Oswego, N. Y	74.2	71.1	65.2	54.5	42.4	32.4	26.5	25.9	35.1	42.2	56.9	62.1	49.0
Pembina, Dak	69.2	65.2	50.8	35.2	30.5	9.1	— 1.0	— 4.3	15.9	41.0	52.5	63.7	35.6
Philadelphia, Pa	77.3	73.4	67.9	58.1	44.8	34.5	29.9	29.9	41.3	49.1	63.6	71.7	53.5
Pike's Peak, Colo	41.6	42.2	29.8	20.7	13.6	— 0.1	4.7	7.4	19.7	17.1	25.8	33.5	21.3
Pioche, Nev	75.6	76.0	62.9	53.5	43.5	32.2	28.7	38.8	49.1	50.6	57.3	66.1	61.2

NOTE.—Unalashka Island, Alaska, reports for May and June, 1879, not yet received.

a Twenty-four days only. *b* Thirty days only. *c* Observations commenced October 3, 1878. *d* Twenty-nine days only. *e* Observations commenced October 6, 1878. *f* Observations commenced Jan. 8, 1879. *g* Station opened July 1, 1878. *h* Twenty-five days only. *i* No local observations taken. *j* Station reopened Nov. 1, 1878. *k* Station opened Aug. 1, 1878. *l* Twenty-seven days only. *m* Local observations discontinued April 6, 1879. *n* Station discontinued Oct. 31, 1878. *o* Station opened Sept. 29, 1878. *p* Local observations commenced April 3, 1879.

Monthly and annual mean temperature, July, 1878, to June, 1879, inclusive—Continued.

Stations.	1878.						1879.						Annual mean.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
	°	°	°	°	°	°	°	°	°	°	°	°	°
Pittsburgh, Pa	78.6	74.2	66.2	54.1	42.4	27.4	26.7	27.7	40.8	48.5	63.9	69.5	51.7
Port Huron, Mich	71.2	70.9	63.3	50.8	37.7	22.7	20.2	19.8	31.7	40.9	55.1	62.4	45.6
Portland, Me	71.6	66.4	62.0	54.0	40.0	30.5	24.2	24.9	34.0	42.6	57.7	61.8	47.5
Portland, Oreg	65.9	67.3	59.1	50.7	46.9	39.8	37.8	44.0	48.8	52.3	54.6	60.5	52.3
Punta Rassa, Fla	82.6	82.9	80.5	75.6	69.6	62.0	62.0	63.5	69.9	71.3	75.8	78.9	72.9
Red Bluff, Cal	82.2	83.0	72.7	64.6	54.7	46.5	44.3	53.0	56.8	61.5	62.8	79.3	62.6
Rochester, N. Y	74.7	71.7	64.7	53.0	38.8	26.5	22.2	21.3	32.3	42.2	60.1	65.7	47.8
Roseburg, Oreg	64.5	66.5	58.1	49.1	45.4	37.4	36.9	43.8	49.5	51.3	52.9	60.7	51.3
Sacramento, Cal	74.3	73.5	68.9	62.7	54.4	46.3	44.9	54.7	57.2	60.8	61.4	73.0	61.0
Salt Lake City, Utah	77.7	78.5	60.5	48.5	42.7	29.7	28.7	39.8	49.8	53.6	59.6	66.4	53.0
San Diego, Cal	66.6	68.3	67.2	61.4	56.8	52.3	51.7	54.1	57.8	58.6	61.4	64.4	60.1
Sandusky, Ohio	75.5	72.8	65.5	53.4	42.8	27.8	25.7	27.9	37.9	46.8	60.4	68.0	50.4
Sandy Hook, N. J	75.0	72.3	67.7	58.6	44.6	33.8	27.0	28.7	38.3	45.5	60.1	69.2	51.7
San Francisco, Cal	57.8	58.2	59.2	61.0	57.0	51.6	48.6	54.1	56.7	55.9	55.9	59.4	64.6
Santa Fé, N. Mex	70.4	68.7	58.4	50.4	38.9	25.9	29.3	36.5	48.3	48.9	60.9	66.4	50.2
Savannah, Ga	83.0	84.5	76.3	67.3	59.1	50.4	51.7	51.5	61.8	65.1	73.7	79.2	67.0
Shreveport, La	83.7	83.1	77.6	65.8	56.7	43.3	46.1	50.7	65.5	65.8	75.9	81.0	66.3
Smithville, N. C	81.3	80.4	75.6	64.5	55.1	45.7	44.5	44.5	54.7	59.7	69.0	75.8	62.6
Springfield, Mass	75.2	70.5	65.3	55.9	40.9	31.8	24.1	25.5	34.8	44.2	61.0	67.3	49.7
Saint Louis, Mo	82.0	79.3	69.3	56.9	47.4	27.2	28.5	34.0	47.8	55.0	69.3	73.3	55.8
Saint Mark's, Fla	81.7	80.3	76.9	66.8	56.7	48.3	49.6	52.0	61.3	63.7	72.1	77.5	65.6
Saint Michael's, Alaska	52.1	52.4	46.0	29.1	15.6	16.6	14.9	3.5	13.6	19.0	31.5	.....	.....
Saint Paul, Minn	73.7	72.0	60.6	46.3	38.3	19.3	16.6	15.3	33.1	50.0	58.7	67.9	46.0
Thatcher's Island, Mass	67.7	65.3	61.7	54.5	41.4	31.0	26.4	26.1	34.3	41.7	53.5	60.4	47.0
Toledo, Ohio	76.5	a73.6	66.1	54.2	43.9	27.7	25.6	28.6	39.2	49.0	62.2	69.4	51.3
Tybee Island, Ga	81.5	82.5	77.4	68.7	58.4	49.6	49.8	b50.4	.....	.....	.....	.....	.....
Umatilla, Oreg	74.3	76.1	62.3	51.5	43.3	32.4	27.6	35.5	49.8	54.7	58.2	65.3	52.6
Unalashka Island, Alaska	.....	.....	c48.0	40.2	33.5	35.1	34.0	29.2	32.2	33.1	.....	.....	.....
Vicksburg, Miss	83.5	82.3	d75.9	e66.6	56.5	44.6	47.4	49.6	64.0	65.2	74.9	79.4	65.8
Virginia City, Mont	67.2	69.2	48.9	38.9	35.1	17.7	18.2	26.2	35.9	44.4	47.9	55.1	42.1
Visalia, Cal	80.5	79.7	69.4	61.1	52.5	43.2	43.7	54.5	60.1	62.0	64.6	78.5	62.5
Washington, D. C	80.4	74.9	68.8	56.9	45.7	33.6	31.1	32.0	43.8	52.1	65.4	73.4	54.8
Wilmington, N. C	80.0	79.2	73.8	63.4	54.0	44.5	45.9	44.6	56.0	59.4	68.7	74.3	62.0
Winnemucca, Nev	74.4	74.8	58.1	46.5	38.9	25.9	24.6	39.9	46.5	51.0	52.6	63.6	49.7
Wood's Holl, Mass	68.8	68.5	62.1	57.8	43.6	34.4	28.5	28.6	36.7	43.0	54.7	62.6	49.1
Yankton, Dak	75.5	73.6	60.1	47.7	38.6	15.3	15.0	19.0	36.1	51.0	64.0	69.8	47.1

a Thirty days only. b Station closed February 15, 1879. c Observations commenced Sept. 1, 1878. d Fifteen days only. e Twenty-nine days only.

PAPER 11.

Monthly and annual amounts of rain-fall, in inches and hundredths, from July, 1878, to June, 1879, inclusive.

Stations.	1878.						1879.						Annual amounts.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Albany, N. Y	5.52	3.76	3.20	3.37	4.43	6.16	2.54	2.80	3.79	3.17	0.89	4.62	44.31
Alpena, Mich	5.56	0.65	9.06	3.74	*a*1.54	2.15	1.63	3.17	1.05	2.21	1.75	3.67	36.18
Albuquerque, N. Mex	.....	.....	.....	*b*0.00	1.83	0.07	0.47	0.26	0.02	0.02	0.03	.....	.....
Atlanta, Ga	.....	.....	.....	*c*1.99	4.54	5.80	4.29	3.09	2.49	3.98	4.16	3.20	.....
Atlantic City, N. J	5.57	2.73	2.01	2.80	2.43	5.82	1.71	2.68	3.04	5.19	1.42	5.20	40.60
Augusta, Ga	5.85	5.46	8.83	1.39	3.81	4.41	2.74	1.79	2.46	5.53	0.84	1.21	44.32
Baltimore, Md	4.66	4.82	0.82	4.41	3.55	5.61	2.59	1.55	1.65	3.69	2.74	3.92	40.01
Barnegat, N. J	6.39	4.78	2.90	2.35	4.75	6.74	3.69	3.82	3.46	4.42	2.00	4.08	49.38
Bismarck, Dak	1.17	2.79	0.67	1.45	0.21	0.58	0.15	0.82	0.58	2.60	3.67	4.97	19.66
Boerne, Tex	*d*1.89	4.10	0.82	0.40	1.27	0.83	1.36	1.04	0.18	5.09	1.98	2.15	21.11
Boise City, Idaho	0.31	0.50	0.27	0.30	0.53	0.35	3.62	1.42	3.04	1.42	0.92	1.43	14.51
Boston, Mass	4.58	7.66	3.47	6.76	8.94	6.76	2.79	4.35	3.90	6.54	0.97	6.24	62.96
Brackettville, Tex	2.66	3.56	2.56	0.58	0.41	0.24	0.08	0.90	2.84	4.56	1.86	.96	21.21
Breckenridge, Minn	3.82	3.83	1.49	3.18	1.38	0.16	0.05	0.40	0.25	1.04	5.42	2.68	23.71
Brownsville, Tex	6.58	7.20	5.21	0.86	1.76	1.34	1.03	1.03	0.33	1.57	0.05	2.55	29.51
Buffalo, N. Y	6.80	3.17	7.44	6.86	4.44	8.55	3.42	2.82	2.13	1.36	1.11	2.48	50.58
Burkes, Ariz	0.03	3.03	0.00	0.00	0.00	0.31	0.00	1.03	0.26	0.00	0.00	0.00	4.66
Burlington, Vt	5.18	5.18	1.13	4.78	3.38	3.24	0.78	1.11	1.45	0.97	0.38	4.52	32.10
Cairo, Ill	2.81	3.45	2.99	2.59	3.80	3.53	2.81	2.03	2.95	2.93	2.79	8.70	41.38
Camp Grant, Ariz	6.44	4.93	0.20	0.00	1.90	1.39	1.38	0.47	0.85	0.07	0.00	0.08	17.74
Campo, Cal	2.32	0.01	0.00	0.31	0.55	1.29	2.18	1.32	0.60	2.01	0.00	0.00	10.59
Camp Verde, Ariz	2.10	4.60	0.98	0.00	0.36	1.24	0.20	0.14	0.00	0.10	0.00	0.00	7.72
Cape Hatteras, N. C	5.36	10.07	2.50	9.99	2.39	10.20	6.44	5.09	12.77	4.64	5.72	2.02	77.19
Cape Henry, Va	1.63	5.28	4.70	6.80	4.02	8.06	4.14	2.59	7.47	3.24	1.31	2.64	51.88
Cape Lookout, N. C	4.71	14.30	6.27	9.20	2.97	11.25	5.84	4.68	4.13	4.62	7.96	2.49	78.42
Cape May, N. J	2.43	6.41	1.33	3.38	3.17	7.00	3.84	3.09	2.99	4.34	0.25	4.21	42.44
Castroville, Tex	0.85	1.00	2.34	0.21	1.27	0.17	0.12	0.29	0.63	2.15	1.21	1.43	11.67
Charleston, S. C	12.10	10.73	8.28	3.98	3.18	5.38	1.74	4.56	1.44	6.29	3.36	3.29	64.33
Charlotte, N. C	.....	.....	.....	*e*3.12	5.11	6.55	3.62	3.62	2.03	2.41	3.97	2.66	.....
Chattanooga, Tenn	.....	.....	.....	.....	.....	.....	*f*8.48	5.85	3.27	3.02	1.51	1.69	.....
Cheyenne, Wyo	1.43	2.50	0.75	0.04	0.00	0.19	0.32	0.20	0.44	1.66	1.30	0.07	7.90
Chicago, Ill	6.09	3.66	1.99	5.17	0.83	2.58	0.54	1.47	2.37	1.93	3.89	3.18	33.70

NOTE.—Unalashka Island, Alaska, May and June not yet received.

a Twenty-four days only. *b* Observations commenced October 1, 1878. *c* Observations commenced October 3, 1878. *d* Fourteen days only. *e* Observations commenced October 6, 1878. *f* Observations commenced January 8, 1879.

Monthly and annual amounts of rain-fall, in inches and hundredths, &c.—Continued.

Stations.	1878.						1879.						Annual amounts.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Cincinnati, Ohio	4.32	4.11	2.84	2.39	2.77	3.89	2.20	2.22	5.30	2.14	4.23	5.22	41.63
Cleveland, Ohio	7.97	2.15	9.30	5.60	2.81	5.06	2.16	2.88	3.50	2.03	2.43	4.26	50.15
Coleman City, Tex	7.60	0.06	5.25	1.65	2.11	0.36	0.97	0.26	1.34	2.68	4.50	2.41	29.19
Columbus, Ohio	3.58	5.00	2.84	3.17	3.06	3.88	1.66	1.43	3.77	0.92	2.09	2.63	34.03
Concho, Tex	6.55	0.23	6.59	0.40	1.70	0.57	0.26	0.06	0.30	2.65	3.13	4.54	26.98
Corsicana, Tex	3.82	0.58	3.23	3.55	2.69	2.33	6.72	0.52	1.04	11.50	4.90	2.85	43.73
Davenport, Iowa	2.19	5.07	1.82	4.21	0.90	0.97	0.79	1.09	1.80	1.54	5.83	4.57	30.78
Deadwood, Dak	.....	.....	.....	.....	a0.75	3.63	0.58	0.72	0.51	7.69	5.03	4.67	.....
Decatur, Tex	7.35	1.39	0.37	0.50	3.17	1.17	2.59	0.66	1.05	2.10	2.75	3.82	26.92
Denison, Tex	9.95	2.61	1.70	0.56	0.62	2.24	2.79	0.45	0.31	4.33	1.52	3.71	30.79
Denver, Colo	1.38	2.25	1.23	0.80	0.67	1.05	0.40	0.39	1.00	2.62	3.36	0.32	15.47
Des Moines, Iowa	.....	b2.21	2.00	2.84	0.34	1.15	0.69	1.90	1.68	1.03	4.74	6.69	25.27
Detroit, Mich	8.76	2.92	3.74	2.89	3.10	4.83	1.11	2.64	1.70	1.56	2.64	3.69	46.58
Dodge City, Kans	1.61	4.48	0.76	0.09	0.60	0.19	0.87	0.08	0.17	0.40	0.90	4.40	14.55
Dubuque, Iowa	6.71	1.72	6.94	2.85	0.80	1.12	0.44	1.00	1.20	2.02	2.94	4.99	32.33
Duluth, Minn	2.53	0.52	4.68	3.55	0.69	1.09	0.72	1.46	1.91	0.90	7.99	5.57	31.01
Eagle Pass, Tex	3.17	4.30	4.18	0.41	0.47	0.35	0.10	0.95	2.05	2.47	0.63	5.12	24.20
Eastport, Me	5.87	3.74	2.54	3.28	2.97	4.28	1.65	3.39	3.77	3.95	3.18	3.42	42.04
Edinburg, Tex	9.25	7.50	0.13	1.26	0.65	1.08	1.32	1.15	0.06	0.00	0.50	1.12	24.02
El Paso, Tex	1.25	2.55	0.66	1.02	0.67	0.11	1.57	0.83	0.18	0.07	0.00	0.08	8.99
Erie, Pa	2.73	2.00	7.08	6.83	4.28	4.45	1.80	2.41	2.99	2.29	1.04	2.33	40.23
Escanaba, Mich	1.56	2.28	6.15	4.17	0.75	0.23	0.35	1.93	2.11	0.45	2.78	4.39	27.15
Florence, Ariz	0.21	3.58	2.75	0.00	1.37	1.85	1.23	1.15	0.96	0.33	0.00	0.00	13.42
Fort Buford, Dak	.....	.....	.....	.....	.....	.....	c0.02	0.59	0.03	2.75	5.56	3.35	.....
Fort Craig, N. Mex	d0.01	1.41	0.08	0.00	0.18	0.13	0.65	0.30	0.00	0.12	0.00	c0.08	2.96
Fort Davis, Tex	2.84	2.83	1.20	0.51	0.65	0.12	0.57	0.51	0.04	0.13	1.05	4.94	15.39
Fort Gibson, Ind. T	4.68	1.70	2.32	1.53	0.35	2.53	3.04	1.44	0.72	4.92	4.54	1.96	29.73
Fort Griffin, Tex	7.84	1.27	2.37	0.56	2.89	1.24	1.96	0.52	0.12	2.96	0.08	6.98	28.79
Fort Keogh, Mont	.....	.....	.....	.....	.....	.....	c0.26	0.69	0.28	2.20	2.75	5.23	.....
Fort McKavett, Tex	3.16	0.54	2.98	2.95	2.87	0.00	1.40	0.63	0.17	2.47	0.97	1.07	19.21
Fort Sill, Ind. T	5.13	2.03	1.26	0.71	2.69	3.01	2.73	0.21	1.47	6.93	2.30	5.97	34.44
Fort Stevenson, Dak	.....	.....	.....	.....	.....	.....	f0.10	0.92	0.86	2.67	3.35	5.80	13.70
Fredericksburg, Tex	1.81	1.34	0.38	0.50	2.09	0.45	0.08	0.82	2.27	5.20	0.61	2.30	17.85
Galveston, Tex	7.70	7.58	5.08	3.72	7.31	9.07	1.88	1.36	0.91	2.55	1.91	1.96	51.03
Graham, Tex	4.37	g1.23	h0.63	1.05	2.10	1.29	1.20	0.37	2.45	4.83	0.73	3.82	24.07
Grand Haven, Mich	2.27	3.35	3.04	6.27	1.44	3.59	1.81	1.86	1.19	1.59	2.46	2.42	31.29
Indianapolis, Ind	4.54	2.42	3.35	4.78	2.87	2.94	1.47	2.17	3.36	2.25	3.38	2.94	36.47
Indianola, Tex	2.72	4.49	0.88	1.12	6.04	2.49	0.70	0.37	0.18	0.87	1.40	0.63	21.89
Jacksboro', Tex	4.42	2.17	1.43	0.85	4.40	0.91	0.63	0.00	0.57	3.28	1.29	4.96	24.89

Jacksonville, Fla	*4.63*	*2.85*	*21.12*	*3.81*	*1.39*	*3.86*	*0.63*	*3.51*	*1.35*	*2.07*	*4.25*	*1.25*	*51.62*
Keokuk, Iowa	*2.37*	*5.27*	*1.36*	*2.31*	*1.93*	*1.95*	*0.50*	*0.53*	*1.71*	*1.56*	*2.27*	*2.63*	*24.39*
Key West, Fla	*7.06*	*4.63*	*8.04*	*5.46*	*1.03*	*1.06*	*4.28*	*3.13*	*0.45*	*0.65*	*5.11*	*7.20*	*50.10*
Kitty Hawk, N. C	*1.34*	*7.27*	*2.43*	*8.21*	*2.68*	*7.52*	*6.90*	*4.07*	*7.85*	*2.03*	*3.15*	*1.44*	*54.89*
Knoxville, Tenn	*5.37*	*6.86*	*0.73*	*5.40*	*5.40*	*5.10*	*9.59*	*5.89*	*3.17*	*3.96*	*3.43*	*1.99*	*56.89*
La Crosse, Wis	*8.51*	*2.30*	*4.85*	*2.90*	*0.49*	*0.71*	*0.31*	*1.38*	*1.38*	*0.42*	*5.37*	*2.49*	*31.11*
La Mesilla, N. Mex	*2.06*	*0.61*	*0.21*	*0.09*	*1.29*	*0.07*	*1.20*	*0.62*	*0.31*	*0.03*	*0.00*	*0.03*	*6.52*
Laredo, Tex	5.83	4.30	1.30	0.00	2.22	0.77	0.35	0.94	1.96	0.04	0.67	2.45	20.83
Lead City, Dak	5.77	2.61	2.06	1.81	(*i*)	.....	.....	.....	.....	.....	.....	.....	.....
Leavenworth, Kans	3.08	3.31	2.64	1.16	1.76	2.16	1.16	0.54	0.32	0.42	3.04	9.90	29.49
Los Angeles, Cal	0.00	0.00	0.00	0.14	0.00	4.70	3.59	0.97	0.49	1.19	0.24	0.03	11.35
Louisville, Ky	4.08	4.21	2.52	3.44	4.78	5.10	2.52	2.31	5.66	4.63	1.68	3.39	44.32
Lynchburg, Va	2.08	5.17	2.78	4.57	3.91	5.26	4.55	1.96	1.08	1.85	1.46	2.03	.....
Madison, Wis	.....	.....	.....	*j*3.78	0.76	0.79	0.79	2.54	1.34	3.33	3.91	2.80	20.04
Marquette, Mich	1.78	2.56	5.37	4.44	1.04	2.46	1.41	4.02	1.98	0.53	3.10	3.32	32.21
Mason, Tex	2.03	2.79	2.25	2.63	3.90	0.56	0.58	0.44	1.02	3.41	0.67	0.73	21.01
Memphis, Tenn	2.40	1.72	2.59	2.91	2.45	3.21	7.71	3.25	2.98	5.54	5.53	3.17	43.46
Milwaukee, Wis	2.94	0.64	4.03	4.13	1.01	1.08	0.51	1.62	1.47	2.04	2.29	2.66	44.42
Mobile, Ala	2.98	9.95	3.86	4.84	6.31	7.64	0.78	1.99	5.94	6.42	3.56	2.35	56.62
Montgomery, Ala	4.59	7.67	2.55	3.49	3.92	6.74	2.06	2.14	2.68	4.50	3.90	3.22	47.46
Morgantown, W. Va	3.74	2.50	3.24	3.87	5.95	4.84	3.41	2.38	4.56	1.47	1.35	4.64	41.95
Mount Washington, N. H	11.00	11.35	7.37	5.78	4.78	8.77	7.13	7.01	7.51	6.79	4.40	11.84	93.73
Nashville, Tenn	9.43	5.02	1.28	2.17	3.20	6.04	6.32	3.13	3.81	2.88	2.88	2.50	48.66
New Haven, Conn	2.53	4.93	7.67	2.33	6.33	5.50	2.69	3.89	5.82	6.08	3.22	4.62	55.61
New London, Conn	3.11	5.44	1.52	3.75	5.80	5.74	3.32	2.81	5.96	6.48	1.47	4.76	50.16
New Orleans, La	6.21	5.31	2.64	5.07	7.78	8.69	2.34	2.13	1.36	9.17	4.63	2.96	58.29
Newport, R. I	2.37	4.15	1.71	5.19	7.99	7.78	3.20	2.28	6.18	6.22	1.46	3.67	52.20
New York, N. Y	5.26	7.30	3.20	1.71	3.74	4.93	3.05	2.74	2.04	4.06	2.23	3.42	43.68
Norfolk, Va	2.02	9.95	2.25	5.03	3.13	4.56	3.26	2.75	4.29	2.15	2.48	2.57	44.44
North Platte, Nebr	3.58	1.52	0.91	0.13	0.46	0.20	2.33	0.43	0.11	1.92	2.25	3.31	17.15
Olympia, Wash	0.98	0.32	4.87	4.32	11.09	7.03	5.96	15.59	14.44	2.10	4.72	0.44	71.86
Omaha, Nebr	7.66	2.48	3.22	0.55	0.29	0.27	0.07	0.93	2.17	1.77	5.53	4.09	29.03
Oswego, N. Y	3.91	4.41	2.62	7.55	5.27	10.49	1.59	2.92	2.54	0.85	1.90	3.49	47.54
Pembina, Dak	4.57	3.01	1.95	6.61	0.32	0.62	0.58	0.98	0.94	0.34	1.54	3.90	25.36
Philadelphia, Pa	4.35	3.83	0.96	2.04	2.19	3.19	2.73	1.19	2.28	4.21	1.22	6.77	34.96
Phœnix, Ariz	2.40	1.63	0.19	0.00	0.27	0.64	0.07	0.75	0.33	0.07	0.00	0.00	6.25
Pike's Peak, Colo	5.46	6.12	2.42	0.24	7.81	4.55	3.71	2.66	2.20	12.15	3.26	0.68	51.26
Pilot Point, Tex	6.00	0.16	1.12	0.09	0.25	1.32	0.25	0.05	0.10	3.05	0.22	0.05	12.66
Pioche, Nev	0.29	0.97	0.22	0.35	0.63	0.42	1.12	0.17	0.12	1.68	0.03	0.40	6.40
Pittsburgh, Pa	5.15	1.29	5.55	2.99	4.20	3.96	1.54	1.74	2.99	1.63	1.20	4.56	36.80
Port Huron, Mich	4.74	4.53	5.48	3.56	2.63	2.67	0.84	1.27	1.56	1.78	1.32	3.29	33.67
Portland, Me	1.56	2.93	1.34	4.48	3.74	5.36	2.30	3.80	4.42	3.68	0.88	6.61	41.10
Portland, Oreg	1.10	0.50	3.54	3.22	5.61	4.52	5.28	13.22	11.70	2.19	6.60	2.18	37.66
Portsmouth, N. C	5.50	11.76	2.64	8.03	1.22	8.99	4.60	4.19	5.08	1.89	4.30	1.35	59.55
Prescott, Ariz	0.91	6.34	0.61	0.00	0.45	1.02	0.91	0.94	0.05	0.03	0.00	0.05	11.31
Punta Rassa, Fla	9.58	3.95	8.77	0.56	0.34	1.07	0.31	2.11	0.14	0.63	1.42	3.22	32.10
Red Bluff, Cal	0.00	0.00	0.42	1.56	1.66	0.69	3.18	3.67	5.39	2.12	2.18	0.30	21.17
Rio Grande City, Tex	5.98	3.00	0.57	1.36	1.88	1.12	0.55	2.43	0.15	0.43	0.93	0.71	19.11

a Station reopened November 1, 1878. *b* Observations commenced August 1, 1878. *c* Observations commenced January 13, 1879. *d* Six days only. *e* Observations discontinued June 26, 1879. *f* Twenty-three days only. *g* Five days only. *h* Station transferred to Deadwood, Dak., November 1, 1878. *i* Observations commenced December 26, 1878. *j* Observations commenced September 29, 1878.

Monthly and annual amounts of rain-fall, in inches and hundredths, &c.—Continued.

Stations.	1878.						1879.						Annual am'ts.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Rochester, N. Y	3.72	3.24	1.35	3.83	5.07	6.17	3.53	3.27	2.53	1.44	1.35	3.73	39.23
Roseburg, Oreg	1.18	0.46	1.29	2.55	3.55	2.73	4.74	4.21	8.60	3.67	4.63	0.56	38.17
Sacramento, Cal	0.00	0.00	0.29	0.55	0.51	0.47	3.18	3.88	4.88	2.66	1.30	0.13	17.85
Salt Lake City, Utah	1.08	0.81	3.15	1.39	0.63	0.11	1.87	0.71	0.67	3.26	0.10	1.34	15.12
San Antonio, Tex	6.09	3.93	3.98	0.56	4.68	1.91	0.98	1.07	0.28	5.71	0.61	2.32	32.12
San Diego, Cal	0.00	0.00	0.00	0.96	0.00	1.57	3.54	1.04	0.10	0.60	(a)	0.07	7.88
Sandusky, Ohio	4.85	1.59	6.76	3.72	2.88	3.44	1.19	2.46	1.95	1.74	1.16	5.97	37.71
Sandy Hook, N. J	6.08	6.19	4.09	2.74	6.96	7.78	3.22	2.72	4.84	6.30	3.59	5.86	60.37
San Francisco, Cal	0.01	0.00	0.55	1.27	0.57	0.58	3.52	4.90	8.75	1.89	2.35	0.05	24.44
Santa Fé, N. Mex	3.20	5.12	1.03	0.00	3.15	0.78	0.77	0.23	0.15	0.48	0.37	0.51	15.79
Savannah, Ga	6.37	6.63	7.20	2.54	3.97	5.06	1.00	3.22	1.55	8.69	3.05	5.86	55.14
Shreveport, La	6.11	2.28	1.66	1.66	3.56	6.57	7.41	2.06	1.26	10.23	2.13	2.09	47.02
Silver City, N. Mex	3.92	7.70	0.27	0.00	3.80	0.77	2.78	1.12	0.32	0.01	0.00	0.08	20.77
Smithville, N. C	6.97	6.05	7.86	8.29	2.04	2.50	2.13	4.76	1.70	3.59	3.82	1.75	51.46
Springfield, Mass	2.04	4.21	2.23	2.55	6.21	6.09	1.48	3.58	4.56	4.94	2.52	7.39	47.80
Saint Louis, Mo	3.92	4.75	3.42	3.27	1.38	3.48	1.64	1.48	1.92	2.31	0.95	4.04	32.56
Saint Mark's, Fla	3.49	7.29	1.94	2.48	6.89	7.11	0.52	3.18	2.40	9.73	1.05	8.60	55.68
Saint Michael's Alaska	3.48	2.16	2.29	0.66	0.95	1.86	1.89	0.07	0.15	0.42	0.30	(b)	.....
Stockton, Tex	1.40	2.32	0.38	0.17	0.22	0.31	0.76	0.18	0.34	0.08	0.34	1.88	8.38
Saint Paul, Minn	4.47	1.43	2.13	1.85	0.61	1.04	0.11	1.12	0.97	0.45	7.18	1.76	23.12
Thatcher's Island, Mass	4.28	6.62	1.02	7.57	9.30	5.53	3.68	3.42	5.80	6.12	1.08	4.25	58.67
Toledo, Ohio	5.35	1.92	2.48	2.52	2.04	2.71	0.86	1.21	1.42	1.44	2.88	3.24	28.07
Tucson, Ariz	5.72	4.71	0.08	0.00	1.31	0.68	2.02	0.94	0.83	0.02	0.00	0.01	16.32
Tybee, Island, Ga	6.25	4.48	7.24	4.88	3.27	7.36	0.90	c3.08	.....	.....	.....	.....	.....
Umatilla, Oreg	0.32	0.15	1.14	0.56	0.72	0.36	0.95	1.81	1.30	1.49	1.96	0.28	11.04
Uvalde, Tex	4.85	2.54	1.28	1.07	1.93	0.69	0.08	0.90	0.94	3.08	3.48	0.80	21.64
Unalashka Island, Alaska	.....	.....	d2.55	3.97	3.78	10.02	2.88	1.35	3.26	2.93	.....	.....	.....
Vicksburg, Miss	3.37	6.37	e2.15	f3.90	5.49	7.24	6.18	5.63	1.00	4.67	5.95	2.74	54.69
Virginia City, Mont	0.88	2.16	1.36	0.98	0.31	0.65	0.96	1.06	1.51	1.45	2.16	3.71	17.19
Visalia, Cal	0.00	0.00	0.00	0.36	0.10	0.20	0.70	0.30	0.53	1.23	0.47	0.06	3.95
Washington, D. C	8.37	8.89	2.46	5.86	3.03	4.94	3.13	1.87	1.74	2.39	1.58	3.29	47.55
Wickenburg, Ariz	0.09	3.75	0.39	0.00	0.12	0.63	0.15	2.14	0.33	0.13	0.00	0.00	7.73
Wilmington, N. C	3.11	7.37	7.24	5.54	2.39	3.62	2.12	3.71	2.06	5.33	5.06	3.35	50.90
Winnemucca, Nev	0.50	0.50	0.94	0.07	0.16	0.02	1.86	0.21	0.56	1.52	0.32	1.27	7.93
Wood's Holl, Mass	2.69	6.65	1.50	4.85	4.60	3.27	3.38	1.98	4.39	4.78	1.35	2.31	41.75
Yankton, Dak	6.96	0.44	1.36	0.18	0.39	0.99	0.23	0.36	1.05	0.37	2.35	5.34	20.02
Yuma, Ariz	0.55	1.59	0.37	0.00	0.02	0.14	0.59	1.21	0.48	0.15	0.00	0.00	5.10

a Rain-fall too small to measure. b Reports for June, 1879, not yet received. c Station closed February 15, 1879. d Observations commenced September 1, 1878.
e Fifteen days only. f Twenty-nine days only.

PAPER 12.

Maximum, minimum, and mean temperatures.

STATION, ALBANY, N. Y.

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	90	69	79	66	86	69	70	48	44	34	38	25	30	11	30	8	32	6	41	28	49	39	90	66
2	90	68	81	64	82	67	75	54	54	35	55	35	29	6	24	2	34	19	43	29	46	38	76	61
3	91	69	83	63	82	62	74	53	48	31	50	37	17	— 1	34	23	33	13	36	23	58	36	63	56
4	86	71	85	65	73	62	71	47	38	27	39	32	26	9	32	26	38	19	30	17	66	41	69	58
5	87	66	83	63	69	62	63	44	36	23	39	26	25	15	30	22	41	7	34	17	74	50	75	58
6	79	59	77	65	79	65	57	45	38	29	32	20	20	8	30	21	34	4	40	20	61	44	74	48
7	84	54	80	64	71	62	60	37	41	27	27	17	24	4	37	18	37	17	48	31	63	42	61	43
8	88	67	81	59	72	56	65	48	36	28	31	22	33	20	35	15	33	7	45	27	64	44	68	44
9	86	72	82	69	74	57	72	47	38	28	36	22	32	16	34	11	40	32	60	30	69	38	67	48
10	83	69	79	63	79	52	56	47	45	32	59	32	24	9	27	2	54	35	45	32	71	45	85	59
11	83	64	78	63	81	64	60	41	53	42	53	31	24	5	43	25	46	33	36	30	72	47	85	67
12	73	64	78	58	81	66	55	47	52	42	37	30	16	— 2	42	22	38	29	44	28	80	51	76	64
13	81	66	80	58	85	63	63	42	49	35	35	29	27	— 6	27	13	47	28	50	31	82	62	74	56
14	86	63	83	62	69	57	68	47	39	28	32	25	33	17	20	6	39	31	52	37	84	65	77	51
15	76	62	77	64	64	51	71	54	40	24	36	25	20	— 3	21	4	40	23	42	32	78	61	68	61
16	80	63	84	69	67	46	77	59	44	24	27	18	16	— 5	32	10	33	19	51	35	78	57	61	54
17	85	66	85	64	72	54	76	56	47	33	30	17	27	— 3	28	12	31	20	45	37	73	51	63	48
18	92	74	77	62	79	60	67	45	46	39	33	24	36	22	19	10	33	15	41	33	77	58	65	48
19	91	73	74	57	77	53	47	39	46	38	29	19	28	8	19	7	35	9	45	33	74	65	69	46
20	86	66	78	62	82	63	56	38	44	41	29	19	22	1	25	11	39	21	53	32	79	63	75	53
21	84	64	76	63	73	55	66	41	50	42	38	18	20	— 8	22	3	38	27	58	33	78	52	80	58
22	70	61	76	63	61	47	66	36	46	41	38	29	39	18	25	— 2	37	21	64	37	67	45	71	63
23	78	59	77	61	62	37	64	47	48	39	30	16	37	20	38	17	38	27	62	46	61	38	81	61
24	82	58	78	59	65	49	57	41	45	37	23	12	33	19	24	10	39	21	57	35	67	37	83	59
25	86	61	73	56	70	54	53	35	42	35	28	12	44	13	26	4	41	28	61	45	74	52	86	66
26	81	67	73	49	74	52	62	33	41	29	28	20	15	— 4	42	18	38	23	67	49	64	43	83	66
27	80	65	77	56	58	41	58	44	38	22	29	20	37	— 2	27	5	39	32	63	45	67	38	90	64
28	79	59	79	59	57	35	48	33	46	35	28	15	44	35	13	— 4	47	34	63	51	73	51	86	69
29	80	56	79	61	63	38	48	30	45	35	30	14	36	8	.....	.....	41	38	64	43	79	50	71	60
30	68	62	81	62	69	44	52	42	43	31	29	13	23	1	.....	.....	44	32	69	43	81	60	74	60
31	73	61	83	60	.....	.....	53	39	.....	.....	30	15	36	16	.....	.....	38	24	.....	.....	89	66	.....	.....
Range	38°		36°		51°		47°		32°		47°		52°		47°		50°		52°		53°		47°	
Monthly mean	73°.5		69°.9		63°.3		52°.9		38°.4		28°.2		18°.6		20°.2		30°.6		41°.9		60°.9		65°.8	

Maximum, minimum, and mean temperatures—Continued.

STATION, ALPENA, MICH.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	78	58	81	62	73	55	77	62	51	25	(*)	(*)	27	16	17	10	30	10	32	20	47	29	44	43
2	68	57	81	62	69	57	71	56	42	32	36	18	20	7	28	13	25	8	26	5	57	30	65	40
3	74	58	85	59	68	55	65	45	46	28	36	19	16	5	30	7	33	5	20	10	55	32	62	40
4	78	63	84	61	78	60	60	43	46	24	28	25	24	12	30	14	48	20	30	14	54	40	67	45
5	85	61	71	56	78	58	61	41	38	22	28	22	23	10	28	15	25	10	36	18	45	35	62	47
6	83	60	80	63	69	63	54	34	37	26	31	23	25	6	28	11	44	15	55	19	50	34	56	40
7	82	62	73	57	79	65	54	45	38	27	29	22	23	12	27	14	30	17	45	28	56	32	59	34
8	84	68	92	60	76	67	58	41	41	35	32	17	23	6	30	4	35	20	45	25	56	33	56	43
9	73	61	78	63	73	69	55	40	42	31	38	15	22	8	26	14	52	32	42	28	52	39	87	51
10	80	63	73	56	70	51	56	34	50	33	35	15	25	0	35	17	66	35	38	30	50	41	85	56
11	66	60	74	56	62	45	58	40	46	39	31	14	30	10	32	18	44	25	38	22	81	45	75	57
12	71	64	70	55	60	48	65	36	40	34	28	14	31	8	19	10	35	20	38	21	86	46	76	55
13	72	58	76	55	54	46	55	45	37	31	30	13	34	19	10	10	33	25	40	30	66	46	64	50
14	86	66	75	65	65	46	68	53	43	28	30	15	22	8	10	15	30	12	50	27	60	45	60	51
15	81	64	75	59	62	44	66	52	( )	(*)	20	12	22	0	20	11	15	0	46	26	60	42	55	47
16	85	69	76	57	78	59	69	52	(*)	(*)	25	12	24	18	22	0	18	5	39	26	53	36	57	45
17	90	76	73	57	69	54	64	42	45	29	26	11	27	21	20	0	23	8	45	30	65	40	56	40
18	78	61	73	53	66	48	44	38	46	40	26	11	30	16	20	10	23	5	49	27	58	44	74	44
19	76	64	82	61	74	55	50	34	45	39	27	10	20	0	22	2	26	4	55	30	55	43	70	46
20	88	68	77	61	74	46	62	34	45	36	30	10	21	5	20	3	27	10	48	31	72	44	65	48
21	75	62	78	59	54	39	58	50	40	32	30	19	27	9	16	0	30	3	48	29	63	43	71	61
22	76	55	81	54	57	33	60	40	36	31	27	11	27	14	40	10	25	8	63	30	55	39	75	56
23	71	53	80	57	63	54	50	36	38	31	20	10	32	13	12	0	40	18	54	38	55	43	77	55
24	77	55	77	60	61	47	50	32	34	30	20	9	33	24	16	5	39	22	47	39	60	50	73	60
25	74	63	72	54	64	45	50	37	33	29	30	19	35	14	21	11	25	13	66	42	65	48	76	66
26	70	60	78	52	55	40	42	34	(*)	(*)	27	19	27	14	16	5	34	21	44	40	55	37	73	61
27	72	54	70	50	49	34	39	31	(*)	(*)	21	14	48	25	7	22	36	25	70	40	63	38	83	60
28	66	49	67	61	56	43	34	26	(*)	(*)	24	9	42	22	20	15	35	24	55	36	60	44	71	58
29	68	63	76	54	59	51	41	34	(*)	(*)	23	13	33	15	.....	.....	44	29	52	35	70	51	76	53
30	68	60	77	54	76	57	42	32	(*)	(*)	21	14	42	27	.....	.....	38	22	50	32	86	62	66	51
31	69	57	75	55	.....	.....	32	25	(*)	(*)	28	10	30	18	.....	.....	37	19	.....	.....	66	45	.....	.....
Range	41°		42°		46°		52°		.....		.....		56°		62°		74°		61°		57°		53°	
Monthly mean	69°.7		67°.9		59°.6		47°.6		35°.5†		23°.0‡		20°.6		14°.0		25°.0		36°.2		51°.7		59°.9	

*No observation taken.

†Mean temperature for twenty-four days only.

‡Mean temperature for thirty days only.

Maximum, minimum, and mean temperatures—Continued.

STATION, ATKA, ALASKA.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June.* Max.	June.* Min.
1																							52	43
2																							46	37
3																							44	34
4																							50	33
5																							50	37
6																					(*)	(*)	54	30
7																					39	30	48	36
8																					47	33	39	37
9																					48	35	37	36
10																					42	33	49	37
11																					44	39	54	36
12																					46	36	42	37
13																					40	30	39	38
14																					45	34	44	40
15																					41	34	52	41
16																					45	34	64	37
17																					44	36	50	41
18																					46	40	55	37
19																					47	40	46	40
20																					47	40	44	40
21																					45	35	43	40
22																					39	34	43	40
23																					38	33	46	42
24																					44	35	47	40
25																					44	36	45	42
26																					39	33	49	40
27																					45	33	47	40
28																					47	37	45	40
29																					45	37	50	38
30																					48	40	53	41
31																					65	47		
Range																							34°	
Monthly mean																					39°.9†		42°1	

* Station opened May 7, 1879.

† Monthly mean temperature for twenty-four days only.

Maximum, minimum, and mean temperatures—Continued.

STATION, ATLANTA, GA.

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	.....	.....	.....	.....	.....	.....	(*)	(*)	54	30	58	44	48	37	51	30	58	31	56	45	75	55	86	68
2	.....	.....	.....	.....	.....	.....	.....	.....	62	40	47	41	46	21	41	24	69	44	56	43	66	49	85	67
3	.....	.....	.....	.....	.....	.....	.....	.....	64	46	57	37	21	11	50	26	62	41	53	37	73	49	73	58
4	.....	.....	.....	.....	.....	.....	78	62	65	42	53	40	25	9	58	38	68	38	48	30	81	55	79	54
5	.....	.....	.....	.....	.....	.....	80	62	64	44	51	34	29	19	65	44	69	46	53	34	79	63	85	63
6	.....	.....	.....	.....	.....	.....	74	61	69	46	57	40	30	9	55	40	69	49	61	38	74	62	87	66
7	.....	.....	.....	.....	.....	.....	75	61	71	59	53	43	45	19	51	37	74	54	62	50	68	55	83	69
8	.....	.....	.....	.....	.....	.....	75	61.5	63	49	49	41	58	38	50	36	76	55	63	47	72	53	84	65
9	.....	.....	.....	.....	.....	.....	73	61.5	61	43	60	42	58	22	56	35	77	55	65	46	71	55	80	68
10	.....	.....	.....	.....	.....	.....	68	63	65	42	53	33	45	18	52	39	76	59	70	59	72	50	83	70
11	.....	.....	.....	.....	.....	.....	70	61	68	51	59	33	46	32	58	43	78	58	62	52	77	53	83	70
12	.....	.....	.....	.....	.....	.....	69	54.5	58	46	63	46	50	38	64	39	66	47	66	42	75	63	88	68
13	.....	.....	.....	.....	.....	.....	70	53	63	41	62	40	52	37	60	36	66	53	75	50	76	64	87	69
14	.....	.....	.....	.....	.....	.....	73	52	62.5	45	60	46	54	37	40	23	68	53	71	57	74	64	92	68
15	.....	.....	.....	.....	.....	.....	74	57	51	44	58	35	59	38	48	22	60	37	73	61	78	63	90	72
16	.....	.....	.....	.....	.....	.....	75.5	63	54	46	48	31	60	47	42	34	68	43	69	58	77	60	86	68
17	.....	.....	.....	.....	.....	.....	77	50	64	50	45	31	52	42	39	32	62	38	65	50	68	61	84	71
18	.....	.....	.....	.....	.....	.....	56.5	41	66	51	41	29	57	41	42	34	54	32	58	43	79	59	79	67
19	.....	.....	.....	.....	.....	.....	57	36	55	50	45	25	43	26	52	31	56	38	67	45	82	62	78	61
20	.....	.....	.....	.....	.....	.....	62.5	39	61	46	37	33	50	23	46	36	70	41	69	45	85	65	78	62
21	.....	.....	.....	.....	.....	.....	70	45	54	46	43	32	60	38	53	27	64	59	74	50	87	67	80	61
22	.....	.....	.....	.....	.....	.....	64	45	52	38	40	31	61	41	64	41	65	54	75	55	88	68	80	66
23	.....	.....	.....	.....	.....	.....	57	39	62	41	46	25	62	52	57	47	60	48	76	57	76	66	85	68
24	.....	.....	.....	.....	.....	.....	69	45	67	47	39	31	67	53	62	44	68	45	80	59	75	56	80	68
25	.....	.....	.....	.....	.....	.....	72	52.5	70	59	34	19	67	52	68	47	65	48	79	57	83	62	80	63
26	.....	.....	.....	.....	.....	.....	74	57	65	59	34	26	60	50	60	34	71	53	78	60	86	68	87	68
27	.....	.....	.....	.....	.....	.....	72	46	63	40	32	22	56	47	46	23	74	59	69	61	90	70	88	70
28	.....	.....	.....	.....	.....	.....	60	38	50	35	37	19	70	49	48	29	79	56	75	61	91	66	89	70
29	.....	.....	.....	.....	.....	.....	54	46	58	34	47	32	73	63	.....	.....	72	62	78	58	89	69	80	68
30	.....	.....	.....	.....	.....	.....	65	51	57	42	45	37	66	55	.....	.....	62	51	79	57	86	68	84	63
31	.....	.....	.....	.....	.....	.....	51	35	.....	.....	44	37	62	48	.....	.....	59	40	.....	.....	88	69	.....	.....
Range	.....	.....	.....	.....	.....	.....	.....	.....	41°		44°		64°		46°		48°		50°		42°		38°	
Monthly mean	.....	.....	.....	.....	.....	.....	†59°.8		53°.6		‡41°.2		44°.4		44°.3		57°.6		59°.8		70°.8		75°.6	

*Observations of maximum and minimum temperature began October 4, 1878. †Mean temperature for twenty-eight days only. ‡Mean temperature for thirty days only.

Maximum, minimum, and mean temperatures—Continued.

STATION, ATLANTIC CITY, N. J.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	79	67	75	65	81	73	69	54	47	34	51	37	35	13	34	20	36	22	55	31	62	40	77	61
2	81	67	89	64	85	73	74	57	58	41	55	45	35	8	29	18	38	30	49	36	58	40	76	62
3	82	69	82	67	81	72	72	59	54	37	49	37	12	−2	36	24	37	29	50	27	63	39	68	61
4	82	67	81	68	75	66	73	52	52	28	52	39	22	4	40	25	47	30	38	25	54	47	73	59
5	85	68	84	69	80	66	66	52	45	24	41	30	20	4	39	26	52	36	35	25	65	50	73	58
6	80	68	84	67	75	65	66	51	55	32	43	29	28	13	37	28	42	33	49	24	71	50	74	58
7	85	66	84	65	73	68	66	47	45	36	41	26	30	13	38	26	45	32	55	37	60	48	74	47
8	82	70	83	65	69	66	67	52	45	31	39	23	40	25	34	22	35	26	49	30	56	44	75	49
9	78	66	78	68	72	66	72	61	44	25	50	32	44	28	43	26	43	32	52	35	56	46	74	56
10	74	65	83	69	74	69	66	53	55	35	57	40	29	18	34	18	52	35	49	43	57	48	74	56
11	76	62	78	67	75	69	62	51	57	37	43	32	34	18	43	33	70	39	49	35	55	49	78	62
12	74	65	81	66	75	69	60	52	63	40	41	27	34	26	46	35	51	29	50	30	62	47	70	58
13	73	65	76	63	77	67	69	43	58	38	39	24	37	26	36	24	47	31	53	31	67	51	77	58
14	76	64	76	67	73	55	67	47	47	29	43	24	36	27	27	17	48	39	57	43	71	55	72	53
15	86	67	74	68	75	50	69	60	46	29	48	33	30	26	24	8	46	30	51	43	68	56	71	62
16	71	66	79	69	69	57	71	62	54	39	34	25	35	24	34	15	43	31	52	42	71	55	85	58
17	78	65	77	69	74	55	71	64	54	49	33	22	31	18	33	29	51	33	44	40	71	55	72	53
18	86	70	86	69	80	62	68	44	55	44	37	25	39	30	35	25	39	26	45	38	71	56	70	52
19	87	70	82	66	80	63	56	43	53	42	33	19	31	21	36	23	40	25	45	35	70	58	66	55
20	79	71	83	62	79	69	62	41	50	41	32	17	23	13	33	26	47	26	61	31	72	60	71	52
21	83	70	78	63	80	68	66	48	54	44	48	22	34	8	28	18	61	35	57	35	71	59	75	51
22	83	65	73	64	71	57	63	47	55	44	48	32	44	32	34	11	45	33	67	41	64	54	72	58
23	87	61	71	65	66	52	66	57	47	38	32	19	48	30	39	26	47	36	75	48	62	48	80	61
24	83	61	78	60	76	64	66	45	58	35	23	18	37	22	37	22	44	27	52	42	69	44	80	63
25	82	67	79	65	77	64	60	44	56	44	22	15	53	32	37	29	48	33	53	44	72	55	73	63
26	77	68	76	57	79	60	63	45	55	36	32	11	36	20	46	33	41	23	75	44	71	58	76	63
27	84	64	80	60	65	49	63	55	53	37	27	20	37	20	38	21	51	37	50	43	66	51	77	62
28	83	65	76	64	62	47	59	36	52	37	31	18	59	31	24	14	50	40	59	43	69	59	73	61
29	80	65	75	65	68	54	51	32	47	37	31	10	50	27	.....	.....	42	36	57	50	75	54	71	59
30	75	66	82	66	66	58	63	50	48	30	35	22	38	23	.....	.....	53	38	63	49	73	59	76	60
31	69	64	79	69	.....	.....	53	40	.....	.....	33	13	43	26	.....	.....	42	33	.....	.....	73	61	.....	.....
Range	26°		32°		38°		42°		39°		47°		61°		38°		48°		51°		36°		38°	
Monthly mean	72°.5		71°.8		68°.5		57°.6		44°.6		32°.7		28°.5		29°.8		39°.2		45°.5		58°.6		65°.4	

Maximum, minimum, and mean temperatures—Continued.

STATION, AUGUSTA, GA.

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	92	73	100	77	94	74	81	62	57	33	63	51	48	39	58	38	60	32	68	49	85	62	87	68
2	92	73	105	78	93	75	85	64	65	33	53	41	54	32	48	29	71	33	66	46	72	57	89	67
3	87	71	94	75	89	73	85	63	71	38	60	34	39	22	57	28	69	49	69	42	75	48	81	71
4	87	72	89	75	94	73	83	63	69	45	61	41	34	19	61	34	63	42	58	34	84	55	84	59
5	88	72	90	75	95	73	84	57	68	44	55	36	34	28	60	43	71	37	60	35	83	63	88	60
6	95	74	95	73	93	76	84	58	73	44	60	33	36	22	57	50	73	45	69	37	83	63	88	67
7	101	76	103	77	89	74	82	62	77	53	59	37	45	17	53	46	78	46	69	44	73	64	87	71
8	95	74	102	76	85	71	85	64	72	54	55	43	62	33	49	39	79	49	69	49	77	59	87	70
9	94	72	102	77	84	73	83	65	62	45	65	47	62	33	57	30	82	54	74	44	75	57	80	71
10	97	74	100	76	83	69	77	68	67	38	60	38	46	24	60	32	81	57	75	60	76	54	82	71
11	96	75	96	76	83	74	77	66	73	46	60	35	59	33	63	48	81	53	75	50	76	54	86	70
12	92	76	96	75	86	68	76	62	69	55	64	38	62	42	63	46	71	57	70	47	78	66	91	71
13	98	77	90	75	82	62	75	54	66	43	64	36	61	34	70	47	72	52	79	44	80	67	91	71
14	104	79	89	73	80	62	75	50	66	42	60	46	67	37	51	40	73	56	72	62	82	67	92	71
15	93	76	90	73	81	61	79	51	60	43	60	46	64	37	51	38	66	46	75	61	82	65	94	72
16	94	74	92	73	80	60	82	58	62	53	52	38	65	41	38	35	73	49	66	59	84	66	92	77
17	94	74	93	74	83	61	84	61	61	55	53	41	59	39	43	34	67	54	73	56	80	65	95	74
18	95	72	99	75	84	60	70	52	67	54	50	31	57	46	54	39	61	46	73	52	80	62	81	72
19	99	78	100	79	85	61	63	43	59	52	47	28	55	33	55	41	62	43	72	45	82	65	81	65
20	102	78	103	79	84	63	67	40	67	50	43	35	52	25	55	37	72	37	71	51	89	66	82	59
21	98	76	94	76	85	69	77	50	64	47	45	35	64	34	54	27	66	54	77	49	91	67	83	61
22	105	83	93	75	83	67	70	63	57	43	48	35	61	37	67	30	76	57	80	51	91	68	86	62
23	95	77	89	72	71	63	67	47	65	40	45	27	65	43	62	50	73	54	80	51	80	66	88	65
24	93	76	92	71	80	69	74	47	69	41	52	33	72	51	66	38	72	44	85	54	78	58	86	70
25	95	74	97	69	83	68	76	49	72	50	51	32	74	46	74	42	74	47	83	58	87	63	90	69
26	95	73	92	75	86	71	79	49	67	59	39	30	66	47	68	47	73	44	84	61	91	66	90	70
27	101	74	90	75	89	66	78	49	66	48	36	26	64	46	48	32	79	55	68	63	91	70	90	70
28	96	77	96	75	72	63	71	53	55	40	43	20	70	52	52	32	79	51	80	63	90	68	93	71
29	97	77	90	74	81	61	61	55	58	33	42	31	79	56	.....	.....	82	54	83	63	90	68	89	74
30	93	76	86	72	82	63	74	58	59	37	48	36	67	56	.....	.....	70	54	84	59	90	68	90	70
31	99	77	91	74	.....	.....	60	42	.....	.....	48	37	55	50	.....	.....	68	44	.....	.....	90	68	.....	.....
Range	34°		36°		35°		45°		44°		45°		62°		47°		50°		51°		43°		36°	
Monthly mean	84°.5		83°.1		74°.8		64°.8		54°.3		43°.6		47°.6		47°.9		60°.1		62°.5		73°.4		79°.3	

Maximum, minimum, and mean temperatures—Continued.

STATION, BALTIMORE, MD.

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	86	70	91	69	87	74	73	54	50	36	48	38	33	29	36	22	41.5	24	58	38	65	45	94	72
2	88	72	90	71	87	71	80	61	60	37	61	44	39	6	33	21	42	32	51	38	62	44	86	70
3	89	72	89	70	86	73	78	64	54	38	52	43	13	0	41	27	43	31	49	29	66	43	74	66
4	92	73	89	72	85	72	78	56	53	34	53	41	22	5	41	31	45	26	41	30	61.5	53	78	63
5	92	74	87	73	82	69	70	55	47	33	43	35	22	6	39	31	52	38	41	32	76	55	86.5	61
6	92	74	88	68	80	66	66	52	57	35	46	32	25	14	39	34	51	33	54	34	70	57	86	65
7	90	72	86	68	79	67	62	45	52	42	44	31	33	13.5	40	31	51	38	53	38	67	49	70	54
8	92.5	70	87	69	71	64	67	51.5	50	39	40	31	46	24	37	23	39.5	32	57	37	69	49	78	52
9	91	77	92	71	76	63	80	59	48	33	55	37	41	28	44	24	48	35	65	37	70.5	48	82	58
10	94.5	76	91	71	75	62	71	54	56	41	58	37	30	20	36	23	63	40	58	49	70	45	90	60
11	91	76	84	68	78	68	64	51	57	38	46	33	37	23	47	33.5	71	47	58	39	75	49	87	65
12	89	70	83	70	80	69	64	53	60	47	44	35	36	27	47	37	54.5	33	53	35	78	56	83	65
13	85	72	82	69	78	65	72	50	58	40	41	32	41	29	38	28	65	38	58	35	79	63	81.5	67
14	91	71	81	71	74	57	73	53	50	38	43	34	42	32	30	19.5	57	46	62	46	79	60	83	60
15	92	74	80	73	76	56	75	52.5	47	33	44	38	37	26	28	12	50	36	64	50	80	64.5	89.5	69
16	85	72	79	72	72	53	76	55	54	37	40	31	41	28	35	20	48	37	60	45	77	65	86.5	67
17	91	74	84	71	77	54	78	62	57	50	37	27	35	21.5	37	29	56.5	38	48	41	72	65	76	59
18	98	76	85	70	83	60	68	46	55	50	40	26	45	30	38	29	43	30	49	38	76	65	73	54
19	95.5	78	86	70	83	64	59	45	58	47	35	22	36	21	35	27	43	30	53	43	74	65	74	60
20	92	75	84	68	84	63	62	42	56	48	35	23	25	18	37	24	48.	29	64	41	80	66	76	55
21	95	76	84	67	76	63	67	42	54	48	39	29	33	18	32	19	60	40	68	43	87	63	81	59
22	86	69	79	66	69	53	63	44	54	41	39	29	51	29	36	21	46	37	74	47	72	55	76	64
23	85	66	78	64	68	50	66	54	46	41	31	18.5	52	29	49	31	47	37	81	54	68	50	85	68
24	85	65	78	61	71	61	66	49	55	38	26	17	37	31	41	28	49	32	63	49	74	49	89	67
25	86	67	77	65	74	65	64	49	61	41	25	15	61	33	37	30	50	39	69.5	48	81	58	78	67
26	91	72	76	61	83	63	64	44	55	42	34	16	39	27	58	30	48	32	83	55	72	60	87	68.5
27	84	75	78	59	65	51	67	51	52	37	29	23	52	26	32	22	57	39	63	50	69	54	92	72
28	88.5	70	74	68	64	47	52	40.5	52	44	29	20	64	46	31.5	17	57	44	67	53	77	60	92	68
29	79	68	79	67	66	52	53	35	50	39	30	16	52	35	.....	.....	57	44	70	58	79	61	83	71
30	85	76	82	69	71	59	64	44	50	35	39	27	45	33	.....	.....	55	41	74.5	51	82	61	85	64
31	85	73	76	69	.....	.....	55	40	.....	.....	33	22	47	31	.....	.....	51	37	.....	.....	94	61	.....	.....
Range	33°		33°		40°		45°		28°		46°		64°		46°		47°		54°		51°		42°	
Monthly mean	80°.8		76°.0		69°.3		58°.7		47°.3		35°.4		32°.2		32°.8		43°.8		52°.4		65°.6		73°.7	

Maximum, minimum, and mean temperatures—Continued.

STATION, BARNEGAT, N. J.

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	82	61	74	64	82	73	69	56	47	37	48	36	36	23	33	20	34	24	55	33	61	43	75	57
2	82	66	85	65	84	72	75	59	56	35	57	45	37	8	26	16	36	26	49	34	59	39	73	55
3	83	67	84	67	78	70	70	59	49	38	49	37	13	− 1	36	25	36	28	50	28	62	39	66	57
4	88	67	82	67	74	70	71	57	50	31	53	40	21	6	38	23	41	32	39	24	54	46	72	56
5	82	66	82	69	76	66	64	53	42	28	41	29	21	11	37	21	50	36	38	25	61	48	76	58
6	77	64	79	65	73	66	64	51	56	31	43	30	28	11	35	28	41	32	47	23	67	49	78	58
7	80	66	82	65	73	66	63	46	40	34	41	27	31	14	37	27	43	30	53	37	57	45	65	48
8	81	69	86	67	68	64	66	52	43	31	38	25	41	22	32	23	33	26	44	32	57	45	74	52
9	75	64	80	68	71	66	73	59	42	29	51	37	41	27	42	18	42	31	60	32	56	46	74	51
10	73	62	81	67	73	68	67	55	53	35	55	41	28	19	33	19	51	36	49	42	57	48	73	60
11	74	64	78	68	74	68	60	55	57	35	45	33	33	17	43	32	65	39	43	37	56	47	79	57
12	70	64	77	67	76	68	58	51	62	43	40	30	35	26	47	34	48	32	49	31	59	48	70	57
13	71	64	78	65	77	67	67	47	58	37	39	27	37	27	35	25	47	31	57	32	66	52	72	59
14	75	62	76	68	73	58	68	46	46	33	42	30	38	28	26	16	51	39	49	41	68	54	71	56
15	84	63	76	70	72	56	70	57	45	30	45	33	29	22	22	8	47	31	48	40	68	53	74	55
16	72	66	80	69	69	60	72	58	53	44	34	26	35	20	33	10	42	30	51	42	68	54	84	56
17	79	65	77	70	71	55	70	62	54	50	33	22	33	18	33	29	54	32	43	39	67	56	73	56
18	94	68	83	71	80	59	70	46	54	43	37	26	38	27	34	26	33	26	42	38	72	56	66	52
19	89	68	78	69	75	63	56	44	52	43	33	21	30	22	29	24	38	23	41	36	65	56	67	55
20	79	72	79	66	82	67	62	39	49	41	32	21	22	12	32	25	51	21	59	34	70	57	67	57
21	84	72	77	65	83	69	67	43	55	40	49	23	35	9	25	16	57	38	56	33	67	57	76	55
22	79	66	72	65	70	56	64	45	54	46	47	30	42	29	32	10	44	34	59	43	63	53	70	58
23	82	63	70	65	65	56	66	56	47	38	31	19	44	28	37	25	44	33	69	45	59	50	75	58
24	78	64	73	60	74	63	61	47	56	35	29	15	38	22	34	23	41	28	55	42	67	41	75	60
25	88	66	78	65	72	63	57	43	57	43	22	13	52	32	36	26	48	33	53	45	71	53	68	59
26	78	65	72	60	77	60	61	44	54	37	31	12	34	17	46	32	38	26	64	43	65	54	74	61
27	84	65	77	59	61	49	63	54	57	37	28	20	37	18	36	20	48	36	48	41	65	48	84	59
28	77	65	75	63	60	54	58	41	57	38	31	18	61	25	26	14	49	38	57	43	66	58	78	56
29	80	63	74	63	67	54	52	38	48	35	30	13	42	29	.....	.....	42	36	54	49	72	55	74	55
30	72	62	78	64	68	62	63	45	48	30	35	21	36	21	.....	.....	55	38	65	47	72	58	72	60
31	67	62	77	64	.....	.....	52	40	.....	.....	34	19	41	24	.....	.....	41	33	.....	.....	70	58	.....	.....
Range	33°		27°		35°		37°		34°		45°		62°		39°		44°		46°		33°		36°	
Monthly mean	71°.2		71°.1		67°.6		57°.2		43°.8		32°.9		28°.2		29°.1		38°.7		44°.2		57°.6		64°.9	

Maximum, minimum, and mean temperatures—Continued.

STATION, BISMARCK, DAK.

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	80	47	90	54	77	52	65	47	47	30	47	30	−8	−26	37	10	15	−21	56	22	67	42	66	36
2	85	61	94	62	85	46	61	47	46	25	48	25	−18	−28	35	21	32	−7	31	13	74	44	78	45
3	90	65	92	64	91	57	60	42	50	27	42	29	9	−29	24	14	35	22	37	11	62	47	81	51
4	86	63	96	64	76	57	58	33	57	30	39	25	−4	−29	16	−1	33	8	50	22	48	40	66	55
5	89	64	92	62	57	51	64	28	60	30	31	17	8	−29	16	−1	41	25	64	31	43	30	69	45
6	84	65	95	67	69	49	56	43	38	29	32	14	34	7	17	1	36	11	48	32	47	32	65	42
7	77	55	95	63	82	46	52	35	37	30	39	13	24	−1	15	5	39	28	65	29	52	41	84	59
8	79	58	86	58	66	48	44	33	45	33	41	28	6	8	12	−8	37	24	70	47	63	43	77	61
9	77	58	82	58	56	39	55	30	57	36	37	18	22	14	31	−1	45	32	59	35	62	49	67	54
10	83	59	80	55	55	33	55	39	36	32	32	20	22	−4	14	2	39	19	57	35	71	54	80	46
11	94	65	81	54	62	30	67	32	48	29	30	10	21	−2	4	−12	32	11	64	38	64	53	80	51
12	95	68	88	51	73	38	70	36	50	30	25	7	19	−3	9	−23	30	16	57	37	70	50	72	61
13	96.5	59	83	56	78	43	60	44	43	23	27	15	3	−12	−3	−20	16	−4	55	30	64	46	77	59
14	99	67	70	56	66	46	58	41	51	38	25	9	3	13	15	−13	10	−6	55	31	70	41	64	58
15	100	72	73	44	58	43	50	37	52	30	32	13	9	−10	18	−8	10	−10	56	36	76	48	72	54
16	80	60	78	46	64	40	37	32	55	27	13	−4	30	−12	15	3	12	−7	57	32	70	51	74	52
17	89	59	86	61	72	39	48	29	58	32	3	5	20	−1	26	10	16	−4	62	33	72	48	70	55
18	92	70	80	63	78	39	65	32	51	38	10	−8	4	−17	25	0	12	−7	60	36	70	46	69	55
19	84	58	83	58	55	44	64	43	46	28	11	−20	39	12	2	−17	12	0	67	32	59	48	75	61
20	80	59	90	63	50	34	57	39	44	30	29	10	34	10	21	−18	13	−10	65	49	61	43	71	56
21	72	59	87	69	65	20	42	29	57	26	19	−5	43	11	44	6	21	−4	60	45	70	47	84	53
22	78	58	88	72	67	40	55	24	48	30	13	−9	25	3	24	5	41	15	58	48	68	56	91	61
23	82	63	79	54	59	41	41	24	45	32	4	−14	40	7	25	−2	40	28	63	46	64	54	87	60
24	84	67	71	53	60	45	30	21.5	34	27	7	−11	46	16	20	1	45	18	59	44	73	50	72	54
25	82	65	76	45	51	36	25	16	44	26	15	−3	32	5	3	−18	60	35	75	43	61	52	78	51
26	77	57	87	56	66	31	25	6	46	25	9	−5	46	18	1	−26	68	33	57	38	62	47	68	50
27	83	57	74	59	72	46	29	14	43	28	20	−8	34	17	20	−2	57	43	64	32	70	45	71	50
28	86	62	84	56	72	51	29	23	39	26	16	−2	32	8	14	−13	58	35	57	45	71	60	79	50
29	90	64	85	57	75	55	40	22	38	19	15	0	35	14	.....	.....	58	40	68	34	67	53	86	58
30	80	57	85	63	67	42	30	20	35	22	22	−3	33	15	.....	.....	56	37	66	41	60	46	84	57
31	85	56	84	55	.....	.....	52	22	.....	.....	19	−12	31	7	.....	.....	43	32	.....	.....	56	36	.....	.....
Range	53°		52°		71°		64°		41°		68°		75°		70°		89°		64°.0		46°		55°	
Monthly mean	73°.6		72°.1		54.°7		39°.8		36°.4		14°.1		8°.8		6°.2		24°.2		47°.1		55°.7		65°.1	

Maximum, minimum, and mean temperatures—Continued.

STATION, BOERNE, TEX.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	(*)	.....	95	72	95	69	94	72	71	39	59	36	64	43	57	40	76	60	(†)	.....	91	63	81	62
2	.....	.....	99	75	94	72	91	71	76	52	68	29	53	31	45	38	63	44	.....	.....	85	64	81	54
3	.....	.....	96	76	91	69	89	69	75	54	75	45	42	28	53	38	69	47	80	38	91	64	85	53
4	.....	.....	101	72	89	69	89	71	73	45	72	38	36	21	58	46	69	55	77	43	88	65	90	46
5	.....	.....	92	74	93	71	87	69	73	45	69	41	38	21	41	35	76	59	75	53	93	56	92	60
6	.....	.....	93	74	93	74	88	65	79	53	73	51	41	15	38	33	82	59	75	65	76	59	96	64
7	.....	.....	94	72	86	73	87	64	79	53	72	52	50	32	53	29	79	60	88	65	75	53	93	60
8	.....	.....	95	74	93	73	88	64	70	67	68	49	49	23	63	28	75	61	(†)	.....	84	60	96	69
9	.....	.....	96	74	85	70	82	66	75	59	59	39	50	21	62	31	74	61	88	54	78	65	94	74
10	.....	.....	96	73	79	62	86	68	78	58	72	30	47	26	67	51	80	64	86	43	91	66	97	76
11	.....	.....	96	74	(†)	.....	92	67	(†)	.....	74	43	56	38	77	47	80	63	88	41	88	66	99	76
12	.....	.....	81	73	.....	53	87	66	.....	.....	75	56	58	28	79	43	77	62	84	47	86	67	89	75
13	.....	.....	91	73	89	59	87	70	.....	.....	65	34	61	32	60	37	77	57	89	57	89	57	99	75
14	.....	.....	92	71	86	56	86	70	65	49	42	30	66	42	51	28	81	49	93	51	90	54	99	76
15	.....	.....	94	71	88	62	84	73	70	46	55	25	71	42	52	26	78	45	89	57	93	55	100	75
16	.....	.....	94	70	89	52	86	69	73	44	58	19	56	52	67	40	80	61	90	56	95	61	101	70
17	.....	.....	94	73	91	61	73	53	64	53	50	27	65	48	56	42	69	38	75	51	92	68	97	70
18	96	69	92	73	89	72	74	41	67	51	(†)	.....	64	36	59	30	70	34	81	40	85	70	94	69
19	89	66	88	72	93	72	75	40	74	40	.....	.....	58	30	66	30	71	32	83	40	98	71	87	70
20	93	70	89	73	86	62	83	49	76	39	45	33	61	30	69	38	87	52	87	55	108	69	87	68
21	95	72	83	71	84	57	78	58	66	45	59	29	65	37	73	53	90	62	87	64	106	71	91	73
22	99	78	91	74	86	58	72	46	72	39	55	28	70	37	76	58	81	53	80	53	105	69	92	76
23	92	73	91	73	92	64	76	38	74	43	64	27	69	36	71	47	82	48	83	53	95	70	94	75
24	94	75	94	73	89	68	81	49	69	47	52	28	70	38	76	42	83	60	62	53	94	72	93	73
25	97	73	93	74	91	75	80	63	47	38	32	22	68	44	86	51	85	65	82	54	93	72	94	73
26	94	74	94	72	91	73	78	65	50	30	46	23	65	54	51	35	92	66	91	55	89	69	(†)	.....
27	85	75	94	75	91	69	66	45	64	30	44	19	68	52	59	35	91	67	93	63	92	57	.....	.....
28	88	71	93	73	92	71	57	44	65	30	44	33	73	54	68	47	89	65	90	54	90	72	99	74
29	93	73	89	75	92	72	79	54	69	43	58	43	72	65	.....	.....	88	60	87	58	96	67	96	70
30	96	74	89	69	89	71	70	48	59	45	53	37	76	64	.....	.....	96	55	93	65	97	74	98	72
31	96	75	92	65	.....	.....	70	42	.....	.....	53	37	68	55	.....	.....	94	65	.....	.....	97	62	.....	.....
Range	.....	.....	36°		.....	.....	56°		.....	.....	.....	.....	61°		60°		64°		.....	.....	55°		.....	.....
Monthly mean	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

*Office closed. †No observations taken.

Maximum, minimum, and mean temperatures—Continued.

STATION, BOISE CITY, IDAHO.

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	94	61	96	63	96	56	61	49	65	33	40	29	29	5	33	11	48	27	72	45	76	55	81	48
2	84	58	94	61	86	60	60	35	62	33	48	35	29	8	32	12	52	39	75	45	67	45	90	53
3	71	49	97	60	78	55	59	33	64	35	52	39	32	9	31	11	43	28	67	49	56	30	82	61
4	69	46	98	64	78	50	68	33	70	37	43	37	31	10	30	13	52	35	64	47	66	37	82	55
5	71	52	94	66	78	57	65	32	54	45	43	34	37	12	37	9	48	35	62	50	69	48	73	53
6	78	48	92	56	83	50	69	40	56	40	53	36	35	20	40	23	55	43	66	47	68	47	60	48
7	88	52	93	55	70	50	67	42	53	31	45	39	36	17	42	24	46	34	62	46	55	39	62	47
8	88	56	90	57	68	38	67	45	55	32	46	34	34	11	50	36	45	32	49	36	63	34	68	43
9	85	55	90	56	68	43	69	45	52	32	53	39	32	20	51	39	37	32	59	35	65	43	74	49
10	91	60	92	58	73	40	59	35	48	24	41	34	38	12	44	34	49	34	63	48	59	36	76	54
11	87	57	95	58	80	43	72	37	58	26	39	23	42	30	49	35	59	45	63	40	64	37	69	56
12	90	58	(*)	(*)	80	45	58	46	55	27	35	17	37	16	55	43	59	32	64	35	72	41	80	54
13	97	59	.....	.....	75	51	52	43	53	29	35	15	33	17	50	37	58	32	66	40	79	48	82	57
14	93	61	96	65	67	49	49	41	62	40	37	17	35	19	47	36	60	35	56	44	70	52	81	54
15	80	59	85	69	67	37	47	37	61	38	39	18	29	3	43	30	56	38	48	35	56	40	75	57
16	84	60	83	63	70	45	51	27	55	36	36	15	28	10	40	29	51	33	54	40	62	35	61	43
17	80	60	73	58	75	43	65	41	57	42	33	16	35	16	42	32	56	39	60	43	65	44	61	45
18	80	51	76	53	78	55	69	43	52	35	37	21	40	20	46	32	62	37	73	44	60	48	68	50
19	90	53	83	53	75	45	74	47	53	44	37	20	30	9	58	39	54	42	63	52	60	48	75	50
20	97	61	90	60	75	45	54	42	57	45	38	17	28	8	64	45	48	35	52	44	65	40	83	52
21	97	63	86	55	75	43	54	29	55	36	36	19	27	6	54	43	46	34	60	36	73	43	93	57
22	94	63	94	58	65	52	70	43	56	39	36	16	49	18	57	37	57	41	65	35	67	48	70	54
23	88	69	92	74	64	39	60	40	41	26	36	20	53	41	61	37	53	33	69	38	61	48	64	41
24	96	66	91	57	59	43	46	26	40	20	36	14	49	40	59	46	62	47	78	38	67	48	73	45
25	93	66	89	59	67	34	45	27	47	23	32	10	48	36	48	32	63	48	68	46	73	45	76	52
26	91	66	88	57	80	40	44	19	45	22	33	12	40	30	52	37	67	50	59	32	74	50	80	54
27	92	60	85	58	71	56	51	24	42	22	31	21	36	15	61	45	53	41	67	39	72	43	83	50
28	92	57	90	65	62	45	61	27	45	23	28	16	31	11	47	34	67	45	75	42	72	46	90	53
29	86	60	88	58	58	43	61	32	37	18	29	7	28	13	.....	.....	75	46	75	50	60	48	84	57
30	89	52	90	57	57	42	62	33	39	18	28	7	27	7	.....	.....	74	44	80	48	68	39	75	56
31	93	58	87	56	.....	.....	63	34	.....	.....	34	16	32	9	.....	.....	71	44	.....	.....	72	43	.....	.....
Range	51°		.....		62°		55°		52°		46°		50°		55°		48°		48°		49°		52°	
Monthly mean	76°.0		†77°.3		60°.5		47°.9		41°.7		29°.9		26°.1		39°.7		47°.2		54°.8		56°.4		65°.4	

* Observer sick; no observations taken.

† Mean temperature for twenty-nine days only.

Maximum, minimum, and mean temperatures—Continued.

STATION, BOSTON, MASS.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	94.5	70	70	58	85.5	67	76	51	49	37	39.5	27	33	15	40	9	34	8	45	24	61	43	96	67
2	95.5	69	74	59	91	71	78	57	61	36	59	37	34	10.5	30	8	37	28	42	31	53	38	91	55
3	98	73	78.5	59	73.5	62	79.5	60	52	32.5	56	40	15	2.5	36	20	36	25	50	24	56	40	55	49.5
4	78	68	81	65	62.5	59	77	56	47	27	45	36	26.5	12	34	25	47	24	30	19	67	41	66	50
5	93.5	70	86.5	62	63	60	66.5	49	40	22.5	38	28.5	30	16.5	37	20	46	19	39	19	76	50	78	56
6	80	59	70	62	70	60	58	47.5	41	25	35	24	25	12.5	36	25	35	12	50	24	67	50	77	53
7	84	56	84.5	62	71	55	62	42	49	25	30	15	33	7	36	18	35	20	52	31	66	43	62	45
8	95	68	81	61	66.5	53	70.5	51	40	29	30	16.5	43	21	31	19	33	15	47	33	60	46	70	45
9	91	72	84.5	63	68	49	71	52	41	31.5	35.5	20	36	26	35	17	34	26	60	34	62	45	66	49
10	90	70	80.5	66	71	60	62	46.5	45	32	55	34	27	16	27	8	61	32	48	32	60	45	81	55
11	79.5	66	83	66	73	62	55	44	60	35	53	36	33	12	51	21	59	34	42	30	71	44	61.5	52
12	74	65	83	61	75	63	51	41	59.5	44	40	32.5	30	15	52	29	41	30	44	30	80	44	62	53
13	70	62	87	62	83	64	64	42	53	36.5	37	28.5	43	17	35	17	46	26	51	30	84	61	76	60
14	86	59	80	63	74	60	61	45	42	31	35	23.5	38	24	23	11	46	35	57	39	86	60	78	51
15	73	58.5	72	62	66	52	74.5	50	49	26	36	27	28	3	26	7	42	26	45	36	79	57	66	48
16	75	54	78	66	66	48	77.5	55	47	29	33	19.5	20	1	37	12	42.5	22	55	36	68	56	63	48
17	76.5	60	79	68	76	50	77	57	48	41	31	16	32	8	35	24	35	25	45	34	80	62	68	49
18	94	71.5	84	63.5	84	58	74	57	44	40	35	20.5	38	23	28	17	35	21	39	33	76	61	62	49
19	96	76	78	59	74	61	60	40.5	45	33	31	21.5	36	16	22	9	39	17	35	30	66	55	61	49
20	81	65	80	62	85.5	61	56.5	39	40	36.5	34	18	26	8	29	14	43	23	55	29	76	61	73	48
21	78	66	76	63	86	65	72	46	52.5	37	40	18.5	23	.....	21	10	36	29	59	36	86	56	81	54
22	76	64	66	57	68	49	64	49	50.5	42.5	52	31	42	16	26	7	35	26	63	38	60	50	80	57
23	79.5	59	72	54	61	43	63	50	53.5	40	36	18.5	41	24	46	19	42	29	62	44	55	44	86	60
24	86	61	76	54	70	48	63	48	47	37.5	27	16	43	19	36	14	46	27	60	36	58	42	76.5	67
25	87.5	63	70	59	80.5	60	61	47	46	34	30	10.5	52	27	30	10	51	34	51	41	73	47	81	62
26	82.5	67.5	77	53	77	56	61	46	43	31	35	16	27	3	56	22	40	29	43	39	61	48	76.5	64
27	86	68	82	57	62	45.5	62.5	46	44	27	29	18	38	2	38	10	37	33	61	38	71	41	92	66
28	83.5	64	79	60	59.5	40	57	38.5	59	40	31	20	56	37	21	4	38	31	70	44	69	49	90	69
29	73	63	72	59	66	41	53	33	47	34.5	27	13	40	16	.....	.....	42	34	69	47	75	57	82	60
30	71	57	84	60	71	49	51	41.5	48	32	32	17.5	33	9.5	.....	.....	51	34	63	47	80	56	77	62
31	61.5	56	84.5	65	.....	.....	52.5	43	.....	.....	33	17	39.5	19	.....	.....	39	24	.....	.....	93	62	.....	.....
Range	44°		34°		51°		46°.5		38°.5		48°.5		56°		52°		53°		51°		55°		51°	
Monthly mean	72°.4		68°.1		62°.9		55°.3		39°.9		29°.6		24°.5		24°.5		33°.8		42°.4		59°.4		64°.2	

Maximum, minimum, and mean temperatures—Continued.

STATION BRACKETTVILLE, TEX.

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	89	73	94	77	92	71	93	72	73	57	74	31	65	42	58	42	82	61	72	51	91	69	89	67
2	94	71	97	75	93	73	91	72	79	59	76	39	51	37	50	41	72	56	76	40	92	68	89	60
3	94	71	107	77	92	71	89	71	75	65	81	40	45	36	56	39	67	52	84	49	94	65	89	59
4	96	70	103	78	91	71	87	73	75	57	82	42	42	27	71	48	76	56	82	55	92	65	92	56
5	97	72	101	75	95	73	91	74	78	57	72	54	40	25	45	39	82	60	79	60	93	72	93	62
6	95	75	102	76	93	76	86	64	84	60.5	76	50	44	25	50	31	84	57	85	67	80	61	95	67
7	90	77	102	76	80	72	88	68	84	68	79	54	52	35	57	31	86	58	90	63	83	63	96	70
8	91	72	104	77	95	74	86	69	83	70	72	49	45	29	68	36	80	63	95	67	87	65	95	75
9	92	70	106	77	85	71	85	67	81	56	74	35	53	16	67	42	82	59	89	64	87	68	93	78
10	95	74	101	77	76	63	92	69	85	55	79	32	52	29	78	53	86	62	90	47	90	69	98	78
11	94	74	105	77	80	61	92	68	76	59	80	46	62	40	82	44	82	63	90	56	90	69	95	72
12	96	76	99	70	79	55	92	69	75	43	68	58	67	33	85	44	78	59	86	62	91	67	85	74
13	94	78	95	73	81	52	89	69	69	47	68	44	69	37	80	46	83	56	90	66	90	66	91	73
14	95	76	100	74	82	56	91	72	78	50	45	33	70	49	60	34	84	53	93	58	90	67	85	75
15	95	76	102	74	82	57	88	76	79	45	59	20	79	56	62	34	78	57	92	61	97	67	90	76
16	99	77	103	75	83	60	94	69	81	52	65	24	72	52	72	40	87	61	80	56	98	67	91	72
17	98	76	107	72	86	62	82	54	63	54	59	30	71	53	69	45	72	42	79	50	98	67	93	74
18	97	76	88	72	89	67	77	48	78	47	56	32	68	35	67	42	77	38	87	46	98	67	93	74
19	95	77	92	73	88	73	78	47	79	41	65	45	65	28	73	39	74	44	84	52	100	73	92	72
20	94	74	81	74	86	73	82	52	83	40	50	35	68	29	73	47	88	62	93	55	105	76	92	72
21	95	76	83	72	85	56	79	55	75	52	66	22	70	32	80	56	93	60	93	65	109	72	93	74
22	98	76	88	73	86	58	78	40	78	43	63	32	79	49	88	58	88	55	87	58	101	81	94	76
23	97	76	89	74	90	70	78	44	84	46	69	33	74	43	80	46	85	49	78	57	98	75	95	73
24	97	76	95	74	91	73	84	55	74	53	36	33	75	44	88	46	81	63	75	58	91	75	96	77
25	97	77	93	75	92	75	83	59	55	41	40	27	78	48	91	50	86	66	85	58	33	74	95	74
26	91	75	93	72	92	77	86	65	59	37	50	26	74	53	75	37	93	63	95	59	94	72	96	74
27	88	73	93	72	88	72	66	43	72	33	45	29	75	53	68	36	94	66	98	64	92	71	96	77
28	88	75	97	76	90	74	60	43	78	41	47	36	70	58	72	50	80	65	89	62	95	72	99	78
29	86	73	95	72	91	74	77	48	79	43	55	43	75	58	.....	.....	86	61	91	69	93	68	98	79
30	92	76	94	67	91	74	70	52	66	41	53	45	82	63	.....	.....	93	60	94	67	96	73	100	78
31	95	76	92	69	.....	.....	71	53	.....	.....	55	44	69	56	.....	.....	94	64	.....	.....	95	73	.....	.....
Range	29°		40°		43°		54°		52°		62°		66°		60°		56°		58°		48°		44°	
Monthly mean	84°.0		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, BRECKENRIDGE, MINN.

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	79	51	80	56	76	56	63	46	49	27	37	24	8	28	30	6	4	−24	49	11	66	37	63	39
2	77	53	87	54	79	50	68	43	43	19	38	14	18	32	27	10	21	22	35	11	70	28	76	41
3	79	59	86	62	82	54	60	36	48	24	40	23	8	28	29	1	37	13	28	4	53	45	81	56
4	82	55	86	56	96	63	63	32	52	22	35	16	2	20	23	1	33	12	46	9	47	38	66	51
5	84	65	83	62	67	58	64	28	59	34	27	14	1	15	14	12	39	18	64	25	42	30	70	39
6	89	71	86	54	68	55	65	40	42	32	21	8	24	10	12	−2	32	16	52	31	54	35	66	39
7	79	67	89	65	79	46	59	29	42	22	27	3	25	3	17	3	44	31	62.5	22	58	29	80	54
8	80	60	81	62	75	51	48	38	48	16	34	24	3	13	14	−11	46	28	67	35	52	43	86	65
9	77	57	80	54	59	39	56	22	59	27	34	21	12	20	24	−11	48	33	54	44	70	45	75	56
10	75	54	76	53	57	33	64	41	42	33	26	19	13	6	24	−1	38	26	60	42	70	51	82	47
11	83	64	80	50	65	27	71	36	50	27	24	14	20	8	5	6	37	21	61	31	65	55	84	52
12	86	68	81	52	68	27	79	34	51	29	24	5	20	3	3	−22	33	20	60	43	69	52	77	58
13	93	68	80	56	72	40	73	38	46	22	18	2	1	16	7	−29	20	2	49	40	68	44	73	64
14	87	70	72	54	76	40	57	37	45	27	10	2	1	15	5	24	12	6	56	33	69	40	72	59
15	97	72	66	45	59	49	54	34	53	32	16	4	8	17	10	13	11	10	55	29	68	44	73	57
16	83	67	73	41	65	42	53	33	57	31	18	6	18	24	14	14	15	8	59.5	29	72	50	74	49
17	86	53	70	59	71	38	43	29	59	30	10	6	18	2	21	3	14	5	61	26	73	44	73	48
18	89	64	74	61	77	37	55	24	51	34	10	5	2	21	26	15	17	5	71	28	70	52	74	53
19	88	69	76	61	67	40	62	34	47	27	13	17	20	−22	23	20	21	2	66	29	69	50	68	59
20	75	60	88	56	55	33	64	42	44	27	19	11	20	0	9	29	22	4	72	34	70	45	75	60
21	78	54	83	68	58	17	50	24	45	23	19	9	35	6	39	7	23	1	75	48	65	50	82	50
22	77	59	84	69	80	39	42	19	46	27	0	15	12	3	16	4	39	10	60	52	62	51	92	65
23	74	58	84	66	58	40	41	29	35	30	0	16	31	2	10	−16	40	21	77	53	78	56	87	65
24	74	58	72	56	56	30	40	20	32	13	3	13	41	19	23	4	42	14	61	49	76	55	78	60
25	84	61	76	41	53	35	34	22	15	3	13	9	24	7	5	29	51	31	76	38	66	46	78	48
26	76	59	89	51	60	20	24	12	37	6	13	2	47	21	16	34	60	31	62	38	47	42	70	55
27	76	52	77	56	67	40	30	13	37	14	7	15	31	15	7	26	69	35	61	31	67	45	71	48
28	76	49	82	53	78	51	32	21	35	13	8	9	33	10	10	1	61	38	62	34	81	58	80	48
29	86	50	87	54	69	54	34	23	28	9	12	5	32	11	.....	.....	57	33	59	32	77	65	80	59
30	79	62	86	58	75	61	31	13	33	9	16	9	29	6	.....	.....	50	26	62	39	65	47	85	65
31	78	57	90	55	.....	.....	51	14	.....	.....	16	13	22	1	.....	.....	42	22	.....	.....	53	39	.....	.....
Range	48°		49°		79°		67°		56°		57°		79°		73°		93°		73°		53°		53°	
Monthly mean	70°.7		68°.7		54°.7		39°.9		32°.8		10°.6		5°.2		3°.0		24°.5		46°.0		55°.5		65°.8	

Maximum, minimum, and mean temperatures—Continued.

STATION, BROCKVILLE, CANA.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	90.9	64.2	81.6	64.2	72.6	63.2	74.6	54.1	44.6	28.1	33.8	26.0	25.7	14.7	20.3	0.8	37.5	0.0	42.6	24.4	47.5	34.1	62.6	55.2
2	90.6	65.3	80.6	65.3	78.6	66.3	75.6	53.1	47.6	36.1	42.6	27.1	27.7	9.4	21.1	0.5	21.8	—4.7	35.6	22.0	44.6	35.1	59.5	53.1
3	78.6	67.3	82.6	62.2	80.6	61.2	69.5	51.0	38.6	27.0	43.6	31.2	11.0	4.4	30.7	20.1	32.8	—2.7	27.7	14.7	55.6	34.6	64.6	53.1
4	86.4	67.7	83.6	63.2	74.1	64.8	66.6	46.1	40.6	19.7	33.7	26.0	22.8	6.9	30.8	24.0	39.6	14.5	22.8	10.5	67.6	34.1	68.5	51.2
5	87.1	60.2	83.1	63.2	76.6	64.2	57.7	40.0	29.2	21.9	27.7	20.8	20.8	11.0	28.7	21.9	35.6	—2.6	31.8	18.6	62.6	42.6	69.8	54.3
6	82.6	55.2	79.5	64.2	72.6	61.2	54.6	45.1	34.7	21.9	22.5	14.9	12.3	— 3.3	28.7	8.5	33.7	—3.7	36.8	23.3	50.4	42.6	55.9	46.1
7	84.6	61.2	76.6	59.2	73.8	57.3	58.6	35.1	33.7	18.8	24.8	17.8	23.8	— 8.7	30.7	13.7	28.8	20.6	41.2	30.0	57.6	39.1	60.6	36.1
8	82.6	64.2	77.6	57.2	77.6	64.1	62.6	48.1	32.7	24.0	26.7	11.6	29.6	19.8	28.9	11.6	29.7	1.0	40.6	19.8	60.6	40.0	63.6	37.8
9	87.7	71.3	82.6	65.3	77.6	61.2	71.6	49.1	39.6	22.9	30.7	19.8	27.7	10.5	29.7	6.9	41.6	23.9	52.6	30.1	67.6	35.0	61.5	45.1
10	85.1	64.8	77.4	60.3	79.9	61.2	51.7	42.1	40.6	30.1	38.9	28.1	20.3	— 2.4	17.8	— 6.7	45.6	33.1	39.6	26.0	67.4	43.1	76.5	55.5
11	74.6	59.7	78.4	59.3	71.6	59.2	57.6	40.1	49.6	39.1	41.6	25.1	23.4	16.6	35.7	13.6	46.6	31.1	39.6	27.7	73.4	51.2	80.6	60.2
12	81.6	53.1	77.6	56.2	75.6	58.2	55.6	41.7	49.6	39.1	29.7	20.8	27.7	9.5	34.7	4.9	36.7	25.0	40.6	27.5	74.7	58.2	79.6	60.3
13	84.6	54.1	78.7	62.2	82.7	59.2	58.6	34.1	41.6	30.1	33.7	23.2	30.3	1.3	9.2	— 2.7	30.7	21.9	41.6	25.9	79.6	58.1	68.1	50.1
14	86.6	65.3	85.5	60.2	63.6	51.2	69.7	50.1	36.6	24.9	28.7	15.8	27.9	— 0.2	6.1	—16.7	36.6	24.1	44.6	26.0	78.6	55.0	72.6	52.1
15	76.5	59.2	83.6	66.3	63.7	49.1	71.6	59.2	39.6	22.8	20.8	8.4	3.3	—18.2	14.0	—20.7	31.8	13.2	44.6	25.0	76.5	58.2	59.6	49.6
16	84.6	55.2	84.6	63.7	69.1	49.1	75.6	59.2	45.6	27.0	14.9	6.4	3.1	—11.0	26.1	5.1	26.2	9.0	47.6	30.1	62.6	49.3	67.2	49.6
17	93.6	73.3	80.6	65.2	72.6	59.1	76.6	58.2	40.6	32.1	29.5	11.7	21.2	—13.7	14.4	— 3.2	20.4	11.4	47.6	30.1	68.7	45.9	67.6	43.1
18	87.6	67.3	75.6	58.2	71.7	56.2	59.6	42.1	43.6	38.1	26.7	12.6	25.6	16.0	16.0	1.8	29.7	7.5	45.5	33.9	76.7	48.1	65.1	46.1
19	87.6	67.3	74.6	57.2	73.1	53.1	43.6	33.1	42.6	36.6	18.8	4.4	26.7	4.4	14.9	— 5.7	28.7	7.5	53.6	36.0	77.6	49.1	70.6	44.1
20	89.6	60.2	77.6	61.2	81.6	67.3	54.6	32.1	41.6	37.1	20.8	17.4	5.4	—16.7	18.9	7.5	33.7	17.8	55.1	35.2	79.6	51.1	72.6	51.3
21	84.6	66.3	75.6	61.2	76.5	50.1	61.6	43.1	50.4	37.1	24.8	18.8	16.4	—11.7	16.8	— 8.7	32.8	18.8	58.8	27.9	64.6	51.1	78.9	48.6
22	67.6	59.2	80.6	56.2	58.6	40.1	69.6	36.1	41.1	33.3	24.7	15.0	25.9	11.6	17.8	—16.1	30.7	5.4	62.6	32.1	57.6	39.1	75.6	60.6
23	81.6	59.2	81.6	60.2	65.6	36.1	56.6	42.1	38.6	32.1	23.3	10.8	22.7	10.5	28.7	13.7	35.6	22.6	57.6	43.1	59.6	35.1	75.6	60.5
24	83.6	49.1	75.6	65.3	63.6	53.1	51.0	38.1	38.6	32.0	18.8	4.4	33.7	10.5	20.8	— 7.4	37.6	18.7	57.1	32.6	67.8	35.1	84.5	57.2
25	81.6	59.2	70.6	55.2	63.5	41.2	49.6	32.1	34.7	27.0	25.9	11.6	36.6	1.7	13.9	—17.7	35.2	16.3	64.9	39.5	70.6	45.6	90.6	62.2
26	73.6	63.2	71.7	48.1	68.6	45.3	47.4	38.0	30.7	20.8	29.7	20.8	—2.3	—12.4	37.4	11.6	34.6	3.1	59.4	44.1	60.1	33.1	76.4	66.8
27	80.6	64.2	75.6	59.2	52.5	35.1	45.6	35.1	33.7	24.4	22.8	14.4	39.6	— 2.8	19.6	—11.7	36.6	24.9	67.6	43.6	64.6	37.6	79.6	65.5
28	76.5	55.2	79.6	52.1	56.6	29.6	40.6	31.1	39.3	32.2	16.1	1.3	43.5	31.1	10.0	—27.0	45.6	32.1	63.6	50.0	65.7	43.0	76.6	64.3
29	76.6	55.2	78.6	63.2	64.6	42.1	44.6	34.1	42.6	32.2	22.6	—2.0	32.7	3.8	.....	.....	41.6	31.1	58.6	36.1	76.4	48.6	74.2	62.3
30	72.6	63.7	82.6	57.2	67.6	49.3	43.6	39.1	38.6	26.0	25.7	14.7	26.6	2.4	.....	.....	37.6	21.0	62.6	39.1	83.6	58.2	73.4	55.2
31	71.6	62.2	84.6	57.2	.....	.....	47.6	33.1	.....	.....	23.8	10.7	29.7	19.0	.....	.....	33.7	13.7	.....	.....	80.7	60.8	.....	.....
Range	44°.5		37°.4		53°.1		45°.5		31°.6		45°.6		61°.7		64°.4		51°.3		57°.1		50°.5		54°.5	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, BROWNSVILLE, TEX.

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	95	77	96	76	90	73	91	77	79	60	67	45	58	52	67	48	78	63	89	70	85	74	86	67
2	97	76	94	78	91	75	90	74	80	70	73	45	61	48	60	49	79	63	75	54	87	68	(*)	(*)
3	84	77	94	80	88	76	90	71	79	66	75	50	61	48	55	47	76	63	80	50	84	75	83	65
4	92	76	96	80	94	76	86	71	79	56	77	50	53	36	73	52	77	60	81	57	87	75	88	67
5	94	74	98	81	93	76	89	71	79	62	74	53	39	34	67	46	79	57	79	64	87	76	89	66
6	88	76	95	78	93	76	93	71	80	70	76	57	39	27	51	39	80	64	81	72	87	73	93	71
7	82	76	98	79	91	76	90	71	86	70	77	66	64	36	55	37	79	64	87	72	89	69	93	71
8	84	73	94	78	93	78	86	73	84	69	80	60	61	41	64	40	78	68	85	74	84	70	89	80
9	94	76	95	80	96	76	84	74	82	73	65	51	47	29	65	50	76	69	91	72	88	64	91	80
10	90	76	95	81	92	76	92	73	84	73	69	44	63	35	74	60	78	70	85	64	87	72	91	79
11	91	74	97	81	80	71	91	72	86	74	75	57	70	57	81	59	78	69	83	63	87	70	90	80
12	90	75	93	76	80	63	89	69	80	57	77	64	59	40	78	52	82	67	87	64	83	75	92	79
13	91	75	96	75	81	61	83	71	76	59	77	61	69	45	77	61	76	59	86	75	88	65	93	75
14	94	75	93	75	82	62	87	76	75	64	66	43	74	52	65	48	79	59	91	70	91	75	93	75
15	93	79	87	75	85	65	86	76	78	61	52	39	76	64	68	49	80	59	97	75	90	71	93	83
16	93	79	92	75	85	65	87	78	80	61	61	37	79	64	76	57	79	69	94	66	88	74	93	83
17	94	76	89	76	89	70	82	64	77	59	60	41	77	65	75	57	77	53	81	60	85	74	95	77
18	96	74	86	75	92	75	78	57	69	56	67	41	69	58	63	44	69	44	78	53	89	74	90	75
19	91	76	91	77	92	74	80	53	74	52	66	56	60	42	72	49	75	53	80	59	90	77	84	74
20	84	76	87	76	93	75	83	62	79	56	58	47	64	37	77	57	79	66	80	62	91	78	89	74
21	91	75	87	74	83	74	84	70	77	56	59	42	70	49	77	59	85	68	82	72	94	77	93	74
22	93	76	91	79	84	72	80	62	74	52	66	42	73	57	78	64	87	69	88	73	90	71	92	74
23	92	80	92	75	92	75	80	56	78	59	70	50	78	59	76	60	82	60	85	74	89	70	91	81
24	92	79	94	77	91	78	82	64	81	59	69	39	78	54	78	53	81	69	84	75	89	72	92	80
25	91	80	92	75	90	78	83	73	75	46	42	32	75	52	78	62	84	70	84	65	89	70	93	70
26	91	81	95	72	92	76	84	70	57	42	38	32	76	61	70	52	83	72	89	69	88	70	94	74
27	88	73	92	73	89	75	77	56	67	40	52	32	78	62	60	51	82	69	90	72	89	67	94	76
28	92	77	90	76	91	74	63	53	71	42	63	43	79	62	77	59	84	69	88	74	91	71	95	83
29	95	79	92	75	92	74	76	53	77	54	68	43	78	69	.....	.....	87	67	85	68	90	73	95	75
30	89	77	90	77	91	76	80	58	77	56	68	49	79	71	.....	.....	92	73	87	73	91	80	95	76
31	96	79	89	74	.....	.....	79	66	.....	.....	57	49	77	67	.....	.....	85	73	.....	.....	92	79	.....	.....
Range	24°		26°		35°		40°		46°		48°		52°		44°		48°		47°		30°		.....	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

(*) No observations.

Maximum, minimum, and mean temperatures—Continued.

STATION, BUFFALO, N. Y.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	90	74	76	67	76.5	71	80	60	46	30	44	29	28	17	26	9	42	28	36	24	39	33	70	55
2	88	72	74.5	67.5	78	67	69	61	49.5	36	49	37	26	4	26	7	28	21	30	21	39	33	55	48
3	77	68	78.5	70	76	63	66.5	59	42.5	31	41	34.5	12	3	28.5	23	39	17	25	19	50	33	61	49
4	80	68	79	69	44	60	65	53	41	27	35	27	18	11	28.5	24	38	28	21	15	59	39	61	51
5	88	67	84.5	65	75	62.5	57	41	33	24	28	22.5	21	10	29.5	25.5	33.5	20	28	17	57	37	62	53
6	85	68.5	76	66	77	63.5	54	45	35	30	34	27	25	19	29	20.5	37.5	20	37.5	20	45	35.5	58.5	45
7	87	64	77	63	85	65	60	36	38.5	28	32.5	23	27	13	24	14	35	23.5	40	32	43	36	54	40.5
8	78	72	78.5	71	81.5	67	66	49	38	29	32	24.5	27	22	31	11	44	25	39	27	60	34	58.5	48
9	80	71	79	71	79.5	61	70	48	40	28	43.5	28	26	16	34	16	64	41	56	33	67	35.5	68.5	54.5
10	81	64	74.5	66	79	63	55	42.5	48	36	46	32.5	18	11	39	9	55	33	51	29	73	49	72	60
11	78	66.5	75	63.5	65	56.5	59	37.5	52	43	34	29.5	23	11	43	35	54	28	37	28	73	53.5	66	58
12	72	65	74	63	58.5	54.5	59	47	48	42	31	28.5	26.5	6	41.5	18	34	26.5	37	29	69	58	74	63
13	81	61	81	62	74.5	52	61.5	42	47	33	31	27.5	29	12	19	7	42	31	42	29	73	57.5	71	56
14	77	68	80	63.5	64.5	52.5	67.5	54	38	30	30	26	28	19	9	2	40	27.5	40	33	76	55	66	49
15	81	70.5	79	68.5	66	52	67	62	46	26	29	18	19	7	11.5	−1	27.5	17	39	33	68	46	72	55
16	85	68	85	69	70.5	47	75	64	48.5	34	26	16.5	19	10	25	11	24.5	16	46	31.5	56	42	66	49
17	83	75	75	68	72	63	71	46.5	54	44	29	20	33	11.5	26	17	24.5	21	42.5	36	74	40	58	47
18	83	76	76	63	71	63	47	42	50.5	46	29	22	34	16	22	17	25.5	13	50	35	77	53	64	50
19	88	72	73	60	77	61.5	45	38.5	50	42	28	18.5	19	12	24.5	14.5	28	15	51	37	77.5	55	69	46
20	86	67	76	62	82	64.5	58	37	50	38	22	15	13.5	1	24	14	31	23	45	34	74	56	72	48
21	78.5	66.5	75	63	66	52	64.5	47.5	49	40	32	18	33	4	9	2	35	27	44	33	68	49	78	57
22	71	62	81	58.5	58.5	45	69	45	43	36	33	18	31	24	32	3	34	25	51	37.5	60	42	73	63
23	76	60.5	81	60	66	40	59	42.5	40	34	18	7	26	20	28	10.5	32	27	52	40	65	42	76	61
24	77	56	78	68	66	56	54	40.5	44	36	18	6	36	20	14.5	2	43	30	70.5	35	69	40	84	65
25	77.5	65	74	59	73.5	45	60	37	37	32	24	16.5	36	14.5	36.5	8	34	27	65	44	63	52	89	73
26	73	64	71	50	69.5	47	59	45	37	30	24	17	19	8	42.5	15	45	24	63	40	57	39	80	72
27	73.5	62.5	76	55	54	40	59	37	37.5	26	26	16.5	43.5	18	15	3	45	33	71.5	54.5	59	40	75	69
28	73.5	59	75	54	60	35	39	33	45	35	23	18	41	31	29.5	−2	44	32.5	62	38	63	45	74	63
29	75	57	79	63	62	44	47.5	36	41	35.5	19	9.5	32	25	.....	.....	46	34	59	36	84	55	69	60
30	70	62.5	84	60	75	52.5	47	36.5	40	33.5	24	17	33	23	.....	.....	36	27	51	35	78	60	74.5	59.5
31	76	65	78	67	.....	.....	45	31	.....	.....	20	15	33	22	.....	.....	38	24	.....	.....	79	56	.....	.....
Range	34°		35°		50°		49°		30°		43°		42°.5		45°		51°		56°.5		51°		48°.5	
Monthly mean	73°.6		71°.1		63°.5		52°.2		38°.9		25°.9		21°.1		20°.3		31°.3		38°.9		55°.7		63°.3	

Maximum, minimum, and mean temperatures—Continued.

STATION, BUFORD, DAK.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1															35	14	26	−22	(*)	(*)	73	40	71	38
2															35	17	43	5	(*)		74	48	83	42
3															26	2	34	15	(*)		67	39	77	54
4															14	−10	37	2	72	26	48	35	65	51
5															12	− 2	36	16	66	32	54	36	74	43
6															17	− 6	37	6	(*)	(*)	51	30	62	50
7															21	4	46	22	(*)	(*)	54	40	74	56
8															10	−14	44	21	(*)	(*)	66	43	69	51
9															33	2	45	25	50	35	63	50	69	48
10															7	− 5	30	18	67	28	76	41	75	48
11															− 2	−20	30	10	67	41	73	43	78	47
12													(‡)	(‡)	− 9	−35	30	12	62	28	66	49	74	60
13													8	1	− 3	−23	12	− 4	67	33	75	37	66	58
14													2	−10	(*)	( )	6	− 5	58	33	78	46	77	57
15													2	−17	(*)	(*)	8	− 9	59	38	85	49	81	52
16													21	− 1	22	3	11	− 6	47	39	68	43	80	55
17													9	(†)	27	10	16	− 8	60	34	68	34	80	58
18													11	(†)	13	− 8	17	−10	61	32	61	46	85	62
19													42	10	− 1	−24	15	− 6	69	40	69	49	68	55
20													43	20	35	−12	26	−13	81	48	62	47	72	50
21													44	7	44	9	36	− 1	56	45	77	45	89	53
22													29	0	17	0	45	18	46	40	67	53	88	56
23													45	14	38	− 2	34	24	44	40	65	48	78	58
24													42	15	29	− 2	52	15	69	42	74	47	63	55
25													40	9	− 2	−22	52	36	62	43	63	50	71	47
26													36	19	5	−33	70	32	47	37	(*)	(*)	68	43
27													30	7	18	5	52	32	67	35	77	50	75	44
28													26	−10	5	−15	57	31	60	37	(*)	(*)	88	48
29													30	− 1			62	36	76	34	70	53	85	57
30													27	0			53	35	71	40	62	48	76	58
31													33	− 6			50	29			67	42		
Range																	92°.0						51°.0	
Monthly mean																								

(*) No observations taken. (†) Minimum thermometer out of order. (‡) Observations of maximum and minimum temperature began January 13, 1879.

Maximum, minimum, and mean temperatures—Continued.

STATION, BURLINGTON, VT.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	94	72	77	64	78	63	72	54	46	34	37	23	27	15	20	5	29	8	37	22	50	40	83	56
2	96	75	78	65	75	68	74	56	52	41	49	22	26	8	16	3	31	12	33	22	43	38	58	53
3	89	71	81	66	77	65	74	54	49	28	(*)	37	18	(†)	29	11	35	9	37	18	51	38	61	54
4	84	68	84	62	75	65	66	45	34	21	(*)	27	25	8	28	24	39	26	22	13	67	41	67	53
5	81	62	84	64	75	62	59	46	30	21	32	23	25	13	32	22	39	3	33	20	64	51	70	55
6	77	53	73	66	74	63	57	45	41	26	(*)	16	16	7	28	12	26	0	41	23	58	44	62	45
7	90	57	73	59	70	58	59	43	36	25	24	17	20	7	32	13	27	17	39	33	52	43	58	41
8	89	71	79	60	75	59	63	49	34	26	24	14	30	18	27	15	30	8	43	26	59	43	67	38
9	92	74	75	64	74	61	71	52	37	29	30	15	31	13	29	10	37	28	51	33	68	40	68	45
10	91	67	75	65	78	59	54	48	39	33	56	23	20	7	20	−2	49	35	37	28	72	48	76	54
11	74	62	79	61	72	65	60	41	52	33	(*)	32	23	13	37	20	50	33	33	27	75	52	77	62
12	82	53	73	56	79	63	53.5	47	50	41	35	25	25	12	33	9	34	28	39	25	76	56	76	61
13	84	58	77	59	85	65	56	43	44	33	35	23	30	8	18	6	39	27	46	29	86	62	68	55
14	84	64	84	57	70	57	69	46	36	28	34	18	27	3	10	−3	38	27	44	33	85	62	76	50
15	74	59	83	67	60	50	66	56.5	47	26	32	14	5	−12	16	−2	38	16	48	31	82	60	65	54
16	80	56	85	68	68	45	76	59	46	33	22	11	15	−6	25	8	30	13	46	37	76	57	57	50
17	86	68	82	65	72	55	74	60	44	39	26	14	20	−1	20	4	28	20	47	31	76	54	53	48
18	85	73	73	59	72	56	61	44	51	40	26	20	35	18	11	4	32	8	41	33	80	54	63	47
19	85	68	74	57	74	49	46	38	44	38	24	12	30	12	16	0	31	9	47	33	73	53	70	48
20	87	62	76	63	81	65	51	36	45	39	29	18	14	−3	24	10	37	22	53	35	81	58	77	49
21	80	68	71	64	72	50	64	43	52	41	31	21	14	−4	13	4	35	23	55	35	68	52	81	56
22	69	57	76	58	58	44	71	45	43	39	34	25	24	11	18	−2	33	13	60	36	59	42	75	63
23	78	57	78	55	63	38	61	51	44	35	26	14	22	10	26	16	34	24	54	39	57	38	73	59
24	83	57	78	63	60	48	57	44	40	36	22	12	31	13	21	4	37	16	51	32	66	34	86	56
25	87	65	67	57	65	52	47	36	41	31	24	10	36	5	22	−6	38	27	59	43	70	49	88	66
26	74	66	73	52	73	51	58	38	35	27	30	23	6	−11	38	19	34	22	59	43	58	36	82	69
27	79	66	78	58	54	45	59	45	37	28	24	17	33	5	28	−2	42	23	65	45	67	38	85	68
28	75	59	76	56	54	34	48	35	50	33	20	8	46	30	12	−7	49	37	68	50	72	47	81	68
29	78	54	80	64	63	39	47	32	43	33	21	6	33	6	.....	.....	42	39	61	44	80	55	68	62
30	71	64	79	61	68	44	48	38	(*)	28	27	16	25	3	.....	.....	40	28	65	40	84	63	72	56
31	70	62	84	59	.....	.....	53	38	.....	.....	29	17	29	18	.....	.....	29	20	.....	.....	89	69	.....	.....
Range	43°		33°		51°		44°		.....		.....		.....		45°		50°		55°		55°		50°	
Monthly mean	73°.2		69°.2		63°.2		53°.1		37°.4		24°.7		16°.6		16°.1		28°.4		39°.7		61°.1		62°.8	

(*) No record. (†) No record.

Maximum, minimum, and mean temperatures—Continued.

STATION, CAIRO, ILL.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	86	72	93	78	84	66	81	67	56	30	50	40	37	26	42	29	62	45	54	44	64	49	74	58
2	75	66	94	73	88	71	76	64	63	45	50	36	36	3	42	23	57	35	58	37	72	47	67	53
3	76	68	88	72	86	73	79	55	57	37	60	43	10	-3	49	32	41	32	45	29	75	53	74	53
4	87	70	91	71	84	68	78	58	61	37	53	39	13	-6	46	37	50	33	49	32	72	64	82	58
5	89	73	89	70	84	67	70	53	69	43	53	31	17	5	45	35	58	39	55	33	78	58	83	64
6	84	75	91	73	86	67	67	46	71	53	48	35	25	2	40	33	70	51	69	42	68	54	85	64
7	87	73	92	75	87	66	74	57	68	48	38	26	34	17	43	28	77	58	62	52	68	48	85	67
8	90	74	94	78	87	73	79	58	54	39	52	32	34	16	49	28	77	60	68	45	70	51	87	71
9	88	74	94	80	81	73	79	66	58	39	41	32	22	8	52	33	75	62	69	58	73	51	88	73
10	91	75	90	78	74	59	70	66	60	42	43	32	31	5	55	38	79	60	58	51	82	57	91	74
11	92	78	84	72	67	56	69	58	59	48	47	33	34	27	55	40	71	50	57	46	83	66	91	69
12	93	79	83	72	67	49	68	47	59	42	41	30	37	25	48	28	67	41	61	39	84	63	85	70
13	95	80	86	70	70	50	74	48	62	39	44	33	40	28	28	17	55	45	71	46	76	68	87	72
14	94	80	88	70	73	52	78	57	59	43	41	32	40	34	26	8	50	35	77	59	77	63	91	74
15	93	82	89	71	78	55	80	64	53	45	32	27	52	34	37	17	42	29	62	53	67	60	86	68
16	94	81	89	73	79	60	77	71	57	50	32	23	52	32	45	32	40	27	53	48	65	56	78	67
17	95	81	90	74	80	60	63	52	55	49	36	24	40	28	38	32	34	21	56	40	76	59	74	55
18	94	80	93	76	83	61	53	42	59	38	31	19	38	24	38	29	40	25	62	40	80	66	75	61
19	96	80	94	78	84	65	58	38	60	38	34	22	31	14	45	33	43	26	77	46	84	63	76	59
20	95	82	91	79	72	60	65	41	55	38	37	27	51	24	42	28	55	42	66	46	85	68	86	63
21	93	80	86	76	65	49	69	50	50	42	37	32	58	32	44	29	55	37	78	54	85	69	83	71
22	83	70	86	72	74	49	53	39	58	36	33	18	58	45	52	43	55	45	83	62	78	62	83	70
23	82	66	88	69	78	58	65	35	63	35	32	15	53	33	54	32	58	39	82	65	83	61	76	72
24	85	68	91	72	81	64	70	43	58	46	23	5	56	28	67	43	63	45	81	61	87	70	81	69
25	89	70	83	73	84	66	73	53	46	42	22	4	60	42	63	39	62	42	73	64	89	70	80	71
26	85	77	81	64	69	55	70	46	44	39	26	14	64	44	39	16	74	52	71	61	89	72	82	71
27	81	74	84	68	70	52	46	37	45	36	28	18	62	57	39	17	73	47	74	62	85	66	86	72
28	83	73	88	69	71	57	48	28	48	38	28	6	62	53	55	29	84	60	68	51	88	72	79	70
29	85	74	82	68	79	65	49	35	54	34	36	22	53	45	.....	.....	74	57	77	52	90	70	79	65
30	89	74	74	66	81	66	60	42	52	38	36	28	49	40	.....	.....	66	50	70	55	88	74	82	66
31	92	75	79	69	.....	.....	44	31	.....	.....	38	23	47	38	.....	.....	60	43	.....	.....	81	71	.....	.....
Range	30°		30°		39°		53°		41°		56°		70°		59°		63°		54°		43°		38°	
Monthly mean	82°.7		81°.2		70°.6		59°.0		50°.1		33°.2		35°.0		38°.8		52°.5		59°.2		72°.0		75°.1	

Maximum, minimum, and mean temperatures—Continued.

STATION, FORT GRANT, ARIZ.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	.....	.....	*77	*66	81	66	84	54	76	45	65	30	59	39	55	32	76	46	67	43	88	60	91	58
2	.....	.....	90	65	82	64	90	59	79	45	68	35	55	38	60	31	74	50	72	49	91	62	88	62
3	.....	.....	86	69	78	65	91	64	71	43	73	41	50	39	59	35	72	43	78	47	83	59	90	62
4	.....	.....	99	67	82	60	86	63	74	41	74	44	52	39	49	33	76	42	82	55	82	57	96	64
5	.....	.....	92	69	83	65	82	65	73	37	72	42	53	36	47	33	79	40	67	47	85	54	95	61
6	.....	.....	100	73	87	62	90	58	61	44	70	47	53	35	50	24	79	48	80	39	82	51	87	62
7	.....	.....	98	71	88	67	89	64	54	41	59	38	46	24	54	29	69	44	75	50	87	44	84	60
8	.....	.....	91	67	84	61	86	62	56	35	58	40	36	20	61	35	58	35	65	41	86	54	87	55
9	.....	.....	90	64	86	62	85	60	54	38	59	32	46	22	56	35	63	35	77	41	89	58	91	59
10	.....	.....	87	67	82	59	74	61	63	35	63	39	40	28	57	38	74	33	83	45	84	59	91	58
11	.....	.....	89	66	79	58	85	55	66	32	58	42	45	21	64	35	77	44	76	51	71	47	87	59
12	.....	.....	87	68	80	56	80	56	64	38	47	32	51	24	69	36	73	48	55	37	82	44	79	54
13	.....	.....	89	67	89	59	81	54	61	34	43	24	52	42	74	41	78	44	62	29	89	56	86	54
14	.....	.....	92	69	84	63	77	60	61	42	41	19	52	36	72	41	80	51	65	39	92	57	91	61
15	.....	.....	93	67	88	63	71	52	62	31	47	21	46	31	66	48	75	52	66	46	85	58	91	65
16	.....	.....	84	68	88	63	72	48	60	42	55	19	54	25	62	40	68	48	73	43	85	61	90	63
17	.....	.....	88	68	88	62	76	50	61	39	59	28	48	28	69	34	69	43	74	39	84	58	90	62
18	.....	.....	92	66	83	63	81	55	68	40	58	27	50	29	74	39	76	41	82	54	87	59	90	63
19	.....	.....	90	67	77	54	83	59	70	38	59	30	54	25	75	45	70	41	77	58	85	60	90	63
20	.....	.....	88	72	81	52	78	55	70	40	52	25	58	31	79	49	71	47	73	48	86	59	93	63
21	.....	.....	78	67	86	58	79	60	72	47	54	26	65	35	71	46	68	47	59	42	87	57	95	68
22	.....	.....	77	66	86	60	79	42	74	50	56	29	67	36	71	44	75	43	66	40	92	69	94	65
23	.....	.....	83	63	91	57	81	40	69	48	59	27	70	41	76	43	77	45	70	39	93	57	93	70
24	.....	.....	81	64	90	63	78	49	58	38	58	30	75	41	72	48	80	51	74	48	87	58	96	67
25	.....	.....	89	65	92	60	77	49	46	21	44	23	76	42	72	47	83	54	86	53	90	56	97	67
26	.....	.....	85	67	88	63	77	50	52	25	48	28	77	42	75	36	87	54	83	53	94	56	97	64
27	.....	.....	83	66	87	63	70	45	64	23	50	25	58	37	80	48	76	54	90	51	88	58	97	70
28	.....	.....	85	69	84	59	72	42	66	24	45	30	57	39	77	47	77	42	90	56	84	57	100	70
29	.....	.....	80	64	81	58	72	41	62	39	49	32	60	42	.....	.....	86	52	93	57	84	56	97	67
30	.....	.....	80	67	81	58	77	38	56	28	47	35	51	34	.....	.....	84	57	92	57	82	55	95	68
31	.....	.....	81	65	.....	.....	72	41	.....	.....	53	33	57	28	.....	.....	68	47	.....	.....	88	54	.....	.....
Range	.....	.....	37°		40°		53°		58°		55°		57°		56°		54°		64°		50°		46°	
Monthly mean	.....	.....	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

(*) Observations of maximum and minimum temperature began August 1, 1878.

Maximum, minimum, and mean temperatures—Continued.

STATION, CAMPO, CAL.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	90	43	90	65	91	63	83	34	78	31	72	35	52	41	58	40	74	30	56	48	84	32	99	43
2	94	49	93	68	87	59	87	38	74	30	80	43	55	40	60	38	73	29	65	43	76	36	96	46
3	87	47	93	47	87	52	85	40	73	32	80	36	56	40	49	44	66	30	75	35	75	35	102	45
4	85	41	93	51	86	40	84	39	73	27	76	32	57	32	50	40	71	24	60	42	72	34	96	45
5	82	35	95	53	86	40	87	37	54	32	77	27	56	45	55	32	72	27	65	41	71	36	82	39
6	88	36	95	56	90	41	89	37	50	40	62	27	56	35	58	23	62	29	70	30	72	45	72	49
7	92	41	93	60	92	40	89	38	55	40	68	36	47	36	57	21	55	36	57	42	72	46	62	47
8	92	41	93	61	89	37	83	33	63	32	64	32	50	29	62	29	51	42	63	42	75	33	73	46
9	88	41	93	54	94	44	80	54	65	29	72	30	48	19	60	31	57	41	75	26	75	27	77	48
10	87	41	92	57	93	47	81	40	68	30	58	21	50	24	60	44	67	39	73	29	65	33	73	41
11	91	34	92	62	92	40	80	39	69	31	56	18	55	21	69	32	72	39	42	33	75	28	59	47
12	96	38	96	62	93	42	73	37	62	35	54	9	53	21	70	35	79	30	55	40	84	35	77	50
13	94	61	97	68	92	45	67	33	70	37	47	7	52	25	73	35	80	33	56	42	81	37	87	41
14	90	60	95	62	90	47	64	50	72	29	48	36	46	38	69	38	79	33	65	43	77	34	92	44
15	87	58	97	59	87	45	60	47	67	31	58	37	47	26	68	35	70	31	73	41	79	32	88	43
16	83	50	95	58	79	42	68	37	69	35	62	23	52	18	61	33	66	45	75	38	80	31	79	37
17	84	49	91	53	70	38	77	39	72	40	65	11	54	27	69	32	67	47	80	36	72	32	82	34
18	85	39	90	43	72	36	84	33	76	21	63	15	53	30	71	34	58	37	78	34	75	28	84	37
19	86	47	92	47	84	34	80	35	81	25	60	15	61	46	75	39	63	43	77	32	71	50	85	37
20	87	53	88	50	90	40	82	35	81	29	56	40	64	45	75	32	62	41	61	42	71	32	85	41
21	88	55	77	49	88	39	78	36	82	41	60	38	67	26	73	31	60	44	69	37	67	44	87	44
22	89	54	77	46	86	35	82	54	79	34	63	37	68	26	76	31	74	31	77	29	69	26	87	39
23	90	52	80	40	88	38	87	33	73	30	68	21	77	24	77	38	78	33	83	33	78	26	85	37
24	90	45	74	47	86	40	84	36	58	30	51	15	79	36	77	31	77	35	85	33	85	26	88	38
25	91	43	79	45	88	39	81	31	57	42	48	33	71	33	81	33	87	38	83	34	85	31	89	34
26	90	42	79	58	89	38	75	33	65	22	50	25	50	38	80	33	85	41	81	32	80	29	90	32
27	92	39	79	38	85	37	76	42	69	20	53	25	52	39	83	35	82	33	90	34	70	35	90	39
28	95	41	82	39	75	37	77	22	71	22	46	36	47	39	71	30	78	42	87	35	71	34	89	37
29	100	50	86	45	68	48	80	23	69	21	47	39	47	36	.....	.....	88	42	89	40	77	42	89	31
30	102	53	91	51	70	49	80	28	65	37	50	35	53	35	.....	.....	82	45	83	34	87	39	87	30
31	96	55	92	57	.....	.....	80	29	.....	.....	55	36	53	25	.....	.....	62	47	.....	.....	93	40	.....	.....
Range	67°		59°		60°		67°		61°		73°		61°		62°		64°		64°		67°		72°	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, FORT VERDE, ARIZ.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	104	64	92	72	90	68	85	45	79	35	61	22	50	32	62	26	75	47	70	54	94	46	92	50
2	99	75	97	76	81	68	90	42	80	46	65	25	55	34	63	25	79	34	73	50	92	46	94	56
3	99	72	101	75	82	67	89	42	75	38	69	27	54	32	67	30	75	40	84	40	90	53	95	58
4	100	71	88	76	82	63	90	52	79	42	71	29	54	44	52	42	75	37	82	46	85	50	99	55
5	95	72	101	71	83	63	89	49	72	39	65	26	55	30	45	29	78	36	73	48	92	47	98	57
6	97	63	106	71	85	62	90	47	65	42	66	32	52	26	46	22	78	35	80	37	82	48	90	58
7	101	62	103	79	90	60	90	47	59	32	64	27	47	32	51	21	73	34	73	41	92	46	86	58
8	103	64	97	76	91	60	87	44	62	35	59	25	42	20	50	20	61	42	70	35	87	47	87	51
9	102	72	97	75	88	57	85	42	62	40	59	21	46	19	60	38	67	32	77	34	89	47	91	51
10	100	77	97	71	87	54	84	40	62	34	56	20	45	20	61	33	70	31	82	40	84	47	90	52
11	93	77	95	73	86	60	85	41	66	35	50	16	46	18	62	31	75	31	66	44	83	47	85	62
12	92	72	97	73	86	49	83	42	64	35	50	21	51	16	65	35	78	35	51	36	87	44	85	57
13	100	74	101	76	88	55	83	45	65	35	46	20	54	21	70	37	78	39	66	33	91	52	87	52
14	91	74	101	74	90	59	80	43	64	34	46	16	51	23	73	40	79	32	71	50	97	47	93	55
15	84	67	92	71	89	57	75	59	60	35	46	11	45	21	70	41	78	41	74	41	97	51	96	54
16	95	71	95	68	86	55	69	40	65	33	50	11	49	19	70	39	77	38	72	37	92	49	95	60
17	95	72	89	69	88	64	81	36	64	34	51	14	46	19	66	34	76	38	83	39	93	50	92	66
18	97	71	85	70	82	55	85	36	62	27	55	11	52	17	71	33	74	38	86	43	90	50	92	52
19	97	71	94	73	81	44	86	43	65	26	52	12	59	18	74	35	72	43	81	50	88	56	94	53
20	97	76	85	71	82	46	82	40	74	34	50	14	58	21	78	35	74	46	75	51	87	52	97	55
21	95	73	85	70	90	48	84	44	74	37	53	14	59	21	74	35	72	43	68	38	89	62	100	56
22	89	72	78	68	84	47	79	36	74	35	56	16	61	23	75	37	76	38	77	41	91	56	99	66
23	97	69	85	67	90	47	81	39	67	34	54	16	65	25	74	34	78	43	78	47	87	45	87	60
24	100	76	89	69	89	48	80	40	57	38	57	16	68	28	75	31	80	42	83	43	88	44	97	64
25	100	71	90	71	90	47	77	36	54	26	45	35	73	29	78	38	86	44	88	43	92	44	100	58
26	99	70	98	71	90	50	71	32	56	22	45	25	65	42	78	37	87	45	93	43	92	45	101	66
27	99	71	93	71	89	50	68	29	61	23	42	17	57	30	81	38	75	45	91	44	89	48	103	66
28	103	65	96	70	87	50	70	28	60	24	44	25	59	37	77	38	81	49	96	48	85	52	102	62
29	106	66	91	70	80	65	72	29	57	23	41	32	65	26	.....	.....	88	44	95	55	87	51	99	56
30	106	65	89	70	81	62	77	33	58	22	44	35	50	37	.....	.....	82	46	92	50	85	52	96	52
31	102	76	92	70	.....	.....	80	36	.....	.....	50	35	54	26	.....	.....	83	48	.....	.....	89	46	.....	.....
Range	44°		39°		47°		62°		58°		60°		57°		61°		57°		63°		53°		53°	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maimum, minimum, and mean temperatures—Continued.

STATION, CAPE HATTERAS, N. C.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	81	73	83	76	84	78	75	68	47	39	65	53	55	45	45	33	42	38	51	47	63	53	78	70
2	81	75	86	71	84	78	74	69	59	41	65	51	51	36	36	27	46	34	52	46	56	48	77	69
3	82	76	81	72	83	78	74	68	61	48	56	44	36	19	43	31	46	39.5	58	39	57	50	78	70
4	81	74	81	72	82	76	73	68	54	48	57	47	28	15	43	36	55	42	46	35	70	57	74	63
5	80	73	79	72	82	75	71	65	51	42	48	42	30	21	55	34	50	41	47	38	73	65	76	64
6	82	73	81	73	80	74	71	56	64	39	52	37	31	22	52	40	55	39	52	38	74	59	78	69
7	82	69	83	77	79	71	71	56	68	58	51	41	34	22	43	37	61	43	62	52	60	55	73	63
8	80	75	80	72	80	69	72	67	58	50	53	39	51	34	41	35	44	41	52	45	57	54	70	62
9	81	74	83	70	79	75	77	65	50	43	65	51	60	43	44	36	60	44	56	44	57	53	76	62
10	81	76	84	79	81	74	78	68	52	42	66	46	43	31	43	36	55	48	67	56	58	53	78	70
11	83	76	84	74	82	75	70	64	65	50	49	40	49	30	58	42	58	48	62	47	62	56	78	71
12	83	76	78	73	84	78	66	60	65	57	52	44	57	43	55	47	58	42	47	42	69	60	78	72
13	84	73	79	74	81	76	63	56	58	48	49	44	43	35	59	40	60	41	62	46	71	60	77	71
14	77	68	78	73	76	70	68	56	57	50	58	45	51	40	40	34	54	51	67	59	72	64	77	66
15	80	69	83	75	73	68	71	57	60	49	63	51	48	39	38	33	53	43	69	60	72	64	80	71
16	81	75	84	78	73	67	77	59	65	59	52	40	52	46	42	35	58	42	67	61	74	65	82	76
17	84	73	83	78	74	69	74	65	67	59	44	36	47	39	47	39.5	64	49	68	61	74	66	76	70
18	83	76	84	74	73	63	75	53	65	54	42	33	52	40	48	35	59	37	65	48	75	65	72	66
19	84	78	85	79	80	62	57	49	59	53	39	30	44	30	40	36	42	36	56	49.5	76	68	68	64
20	84	79	82	71	79	65	57	48	57	50	43	31	35	21	42	34	59	41	53	46	76	67	66	63.5
21	84	78	80	75	79	72	66	45	63	48	64	43	46	24	37	28	62	55	63	44	77	68.5	68	61
22	81	72	79	74	77	68	75	64	60	49	56	43.5	50	43	49	26	64	51.5	66	50.5	73	61	76	59
23	78	68	76	71	74	69	73	54	51	44	44	34	52	45	53	44.5	60	45	67	53	61	56	80	70
24	79	70	74	69	78	71	63	53	62	41	43	37	54	45	48	36	59	43	62	51	59	52	78	69
25	81	76	78	68	75	71	65	58	65	57	39	29	58	45	56	42.5	58	46	68	50.5	73	57	80	68
26	81	73	78	72	80	69	65	57	62	58	43	29	53	37	60	50	59	44	69	61	75	63	82	69.5
27	84	77	77	72	76	65	71	61	68	58	43	29	56	35	55	32	61	52	71	61	75	63	82	75
28	83	79	77	71	71	65	67	55	60	45	33	25	58	50	39	33	52	45	70	60	75	64	80	73
29	82	77	80	71	72	68	67	54	50	42	38	29	57	42	.....	.....	63	43	69	57	73	64	82	72
30	84	79	82	74	73	68	71	61	54	40	41	32	43	37	.....	.....	54	42	69	55	78	68	76	71
31	81	75	83	76	.....	.....	66	44	.....	.....	48	35	46	32	.....	.....	53	39	.....	.....	78	69	.....	.....
Range	16°		18°		22°		34°		29°		41°		45°		34°		30°		36°		30°		23°	
Monthly mean	79°.1		78°.2		75°.3		65°.3		55°.0		44°.8		41°.6		41°.8		46°.9		56°.1		64°.7		72°.2	

Maximum, minimum, and mean temperatures—Continued.

STATION, CAPE HENRY, VA.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	87	72	95	76	91	76	76	65	(*)	(†)	58	47	46	35	40	29	48	30	59	42	67	49	90	69
2	85	73	92	76	89	75	79	60	(*)	(†)	65	47	46	26	42	23	49	32	63	42	67	47	88	70
3	86	73	90	72	88	73	76	60	(*)	(†)	56	35	26	14	43	30	46	37	65	32	65	48	84	68
4	88	74	88	71	86	71	75	61	61	(†)	57	38	26	9	41	33	50	38	48	29	76	53	77	59
5	87	74	88	74	85	73	71	60	57	(†)	50	40	26	18	52	34	55	41	48	38	77	63	85	62
6	89	74	91	72	83	72	66	60	72	(†)	50	32	31	21	45	36	60	33	59	37	72	58	90	64
7	86	71	92	76	82	72	69	59	77	(†)	51	34	32	22	38	34	64	40	69	43	60	53	71	58
8	93	72	91	73	76	72	72	59	58	(†)	52	37	56	27	37	29	49	38	59	40	59	53	73	56
9	92	73	96	71	80	73	83	63	58	(†)	62	45	71	38	48	28	64	40	65	35	60	51	84	62
10	95	74	99	77	84	72	73	65	59	(†)	66	41	38	22	43	30	76	61	70	51	60	53	89	66
11	92	75	88	74	83	73	66	58	70	(†)	50	36	46	22	58	37	83	50	72	44	59	53	88	68
12	95	76	78	73	85	75	64	58	74	(†)	54	38	45	35	58	41	62	42	57	42	67	52	85	69
13	85	74	76	73	85	70	66	53	65	36	48	36	39	32	50	34	68	40	71	40	75	55	80	68
14	84	71	81	72	81	64	74	51	55	43	52	33	42	36	37	29	65	46	67	56	73	58	82	62
15	91	68	82	74	76	61	77	54	57	44	53	41	41	32	30	24	60	42	78	56	75	59	91	68
16	88	70	84	74	79	67	81	60	62	44	48	35	60	37	36	27	61	40	68	49	79	61	91	73
17	86	70	87	73	80	61	78	62	70	50	43	31	38	31	40	35	73	41	69	49	79	64	79	64
18	96	72	88	73	85	60	74	49	64	43	43	28	46	34	39	33	52	36	57	38	70	63	72	62
19	101	77	90	72	86	63	60	47	57	41	44	27	38	27	40	30	53	35	59	46	74	62	70	57
20	89	75	84	71	86	66	62	48	59	45	40	28	27	20	36	30	62	37	67	42	74	62	72	61
21	96	75	83	73	86	62	68	45	66	47	61	32	42	23	33	26	70	49	65	44	80	63	76	54
22	85	76	81	71	75	63	67	54	62	42	49	38	65	36	54	25	68	45	70	45	73	56	78	55
23	88	70	76	68	75	61	(*)	(†)	53	42	42	27	61	39	50	39	70	43	77	52	65	53	85	65
24	88	65	82	68	75	68	(*)	(†)	68	35	38	29	41	34	52	35	54	40	65	45	67	47	81	66
25	86	68	86	66	78	68	(*)	(†)	75	49	38	23	65	35	69	46	57	42	78	46	81	54	79	68
26	90	74	82	71	86	68	(*)	(†)	65	49	38	23	45	33	74	41	54	37	82	63	76	61	83	66
27	98	75	80	68	71	59	(*)	(†)	62	50	36	26	60	33	41	27	67	48	72	63	72	58	92	71
28	83	74	82	69	71	62	(*)	(†)	60	46	37	23	74	56	34	28	55	44	70	57	75	62	91	71
29	88	74	(:)	(:)	76	65	(*)	(†)	58	37	40	22	61	35	.....	.....	64	43	65	54	72	58	88	70
30	91	76	79	(:)	75	60	(*)	(†)	59	42	43	30	40	32	.....	.....	55	43	71	53	85	64	82	69
31	91	76	87	73	.....	.....	(*)	(†)	.....	.....	38	28	48	32	.....	.....	52	35	.....	.....	92	70	.....	.....
Range	36°		.....		32°		.....		.....		44°		62°		51°		53°		53°		45°		38°	
Monthly mean	79°.8		77°.9		73°.4		62°.3		51°.9		40°.3		37°.9		38°.2		47°.9		53°.9		64°.3		73°.1	

(*) Maximum thermometer broken. (†) Minimum thermometer broken. (:) No observation taken.

Maximum, minimum, and mean temperatures—Continued.

STATION, CAPE LOOKOUT, N. C.

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	83	72	87	78	87	72	76	67	50	37	64	47	52	39	46	34	45	35	53	45	66	57	80	72
2	86	76	88	74	87	78	75	68	61	46	65	54	52	37	37	28	53	36	58	46	61	52	79	72
3	84	74	83	68	85	77	76	66	61	51	57	43	38	22	45	30	51	42	60	39	67	57	80	72
4	82	74	86	74	85	75	76	66	55	46	58	49	31	17	49	36	54	43	50	34	72	61	76	66
5	84	74	86	74	85	69	75	64	53	46	49	42	33	22	56	45	56	43	52	40	73	66	79	68
6	87	76	84	75	85	69	75	65	67	49	56	38	32	22	51	46	53	42	54	41	76	64	79	71
7	87	76	87	79	82	69	73	63	68	62	58	40	39	21	46	37	62	48	63	53	65	58	74	65
8	84	77	87	71	81	70	78	63	67	49	55	32	54	39	41	38	48	44	57	48	59	55	73	65
9	86	76	86	72	82	72	80	70	49	44	63	44	61	44	51	33	66	46	61	46	61	54	79	69
10	86	77	87	71	83	73	79	69	60	40	64	46	45	30	51	36	59	52	65	57	62	55	80	71
11	89	77	86	71	83	74	70	60	65	58	53	40	52	33	58	51	61	53	67	51	66	57	80	72
12	89	78	86	70	85	74	65	58	67	57	56	44	60	41	54	49	60	47	55	44	71	62	80	73
13	85	79	82	75	81	76	66	53	61	48	50	42	48	38	58	44	61	47	64	50	73	64	82	73
14	82	73	81	74	78	69	69	53	58	43	54	46	54	41	44	36	58	53	68	59	74	66	81	68
15	83	72	86	77	75	68	76	60	57	48	65	51	48	38	39	32	54	50	69	59	76	66	82	73
16	83	78	87	77	75	65	77	68	68	54	62	40	54	43	41	33	60	49	66	60	76	67	81	76
17	87	78	86	80	75	65	76	68	67	56	41	33	50	39	57	40	66	54	65	60	71	66	78	72
18	88	79	86	75	76	67	73	52	65	53	44	33	56	45	48	38	58	39	65	47	72	63	75	69
19	87	80	87	77	80	67	58	47	59	53	38	31	49	31	42	36	46	37	57	47	79	67	71	63
20	87	80	86	76	80	72	61	46	59	51	41	31	39	22	45	35	60	45	60	48	78	68	69	61
21	86	78	85	75	82	75	68	53	63	54	65	38	49	33	40	28	63	55	67	50	78	60	72	58
22	86	79	83	73	79	68	74	68	59	49	60	42	54	47	51	33	64	55	67	52	73	62	76	62
23	85	76	78	69	75	69	75	54	55	47	46	34	55	48	54	49	62	46	67	59	65	58	79	73
24	86	76	78	67	79	70	65	49	63	54	47	37	56	44	51	42	62	48	63	56	69	54	80	74
25	84	72	81	70	80	71	66	53	67	59	42	31	55	50	60	48	59	50	70	57	72	63	82	70
26	86	77	80	71	82	75	64	54	65	53	51	31	55	38	64	53	61	49	69	61	77	68	82	73
27	87	80	80	69	79	66	71	54	66	54	37	26	56	37	56	33	62	56	74	62	81	67	81	73
28	88	79	84	72	71	66	69	53	61	44	41	22	56	51	39	33	58	51	68	64	82	70	80	74
29	87	79	87	78	72	66	64	54	52	38	40	28	53	46	.....	.....	65	50	72	61	81	70	83	70
30	86	80	87	72	74	68	73	59	55	42	43	34	48	41	.....	.....	58	40	71	60	80	73	78	69
31	83	80	87	72	.....	.....	65	42	.....	.....	44	35	49	38	.....	.....	54	40	.....	.....	81	72	.....	.....
Range	17°		21°		22°		38°		31°		43°		44°		36°		31°		40°		30°		25°	
Monthly mean	81°.3		80°.1		76°.4		65°.7		55°.8		45°.4		43°.8		43°.6		52°.2		58°.2		67°.4		74°.3	

Maximum, minimum, and mean temperatures—Continued.

STATION, CAPE MAY, N. J.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	82	70	81	66	83	73	77	56	48	38	53	37	39	26	34	23	41	21	51	37	61	46	79	67
2	81	68	82	67	86	74	74	64	59	46	59	46	36	12	30	21	41	33	46	41	57	43	80	67
3	80	70	84	71	83	75	76	66	59	39	51	43	14	1	36	27	44	32	53	30	57	46	71	63
4	81	70	79	70	81	72	75	60	50	33	54	43	22	5	35	31	44	31	37	29	58	50	72	60
5	85	70	82	69	80	70	69	53	44	31	43	34	21	12	40	32	45	36	37	33	67	56	81	63
6	82	70	83	64	80	66	64	58	64	43	44	35	26	18	38	32	46	34	46	30	63	55	79	63
7	83	71	79	66	77	66	67	45	50	40	41	36	30	18	36	31	46	34	48	43	63	47	67	52
8	79	70	82	70	72	65	65	57	46	36	40	34	42	29	36	28	41	26	48	37	65	48	71	57
9	79	70	85	71	78	61	75	64	45	35	53	39	44	29	38	30	48	36	58	40	62	47	75	62
10	81	71	85	74	82	67	72	54	50	42	57	42	30	23	38	23	61	38	52	46	64	43	76	65
11	84	72	76	69	81	69	64	49	57	42	45	25	37	25	45	35	57	43	47	38	64	50	77	68
12	78	70	82	70	81	70	60	53	57	49	42	26	37	30	47	36	44	37	46	37	67	52	76	68
13	78	69	80	67	78	71	65	53	55	45	38	34	37	29	42	26	53	40	54	41	70	55	77	66
14	78	67	81	70	74	62	69	59	47	37	46	30	38	29	27	20	54	43	57	47	71	55	75	62
15	84	70	76	70	72	65	68	61	51	29	51	36	33	28	24	12	45	35	56	48	73	57	77	67
16	78	70	75	70	77	54	73	62	59	41	39	28	37	30	36	20	50	35	55	43	73	62	77	68
17	78	69	75	68	77	58	70	64	61	52	35	26	32	18	38	31	53	35	47	42	72	58	71	62
18	86	69	80	69	81	66	67	49	57	46	39	30	36	30	38	27	41	29	45	39	72	58	71	58
19	90	74	82	71	81	70	57	48	54	48	34	24	31	22	35	24	39	30	47	42	72	60	74	60
20	86	73	79	69	79	71	61	48	52	46	32	26	22	18	34	27	50	34	57	42	75	61	72	55
21	84	71	77	68	81	70	64	54	56	50	50	29	37	12	29	22	52	43	58	44	71	62	74	62
22	80	72	74	64	71	55	65	57	55	45	43	34	50	36	38	21	47	35	63	47	69	57	71	63
23	82	69	73	60	71	48	67	60	47	42	35	23	41	30	43	31	45	37	64	48	65	48	80	65
24	82	72	79	62	75	66	61	51	55	43	36	21	38	24	38	29	46	31	55	43	69	47	79	67
25	81	70	78	65	79	65	59	47	59	49	25	18	47	33	43	33	45	40	56	47	75	57	72	66
26	76	71	76	59	82	64	62	48	52	39	33	19	35	23	50	36	46	30	76	49	67	61	73	65
27	81	70	79	65	65	53	63	57	59	38	29	21	44	26	37	23	55	42	55	46	66	54	79	67
28	82	73	79	67	66	46	59	44	57	43	29	24	55	39	33	16	47	41	60	47	73	62	75	68
29	78	70	80	66	72	49	53	36	48	42	33	20	41	32	.....	.....	45	40	61	53	74	58	77	66
30	74	70	81	68	71	56	64	52	49	39	38	29	37	26	.....	.....	47	42	63	51	71	61	77	65
31	76	66	79	72	.....	.....	55	43	.....	.....	32	23	40	32	.....	.....	45	34	.....	.....	77	63	.....	.....
Range	24°		25°		40°		41°		35°		41°		54°		38°		40°		47°		34°		29°	
Monthly mean	75°.6		73°.7		70°.2		60°.0		47°.5		36°.4		29°.8		32°.1		42°.0		47°.5		61°.0		69°.4	

Maximum, minimum, and mean temperatures—Continued.

STATION, CASTROVILLE, TEXAS.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	86	71	97	75	94	66	95	74	73	42	66	33	57	50	62	45	84	63	78	56	90	65	87	68
2	87	72	99	79	95	71	(*)	(*)	81	55	70	33	54	37	47	42	69	53	79	44	87	67	86	59
3	90	72	100	80	92	69	95	70	76	58	78	37	43	33	55	38	77	50	81	46	90	67	87	61
4	89	71	100	72	92	73	92	73	75	49	76	39	36	25	62	48	78	58	81	53	90	68	90	53
5	92	69	94	74	97	72	92	68	76	52	71	47	40	26	60	41	83	59	78	60	95	62	92	57
6	94	73	98	75	91	76	90	67	81	65	77	47	42	20	44	35	84	63	82	68	80	62	97	68
7	91	73	96	76	87	72	90	66	80	69	77	55	52	33	57	33	85	64	90	62	78	60	96	67
8	93	73	99	78	91	75	80	71	81	71	70	52	50	27	68	32	80	63	92	64	84	64	97	74
9	95	71	98	78	89	77	90	66	79	66	(*)	(*)	47	20	68	37	79	63	92	65	89	64	94	76
10	94	75	98	77	79	64	93	69	84	64	.....	.....	50	23	73	54	82	66	90	51	92	68	99	79
11	93	72	98	79	80	64	96	69	67	55	76	31	(*)	(*)	81	46	83	65	89	49	92	68	98	76
12	95	76	94	75	82	54	91	68	70	47	74	60	.....	.....	82	43	79	64	86	50	(*)	(*)	94	78
13	94	75	94	72	85	51	90	65	59	39	69	42	63	30	70	45	81	60	90	68	.....	.....	97	75
14	96	73	96	73	86	53	91	71	66	53	42	34	75	44	60	33	84	53	94	59	91	63	98	78
15	96	74	97	72	87	55	91	74	75	47	59	24	77	61	52	34	84	51	91	61	96	61	101	77
16	98	79	96	73	87	57	92	75	76	45	60	23	64	55	70	48	85	63	79	62	95	62	97	70
17	98	76	94	73	91	57	78	59	61	54	54	30	67	52	63	47	72	45	77	56	97	70	95	75
18	98	74	85	77	92	75	79	46	72	51	50	29	68	38	63	33	72	40	81	45	90	72	92	74
19	92	78	88	76	92	74	79	44	77	43	50	43	62	31	72	35	75	40	84	45	101	74	88	73
20	95	75	90	76	90	72	83	46	81	43	47	38	66	28	75	42	87	62	88	57	105	69	88	74
21	98	76	(*)	(*)	85	60	81	58	73	52	63	30	70	34	79	59	93	65	88	66	108	71	92	75
22	101	73	.....	.....	86	56	77	43	73	40	58	27	77	41	84	58	87	60	90	59	(*	(*)	95	76
23	95	76	96	71	93	73	79	38	78	41	68	30	70	46	80	48	84	56	74	57	97	75	97	77
24	98	77	95	73	94	77	86	48	75	51	53	33	76	42	82	45	85	63	65	59	95	72	98	76
25	98	77	95	75	96	75	85	54	54	41	37	27	75	50	91	46	86	68	84	58	96	72	97	68
26	92	73	98	71	92	77	87	60	55	37	(*)	(*)	71	52	75	41	92	68	92	59	91	72	98	75
27	89	72	97	73	89	73	65	50	69	28	49	24	78	58	65	41	90	69	97	61	93	63	99	77
28	92	76	95	73	92	71	60	46	68	33	46	36	81	57	77	47	87	67	88	62	95	72	99	78
29	95	75	90	74	92	73	79	54	74	37	59	45	79	67	.....	.....	90	63	90	62	96	69	99	75
30	98	75	95	67	92	74	74	53	59	47	55	43	76	66	.....	.....	(*)	.....	94	67	98	76	101	77
31	99	75	94	65	.....	.....	74	54	.....	.....	56	41	71	62	.....	.....	96	62	.....	.....	92	77	.....	.....
Range	32°		.....		46°		.....		56°		.....		.....		59°		56°		53°		.....		48°	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

* No observations taken.

Maximum, minimum, and mean temperatures—Continued.

STATION, CHARLESTON, S. C.

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	86	75	91	80	90	81	75	63	57	37	66	56	57	43	55	40	54	35	70	52	86	63	86	73
2	85	75	94	79	88	79	80	68	64	44	66	45	57	41	45	30	60	39	65	49	71	58	86	72
3	81	74	93	77	86	78	83	66	66	49	57	39	41	29	54	30	65	46	72	49	75	59	84	72
4	85	73	88	77	87	77	82	66	64	51	60	46	36	23	54	40	60	42	58	39	79	63	81	68
5	85	77	86	78	88	77	79	63	65	52	52	40	39	31	59	48	61	44	58	40	82	70	87	70
6	92	76	85	77	87	78	84	67	71	56	59	40	35	26	60	53	63	48	65	44	88	69	89	70
7	89	77	94	78	85	76	83	69	75	60	57	47	42	27	55	46	76	50	69	53	75	61	86	73
8	86	79	91	80	84	74	81	70	71	56	57	46	56	36	48	36	68	52	66	53	66	58	80	72
9	89	78	93	82	85	75	82	72	58	43	67	53	65	42	55	35	72	56	67	51	73	55	82	75
10	89	79	92	79	82	71	77	69	65	46	63	40	47	31	56	40	77	59	72	63	74	57	82	74
11	88	78	93	82	82	75	73	63	70	52	59	37	57	37	61	53	76	61	73	58	74	63	86	74
12	86	79	93	82	83	75	72	60	67	56	59	47	60	43	66	51	63	54	63	48	78	65	88	75
13	93	78	90	72	81	68	72	59	64	48	60	47	52	39	64	52	65	53	72	58	76	67	90	74
14	93	73	86	73	80	67	73	58	63	48	61	49	63	39	59	42	69	58	73	64	81	67	85	75
15	87	76	88	74	79	67	75	61	64	51	66	54	61	44	50	40	66	51	76	63	80	69	89	76
16	87	75	87	77	80	67	79	67	66	56	60	45	64	47	45	36	69	52	72	64	81	66	92	78
17	87	76	88	76	79	67	77	70	71	61	55	42	59	46	55	37	72	57	70	60	81	69	90	77
18	91	77	93	77	80	64	72	56	62	56	50	38	63	49	55	44	62	49	65	52	77	67	80	71
19	91	82	96	78	81	67	61	47	60	51	49	35	58	37	57	40	64	44	69	48	79	67	80	66
20	86	75	97	79	81	69	66	49	62	51	49	40	48	29	52	40	69	49	64	53	82	68	78	60
21	91	77	85	77	85	73	70	58	65	50	63	46	59	40	51	32	75	60	69	53	84	71	77	65
22	95	75	86	74	83	72	70	64	55	44	53	40	62	44	58	41	72	61	72	55	83	72	85	66
23	87	77	84	72	80	69	65	51	62	43	46	33	68	50	63	50	73	59	79	59	74	63	89	69
24	85	80	81	70	81	72	69	49	67	50	57	39	70	50	57	45	74	58	75	59	73	59	86	72
25	86	75	86	69	83	72	71	54	71	55	52	41	73	50	66	48	66	55	79	62	82	59	84	73
26	88	76	89	77	84	74	70	57	67	59	58	42	60	44	72	56	72	56	79	65	86	66	87	74
27	94	79	84	75	79	67	71	57	69	56	46	31	66	47	57	42	74	61	75	67	86	70	86	73
28	93	82	92	78	70	64	68	61	56	43	42	25	75	59	49	33	69	58	80	66	86	70	89	74
29	92	82	91	80	79	63	70	59	56	41	47	35	80	57	.....	.....	78	57	78	66	85	70	90	76
30	92	81	90	81	80	66	74	63	61	47	53	44	61	50	.....	.....	68	52	81	66	87	71	84	74
31	88	76	91	82	.....	.....	67	44	.....	.....	48	42	58	50	.....	.....	65	46	.....	.....	83	73	.....	.....
Range	22°		28°		27°		40°		38°		42°		57°		42°		43°		42°		33°		32°	
Monthly mean	82°.9		83°.1		77°.2		67°.5		57°.9		49°.2		50°.3		49°.6		60°.2		63°.8		72°.7		79°.6	

Maximum, minimum, and mean temperatures—Continued.

STATION, CHARLOTTE, N. C.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1							(*)	(*)	52	30	52	43	42	34	46	28	53	26	52	45	62	54	88	68
2									60	32	54	38	47	25	42	24	65	33	62	44	68	48	87	67
3									66	41	54	31	28	15	50	22	55	37	62	35	70	45	76	64
4									61	42	54	38	30	11	58	29	56	36	52	30	78	53	78	57
5									59	41	49	33	29	18	51	39	63	41	56	32	78	63	85	57
6							67	60	68	42	50	31	32	12	53	44	66	46	63	39	79	61	88	64
7							61.5	54	72	48	48	36	39	12	47	38	75	50	61	43	70	56	83	65
8							75	54	65	42	41	34	41	34	41	32	65	47	61	41	76	51	77	64
9							78.5	61	55	36	49	35	60	32	54	27	76	53	68	41	70	49	86	66
10							73	65	63	34	51	35	39	21	45	33	78	55	70	58	72	47	84	67
11							68	48	63	44	52	30	44	27	50	37	79	54	67	46	70	57	81	67
12							69	55	63	47	56	37	42	35	57	39	64	45	64	38	73	60	86	68
13							67.5	45	64	37	54	37	57	29	56	40	68	43	74	44	77	63	84	68
14							71.5	46	55	41	52	37	58	40	44	30	69	54	68	58	75	61	87	66
15							74	50	55	36	61	45	50	36	39	22	60	40	76	54	79	63	91	70
16							76	55	53	46	46	35	61	39	33	28	63	40	67	59	75	61	89	73
17							75	62	63	49	48	32	50	34	35	30	61	45	66	51	75	63	84	69
18							70	46	60	46	43	30	52	41	47	32	51	34	59	45	75	61	73	62
19							55	39	53	44	39	24	47	25	44	31	55	38	64	42	78	61	76	55
20							61	36	61	46	37	26	40	18	42	29	67	38	65	43	84	67	77	54
21							69	41	58	46	37	30	56	32	46	24	68	56	72	46	86	65	81	57
22							61	57	53	41	43	31	61	39	60	34	72	55	77	45	79	64	86	63
23							60	46	55	35	38	22	60	46	57	45	64	48	82	54	71	57	87	67
24							68	42	66	39	49	29	60	44	59	40	65	41	73	58	74	50	88	68
25							72	40	70	50	40	21	70	47	60	44	64	46	80	57	85	59	83	68
26							74	49	63	55	34	24	59	41	61	43	63	47	81	58	89	66	88	65
27							72	51	58	45	34	22	49	41	45	24	74	48	73	59	86	66	91	69
28							62	45	53	36	35	17	67	44	43	25	72	48	77	62	90	68	92	69
29							51	45	50	30	40	26	69	58			76	52	77	61	89	68	84	72
30							64	46	55	36	43	33	57	41			59	44	80	57	88	67	80	64
31							54	34			40	31	48	40			60	40			89	69		
Range									42°		44°		59°		39°		53°		52°		45°		38°	
Monthly mean							†57.4		49°.8		38°.3		41°.5		40°.9		54°.8		59°.1		68°.7		74°.9	

* Station opened October 6, 1878.

† Mean for twenty-six days only.

Maximum, minimum, and mean temperatures—Continued.

STATION, CHARLOTTETOWN, P. E. I.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	87.5	67.1	74.8	56.4	68.0	60.3	59.7	48.2	53.8	39.2	29.4	23.0	18.9	11.5	32.3	8.5	22.0	1.2	46.7	33.5	56.9	44.2	63.7	48.1
2	79.4	62.2	69.0	55.9	73.9	59.2	65.0	54.1	48.1	35.4	38.4	19.7	26.6	11.4	32.1	26.5	27.4	10.1	36.0	24.4	56.9	39.2	52.9	42.2
3	74.0	58.6	69.0	60.0	67.5	54.1	63.0	55.8	52.3	36.1	47.1	36.0	29.2	13.4	32.9	23.4	18.3	8.2	29.0	19.5	50.0	38.6	52.3	41.0
4	78.0	56.1	74.2	59.3	67.0	51.6	66.7	52.1	38.9	29.3	42.3	37.6	28.9	11.4	30.8	22.0	37.4	11.1	31.1	24.1	52.0	32.7	60.1	44.2
5	65.5	51.6	76.2	61.2	68.5	55.5	59.1	45.7	32.3	23.0	45.1	37.1	30.9	23.0	28.8	15.5	37.9	6.1	38.1	18.5	52.0	32.6	68.3	49.1
6	56.8	50.1	76.3	61.7	66.2	53.1	56.8	46.2	36.4	25.4	38.3	27.6	33.3	20.3	31.4	9.0	11.5	5.2	35.9	29.0	59.3	39.3	67.9	51.2
7	64.4	50.1	70.4	61.5	58.9	46.2	57.5	47.1	39.0	26.0	28.8	22.5	32.1	26.5	25.5	12.5	18.2	7.7	40.0	24.1	57.9	40.2	55.6	44.1
8	75.7	55.1	73.0	61.5	66.0	42.2	59.4	48.5	40.1	32.1	29.8	21.1	31.2	21.4	21.2	9.0	21.0	11.1	39.7	28.1	55.0	39.2	49.2	40.2
9	80.3	58.2	78.0	59.8	70.6	54.3	60.1	51.6	40.0	34.1	24.9	19.5	30.2	17.4	18.3	2.8	24.9	13.1	39.0	25.5	60.1	35.4	54.4	39.1
10	82.7	62.4	76.0	63.2	71.3	59.1	61.0	43.7	42.5	31.1	36.1	15.5	28.2	7.0	21.2	6.7	32.1	20.1	34.3	23.0	64.1	39.9	61.9	41.5
11	69.0	57.1	74.2	60.2	73.9	59.1	47.0	40.8	44.9	34.6	43.0	34.5	13.2	4.5	34.0	3.0	36.4	29.6	33.3	25.9	59.0	43.5	68.4	43.9
12	76.0	54.2	74.0	59.2	75.7	60.7	51.1	38.2	53.0	34.1	42.5	28.4	16.9	3.6	43.0	31.4	35.4	23.1	38.0	29.2	57.5	44.1	64.7	49.5
13	78.5	59.2	78.1	59.7	73.4	65.9	52.0	44.9	49.8	38.2	30.3	24.3	26.6	9.0	37.0	10.5	31.9	18.5	41.1	26.0	66.0	47.2	56.0	45.5
14	66.3	56.1	78.3	61.2	74.7	59.4	57.0	45.2	42.4	30.1	40.3	27.1	28.4	5.0	16.9	5.7	37.3	26.1	40.3	27.7	72.2	47.2	63.8	42.0
15	61.1	50.6	78.0	62.0	65.3	55.1	61.0	46.2	32.3	28.3	38.0	33.1	6.6	— 8.2	10.9	4.0	42.9	30.1	44.4	29.1	72.4	49.0	63.4	41.2
16	71.1	50.2	81.0	65.2	59.0	49.1	60.0	51.6	36.1	24.1	36.1	20.7	1.8	—10.0	24.5	— 0.7	31.3	22.0	47.6	29.1	74.3	49.1	62.0	46.2
17	70.9	53.2	79.0	63.2	65.0	53.9	62.7	53.1	37.4	30.1	22.4	18.5	9.9	— 0.4	22.2	7.8	37.8	19.0	48.1	31.1	68.7	54.1	57.1	44.4
18	63.4	54.0	75.0	66.2	70.0	54.6	65.2	53.8	36.0	29.5	23.8	17.5	29.1	7.3	17.9	8.0	38.7	25.9	43.0	28.3	67.7	41.6	50.3	39.8
19	65.3	58.4	68.3	63.9	67.7	53.1	67.0	60.2	42.3	31.1	21.1	8.5	26.6	— 1.0	13.9	0.0	31.7	19.1	(*)	28.6	55.6	41.7	63.0	38.0
20	60.2	49.6	64.2	59.2	72.4	57.2	60.5	43.6	43.4	41.1	15.3	5.0	17.9	— 1.0	17.2	— 5.0	27.9	17.9	35.9	26.1	60.8	43.1	72.2	48.1
21	68.7	49.1	59.6	54.1	73.0	61.1	51.0	42.2	45.5	39.2	19.7	9.7	12.5	— 8.8	21.2	10.8	34.2	16.3	42.8	24.1	67.1	41.0	75.9	54.1
22	73.6	57.1	56.9	49.6	68.0	50.1	49.2	44.1	43.0	34.7	39.6	17.7	22.2	—11.7	15.0	5.0	31.9	21.6	41.0	26.3	43.5	31.6	74.0	53.1
23	61.9	51.1	67.0	45.2	56.1	43.7	52.0	43.5	55.2	41.5	35.3	18.5	24.1	9.7	30.6	5.0	35.6	20.5	47.2	29.7	45.0	31.6	71.7	52.3
24	67.3	51.5	69.1	49.1	61.6	42.2	55.0	44.2	49.4	40.2	24.5	13.2	26.9	9.1	33.4	14.0	30.8	21.3	34.3	28.5	43.3	37.0	70.1	51.1
25	76.5	57.8	67.1	54.8	64.2	48.9	54.0	44.7	41.7	36.6	18.9	11.0	31.9	15.0	18.2	4.5	36.2	21.5	42.7	30.1	59.6	39.4	80.9	59.2
26	71.0	60.5	66.1	52.0	68.5	48.1	49.4	44.2	37.2	34.1	26.7	10.0	17.3	— 1.8	40.2	5.3	33.8	18.1	42.3	29.3	47.1	36.8	78.1	53.6
27	67.9	60.2	70.0	54.1	60.0	43.2	51.0	43.9	34.1	29.6	26.1	10.0	13.4	— 4.5	46.7	21.5	31.1	8.1	49.3	30.1	57.0	34.1	69.1	52.6
28	71.8	57.1	66.3	57.4	52.7	40.7	51.1	44.0	52.1	28.2	17.9	10.0	32.6	11.0	23.2	4.5	36.0	13.2	58.0	32.4	63.9	45.8	75.9	59.8
29	74.4	54.6	67.0	55.1	59.0	45.1	44.8	38.7	49.9	33.1	18.0	9.0	32.3	19.5	.....	.....	41.0	23.0	59.9	41.6	61.8	40.4	68.6	55.1
30	72.5	54.1	66.6	53.1	63.2	46.9	47.8	37.6	34.4	26.5	15.7	4.5	21.1	16.0	.....	.....	40.0	32.3	62.9	44.2	69.0	46.5	61.9	52.3
31	75.0	58.4	70.0	49.1	.....	.....	60.8	45.5	.....	.....	18.8	7.2	19.0	0.0	.....	.....	47.9	33.9	.....	.....	72.1	54.6	.....	.....
Range	38°.4		35°.8		35°.0		29°.4		32°.2		42°.6		45°.0		51°.7		46°.7		.....		42°.7		42°.9	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

* Maximum thermometer out of order.

Maximum, minimum, and mean temperatures—Continued.

STATION, CHATHAM, CAN.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	97.6	66.7	83.1	53.2	67.0	60.4	67.1	39.2	49.4	33.3	32.2	16.4	23.2	— 0.3	34.2	11.1	15.1	—17.5	37.1	33.9	61.4	45.7	67.5	50.9
2	75.8	60.5	72.5	50.3	77.7	55.0	66.7	54.9	48.1	29.7	36.3	10.3	26.1	4.3	38.3	29.2	26.2	4.3	35.3	18.5	54.1	39.1	54.6	40.1
3	82.6	58.0	70.1	58.3	61.3	49.5	70.5	52.4	46.1	28.2	49.7	26.9	33.4	4.6	35.2	26.1	27.6	— 2.3	26.6	12.1	54.7	37.1	60.5	36.8
4	86.8	56.0	73.3	56.5	71.1	44.9	69.3	44.9	41.1	23.7	41.4	34.0	27.5	— 9.6	33.2	16.9	43.7	3.5	29.8	10.5	54.2	36.0	56.5	37.9
5	72.7	53.2	78.5	59.2	72.5	49.9	57.7	38.8	32.4	20.7	40.2	34.1	32.0	24.0	32.5	11.7	36.3	— 1.5	45.2	6.7	49.1	31.2	71.7	54.7
6	67.8	49.1	78.4	60.8	71.5	49.1	55.5	34.8	33.2	22.0	35.2	21.0	34.2	14.7	32.2	9.9	20.2	—11.7	36.5	25.9	53.2	42.2	70.5	48.1
7	76.2	46.1	66.1	61.2	65.4	41.0	64.5	39.5	37.3	11.1	29.2	15.5	31.8	20.2	25.2	8.7	15.0	3.8	43.6	28.8	49.0	38.9	53.1	41.6
8	87.7	55.3	72.8	58.9	71.5	39.8	57.1	39.2	39.3	30.8	27.4	18.7	24.0	14.9	22.3	— 1.4	30.6	— 2.1	44.5	25.1	62.1	34.1	51.5	38.5
9	92.5	67.5	81.5	54.8	81.5	52.0	56.1	42.4	35.5	25.7	25.8	12.9	29.2	8.9	19.6	— 5.3	36.1	— 5.8	36.5	22.9	69.5	31.8	63.1	37.8
10	85.7	60.7	76.2	61.0	78.4	57.2	53.0	41.6	37.5	25.9	33.6	10.7	20.4	1.5	21.2	5.3	34.1	22.4	47.1	19.7	71.5	37.2	72.5	36.9
11	74.7	55.6	72.5	54.8	79.5	57.0	52.3	30.0	46.1	29.5	44.1	33.6	16.6	— 8.4	29.9	3.8	38.1	32.8	30.6	22.2	70.7	41.2	63.1	38.0
12	80.1	49.8	79.7	53.2	71.3	54.5	49.5	27.4	48.5	24.9	38.3	27.4	21.5	—13.4	39.9	20.9	34.3	15.9	35.6	26.4	59.9	49.0	58.2	46.0
13	78.1	50.1	78.7	55.9	79.5	68.5	53.4	39.0	47.5	29.8	29.2	19.9	27.6	1.7	27.6	0.5	35.2	13.9	45.9	19.7	72.7	48.9	61.9	50.5
14	64.4	46.8	83.5	54.2	79.6	54.8	62.1	37.4	39.7	28.0	33.1	20.5	27.6	— 3.1	17.8	— 7.3	32.3	18.8	46.8	17.4	57.5	48.0	62.5	40.1
15	73.7	50.0	83.1	56.0	64.6	47.0	67.4	34.1	32.3	21.4	35.4	30.1	—2.5	—11.9	8.2	—10.1	42.5	23.7	48.1	18.9	58.1	42.9	68.6	35.0
16	74.5	49.2	86.2	65.1	65.4	42.2	69.4	49.7	37.1	14.9	30.6	14.1	—1.5	—22.5	21.6	—20.9	26.6	12.1	46.7	24.1	70.1	41.3	63.4	38.9
17	64.1	49.0	73.4	65.1	67.1	42.9	63.4	52.4	36.5	23.2	24.6	13.3	15.6	—22.3	20.8	—12.7	23.9	6.0	54.1	28.1	73.2	53.4	53.2	45.1
18	66.2	52.2	80.4	63.6	72.5	53.0	70.2	54.2	37.3	16.0	23.1	7.8	29.6	6.8	14.2	— 4.3	31.7	12.0	45.1	26.9	66.1	39.5	53.4	43.3
19	73.5	54.2	68.4	59.0	71.1	45.0	71.5	56.9	35.9	24.6	19.6	2.0	19.4	0.0	14.8	—14.3	29.8	— 6.3	40.0	23.6	52.4	38.5	73.4	43.8
20	71.6	52.5	69.5	61.2	76.1	50.8	58.4	41.6	37.1	34.8	16.9	0.2	11.2	— 5.6	10.1	—22.0	29.6	— 4.4	47.5	19.1	62.4	42.0	81.2	44.9
21	66.5	56.8	62.9	56.6	74.5	60.0	55.5	40.1	41.2	33.6	24.0	1.7	8.4	—20.8	13.8	7.0	36.5	— 6.1	51.5	19.6	67.7	41.2	84.1	59.0
22	66.9	52.9	68.3	49.0	69.1	44.0	59.2	33.5	39.1	25.3	40.5	16.8	15.6	—12.4	20.2	1.7	33.5	17.7	54.9	26.4	53.5	33.2	83.1	54.8
23	62.2	49.9	78.1	41.9	60.1	41.2	48.4	32.2	57.3	38.2	30.1	16.1	17.8	— 4.8	33.2	— 3.3	30.0	21.9	44.4	31.0	57.5	31.8	74.6	54.9
24	81.5	46.3	78.5	47.7	68.1	33.9	51.9	46.0	45.1	34.7	24.1	1.7	27.2	— 2.3	21.0	2.7	42.3	11.9	45.6	26.4	56.1	32.2	81.5	46.3
25	77.3	53.3	61.5	51.1	66.5	48.2	51.5	46.5	41.4	33.8	17.6	3.8	28.0	4.0	22.6	— 3.4	40.7	26.7	52.3	26.9	65.7	42.2	81.5	51.4
26	67.2	59.8	68.5	44.0	67.6	38.5	49.5	43.0	37.1	29.1	23.5	—1.3	2.1	— 5.6	45.1	— 0.1	36.5	11.5	54.4	22.8	52.1	38.9	59.1	47.9
27	78.4	59.8	68.5	50.8	57.5	41.1	46.1	42.0	37.5	23.2	19.8	1.8	13.7	— 8.3	47.7	11.7	37.4	7.7	61.2	25.7	67.4	33.0	58.6	48.0
28	70.5	52.2	65.6	45.8	57.3	38.0	51.1	31.7	40.5	22.9	16.7	—2.3	22.4	7.8	11.7	—17.3	38.7	18.0	59.7	34.0	69.5	39.1	71.4	51.0
29	78.5	47.0	68.3	41.9	66.1	40.5	43.7	25.1	39.5	31.6	18.6	2.8	23.1	10.5	.....	.....	46.5	9.9	61.4	43.8	73.5	33.5	75.5	53.8
30	78.5	44.8	74.6	49.9	69.7	38.5	44.2	22.9	36.4	23.2	17.8	—6.1	21.2	7.0	.....	.....	35.7	33.6	50.3	40.8	79.5	48.9	74.1	50.1
31	81.6	53.8	82.5	47.0	.....	.....	54.5	43.0	.....	.....	20.8	—7.1	21.1	2.7	.....	.....	39.7	31.8	.....	.....	87.4	52.8	.....	.....
Range	52°.8		44°.3		47°.6		48°.6		46°.2		56°.8		56°.7		69°.7		64°.0		54°.7		56°.2		49°.1	
Monthly mean																								

Maximum, minimum, and mean temperatures—Continued.

STATION, CHATTANOOGA, TENN.

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1													(*)	(*)	46	29	60	35	51	43	62	54	90	69
2															39	22	67	36	57	40	68	47	79	59
3															50	24	52	35	49	35	74	41	72	54
4															51	29	63	32	47	30	79	56	83	51
5															58	42	66	43	54	32	79	61	87	58
6															45	36	72	47	65	33	69	56	84	60
7															47	33	77	51	57	48	78	53	87	64
8															55	33	77	46	67	45	77	51	91	66
9													40	15	55	33	77	52	65	49	77	51	83	69
10													33	13	51	33	79	56	69	57	78	55	87	69
11													42	27	58	47	75	56	63	48	83	53	91	70
12													44	33	60	35	69	45	64	40	83	60	88	68
13													44	31	43	27	70	46	75	43	82	61	88	64
14													50	34	33	17	65	43	76	59	77	65	94	66
15													52	30	41	16	54	31	75	57	83	62	91	70
16													58	38	42	31	63	40	77	56	76	59	88	70
17													48	34	42	35	60	31	57	49	76	59	84	66
18													48	36	40	32	50	28	59	43	77	59	80	64
19													37	22	52	30	55	34	69	49	85	60	80	60
20													50	21	44	31	62	39	68	45	89	59	84	58
21													62	31	43	26	70	56	76	43	87	59	87	58
22													62	45	52	35	62	55	80	50	86	67	81	64
23													56	50	56	41	57	42	80	51	82	63	87	64
24													63	44	65	37	65	38	83	52	82	61	83	68
25													62	49	69	49	63	43	81	55	87	60	79	63
26													65	40	62	26	60	46	79	62	91	66	90	65
27													57	50	38	19	75	53	73	60	92	69	88	67
28													73	52	54	25	79	46	74	60	93	67	92	67
29													67	62			70	58	78	53	92	68	84	69
30													67	50			60	48	80	53	92	67	88	64
31													57	44			60	37			90	67		
Range															53°		51°		53°		52°		43°	
Monthly mean													†44°.9		39°.8		54°.1		58°.3		70°.8		75°.5	

* Observations began January 9, 1879.

† Mean for twenty-three days only.

Maximum, minimum, and mean temperatures—Continued.

STATION, CHEYENNE, WYO.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	76	47	85	56	85	48	58	35	60	35	49	28	30	— 5	41	8	24	11	61	25	70	33	50	36
2	89	50	90	56	87	48	65	40	56	26	56	38	26	1	40	12	49	8	64	28	84	44	74	32
3	88	54	90	49	84	46	60	27	62	28	(*)	(*)	23	—15	44	14	54	32	67	22	65	38	82	39
4	87	51	86	59	68	43	56	31	66	25	47	24	30	3	16	5	48	25	71	32	60	30	78	52
5	85	55	86	58	68	42	66	23	66	29	52	21	29	11	15	— 6	61	32	72	33	61	31	80	47
6	79	55	85	61	76	43	61	37	62	28	32	13	41	18	27	7	60	32	47	33	73	39	83	51
7	76	51	90	56	78	41	72	36	56	27	41	25	26	4	41	16	65	32	60	32	73	34	81	57
8	83	57	91	55	57	34	70	39	56	34	33	18	22	— 6	39	23	50	27	45	35	69	44	78	43
9	80	54	76	60	52	31	72	35	48	36	46	19	29	5	46	23	52	27	45	24	80	47	71	44
10	85	56	74	55	47	28	60	40	44	27	44	16	27	0	45	33	56	31	61	30	79	39	82	40
11	87	53	80	55	62	23	73	35	50	23	27	10	40	0	45	19	60	26	62	30	61	36	84	46
12	85	56	79	51	73	29	69	37	61	24	23	9	45	14	50	8	56	30	55	29	50	38	83	51
13	91	55	76	45	77	41	71	33	51	23	17	— 9	31	13	42	19	56	14	47	35	66	36	72	48
14	92	56	83	45	79	40	60	31	51	23	25	— 6	39	3	41	17	51	14	52	31	68	38	71	49
15	84	63	72	49	70	37	61	31	57	21	27	17	26	2	39	24	36	17	45	35	77	43	80	41
16	86	59	83	54	69	43	41	29	50	32	19	— 4	30	4	37	16	37	11	42	31	70	45	81	48
17	91	57	85	60	73	38	67	24	61	29	18	—12	25	1	40	7	35	11	59	26	73	50	84	53
18	88	58	81	53	80	38	70	27	48	29	34	7	23	3	42	22	37	9	69	33	75	48	82	45
19	91	53	84	60	62	37	(*)	(*)	50	25	22	—10	39	23	52	20	56	21	64	35	71	43	76	44
20	83	61	85	55	60	37	60	29	46	29	26	— 3	48	27	59	20	47	8	64	36	79	47	78	37
21	85	63	82	56	69	37	42	23	60	29	29	14	51	34	53	19	40	26	46	31	79	48	88	43
22	85	57	87	57	71	40	61	32	67	40	38	16	51	26	47	7	50	22	39	29	86	46	90	46
23	79	61	88	56	57	31	56	27	52	21	33	8	57	27	54	40	49	35	44	32	79	50	92	57
24	79	55	71	60	79	37	31	12	29	12	14	—11	60	35	56	42	63	29	56	35	71	37	80	49
25	73	55	72	51	56	31	21	12	39	2	12	—12	47	30	44	13	65	47	67	35	74	41	83	51
26	72	53	85	55	65	30	28	— 5	49	21	18	1	52	28	46	19	70	42	59	34	79	41	83	42
27	79	55	73	54	73	40	46	7	45	11	24	3	36	22	58	41	59	37	59	32	84	45	73	48
28	77	49	75	48	71	39	45	27	41	20	14	— 2	42	12	52	19	63	25	65	37	78	53	86	52
29	86	51	82	48	75	37	48	33	36	14	20	— 6	43	17	.....	.....	73	40	72	39	61	48	85	49
30	82	44	79	54	56	40	50	31	44	15	33	— 7	32	14	.....	.....	77	38	56	41	49	42	92	48
31	82	50	83	49	.....	.....	62	28	.....	.....	33	11	28	16	.....	.....	59	34	.....	.....	60	35	.....	.....
Range	48°		46°		64°		.....		65°		.....		75°		65°		69°		50°		56°		60°	
Monthly mean	70°.2		68°.3		52°.4		†42°.4		36°.7		20°.0		†24°.3		31°.5		39°.3		44°.3		56°.3		64°.1	

* Observations not taken.

† Mean 30 days.

Maximum, minimum, and mean temperatures—Continued.

STATION, CHICAGO, ILL.

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	78	61	87	71	85	65	79	64	57	31	42	39	25	8	28	18	55	29	43	35	49	39	49	43
2	65	59	84	69	81	68	76	54	53	42	43	36	8	—16	31	15	32	28	36	24	48	39	56	43
3	67	63	84	67	75	64	72	54	50	38	46	36	0	—18	35	30	45	30	31	17	55	44	65	51
4	72	63	85	70	73	62	64	58	49	40	39	34	3	— 8	45	30	49	37	39	25	68	51	82	56
5	78	64	87	71	79	62	62	51	56	40	41	31	14	—11	35	30	52	35	44	34	62	47	74	50
6	79	67	80	71	82	67	64	46	55	39	34	27	15	— 1	37	25	52	40	62	37	50	40	56	45
7	85	70	86	69	84	70	65	51	50	40	35	23	28	12	40	24	50	37	57	37	47	41	60	46
8	86	75	91	73	87	71	72	53	48	36	39	30	27	8	49	30	71	42	54	36	53	44	76	55
9	87	72	83	70	81	64	62	54	56	35	38	34	14	0	35	22	60	51	61	46	62	47	81	63
10	78	66	84	68	68	54	62	52	54	43	39	32	27	1	51	33	69	47	55	38	80	53	84	68
11	86	66	78	64	64	47	60	51	52	44	39	30	27	17	44	25	51	37	41	36	85	65	74	63
12	84	70	79	69	63	50	66	46	56	38	33	21	29	17	26	17	58	39	54	34	87	65	65	54
13	80	69	83	67	64	48	62	51	48	37	36	23	29	20	17	4	53	35	57	40	77	64	68	55
14	87	73	83	63	69	47	76	55	50	36	35	29	29	16	8	— 2	42	17	44	38	67	43	81	62
15	88	78	78	66	75	55	72	55	50	41	34	26	32	25	31	8	29	16	42	37	50	44	75	53
16	97	80	74	65	83	59	74	53	52	45	30	24	35	25	32	27	28	16	44	37	58	45	54	48
17	95	80	77	62	81	61	53	41	52	46	33	15	34	20	30	26	39	17	43	36	65	50	57	47
18	88	71	82	70	80	63	48	39	51	46	23	8	23	8	30	24	40	19	45	35	57	46	60	51
19	81	68	78	71	86	63	56	34	50	40	16	4	9	— 2	35	25	41	17	47	38	70	46	68	51
20	90	76	76	72	80	50	68	44	54	36	31	10	19	9	27	18	35	30	52	37	84	51	78	60
21	82	70	77	70	66	43	67	50	48	37	30	23	40	10	36	17	39	31	60	47	53	45	71	64
22	74	68	82	70	73	55	47	39	46	36	23	6	39	23	41	35	38	33	67	50	60	49	80	63
23	76	64	80	70	74	56	58	37	46	32	6	— 3	36	22	35	18	50	32	80	60	67	52	86	69
24	79	67	81	72	66	54	53	42	46	41	8	— 9	47	30	34	24	47	39	80	57	83	57	87	68
25	87	71	73	63	78	56	56	46	42	35	15	3	43	32	35	28	55	35	77	60	75	45	85	72
26	78	66	75	57	58	47	46	36	42	34	20	7	42	29	28	2	51	40	75	62	53	47	81	71
27	78	63	82	61	60	53	36	28	42	33	22	10	49	40	21	— 6	44	36	66	52	61	48	78	62
28	79	70	76	65	68	55	44	27	46	35	16	1	40	34	46	21	64	42	59	43	70	56	72	60
29	79	71	74	68	75	63	55	39	49	32	23	8	41	35	.....	.....	62	40	67	42	85	65	67	52
30	79	67	75	69	82	62	51	34	46	35	19	5	40	29	.....	.....	42	36	49	40	81	68	75	57
31	89	72	79	69	.....	.....	37	28	.....	.....	27	6	34	27	.....	.....	47	33	.....	.....	83	45	.....	.....
Range	38°		34°		44°		52°		26°		55°		67°		57°		55°		63°		48°		44°	
Monthly mean	75°.1		74°.1		66°.3		52°.4		43°.4		24°.2		22°.0		27°.5		39°.4		47°.1		57°.8		64°.8	

Maximum, minimum, and mean temperatures—Continued.

STATION, CINCINNATI, OHIO.

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	90	73	88	77	81	72	82	65	51	28	50	40	36	28	36	22.5	58	42	51	36	63	43	78	67
2	81	72	88	75	86	68	77	62	61	44	48	38	33	− 2.5	36	21	44	33	52	31	64	41	67	56
3	85	72	89	72	82	70	77	52	52	39	50	41	5	−10	44	27	43	30	48	23	70	44	69	53
4	91	71	88	70	79	66	77	52	54	35	46	38	11	− 4	50	28	49	34	42	30	71	57	82	56
5	88.5	75	90	74	81	64	62	50	57	35	47	33	9	− 4	46	36.5	57	33	51	31	70	54	88	68
6	92	76	92	72	84	67	63	45	66	45	42	34	21	7	39	34	61	45	60	32	64	49	78	65
7	92	76	87	70	87	68	72	46	59	44	36	30	35	8	45	30	55	44	57	46	63	45	75	58
8	90	78	92	74	88	75	78	53	49	40	43	32	35	30	49	30	74	46	62	38	65	42	81	57
9	90	77	92	75	85	71	72	62	57	42	52	38	31	15	42	33	72	56	69	42	75	47	85	58
10	90	78	83	72	76	65	64	52	54	36	39	34	23	− 1	54	33	73	56	62	50	80	51	88	69
11	96	77	85	70	65	55	63	50	58	47	49	34	38	15	55	35	66	45	54	41	84	55	88	68
12	94	81	86	68	61	56	63	43	56	45	42	34	34	27	38	24	60	39	57	38	85	61	86	69
13	87	72	86	68	67	54	70	42	55	45	40	30	38	27	26	18	63	49	70	45.5	83	64	80	67
14	93	75	86	69	69	49	75	58	51	37	48	35	38	28.5	20	6.5	52	30	66.5	54	81	66	89	66
15	90	77	88	70	72	51	76	64	62	40	37	32	40	33	31	11	39	25	57	47	81	64	87	71
16	91	78	90	73	75	52	78	66	58	50	37	28	43	30.5	36	25	39	25	55	41	72	55	76	67
17	96	77	84	73	79	55	73	50	56	51	36	30	43	22	33	24.5	33	26	50	39	79	57	74	58
18	96	81	89	68	82	62	52	44	57	49	30	22	40	27	29	21	35	18	56	39	83	58	75	55
19	88	78	93	78	84	64	56	39	53	43	29	22	32	7	34	24	38	24	58	39	83	62	77	56
20	94	75	83	72	81	66	62	38	54	39	35	18	32	13	32	25	44	31	62	43	87	60	85	56
21	91	75	82	65	66	54	68	43	49	42	40	30	50	20	37	23	46	37	67	42	77	61	84	62
22	83	67	82	65	69	48	63	42	48	40	32	14	57	41	48	36	49	38	74	45	74	50	87	68
23	83	65	84	67	69	54	60	38	52	37	25	11.5	52	34	43	34	49	35	81	49	77	53	88	66
24	85	69	86	70	75	65	68	43	61	40	17	− 1	50	34	51	31	57	41	82	54	86	56	90	67
25	92	69	80	66.5	81	61	71	47	53	43	20	5	54	40	61	43	53	35	73	63	84	70	90	71
26	85	76	80	62	67	57	66	53	46	38	22	6	49	34	57	16	58	45	80	62	70	63	86	70
27	83	71	83	63	68	51	59	34	52	38	27	15	64	42	31	11	55	44	75	62	80	63	83	69
28	86	68	82	66	62	53	46	30	46	37	24	12	60	43	52	25	69	39	69	54	80	60	79	68
29	86	74	80	65	77	61	53	32.5	52	34	32.5	9.5	49	41	.....	.....	66	50	73	51	89	66	81	65
30	89	74	84	64	80	62	55	41	49	34.5	34	20	47	34	.....	.....	52	36.5	65	52	90	71	84	64
31	92	75	83	72	.....	.....	41	34	.....	.....	35.5	12	46	35	.....	.....	51	32	.....	.....	89	71	.....	.....
Range	31°		31°		40°		52°		38°		53°		74°		54.°5		56°		59°		49°		37°	
Monthly mean	81°.5		77°.5		68°.0		56°.6		47°.8		31°.4		31°.0		34.°0		45°.8		54°.0		68°.2		73°.5	

Maximum, minimum, and mean temperatures—Continued.

STATION, CLEVELAND, OHIO.

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	88	70	80	68	78	69	80	61	45	27	46	34	27	21	30	18	46	32	41	30	49	36	76	53
2	77	70	81	67	84	66	72	55	52	39	44	38	25	−12	25	16	32	26	33	25	49	34	55	49
3	75	69	78	67	72	62	74	54	44	35	39	34	2	−16	32	21	45	22	28	21	61	38	60	52
4	73	69	83	62	72	62	63	50	42	32	37	32	10	− 7	36	22	41	36	33	22	63	50	75	52
5	76	70	83	67	74	68	58	45	44	26	32	29	13	− 3	34	28	38	30	31	28	62	48	71	63
6	81	65	78	68	76	60	58	45	53	36	35	30	20	8	29	25	47	37	50	27	49	40	65	48
7	86	67	81	64	86	64	72	38	40	35	32	28	27	12	31	21	39	28	45	36	48	39	58	40
8	82	67	90	70	85	67	70	46	45	40	33	21	28	23	39	15	67	35	51	30	51	37	64	43
9	81	71	82	72	84	62	70	55	44	39	46	33	23	13	35	20	72	56	65	38	69	40	83	51
10	79	71	76	68	75	67	57	47	53	40	42	35	15	6	44	17	71	48	60	33	76	48	82	66
11	82	66	75	63	67	60	57	44	50	45	36	32	27	10	46	36	60	35	38	32	82	53	84	65
12	82	69	76	60	61	59	60	45	49	45	36	31	27	23	37	23	44	31	41	29	88	63	71	63
13	75	69	78	59	60	53	66	40	45	40	32	29	33	22	23	14	45	34	52	36	85	68	70	60
14	82	62	82	63	79	49	76	53	41	35	36	29	28	25	14	2	35	23	42	36	81	65	81	51
15	84	66	83	63	66	51	76	62	51	32	32	26	28	20	18	− 2	24	20	41	36	70	49	80	65
16	89	68	82	66	75	52	78	60	49	40	30	24	38	24	30	15	26	18	44	30	56	47	68	53
17	92	71	73	65	80	57	70	47	52	48	31	24	35	23	26	22	26	21	39	35	59	44	61	52
18	96	76	77	60	80	65	52	40	49	45	27	16	35	25	24	17	28	17	46	36	70	47	63	47
19	82	74	76	66	84	63	50	42	52	38	22	15	25	13	25	14	33	21	46	38	69	55	65	50
20	86	74	74	66	81	60	60	38	48	40	25	13	14	3	25	15	33	26	50	35	78	57	76	50
21	78	72	75	66	61	55	67	43	48	36	29	24	40	10	22	10	33	30	52	34	68	50	82	57
22	75	68	75	58	61	46	71	47	48	38	28	8	46	30	41	20	40	28	60	40	57	47	74	64
23	76	58	79	61	67	45	51	45	40	36	14	3	42	26	34	20	36	29	65	48	63	43	81	62
24	77	57	83	65	68	55	57	37	51	32	7	− 2	42	26	23	17	49	32	77	50	75	49	88	67
25	82	61	75	62	78	53	68	43	43	38	7	3	42	27	47	23	35	30	76	59	72	53	89	69
26	78	70	73	48	63	56	58	48	39	33	15	5	32	17	33	14	45	31	69	58	53	48	90	69
27	75	65	73	54	58	47	50	35	46	32	24	12	49	28	14	6	40	33	72	60	59	47	83	70
28	75	60	75	59	61	43	37	29	43	35	19	8	48	35	40	8	57	37	60	50	60	48	74	65
29	72	63	74	58	70	54	48	30	45	32	20	5	35	28	.....	.....	57	40	60	42	89	57	72	64
30	73	64	80	59	78	58	49	37	42	34	27	15	36	25	.....	.....	40	32	54	40	92	63	74	63
31	85	63	78	69	.....	.....	39	33	.....	.....	22	5	34	26	.....	.....	37	30	.....	.....	86	66	.....	.....
Range	39°		42°		43°		51°		27°		48°		65°		49°		55°		56°		58°		50°	
Monthly mean	74°.3		71°.7		65°.1		53°.3		41°.6		25°.0		23°.2		23°.9		36°.1		44°.2		59°.2		66°.6	

Maximum, minimum, and mean temperatures—Continued.

STATION, COLEMAN CITY, TEX.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	80	64	94	73	92	65	90	66	69	37	53	32	66	31	45	34	60	34	70	40	74	61	75	60
2	81	65	97	74	95	63	91	61	73	45	69	29	36	19	40	35	53	30	70	38	78	60	77	48
3	82	60	96	73	95	64	91	64	72	52	70	42	26	20	52	33	73	45	71	44	91	63	83	48
4	84	64	96	76	90	65	90	63	70	43	68	37	23	16	53	31	76	44	71	36	92	60	91	52
5	87	71	93	70	90	67	74	58	70	44	66	33	27	13	34	26	78	47	75	47	75	58	90	55
6	95	68	94	70	79	68	77	51	77	49	70	42	32	11	38	26	82	49	86	65	72	55	96	56
7	96	69	96	73	83	67	85	52	76	56	73	39	42	29	53	20	81	49	(*)	(*)	75	57	94	66
8	97	67	97	73	77	68	82	62	70	56	51	31	32	14	65	27	77	59	(*)	(*)	80	58	93	69
9	97	66	99	71	72	60	82	57	68	51	58	35	40	7	64	33	81	50	89	50	87	62	99	72
10	99	77	98	72	69	56	90	60	70	45	72	33	47	24	72	50	84	58	79	44	88	61	98	72
11	95	65	85	71	70	49	82	58	58	42	57	41	40	29	71	43	80	52	81	44	88	65	99	75
12	98	71	86	65	74	48	91	55	65	34	45	35	55	21	62	36	60	52	80	52	87	61	87	72
13	97	71	92	60	82	48	89	59	62	36	36	25	65	30	42	22	70	48	78	59	84	57	95	75
14	90	73	96	65	84	50	87	63	63	47	33	23	71	38	39	16	52	32	80	48	80	56	99	72
15	96	69	95	68	82	52	87	72	62	45	49	20	69	52	58	23	78	38	80	58	85	53	98	69
16	99	72	97	73	83	53	79	55	62	42	52	20	54	30	72	33	(*)	(*)	58	48	95	62	98	67
17	102	72	95	66	86	53	68	44	53	46	40	18	55	34	45	29	(*)	(*)	69	46	90	64	96	72
18	100	71	92	71	91	63	74	38	64	39	48	16	50	25	57	18	(*)	(*)	77	43	96	65	95	71
19	95	70	94	74	88	65	75	42	66	36	42	26	54	23	71	29	(*)	(*)	82	48	99	68	95	75
20	95	70	98	70	69	53	85	43	64	38	30	24	63	33	71	32	(*)	(*)	89	51	105	70	85	73
21	98	71	93	68	77	47	67	45	61	40	56	22	67	29	75	43	(*)	(*)	87	60	96	64	85	60
22	98	74	96	69	84	41	69	36	71	42	52	21	73	37	68	43	(*)	(*)	(*)	(*)	97	68	93	72
23	99	71	100	69	95	57	80	38	78	40	62	30	63	33	69	34	(*)	(*)	(*)	(*)	95	68	96	74
24	100	71	102	70	92	64	87	45	52	41	24	18	73	36	84	37	(*)	(*)	(*)	(*)	93	70	98	75
25	102	73	100	73	90	68	65	45	39	32	24	15	69	39	80	40	(*)	(*)	78	46	92	67	97	73
26	100	69	101	75	75	60	55	45	43	22	35	19	70	45	46	24	90	25	88	53	90	66	97	74
27	80	69	100	75	80	60	46	33	58	22	42	14	78	45	62	24	89	62	80	61	89	64	99	75
28	82	71	88	75	88	64	48	37	70	28	43	29	73	48	73	36	77	59	84	52	92	64	92	74
29	88	71	90	72	88	64	72	36	70	35	57	39	77	53	.....	.....	81	52	83	57	100	69	96	73
30	96	72	88	61	91	65	65	37	46	37	36	29	70	50	.....	.....	90	58	94	61	99	72	100	74
31	98	73	94	59	.....	.....	65	38	.....	.....	48	31	60	50	.....	.....	93	57	.....	.....	(*)	(*)	.....	.....
Range	42°		43°		54°		58°		56°		59°		71°		68°		.....		.....		.....		52°	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

* No observations taken.

Maximum, minimum, and mean temperatures—Continued.

STATION, COLUMBUS, OHIO.*

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	90	69	86	71	80	68	81	62	44	24	48	36	33	25	31	20	52	36	47	34	60	39	81	66
2	84	72	85	70	85	65	74	58	56	38	48	37	29	−13	28	18	39	31	45	26	59	38	72	55
3	86	68	85	68	80	65	77	48	48	33	42	34	−4	−20	39	21	39	28	43	18	62	38	66	55
4	88	69	86	65	78	61	72	48	47	29	42	34	4	−10	42	24	42	31	37	27	68	51	78	53
5	89	70	86	71	80	60	58	47	48	30	37	30	7	−6	40	32	50	25	43	27	67	50	85	68
6	90	70	86	71	82	62	59	38	63	42	40	29	18	6	37	29	53	39	57	32	63	44	75	59
7	88	73	82	64	85	68	70	42	62	38	35	22	26	6	38	25	53	32	53	42	57	41	72	48
8	86	73	89	68	84	70	76	46	43	37	36	24	35	26	42	25	71	43	59	33	64	38	79	51
9	88	73	87	67	84	68	71	56	45	37	47	36	27	14	39	30	71	54	68	39	72	44	87	54
10	91	74	78	68	80	64	62	45	52	30	40	33	16	−1	46	27	70	53	64	47	78	49	84	68
11	87	70	82	65	65	57	61	48	55	44	40	31	31	12	49	34	60	43	50	35	83	53	87	67
12	91	77	82	65	66	56	61	39	51	41	38	30	32	21	37	25	54	34	54	31	87	61	83	67
13	89	75	84	64	62	54	65	39	48	38	34	26	32	22	27	16	57	46	66	44	80	66	80	64
14	91	69	85	69	67	48	75	54	47	30	40	32	35	37	17	4	50	28	59	48	80	63	85	59
15	89	73	85	66	70	45	75	59	54	32	34	27	35	26	25	5	34	20	51	43	79	58	85	71
16	90	70	85	61	75	48	78	60	52	44	35	23	42	19	30	22	35	21	56	34	72	52	75	65
17	94	70	83	61	82	54	69	46	54	50	36	28	38	15	31	25	32	24	50	37	77	52	70	54
18	91	77	79	68	80	58	47	42	56	46	28	17	39	24	29	21	31	15	52	36	82	52	71	49
19	89	75	88	71	83	60	53	35	57	38	24	20	29	7	30	22	35	19	57	34	84	55	76	48
20	93	73	83	68	82	62	60	34	50	38	28	15	23	3	28	22	41	29	62	38	88	62	82	59
21	86	72	80	60	63	51	65	39	48	38	35	25	43	12	30	12	42	35	65	37	78	54	83	60
22	80	66	82	60	65	44	69	42	44	36	28	7	48	36	42	30	46	36	73	40	70	46	84	67
23	81	59	84	60	67	49	54	37	47	32	14	5	48	31	39	26	43	34	82	44	73	45	89	66
24	83	64	84	66	75	60	61	38	58	35	12	−7	43	31	39	22	53	37	82	58	86	53	92	68
25	91	63	75	62	79	58	69	43	52	40	10	−2	49	35	56	34	47	30	74	61	78	67	93	76
26	82	69	77	53	69	52	60	52	43	34	16	0	40	28	49	13	50	40	78	59	69	55	87	72
27	84	69	80	57	62	43	57	34	50	37	19	10	56	36	25	8	49	41	77	60	74	59	87	72
28	83	66	83	61	61	48	43	26	40	35	18	10	53	42	43	19	63	42	70	56	80	55	81	67
29	80	68	79	61	72	58	51	29	45	31	25	2	46	36	.....	.....	58	49	71	47	87	66	81	64
30	79	66	83	61	79	57	49	37	45	26	30	14	43	30	.....	.....	49	38	59	47	88	67	80	61
31	87	68	80	69	.....	.....	40	31	.....	.....	30	8	43	29	.....	.....	48	30	.....	.....	87	70	.....	.....
Range	35°.0		36°.0		42°.0		55°.0		39°.0		55°.0		76°.0		52°.0		56°.0		64°.0		50°.0		45°.0	
Monthly mean	79°.3		74°.6		65°.6		53°.0		43°.2		26°.8		25°.8		29°.2		41°.9		51°.6		65°.7		72°.1	

* Station opened July 1, 1878.

Maximum, minimum, and mean temperatures—Continued.

STATION, CONCHO, TEX.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	187 January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	(*)	(*)	93	72	93	67	89	67	72	43	59	26	70	31	44	35	52	38	68	43	78	62	80	55
2	(*)	(*)	93	73	94	62	90	57	75	50	69	27	34	21	42	32	55	32	75	36	82	65	78	53
3	(*)	(*)	96	74	91	62	88	64	75	56	70	41	32	20	52	39	70	44	74	43	94	62	85	49
4	(*)	(*)	95	73	91	66	87	63	70	48	68	29	25	18	55	39	74	48	78	35	94	65	93	54
5	(*)	(*)	93	69	92	65	74	60	74	46	67	34	24	18	32	28	78	52	75	48	80	58	94	54
6	(*)	(*)	93	70	72	65	81	53	79	56	71	43	30	20	37	28	83	54	85	62	75	57	102	60
7	92	71	94	70	79	66	87	57	72	57	73	36	43	28	56	22	79	56	78	52	82	55	98	65
8	95	73	94	70	79	66	84	63	78	59	55	32	33	15	66	34	79	59	91	52	87	62	99	70
9	95	69	99	72	66	63	87	61	71	55	60	30	41	6	64	38	81	55	82	51	92	64	102	70
10	96	71	96	73	71	56	93	60	75	43	74	32	44	28	72	52	81	60	78	40	94	65	102	70
11	93	71	84	73	70	51	80	61	59	41	58	42	44	28	73	41	80	53	85	40	95	67	101	74
12	94	71	86	70	77	46	93	57	64	38	37	35	62	21	76	38	64	56	87	50	87	65	84	75
13	94	70	92	60	84	52	90	65	66	35	34	27	69	33	48	26	71	44	82	63	85	58	100	73
14	83	69	94	60	85	50	88	68	67	42	35	24	69	38	38	18	58	36	84	51	81	52	98	73
15	94	69	99	65	83	52	89	73	64	37	50	18	71	45	61	23	81	36	82	60	94	54	101	65
16	101	74	95	66	85	54	78	57	72	45	47	19	55	36	76	36	82	52	65	50	101	60	98	65
17	99	75	91	65	86	57	68	38	53	47	47	23	59	36	52	33	50	27	70	40	102	62	95	72
18	95	75	92	70	90	58	73	35	69	36	54	20	54	25	63	20	57	30	75	40	101	70	95	74
19	93	74	91	71	90	66	77	43	66	37	81	27	58	20	75	31	72	33	83	40	104	69	94	74
20	86	67	91	69	72	56	86	51	72	37	31	25	68	30	70	32	83	55	92	55	107	69	85	72
21	94	70	89	66	75	46	68	49	62	40	56	20	68	33	75	49	88	43	93	64	103	65	82	63
22	99	75	93	70	87	46	71	32	74	33	55	20	75	41	68	48	71	48	82	52	100	69	92	70
23	99	75	96	67	92	66	80	38	81	48	63	32	62	32	74	35	83	40	70	55	98	62	98	72
24	98	75	100	68	92	63	87	49	54	42	24	20	72	28	85	42	79	51	71	47	92	67	98	74
25	102	75	98	72	94	63	66	44	38	32	27	17	72	37	82	47	85	52	75	50	95	65	100	72
26	98	66	99	71	76	62	63	41	46	24	37	20	71	46	46	26	91	61	92	52	90	67	98	75
27	76	70	100	70	82	64	45	36	57	27	44	15	78	48	65	24	93	61	82	60	88	68	100	74
28	76	71	85	74	88	67	53	35	67	26	46	31	71	42	70	42	78	62	89	50	94	65	95	75
29	81	69	90	71	90	68	78	37	71	40	62	31	75	52	.....	.....	82	51	93	60	98	67	95	75
30	90	69	87	57	91	68	61	38	50	36	37	30	74	55	.....	.....	93	52	97	68	102	72	100	73
31	92	73	95	55	.....	.....	67	41	.....	.....	48	34	60	47	.....	.....	97	61	.....	.....	86	63	.....	.....
Range			45°		48°		61°		57°		59°		72°		67°		70°		62°		55°		53°	
Monthly mean	†82°.3		82°.0		71°.3		64°.1		53°.6		38°.8		43°.5		48°.2		63°.4		69°.0		78°.1		(‡)	

*Observer sick. † Mean temperature for twenty-five days only. ‡ Computation of monthly mean temperature discontinued May, 1879.

Maximum, minimum, and mean temperatures—Continued.

STATION, CORSICANA, TEX.

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	85	73	100	75	95	70	93	73	71	41	55	36	57	40	53	40	73	43	79	53	74	64	77	59
2	88	71	101	76	94	68	89	71	75	50	67	34	46	25	52	36	50	34	72	37	78	60	77	52
3	87	69	98	76	93	69	91	69	77	52	70	45	33	20	58	35	63	35	73	43	85	60	84	52
4	90	67	96	74	90	70	89	66	77	50	68	41	28	19	58	44	76	49	73	41	89	65	91	51
5	90	70	98	72	87	68	80	63	76	49	68	39	27	13	44	34	79	55	81	48	78	61	91	59
6	91	69	99	73	90	70	79	61	81	49	72	46	35	4	43	31	79	58	74	63	73	60	90	62
7	94	70	101	76	93	71	86	63	80	59	73	54	41	28	55	33	80	60	80	56	76	57	89	65
8	97	71	104	75	90	72	86	67	83	59	64	42	37	21	63	33	78	59	87	53	83	58	94	66
9	98	73	101	75	85	70	83	68	71	58	56	35	35	13	62	37	78	62	84	63	86	63	95	71
10	97	72	104	75	76	63	90	66	76	61	70	35	40	23	70	51	79	61	80	47	88	66	95	75
11	99	72	93	76	77	56	89	70	63	46	67	44	36	30	70	45	85	62	80	50	85	66	96	75
12	100	73	89	73	77	49	90	67	64	37	71	46	39	23	78	46	70	59	78	49	85	66	96	71
13	94	76	91	73	86	54	90	71	66	39	65	34	60	29	46	29	74	58	70	58	84	65	96	74
14	97	73	98	70	90	56	90	68	60	50	40	28	61	40	43	23	64	49	84	63	83	58	99	71
15	100	74	99	72	89	58	90	72	58	51	49	23	73	56	52	26	80	41	85	56	84	55	91	68
16	100	74	99	71	89	59	85	66	70	45	54	28	61	36	59	46	72	45	73	56	88	61	96	70
17	100	75	97	72	92	64	73	47	61	52	45	31	52	47	52	36	54	33	69	53	89	65	96	73
18	101	76	96	73	94	73	75	44	67	47	52	24	53	30	54	32	57	34	76	46	89	65	96	73
19	97	75	98	73	91	70	78	46	70	45	47	40	48	26	66	34	69	38	82	48	92	70	94	73
20	99	72	100	73	80	63	80	47	73	46	40	32	66	34	72	42	83	50	83	57	97	70	93	73
21	102	75	98	72	83	51	75	59	62	46	56	27	66	36	75	47	84	60	82	61	96	72	91	73
22	101	78	102	72	85	52	73	41	75	42	49	26	73	48	72	60	73	56	80	59	95	68	93	71
23	93	75	101	75	95	60	79	47	76	52	63	31	67	44	70	42	79	46	64	58	94	71	97	75
24	96	75	102	76	93	71	84	57	67	50	51	25	70	51	78	50	80	52	74	57	91	67	97	76
25	101	74	101	76	95	73	80	59	50	41	29	18	70	53	85	53	86	61	74	58	91	70	97	76
26	101	76	95	78	82	65	65	50	49	35	31	21	65	54	53	33	87	66	84	58	90	65	97	75
27	99	76	95	75	75	64	55	40	60	26	40	20	77	56	66	33	87	67	83	61	90	64	98	77
28	99	76	93	75	90	66	48	40	65	33	40	26	75	63	70	37	87	64	84	55	90	66	88	67
29	92	72	91	72	91	70	58	42	70	40	46	36	78	63	.....	.....	85	61	86	60	94	68	92	69
30	97	75	91	67	92	71	65	47	60	43	43	37	72	65	.....	.....	92	58	85	63	96	72	96	70
31	99	78	94	68	.....	.....	66	42	.....	.....	47	39	67	53	.....	.....	93	60	.....	.....	85	73	.....	.....
Range	35°		37°		46°		53°		57°		55°		74°		62°		60°		50°		42°		48°	
Monthly mean	83°.1		84°.3		75°.5		67°.7		57°.2		43°.8		46°.2		50°.4		65°.6		66°.4		76°.2		81°.7	

Maximum, minimum, and mean temperatures—Continued.

STATION, DAVENPORT, IOWA.

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	75	59	85	70	86	66	78	61	59	31	38	33	15	— 5	31	20	42	23	44	33	65	41	56	48
2	75	56	86	70	79	67	75	54	51	38	46	29	— 5	—19	34	15	34	24	44	25	65	40	64	52
3	77	58	87	66	79	62	70	52	51	33	43	35	— 1	—17	38	23	41	21	36	20	66	49	73	50
4	82	65	87	72	80	63	66	55	56	33	42	32	0	—15	41	31	52	33	42	24	69	48	81	60
5	85	67	89	70	84	67	60	49	59	36	42	31	8	—13	36	26	45	30	51	27	60	45	73	63
6	87	70	87	71	83	67	63	46	59	45	34	25	13	— 6	42	24	51	37	60	38	58	33	65	54
7	89	72	84	69	84	68	64	51	48	37	35	17	27	11	43	20	61	36	56	37	58	41	81	48
8	88	73	84	75	85	69	73	54	51	34	32	26	25	2	45	25	71	51	61	38	66	41	86	63
9	88	70	77	73	72	60	66	49	54	35	33	22	10	— 6	36	19	67	51	59	49	73	52	88	66
10	82	67	82	66	65	50	69	50	49	43	35	19	26	2	50	33	68	45	51	39	84	58	84	65
11	90	71	80	64	59	42	63	48	50	42	34	26	27	16	44	26	51	34	54	33	86	69	79	68
12	95	79	82	62	62	41	67	48	55	37	28	20	30	5	26	8	62	34	55	37	83	72	81	66
13	92	76	82	68	63	44	69	51	50	36	27	20	31	15	10	0	48	31	64	51	81	62	72	64
14	92	75	84	65	70	45	80	61	51	33	29	18	26	10	12	— 3	31	8	52	41	64	53	84	67
15	95	78	75	63	79	57	70	58	52	35	27	11	29	18	32	6	25	13	54	34	66	49	74	61
16	95	79	76	56	81	62	75	50	49	42	28	19	27	15	30	17	24	17	55	35	70	45	69	55
17	92	80	73	64	75	64	50	40	47	42	26	10	30	7	32	17	29	13	53	32	75	52	67	48
18	89	75	90	69	80	60	48	36	57	40	15	5	17	3	31	9	33	17	62	38	79	57	74	50
19	90	75	89	70	86	67	57	37	51	39	17	— 3	5	— 8	31	19	35	17	61	41	82	56	79	53
20	92	74	79	71	70	48	70	48	50	40	27	13	20	5	23	5	35	29	64	41	84	62	82	62
21	80	68	82	67	64	45	62	40	45	34	27	15	40	12	38	22	42	21	70	43	70	49	82	66
22	81	65	82	65	70	51	51	38	44	35	15	0	34	23	44	33	37	28	80	51	72	52	86	66
23	79	68	83	71	69	57	58	42	47	33	7	— 6	32	15	33	18	53	28	81	61	80	51	85	71
24	84	69	88	74	70	50	48	41	45	33	8	— 7	50	27	36	23	48	36	76	62	77	62	82	69
25	84	70	75	59	69	52	53	40	40	35	13	0	45	36	34	12	52	33	71	60	73	55	82	70
26	80	66	75	61	60	43	42	33	38	31	18	7	45	27	12	— 3	57	43	77	58	56	51	83	71
27	81	66	79	61	62	47	38	28	38	25	19	7	44	37	22	— 2	67	41	68	50	64	51	77	68
28	82	69	75	66	65	52	48	31	44	28	20	0	39	31	44	20	63	53	67	43	85	57	76	59
29	83	68	79	61	78	62	49	38	45	30	26	6	45	28	.....	.....	63	45	67	54	86	68	80	58
30	83	66	78	60	83	69	46	29	40	32	17	2	43	27	.....	.....	51	38	61	43	80	64	84	61
31	87	70	81	63	.....	.....	37	23	.....	.....	26	10	37	28	.....	.....	46	39	.....	.....	76	55	.....	.....
Range	39°		34°		45°		57°		34°		53°		69°		53°		63°		61°		53°		40°	
Monthly mean	78°.4		74°.4		65°.3		51°.9		42°.4		20°.4		18°.3		25°.6		39°.6		51°.0		64°.1		69°.9	

Maximum, minimum, and mean temperatures—Continued.

STATION, DEADWOOD, DAK.*

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	.....	.....	.....	.....	.....	.....	.....	.....	62	27	44	24	2	—10	45	15	33	10	52	21	64	36	57	41
2	.....	.....	.....	.....	.....	.....	.....	.....	56	30	54	33	10	—20	39	29	56	17	37	25	79	44	71	37
3	.....	.....	.....	.....	.....	.....	.....	.....	58	31	40	32	13	—24	40	17	53	30	54	20	51	40	80	43
4	.....	.....	.....	.....	.....	.....	.....	.....	66	33	39	28	20	4	19	2	53	16	69	33	56	30	65	48
5	.....	.....	.....	.....	.....	.....	.....	.....	59	33	35	29	34	10	20	— 4	51	32	71	38	55	29	66	47
6	.....	.....	.....	.....	.....	.....	.....	.....	53	32	35	15	38	22	32	8	63	29	53	35	58	37	81	49
7	.....	.....	.....	.....	.....	.....	.....	.....	50	27	45	23	23	10	39	9	58	36	66	36	63	40	81	62
8	.....	.....	.....	.....	.....	.....	.....	.....	61	33	40	29	25	8	35	7	52	30	63	33	54	37	71	48
9	.....	.....	.....	.....	.....	.....	.....	.....	54	31	46	22	31	8	50	32	53	30	44	23	74	44	65	46
10	.....	.....	.....	.....	.....	.....	.....	.....	34	27	40	28	30	8	32	16	49	29	58	31	69	51	72	43
11	.....	.....	.....	.....	.....	.....	.....	.....	50	25	32	13	38	5	27	— 6	61	34	63	35	53	48	73	44
12	.....	.....	.....	.....	.....	.....	.....	.....	57	31	25	1	39	15	0	—12	51	33	57	30	56	41	69	53
13	.....	.....	.....	.....	.....	.....	.....	.....	47	28	24	7	36	12	10	—10	33	5	64	32	57	37	72	49
14	.....	.....	.....	.....	.....	.....	.....	.....	52	27	29	6	14	— 5	36	4	33	— 1	57	33	70	41	64	53
15	.....	.....	.....	.....	.....	.....	.....	.....	58	30	30	14	25	—13	36	14	27	6	53	35	80	55	70	47
16	.....	.....	.....	.....	.....	.....	.....	.....	52	32	15	—10	26	11	30	19	22	5	47	32	60	40	77	58
17	.....	.....	.....	.....	.....	.....	.....	.....	60	32	6	—25	26	4	33	16	32	— 5	59	27	64	39	72	57
18	.....	.....	.....	.....	.....	.....	.....	.....	50	34	21	—12	26	3	28	14	30	7	58	37	72	49	71	54
19	.....	.....	.....	.....	.....	.....	.....	.....	48	28	27	5	45	13	32	17	38	8	66	37	61	44	68	52
20	.....	.....	.....	.....	.....	.....	.....	.....	40	28	33	22	53	32	52	21	40	10	65	42	71	53	70	44
21	.....	.....	.....	.....	.....	.....	.....	.....	56	25	33	14	51	37	53	33	34	11	49	44	64	47	82	49
22	.....	.....	.....	.....	.....	.....	.....	.....	68	35	26	14	42	25	40	30	50	28	54	39	81	55	92	55
23	.....	.....	.....	.....	.....	.....	.....	.....	51	26	19	0	52	21	50	31	42	30	44	35	71	48	83	61
24	.....	.....	.....	.....	.....	.....	.....	.....	30	21	13	— 7	54	34	50	28	58	18	59	36	66	38	67	50
25	.....	.....	.....	.....	.....	.....	.....	.....	36	3	20	—11	55	30	28	0	60	40	70	39	60	46	73	48
26	.....	.....	.....	.....	.....	.....	.....	.....	45	23	23	10	56	29	45	19	68	34	50	35	69	39	69	43
27	.....	.....	.....	.....	.....	.....	.....	.....	42	20	22	14	38	17	45	31	57	39	59	31	80	57	64	49
28	.....	.....	.....	.....	.....	.....	.....	.....	37	21	15	— 4	40	16	31	7	58	34	56	36	80	54	76	44
29	.....	.....	.....	.....	.....	.....	.....	.....	40	20	15	— 4	37	13	.....	.....	64	41	66	36	64	45	88	59
30	.....	.....	.....	.....	.....	.....	.....	.....	38	24	22	—14	34	15	.....	.....	71	33	64	44	52	45	80	58
31	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	14	— 4	33	18	.....	.....	53	30	.....	.....	56	35	.....	.....
Range	.....	.....	.....	.....	.....	.....	.....	.....	65°		79°		80°		65°		76°		51°		52°		55°	
Monthly mean	.....	.....	.....	.....	.....	.....	.....	.....	36°.7		18°.6		21°.8		24°.4		34°.8		45°.5		53°.8		61°.3	

* Station reopened November 1, 1878.

Maximum, minimum, and mean temperatures—Continued.

STATION, DECATUR, TEX.

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	89	67	102	75	98	67	90	69	71	41	51	31	62	35	47	31	61	30	(*)	(*)	77	62	75	54
2	83	67	102	76	95	71	88	65	74	46	69	34	36	15	50	31	50	26	82	48	76	55	75	53
3	83	64	100	70	95	71	93	67	77	51	70	46	(*)	(*)	57	32	70	32	60	42	86	63	88	53
4	84	65	95	78	95	70	91	64	74	50	70	43	20	11	52	34	76	45	67	38	88	67	93	59
5	91	68	97	74	90	66	75	58	74	51	66	42	21	4	37	30	76	50	77	42	75	58	94	60
6	94	67	98	75	90	67	80	55	78	54	69	46	27	2	38	26	80	52	86	58	67	55	94	62
7	95	69	100	76	92	72	85	59	77	57	67	44	35	19	55	27	81	60	71	51	73	56	88	63
8	98	71	101	76	84	70	88	65	80	59	46	34	31	19	66	27	70	62	82	50	81	60	94	66
9	97	70	100	73	77	63	89	65	65	56	53	33	32	7	60	35	(*)	(*)	75	55	85	62	96	70
10	100	73	100	72	74	56	91	64	71	54	71	36	35	19	73	48	83	57	75	45	88	65	96	70
11	98	72	79	70	72	53	81	63	(*)	(*)	57	37	32	21	65	44	(*)	(*)	75	50	83	64	92	75
12	(*)	(*)	82	67	76	49	89	58	.....	.....	43	34	35	14	55	31	81	52	77	48	85	65	93	73
13	.....	.....	90	67	84	54	90	65	64	35	42	25	56	30	35	23	70	56	(*)	(*)	(*)	(*)	97	74
14	99	70	94	69	88	50	89	67	56	47	34	22	64	40	38	19	56	32	.....	.....	80	55	100	71
15	100	73	95	71	89	56	87	70	59	46	45	20	67	40	57	19	76	32	83	56	82	57	92	65
16	100	74	96	70	86	55	79	59	62	42	50	28	47	24	60	35	76	35	67	54	85	62	(*)	(*)
17	96	73	95	72	90	61	79	46	63	41	29	14	45	32	45	34	50	25	68	47	(*)	(*)	.....	.....
18	99	70	95	71	90	72	77	49	65	44	35	11	47	25	50	26	60	32	77	48	90	62	95	72
19	101	75	96	73	90	66	78	50	66	45	32	29	50	20	70	32	65	34	(*)	(*)	(*)	(*)	92	70
20	99	71	96	72	77	57	80	49	70	44	30	26	63	32	66	35	71	45	83	52	96	67	85	70
21	102	75	95	71	77	51	72	54	58	42	50	20	66	40	(*)	(*)	(*)	(*)	80	62	93	70	90	70
22	102	78	97	69	83	52	71	41	75	42	49	22	71	41	75	35	.....	.....	71	58	93	69	95	74
23	101	72	99	75	94	59	80	49	79	48	60	27	62	36	75	40	.....	.....	63	55	94	72	97	74
24	99	74	103	76	93	67	84	54	58	46	27	10	72	41	81	47	75	42	73	53	92	71	98	75
25	101	75	100	74	92	71	70	50	47	32	24	10	64	46	77	37	85	56	75	57	93	68	97	75
26	102	76	97	73	74	55	53	42	40	25	30	19	68	47	40	22	89	64	82	58	92	70	98	75
27	91	73	98	71	71	59	51	34	55	23	39	11	(*)	(*)	50	23	86	64	71	62	90	69	99	76
28	88	71	90	70	89	65	46	34	64	39	35	24	80	51	66	35	80	61	84	55	91	67	85	63
29	91	69	86	70	89	68	49	40	66	41	40	30	63	48	.....	.....	85	53	84	62	95	71	91	68
30	101	74	88	64	90	67	67	42	56	39	35	26	55	45	.....	.....	85	62	88	63	95	71	93	67
31	102	76	95	64	.....	.....	63	40	.....	.....	45	31	60	39	.....	.....	(*)	(*)	.....	.....	83	66	.....	.....
Range	.....		39°		49°		59°		.....		61°		.....		.....		.....		.....		.....		.....	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

* No observations taken.

Maximum, minimum, and mean temperatures—Continued.

STATION, DENISON, TEX.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	82	69	95	76	93	69	88	73	68	45	55	35	50	37	48	33	64	35	70	48	72	59	70	58
2	83	68	96	75	93	72	85	67	72	51	61	35	37	15	49	33	43	31	70	41	79	58	76	51
3	86	65	87	72	97	71	88	68	75	50	71	45	20	9	56	37	58	30	58	40	84	64	86	52
4	86	69	94	73	95	71	86	64	74	53	61	45	17	13	56	38	75	49	66	40	82	67	94	59
5	90	71	94	76	88	68	74	60	75	53	64	40	24	8	40	34	77	58	78	46	72	61	95	63
6	90	69	97	76	89	70	73	57	77	55	65	48	30	1	39	29	80	59	79	65	75	56	95	64
7	91	71	95	77	91	73	82	60	81	59	61	47	37	24	50	28	80	60	71	54	77	55	86	67
8	92	75	98	77	83	74	86	66	77	55	58	36	35	19	59	34	73	61	79	52	83	59	94	69
9	99	75	102	77	78	66	86	66	69	55	55	33	37	12	61	39	81	63	77	60	86	62	97	72
10	99	75	97	73	73	61	84	67	73	52	65	35	40	20	72	50	80	62	78	48	87	66	100	76
11	100	75	83	73	71	51	82	62	57	42	54	36	36	28	62	45	80	63	74	48	84	66	100	76
12	98	76	76	71	71	49	82	57	61	36	48	34	36	24	57	33	78	56	75	50	83	66	97	75
13	102	79	84	69	80	54	87	64	65	43	48	29	53	27	35	22	67	57	70	56	82	60	99	77
14	97	74	88	69	84	59	85	70	61	49	38	27	52	40	30	19	59	35	79	62	80	57	99	71
15	101	77	88	72	88	60	86	72	58	49	43	23	66	39	49	26	75	38	75	56	77	57	95	69
16	95	76	92	72	84	60	79	58	64	45	49	29	46	26	46	33	68	33	69	54	84	58	101	72
17	95	76	92	74	88	61	69	45	64	53	37	23	46	34	41	35	46	26	68	47	83	62	96	74
18	96	78	91	74	91	72	71	45	66	45	39	19	49	26	50	31	55	33	77	48	90	66	96	74
19	94	77	95	74	90	69	75	49	67	44	37	33	46	26	65	33	66	35	83	55	95	70	94	72
20	94	75	97	75	78	58	80	51	69	46	34	29	60	35	66	38	73	55	81	60	91	72	89	71
21	100	77	99	75	75	50	72	52	59	43	52	23	66	42	71	50	84	47	76	63	93	69	89	72
22	100	79	99	73	76	53	67	42	74	44	45	24	68	50	67	52	71	54	74	58	95	69	96	72
23	94	75	100	77	88	59	77	50	74	47	54	28	61	36	68	41	74	46	64	59	96	71	99	74
24	95	75	99	76	89	68	81	57	64	49	28	18	67	44	78	53	75	52	72	57	93	72	100	77
25	94	76	96	77	88	72	69	52	50	36	25	11	63	54	75	37	84	56	73	59	93	70	97	74
26	97	77	95	76	73	57	58	42	46	33	33	20	68	53	39	26	87	66	84	57	94	68	99	74
27	89	70	94	73	69	62	51	35	58	27	36	16	78	57	58	31	86	65	68	60	91	67	99	76
28	87	72	90	73	84	65	44	39	62	36	41	26	75	62	66	39	83	67	84	54	93	66	86	66
29	87	73	86	69	88	70	49	39	65	46	40	32	65	51	.....	.....	85	56	85	63	93	70	94	69
30	92	75	86	66	89	72	67	43	59	41	40	32	55	45	.....	.....	83	60	85	64	94	72	89	71
31	95	77	87	65	.....	.....	59	38	.....	.....	42	35	59	44	.....	.....	92	61	.....	.....	82	68	.....	.....
Range	37°		37°		48°		53°		54°		60°		77°		59°		66°		45°		41°		50°	
Monthly mean	82°.5		82°.5		73°.5		64°.4		56°.1		38°.5		41°.0		45°.6		61°.4		64°.0		74°.4		80°.0	

Maximum, minimum, and mean temperatures—Continued.

STATION, DENVER, COLO.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	85	54	95	65	90	57	71	41	70	35	54	17	12	— 5	34	5	34	21	60	37	78	45	62	45
2	88	58	100	62	93	58	74	44	62	29	62	20	17	—10	43	13	48	17	64	32	90	48	71	43
3	94	64	100	62	92	58	65	39	71	31	62	25	10	—10	56	27	65	34	69	28	71	52	85	46
4	92	62	90	70	76	53	63	36	66	31	51	23	25	— 4	36	9	60	28	73	39	70	37	80	55
5	90	61	90	64	65	47	76	36	67	25	54	24	35	3	24	— 3	69	36	75	43	70	37	83	53
6	92	62	94	61	80	48	70	44	60	33	35	21	50	6	38	2	70	34	51	42	73	41	86	57
7	90	59	98	61	82	52	81	36	55	37	51	23	27	12	46	9	72	43	62	35	83	47	86	64
8	98	60	105	65	65	41	83	48	54	32	44	29	24	—10	41	20	59	31	55	45	68	50	74	48
9	85	59	82	66	54	38	82	36	46	36	53	31	28	0	53	21	66	27	52	34	83	47	79	49
10	90	62	77	57	60	35	78	48	49	38	52	28	24	2	53	34	67	29	67	31	83	49	84	50
11	91	58	85	58	64	34	80	38	52	30	45	17	27	— 2	58	32	66	29	61	37	76	42	84	55
12	90	63	90	55	82	38	77	45	58	32	28	10	38	2	60	16	56	37	54	38	58	43	89	56
13	95	65	90	56	87	47	80	48	50	32	26	— 4	36	6	37	19	69	28	45	39	65	43	74	57
14	100	63	89	54	85	48	69	39	52	32	32	—12	40	4	50	25	61	20	59	36	74	47	80	51
15	92	61	78	59	80	45	67	42	53	26	37	— 1	35	1	47	30	50	20	49	39	79	50	85	50
16	92	62	90	65	67	47	50	37	54	33	37	— 3	30	1	41	24	40	21	48	36	73	47	83	55
17	99	61	90	60	76	45	64	29	63	33	12	— 9	28	3	36	11	37	17	64	30	75	47	90	54
18	93	70	85	62	85	46	78	33	60	36	26	— 1	35	19	50	22	49	19	74	42	83	46	90	55
19	94	63	87	63	62	43	80	45	55	31	31	1	49	18	50	21	65	23	67	45	81	51	81	53
20	92	66	86	62	73	40	70	45	57	42	41	— 1	49	22	67	35	57	24	67	43	81	46	83	52
21	95	63	90	62	76	45	50	33	67	28	36	18	56	23	59	37	48	35	51	33	80	56	90	57
22	90	64	95	61	83	46	68	34	73	32	43	15	52	31	57	33	62	25	52	32	88	48	90	57
23	89	63	98	62	70	45	62	37	59	30	41	17	55	28	61	45	64	39	57	34	84	58	95	63
24	83	64	79	64	88	50	50	32	33	16	23	— 1	61	37	64	40	70	31	65	39	78	46	81	60
25	82	61	75	59	61	41	30	18	45	16	16	— 3	48	31	54	26	73	50	76	38	77	46	90	57
26	81	58	91	61	67	38	33	10	57	19	27	— 5	61	31	51	23	77	43	65	46	84	46	89	52
27	83	60	75	62	79	45	55	13	51	21	29	— 5	51	28	68	38	74	39	73	40	89	51	78	53
28	84	57	77	57	80	42	55	18	50	22	16	— 9	51	25	72	30	70	36	71	42	79	58	90	58
29	92	55	85	56	78	48	57	33	31	21	18	—12	42	24	.....	.....	79	47	73	46	69	56	90	66
30	95	55	83	63	65	45	53	31	40	11	19	—10	38	24	.....	.....	81	42	70	45	59	41	95	58
31	99	61	85	58	.....	.....	70	28	.....	.....	25	5	31	21	.....	.....	65	37	.....	.....	58	42	.....	.....
Range	46°		51°		59°		73		62°		74°		71°		75°		64°		48°		53°		52°	
Monthly mean	74°.0		*72°.7		58°.7		49°.7		41°.1		21°.6		23°.7		35°.4		46°.2		50°.4		62°.0		68°.6	

* Monthly mean for thirty days only.

Maximum, minimum, and mean temperatures—Continued.

STATION, DES MOINES, IOWA.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	.....	.....	85	72	86	69	75	56	66	33	42	27	18	—14	33	15	28	15	40	25	64	39	57	45
2	.....	.....	86	72	80	67	77	50	50	33	52	24	— 9	—19	42	16	36	20	38	27	72	50	68	49
3	.....	.....	87	71	82	66	69	47	57	26	49	37	0	—21	42	20	43	20	36	17	60	57	80	54
4	.....	.....	87	73	86	67	69	45	60	30	44	28	— 1	—18	38	29	52	33	47	18	75	43	87	58
5	.....	.....	90	69	89	71	63	48	69	41	45	28	5	—15	33	17	45	34	61	25	62	42	78	59
6	.....	.....	87	69	86	74	66	46	69	56	32	26	24	— 7	36	19	53	31	49	38	60	34	73	60
7	.....	.....	86	68	84	69	69	42	59	36	32	10	30	15	48	16	74	39	60	36	62	43	85	50
8	.....	.....	90	73	80	71	85	50	53	26	30	26	16	— 1	40	21	72	56	66	38	70	47	89	66
9	.....	.....	85	73	77	62	61	40	58	28	34	25	20	—10	45	11	64	48	62	46	81	54	90	65
10	.....	.....	81	68	66	52	81	50	54	44	33	27	29	6	48	35	60	41	52	43	88	63	90	60
11	.....	.....	80	66	62	48	65	40	49	37	33	27	32	16	35	22	52	30	62	33	86	67	86	66
12	.....	.....	83	67	61	45	69	47	59	34	28	17	39	11	28	1	62	36	67	40	83	68	80	66
13	.....	.....	84	69	63	45	80	52	48	32	25	18	29	12	5	— 5	50	16	64	45	85	62	77	66
14	.....	.....	83	71	72	51	82	57	50	31	23	13	20	6	20	— 7	26	1	50	43	63	51	81	65
15	.....	.....	75	66	76	57	70	57	55	33	21	12	30	16	36	13	23	5	58	32	72	4	66	60
16	.....	.....	75	63	81	64	68	44	56	36	27	13	23	4	31	22	22	15	58	37	76	46	72	56
17	.....	.....	83	64	74	65	44	36	57	29	18	9	26	9	32	16	24	6	59	33	80	48	72	52
18	.....	.....	90	74	81	62	51	29	64	36	18	— 2	16	— 1	37	15	27	16	68	32	83	58	75	54
19	.....	.....	92	78	81	70	66	36	55	38	18	— 5	17	—12	34	15	35	5	67	43	83	61	77	55
20	.....	.....	86	76	70	57	74	50	48	38	29	11	37	13	23	4	36	30	69	44	73	55	72	63
21	.....	.....	85	76	66	50	56	37	43	28	24	1	47	21	49	21	38	22	73	48	72	52	83	64
22	.....	.....	89	76	70	52	57	29	53	34	11	— 6	32	17	48	34	37	31	84	58	76	52	87	67
23	.....	.....	93	78	67	60	57	46	51	35	11	— 3	35	5	35	23	58	31	78	60	81	57	85	70
24	.....	.....	94	76	68	50	46	37	41	34	9	—10	50	29	49	31	50	34	67	59	82	65	86	68
25	.....	.....	76	64	67	51	49	33	37	32	13	— 1	41	32	42	2	64	35	73	53	85	66	84	65
26	.....	.....	79	65	61	38	34	27	34	27	18	8	52	31	9	—12	65	42	83	53	74	55	82	69
27	.....	.....	77	67	65	41	37	15	44	24	12	4	50	33	23	5	79	40	60	41	64	53	75	66
28	.....	.....	75	64	65	49	48	31	49	22	22	0	41	28	52	19	66	52	65	40	88	60	76	60
29	.....	.....	79	63	86	61	53	38	45	21	25	9	47	26	.....	.....	72	44	69	44	85	62	81	57
30	.....	.....	79	66	84	70	44	29	37	30	24	— 1	42	23	.....	.....	56	36	65	42	79	60	83	61
31	.....	.....	83	65	.....	.....	46	19	.....	.....	30	18	37	29	.....	.....	50	42	.....	.....	65	54	.....	.....
Range	.....	.....	31°.0		51°.0		70°.0		48°.0		62°.0		73°.0		64°.0		78°.0		67°.0		54°.0		45°.0	
Monthly mean	.....	.....	78°.0		68°.1		50°.4		42°.2		†19°.9		18°.7		25°.2		39°.9		51°.2		64°.2		70°.1	

* Observations began August 1, 1878.

† Monthly mean for thirty days only.

Maximum, minimum, and mean temperatures—Continued.

STATION, DETROIT, MICH.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	88	70	82	66	75	67	79	63	47	25	42	32	28	11	25	16	44	28	42	26	56	31	72	46
2	76	61	86	65	82	64	73	60	50	34	41	36	23	−12	27	14	30	22	35	21	57	30	57	45
3	69	62	84	62	70	62	73	53	47	26	40	32	7	−15	32	19	39	16	30	16	65	39	55	47
4	80	64	83	67	76	61	69	49	42	29	37	28	16	− 2	35	21	42	33	36	22	65	49	75	50
5	84	65	84	66	82	61	55	45	43	25	32	21	18	2	32	27	34	26	42	24	61	47	71	58
6	87	64	80	67	85	63	62	35	44	35	35	29	25	11	31	24	49	31	52	27	52	37	60	46
7	87	67	84	60	85	67	62	47	38	24	32	26	25	11	32	19	37	26	49	32	52	39	65	39
8	89	71	90	69	84	69	68	45	45	34	35	23	27	19	37	16	56	31	60	31	62	33	66	48
9	82	67	85	68	82	68	67	46	45	32	40	32	19	10	37	21	67	46	60	40	70	38	79	54
10	83	66	77	64	72	61	60	37	53	34	36	32	14	0	41	22	62	34	51	34	76	49	82	64
11	80	68	80	60	61	53	57	45	50	42	37	27	25	12	41	34	53	36	42	29	81	59	80	64
12	85	70	80	59	61	53	65	39	49	40	31	22	22	7	34	15	43	30	49	26	86	60	74	61
13	81	69	82	62	55	50	62	45	49	34	34	23	32	16	19	7	42	35	52	37	85	63	74	56
14	86	66	80	66	70	45	73	51	41	28	30	26	30	20	11	− 1	35	19	49	34	79	58	76	55
15	91	71	84	64	70	47	77	61	49	31	28	15	27	15	21	− 3	23	15	49	36	58	49	78	60
16	92	72	81	62	73	54	75	62	47	40	25	13	29	13	30	14	28	14	48	32	67	42	66	48
17	100	75	77	56	80	58	71	45	52	45	30	21	32	18	25	19	28	20	47	34	75	47	65	44
18	92	72	82	58	80	61	47	38	40	43	25	14	32	20	30	16	27	17	52	33	77	51	68	47
19	85	67	80	65	81	64	53	35	48	39	20	11	21	10	26	16	31	18	57	34	80	47	70	48
20	91	70	77	63	77	53	60	36	48	39	24	6	11	3	25	14	32	25	57	36	85	55	76	52
21	89	68	78	57	63	46	64	46	47	37	31	23	35	8	22	11	42	27	63	37	64	47	79	59
22	78	58	82	57	64	40	64	41	41	35	27	8	37	25	42	21	34	27	70	44	65	41	82	64
23	80	56	83	60	70	50	52	36	43	31	10	1	30	22	31	15	36	27	68	46	66	45	85	64
24	81	60	79	68	71	59	55	34	45	33	8	− 4	35	21	20	14	41	34	75	46	78	52	88	69
25	82	66	75	59	77	55	65	44	40	34	15	4	42	23	28	18	38	23	76	55	70	51	91	70
26	70	66	75	51	64	47	50	37	35	26	20	7	30	14	24	7	42	31	70	56	55	42	85	69
27	78	63	78	53	60	39	40	32	35	27	25	10	44	30	13	− 3	42	32	72	55	65	47	86	69
28	75	58	75	64	64	41	39	24	38	32	22	10	42	32	36	8	49	33	65	48	72	47	72	64
29	67	59	76	58	70	53	46	37	40	30	18	7	38	24	.....	.....	57	41	64	44	82	57	77	59
30	75	60	81	56	79	62	45	38	42	27	21	10	40	24	.....	.....	41	31	56	35	87	66	76	58
31	81	62	73	64	.....	.....	38	30	.....	.....	18	2	34	24	.....	.....	47	25	.....	.....	86	64	.....	.....
Range	44°		39°		46°		55°		29°		46°		59°		45°		53°		60°		57°		52°	
Monthly mean	72°.9		71°.6		64°.4		51°.7		39°.4		23°.6		21°.6		23°.2		34°.4		44°.9		59°.2		65°.8	

Maximum, minimum, and mean temperatures—Continued.

STATION, DODGE CITY, KANS.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	77	58	100	70	92	63	75	53	72	36	51	19	26	1	37	22	29	16	56	31	72	44	66	40
2	84	54	100	75	93	58	81	49	55	35	65	34	13	− 7	43	26	48	13	69	35	80	49	76	45
3	84	56	95	68	92	67	75	56	67	32	59	33	8	− 4	53	29	72	28	51	19	78	60	89	47
4	84	60	97	69	89	63	60	52	73	36	55	28	13	− 1	37	20	56	38	69	29	75	42	98	55
5	87	65	93	70	76	67	65	48	74	48	58	27	10	− 9	23	12	78	44	81	42	55	47	96	61
6	90	65	97	71	83	66	79	47	73	40	37	24	31	− 9	33	6	59	43	69	41	71	42	96	64
7	96	68	99	72	84	59	80	44	57	40	32	26	27	14	40	17	85	45	68	39	77	51	91	67
8	91	70	100	72	87	55	87	58	53	38	48	19	20	4	39	25	78	51	79	45	80	58	94	67
9	98	71	101	72	62	46	80	42	57	37	51	22	24	− 3	43	23	68	36	62	42	90	63	92	68
10	97	71	82	64	66	39	88	55	48	35	62	26	22	10	55	33	71	33	69	33	98	58	96	62
11	98	70	80	57	63	46	72	36	48	31	47	25	28	4	48	25	62	31	71	31	87	64	96	73
12	100	70	85	57	75	42	85	48	64	28	32	20	30	12	41	9	65	39	77	46	71	49	90	69
13	99	71	85	63	85	46	87	49	61	37	21	17	29	17	18	7	67	25	71	50	73	53	91	70
14	97	71	87	64	93	56	81	48	55	37	24	0	30	22	37	12	43	11	50	42	72	52	88	64
15	97	70	85	61	87	61	86	63	53	30	36	10	30	8	38	25	42	23	50	42	80	43	96	58
16	102	68	97	68	89	59	67	43	50	32	27	5	31	6	33	20	36	20	59	42	78	57	87	61
17	91	67	97	71	85	60	64	39	59	29	10	− 1	30	13	32	21	37	15	62	37	65	59	90	64
18	95	73	95	68	87	58	72	34	62	33	15	− 3	27	6	42	17	41	23	79	38	76	58	90	69
19	96	75	98	72	86	50	80	45	55	28	21	4	38	6	43	25	68	22	85	52	92	66	86	67
20	96	72	98	72	68	39	80	45	52	38	25	6	43	17	46	24	54	28	87	54	84	59	84	62
21	95	69	96	71	83	47	60	40	62	28	35	12	44	21	68	31	54	31	78	57	87	61	88	58
22	94	70	96	68	85	56	71	26	74	34	36	6	43	26	49	31	63	24	65	54	91	66	94	67
23	83	69	97	71	73	49	65	44	64	35	24	9	45	25	67	30	76	39	71	46	98	65	101	71
24	94	70	101	70	89	45	53	35	45	33	15	0	61	33	74	34	65	31	72	49	96	70	90	71
25	87	69	71	56	75	48	45	30	36	23	24	2	53	33	52	21	74	41	79	45	85	72	91	62
26	84	66	92	58	66	39	33	18	45	13	20	0	58	35	47	17	77	44	83	50	84	65	91	63
27	82	62	94	65	69	51	53	10	53	26	20	0	51	36	66	29	89	48	68	50	90	64	96	64
28	89	66	81	63	86	62	59	27	55	26	27	11	46	34	71	29	73	48	85	48	91	65	83	60
29	95	60	82	56	92	63	62	36	45	24	19	1	47	34	.....	.....	83	42	84	52	90	67	89	65
30	95	67	85	56	89	50	58	38	44	28	24	0	40	36	.....	.....	76	45	71	53	86	58	81	64
31	101	67	91	60	.....	.....	68	33	.....	.....	26	21	38	27	.....	.....	73	48	.....	.....	63	53	.....	.....
Range	48°		45°		54°		78°		61°		68°		70°		68°		78°		68°		56°		61°	
Monthly mean	80°.0		79°.0		67°.9		54°.0		43°.4		23°.8		23°.9		32°.5		47°.7		57°.0		68°.9		76°.0	

Maximum, minimum, and mean temperatures—Continued.

STATION, DUBUQUE, IOWA.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	75	64	86	66	90	64	75	59	57.5	29	37	30	14	—10	28	19	43	18	42	31	68	39.5	58	46
2	79	55	88	67	81	61	74	53	47.5	35	43.5	25	—10	—22	36	12	36	24	36	24	64	38	64	50
3	80.5	57	89	64	82.5	58	65.5	48	49	26.5	41	34	1.5	—18	38	23.5	42.5	15	35	18	64	49	77	47
4	84	63	87	67	83	59	66.5	45	52	30	40	31	2	—14	35	30	48.5	34	42	23.5	69	48	86	61.5
5	91	65	89.5	68	92	64	63	48	58	36	39	25.5	16	— 8	32	26	40	28	52	24.5	56.5	42	77.5	61
6	94.5	70	90	69	88	64.5	64.5	46	55	39	32	23	16	— 7	33.5	21	53	34.5	64	36.5	61	35	67	57
7	95.5	71	88	65	84	68	64	46	46	31	32	15	26	9.5	40	15	51	32.5	57	35	61	38	78	50.5
8	90	69.5	90	72.5	87.5	69	71	54	51	32.5	31	24	26	1	41.5	23	71	38	62.5	35	66	40	88	61
9	88	68	84	70	72	59	60	47.5	53	31	34	27	10	—10	35	17	63	45	58	48	76	48.5	86	64
10	83.5	62	82	64.5	65	47	66	47	48	40	36	23	25	— 4	47	33	66	42	53	41	85	60	84.5	63
11	86	67	81	60	58.5	41	62	43	47	39	33.5	28	30.5	17	41	23	50	32.5	57	34	90	66	79	67
12	94	70.5	83.5	60	62	40	67	46	54	34	32	19	31	4	23	10	59	30	54	37	85	71	82	65
13	92	75	85	64	65.5	38	68	51	49	34	27	20	30	15	10	— 5	45	27	60	45	83	63	74	64
14	93	72.5	84.5	63	74	40	79	55	46	27	29	17	27	9	7	—11	27	7	55	39	63	56	85	67
15	96	72	77	63.5	81	53	68	59	50.5	31	26	8	30	16	30	— 2	22	9	56	34.5	70	47	72	60
16	97	77	76	54	80.5	67	69	49	45	39	29	19	28	13	27	16	24	13	56	35	75	42	70	53
17	93	78	74	59	80	62	49	39	46	41	26	14	25	5	28	14	27	10.5	55	33	79.5	47	68	48
18	91	72.5	90.5	70	81.5	55	50.5	37.5	54	39	19	7	18	— 1	30	8	29.5	13	63.5	36	78	50	76.5	48.5
19	79	72	87	72	83	67	57	34	52	37	18.5	— 2	9	—10	30	19	37	12	62	41	84	58.5	80	52
20	92	72.5	82.5	71	67	47	70.5	44	46	34.5	27	13	24.5	— 4	22	4	35	28	67.5	36.5	79.5	57	74	62
21	82	66	86	64	62	42.5	59	39	44	33	25	17	40	5	38.5	19	42	26.5	72	39	70	51	82.5	65
22	81	63	82	64	72	49.5	48	30	41.5	32	17	— 1	36	19	38.5	30	39	27	83	50	73	55	88	64
23	77	66	92.5	71	66	55	56	39	43	30.5	2.5	— 7	33	12	30	12	48	23	84	60	81	56	88	69
24	76	63	89	69	69	45	46	38	45	36	9	—10	46	26	33	21	48	36	75	60	85	62	79	69
25	81	68.5	77	59	65.5	53	49	38	39	30	16	0	43	32	33	12	51.5	31	72	57	72	56	85	69
26	81.5	66	79.5	56	61	44	38	33	34	23	16	2.5	42	29	12	— 2	58	42	81	55	57	48	85	71
27	86	65	84	60	63	39	36	27	37	26.5	18	7	42	35	14	—12	65	36	68	51	71	49	74	65
28	82	63	79	63	63	50	42	27	44	27	17	— 1	40	27	44	14	63	48.5	71	41	80	59	77	58
29	81	67	82	58.5	69	59	46	38	43	27	25	8	44	21.5	.....	.....	63	43	67	50	87	67	78	58.5
30	86.5	64	83	55.5	82	67.5	45	30	39	28	14.5	— 2	42	24	.....	.....	50	40	64	41	83	62	83	60
31	88	68	83	57.5	.....	.....	34	23	.....	.....	27.5	7	37	23	.....	.....	44	28	.....	.....	68	54	.....	.....
Range	42°		38°.5		54°		56°		33°		53°.5		68°		59°		64°		66°		55°		42°	
Monthly mean	76°.4		73°.9		64°.0		50°.2		40°.0		20°.2		18°.1		23°.4		37°.8		50°.5		63°.1		68°.9	

Maximum, minimum, and mean temperatures—Continued.

STATION, DULUTH, MINN.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	75	57	85	63	83	65	63	54	46	30	36	18	2	−12	21	−1	25	2	36	16	57	32	63	39
2	72	55	87	63	72	63	64	48	41	28	37	27	−5	−28	25	8	39	0	30	15	66	32	74	42
3	74	57	87	69	70	60	57	43	52	33	38	31	1	−17	34	14	42	7	35	7	55	38	70	47
4	74	57	88	64	73	59	61	42	40	31	35	24	11	−16	31	22	40	22	43	14	40	34	72	55
5	76	59	85	65	70	61	58	37	46	32	31	20	18	0	25	6	34	18	46	16	47	33	70	45
6	80	63	86	63.5	68	59	56	41	40	29	26	12	22	3	25	10	41	27	52	28	50	36	56	41
7	87	66	92	68	71	59	58	41	46	22	25	4	26	11	25	13	36	27	49	27	53	31	52	40
8	82	62	88	71	70	56	50	43	50	32	30	18	11	−8	23	8	42	33	50	30	51	35	62	44
9	77	65	81	60	64	51	57	37	53	29	35	22	9	−15	20	−3	45	32	45	34	48	39	74	51
10	68	58	78	57	57	41	52	40	44	38	33	22	23	−3	30	14	48	32	46	34	52	39	83	56
11	63	56	80	57	61	39	64	42	45	36	31	14	26	−2	19	4	32	17	42	30	52	40	82	58
12	70	60	78	56.5	65	38	58	43	43	33	27	13	28	17	16	−2	30	23	39	30	56	43	68	55
13	96	61	82	60	68	41	60	45	43	27	25	12	23	2	1	−21	27	5	43	34	55	46	60	49
14	83	68	78	58	70	45	57	46	46	24	25	7	8	−5	7	−24	12	−9	51	32	60	42	54	45
15	84	67	68	53	68	53	51	41	46	36	27	18	17	−9	17	−2	13	−11	51	28	64	37	61	47
16	89	67	68	54	65	55	51	41	46	33	26	9	23	7	16	−5	20	−14	48	33	64	41	55	41
17	80	68	66	49	70	50	41	34	40	34	20	8	29	10	21	−7	17	−4	51	26	68	42	62	40
18	81	63	69	57	63	46.5	48	30	52	32	13	−3	20	1	26	13	21	−7	50	30	45	37	63	44
19	92	67	73	61.5	62	49	59	34	47	32	17	1	4	−17	27	4	26	0	52	30	47	36	63	47
20	80	67	69	63	55	40	55	40	43	32	20	7	15	0	6	−15	31	1	48	31	62	42	67	54
21	80	56	74	61.5	56	33.5	50	35	43	25	17	6	30	8	26	0	27	3	50	35	65	42	83	57
22	78	60	72	63	71	37	43	32	40	33	6	−2	22	10	25	−3	39	17	56	38	53	41	70	53
23	83	64	81	64	66	47	48	34	40	31	2	−14	28	2	15	−8	38	22	48	38	53	42	85.5	44
24	81	64	78	63	52	36	44	29	37	27	11	−3	45	23	16	6	42	23	52	36	80	45	74	55
25	77	65	77	52	52	43	41	32	28	14	21	2	42	8	15	−2	40	28	69	37	67	41	85	56
26	82	61	78	55	54	34	32	23	30	16	17	5	42	11	−2	−19	57	33	67	38	48	41	69	53
27	76	57	72	60	61	38	27	17	34	26	17	−5	43	27	5	−26	39	31	60	38	69	42	76	54
28	79	56	75	58	58	44	32	13	45	24	14	3	36	13	13	0	62	34	47	31	58	46	73	56
29	77	63	84	60	60	52	36	27	38	27	17	5	40	26	.....	.....	52	35	52	33	67	42	73	52
30	72	60	83	62	67	55	36	21	37	13	19	−4	40	17	.....	.....	47	33	50	35	66	55	70.5	51
31	80	63	82	64	.....	.....	31	8	.....	.....	19	2	28	14	.....	.....	48	28	.....	.....	57	43	.....	.....
Range	41°		43°		49°.5		56°		40°		52°		73°		60°		76°		62°		38°		46°.5	
Monthly mean	70°.8		70°.5		57°.3		42°.8		36°.7		17°.7		14°.3		11°.2		27°.1		39°.3		48°.5		59°.9	

Maximum, minimum, and mean temperatures—Continued.

STATION, EAGLE PASS, TEX.

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	82	69	95	71	91	65	91	65	75	58	68	32	62	48	63	48	80	61	81	58	91	70	90	67
2	88	67	97	70	95	64	92	65	82	55	72	35	52	43	51	43	71	53	71	46	96	69	88	59
3	92	66	98	72	92	66	90	65	77	64	73	35	43	37	59	42	72	50	81	51	100	69	91	61
4	92	67	99	72	92	67	91	67	76	56	76	38	37	30	63	46	75	55	80	56	98	69	94	58
5	97	65	97	70	95	67	91	63	79	61	71	53	41	33	57	42	80	56	82	63	98	71	97	62
6	92	70	97	73	95	70	88	63	83	60	75	49	42	29	42	34	83	58	81	71	82	63	100	70
7	95	69	97	71	82	65	90	62	83	69	75	45	54	32	52	30	83	58	87	62	90	65	98	70
8	92	67	97	72	91	70	87	64	83	72	73	52	46	33	67	35	80	63	94	68	96	67	99	75
9	92	68	99	72	91	69	89	64	85	70	64	46	49	23	65	43	81	64	88	69	95	67	98	77
10	93	67	98	71	78	58	94	65	81	61	77	35	50	27	75	57	84	65	85	53	98	67	102	78
11	96	68	98	71	78	57	95	61	72	64	73	42	64	41	77	48	78	64	89	56	100	66	99	78
12	97	72	96	72	76	50	93	65	69	49	68	53	63	29	83	45	75	59	85	61	96	66	97	76
13	95	70	97	70	81	47	91	65	68	48	56	42	64	37	75	48	78	58	87	71	98	66	89	74
14	97	69	98	69	82	50	91	68	73	47	44	36	72	45	60	40	83	57	92	61	97	66	96	75
15	97	69	98	67	82	54	91	75	72	45	53	27	86	55	60	36	81	59	92	65	103	67	97	76
16	101	69	98	69	84	55	93	75	78	46	60	28	70	57	69	38	85	61	83	62	105	65	95	70
17	100	69	97	70	85	55	78	53	67	55	53	31	71	57	66	47	77	54	77	56	104	72	97	73
18	98	69	87	72	80	60	77	45	69	49	52	30	68	44	62	39	66	42	80	47	105	72	95	75
19	95	73	88	70	90	60	78	48	75	43	53	46	60	32	70	40	71	45	83	51	110	73	100	75
20	96	69	88	68	87	67	84	45	77	43	50	38	66	34	73	48	84	63	90	60	111	73	96	75
21	95	71	86	68	87	55	79	57	69	48	60	30	69	40	78	55	89	57	93	62	116	71	95	76
22	99	70	88	67	86	55	73	46	74	42	58	35	74	47	83	62	89	59	86	63	108	75	96	76
23	97	72	91	69	90	64	80	43	82	45	63	32	68	47	74	51	82	58	77	56	108	75	99	78
24	99	73	94	69	91	66	85	49	72	48	51	38	73	38	85	47	85	64	72	62	101	73	98	78
25	99	74	91	71	91	67	83	59	57	43	38	30	73	43	90	50	87	67	80	61	100	71	96	75
26	97	71	92	67	92	68	83	65	57	42	46	24	73	58	72	44	92	67	93	63	98	71	99	77
27	90	69	94	67	89	65	74	48	66	32	45	28	78	48	64	40	92	66	94	65	100	70	101	79
28	87	67	95	68	91	65	58	46	69	32	47	36	74	49	71	47	83	65	90	69	103	70	102	79
29	93	66	92	70	92	67	80	51	73	37	54	42	77	55	.....	.....	82	65	97	68	95	67	99	80
30	93	69	92	68	92	65	66	55	59	50	51	46	81	67	.....	.....	89	64	100	69	100	73	104	81
31	92	70	93	64	.....	.....	72	57	.....	.....	55	44	72	67	.....	.....	93	65	.....	.....	99	69	.....	.....
Range	36°.		35°.		48°.		52°.		53°.		53°.		63°.		60°.		51°.		54°.		53°.		46°.	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, EASTPORT, ME.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	82	56	70	53	63	55	61	50	46	38	30	22	26	12	21	12	29	9	43	28	47	40	65	45
2	83	51	61	51	65	54	60	50	52	37	45	28	30	17	37	16	29	21	38	26	55	38	55	45
3	66	49	65	53	64	53	63	51	48	31	52	40	30	20	36	25	29	15	39	25	50	37	48	44
4	81	59	64	50	59	53	68	52	40	19	43	35	27	15	29	20	38	25	30	16	54	37	49	44
5	74	55	65	51	60	53	62	47	30	17	37	33	30	19	31	16	39	9	34	23	50	39	61	48
6	64	51	63	51	68	55	55	46	35	25	33	23	27	19	31	23	22	4	35	29	46	38	63	48
7	69	47	62	54	60	49	57	42	39	24	25	20	28	22	27	17	24	14	40	32	54	40	53	43
8	65	51	75	58	62	47	56	45	35	31	29	19	35	21	24	13	31	13	44	31	59	40	54	40
9	75	52	68	54	64	48	59	48	35	30	26	14	34	23	29	11	33	20	48	31	56	42	62	42
10	72	53	78	54	66	49	58	48	36	28	45	25	26	7	26	12	35	30	40	26	61	39	60	43
11	73	56	77	60	63	55	49	40	40	28	50	40	23	3	40	16	38	32	33	30	56	40	49	45
12	71	53	71	57	65	57	48	43	54	39	40	27	24	13	46	30	36	25	34	28	49	41	53	45
13	70	53	72	52	67	58	51	40	48	36	27	20	34	19	31	16	36	24	41	30	60	42	60	45
14	64	49	67	49	70	54	57	40	38	29	29	20	31	7	18	4	38	33	41	33	56	40	69	45
15	64	51	69	48	64	51	55	42	36	26	37	29	7	— 6	14	0	44	28	44	30	63	43	59	45
16	67	48	69	56	62	47	61	48	41	28	38	16	7	— 8	28	12	31	21	45	36	52	44	51	47
17	57	51	65	54	62	46	56	50	42	36	22	14	21	— 4	23	17	33	23	50	38	61	42	50	46
18	65	51	69	52	63	49	62	53	39	34	24	17	36	21	21	13	32	26	44	31	59	41	53	45
19	75	54	73	52	65	50	60	49	40	34	21	9	26	17	18	10	30	17	36	28	48	45	67	42
20	68	52	69	63	59	51	52	41	41	36	24	8	22	3	17	12	35	20	45	29	55	45	67	46
21	61	53	69	58	63	54	57	40	40	36	31	19	13	— 4	16	9	35	23	52	33	63	45	63	47
22	64	52	65	53	64	48	52	45	44	36	43	29	28	13	25	6	35	23	53	36	56	42	62	48
23	62	52	65	49	58	44	49	44	52	41	31	23	27	13	34	20	34	27	44	34	48	40	71	47
24	74	51	65	49	59	43	54	46	45	37	23	17	35	10	33	12	35	29	46	33	54	36	69	50
25	78	51	60	53	66	52	53	49	42	33	20	14	35	12	21	4	38	31	51	32	51	43	79	48
26	61	54	66	50	62	48	52	46	38	30	33	17	16	—13	43	21	39	31	55	36	52	40	69	51
27	71	57	64	50	59	44	49	44	37	26	21	15	26	— 6	43	11	34	31	55	36	62	37	62	47
28	72	58	62	52	56	38	51	36	52	37	21	14	36	24	11	0	37	31	48	40	60	42	65	49
29	74	51	63	53	58	46	40	29	45	33	16	9	30	13	.....	.....	39	31	47	40	57	39	65	52
30	66	53	73	49	60	42	48	37	41	27	23	13	24	8	.....	.....	39	35	50	40	59	42	71	55
31	66	50	72	53	.....	.....	55	45	.....	.....	23	15	26	10	.....	.....	42	34	.....	.....	56	46	.....	.....
Range	36°		30°		32°		39°		37°		44°		49°		46°		40°		39°		27°		39°	
Monthly mean	61°.3		60°.7		56°.5		50°.5		37°.0		26°.3		19°.3		21°.6		29°.9		37°.5		47°.2		53°.2	

Maximum, minimum, and mean temperatures—Continued.

STATION, EL PASO, TEX.

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	92	80	94	77	90	68	86	67	74	55	51	42	57	51	57	53	75	50	60	(†)	91	62	87	(†)
2	89	79	93	75	87	68	85	64	73	58	55	45	59	42	55	52	72	45	75	.....	97	58	84	.....
3	88	76	95	81	88	71	89	67	64	57	58	44	57	47	55	50	75	48	82	.....	92	64	89	.....
4	89	75	95	79	81	75	88	68	69	57	62	45	58	44	57	50	81	48	81	.....	89	64	93	.....
5	89	70	97	76	85	72	82	67	74	55	(*)	(*)	59	52	58	52	80	45	84	.....	86	58	98	.....
6	93	80	96	80	87	74	76	63	66	54	63	45	58	50	55	35	85	54	82	.....	89	53	97	.....
7	94	78	96	83	85	72	80	64	67	58	59	50	58	52	57	32	85	54	81	.....	90	51	89	.....
8	98	80	96	80	87	70	77	50	67	58	56	50	50	45	65	30	85	47	78	59	93	48	93	.....
9	94	82	96	78	87	71	84	66	62	54	54	47	49	42	57	40	72	45	74	41	97	56	96	.....
10	96	80	90	76	78	67	84	64	67	52	52	45	50	39	65	37	77	43	83	31	98	57	98	.....
11	95	81	84	75	77	67	83	65	67	55	56	46	50	43	69	34	83	(†)	83	47	85	64	98	.....
12	95	80	87	74	78	64	86	62	65	54	53	45	51	43	75	42	80	.....	78	46	84	48	93	.....
13	95	82	90	74	82	65	83	62	66	56	50	46	50	45	82	45	78	.....	71	37	86	47	91	.....
14	93	80	92	75	84	63	85	68	63	56	49	43	51	43	80	47	82	.....	72	49	90	65	95	.....
15	93	79	92	77	85	67	80	68	67	53	46	39	54	44	74	49	81	.....	73	49	92	53	97	.....
16	93	80	92	76	89	69	74	68	61	52	47	38	56	46	75	52	74	.....	70	46	91	61	98	.....
17	95	78	93	76	90	73	74	60	62	52	50	37	57	46	77	51	80	.....	75	35	90	58	99	.....
18	93	77	93	78	87	73	77	58	62	53	53	39	55	46	73	39	78	.....	81	39	94	62	96	.....
19	85	76	90	82	85	73	80	54	62	54	57	43	52	43	78	38	80	.....	80	48	94	62	97	.....
20	87	75	89	79	83	70	80	62	65	52	(*)	(*)	57	45	80	34	78	.....	84	48	95	(†)	99	.....
21	86	75	92	76	84	68	74	64	67	55	53	46	57	46	80	47	76	.....	72	51	99	.....	96	.....
22	87	77	87	75	84	69	71	58	67	56	53	43	62	48	77	55	77	.....	73	44	101	.....	93	.....
23	90	74	83	80	83	65	75	50	67	52	57	42	64	52	76	52	83	.....	77	39	101	.....	99	.....
24	90	74	89	75	90	67	77	50	62	52	52	42	68	50	79	46	83	.....	76	46	99	.....	101	.....
25	90	75	93	75	89	65	76	58	52	45	49	39	72	56	78	51	85	.....	84	41	98	.....	102	.....
26	89	74	93	80	86	70	73	59	49	43	51	40	63	57	61	49	88	.....	89	46	95	.....	104	.....
27	90	74	87	78	87	68	64	57	52	40	50	41	66	57	78	44	86	.....	92	58	95	.....	103	.....
28	88	73	91	75	87	64	69	53	51	40	51	41	69	59	80	46	79	.....	95	48	93	.....	104	71
29	91	73	83	74	87	61	67	50	58	43	53	44	64	58	.....	.....	86	.....	98	49	92	.....	104	74
30	88	76	85	72	85	69	73	54	55	43	57	47	63	55	.....	.....	88	.....	96	47	90	.....	102	69
31	93	76	80	69	.....	.....	71	54	.....	.....	59	43	62	57	.....	.....	81	.....	.....	.....	86	.....	.....	.....
Range	28°		26°		29°		39°		34°		.....		33°		52°		.....		.....		.....		.....	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

* No observations taken.

† Minimum thermometer broken.

Maximum, minimum, and mean temperatures—Continued.

STATION, ERIE, PA.

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	90	73	80	68	79	70	80	60	44	33	48	36	31	23	28	14	47	31	41	29	48	35	79	55
2	84	71	80	66	83	69	69	59	50	39	48	38	28	— 5	28	11	33	22	33	23	48	34	58	50
3	79	70	82	60	74	64	69	57	43	37	45	38	8	- 11	33	23	40	19	30	20	57	39	59	51
4	80	70	83	66	75	62	64	52	43	34	40	30	15	4	34	26	44	35	30	21	61	49	70	51
5	85	70	84	68	76	64	64	47	42	33	34	29	19	3	36	30	39	31	32	21	65	46	72	60
6	88	67	80	68	79	64	58	46	47	37	39	32	23	15	34	27	45	30	45	26	50	43	64	49
7	89	68	78	65	84	66	63	42	41	36	36	32	29	11	31	23	37	27	47	35	51	42	62	42
8	85	72	85	69	84	66	68	51	42	37	40	27	31	25	38	17	54	30	51	30	57	41	70	46
9	84	72	80	69	83	62	73	54	44	37	46	35	28	17	34	19	70	47	56	40	64	39	77	53
10	81	73	76	67	82	66	55	48	50	42	47	36	20	12	44	15	68	42	60	33	75	51	81	64
11	81	66	77	64	66	60	61	46	56	47	37	33	30	15	47	38	59	36	40	31	83	55	80	66
12	78	68	78	62	62	56	62	51	49	45	36	31	29	19	39	22	41	31	42	30	83	59	75	64
13	82	69	81	59	65	55	65	49	45	40	36	30	34	25	24	11	47	35	49	35	81	66	75	60
14	82	63	83	66	66	50	75	56	41	34	40	32	32	25	12	6	44	26	48	36	82	65	72	53
15	86	68	85	66	68	52	71	63	49	33	36	27	30	15	20	0	28	20	40	35	70	53	79	65
16	90	71	84	69	75	52	78	64	55	41	33	24	36	17	32	15	30	19	46	34	63	49	68	54
17	94	74	77	65	78	61	72	46	58	50	35	29	38	17	29	19	32	22	39	35	65	46	59	51
18	90	78	80	60	73	65	48	45	51	48	30	20	37	25	27	20	31	18	45	36	75	54	67	54
19	88	75	79	63	82	65	49	45	56	45	27	22	25	15	30	10	34	21	48	37	75	54	70	50
20	80	70	78	66	82	64	60	42	53	42	26	19	20	10	28	12	35	27	53	35	80	60	72	55
21	78	69	79	65	64	55	67	46	51	37	36	23	40	9	18	0	41	30	57	39	70	52	82	60
22	75	66	81	60	60	47	71	50	46	39	33	16	40	29	39	15	42	29	61	41	64	45	76	61
23	79	60	81	64	68	45	59	46	42	38	16	7	34	25	34	16	37	29	63	43	42	61	80	64
24	80	62	85	66	69	57	57	42	47	37	14	5	42	26	24	9	46	32	65	40	74	50	84	67
25	80	63	76	57	78	53	68	44	44	38	15	6	41	22	44	18	38	30	75	57	74	54	88	72
26	76	66	75	52	65	53	60	52	43	35	21	10	31	12	35	18	49	30	69	54	55	44	88	71
27	77	66	77	57	56	47	56	36	46	33	28	17	49	31	18	6	40	35	72	58	58	46	87	71
28	80	60	75	58	64	43	41	37	46	38	27	12	49	34	37	4	50	37	60	46	66	44	76	66
29	76	61	79	62	66	52	52	35	42	35	24	8	35	26	.....	.....	52	38	58	43	79	61	73	62
30	75	66	80	63	80	58	49	39	45	36	29	19	37	25	.....	.....	39	31	50	39	91	68	78	61
31	80	63	77	68	.....	.....	44	35	.....	.....	25	14	33	27	.....	.....	39	28	.....	.....	89	66	.....	.....
Range	34°		33°		41°		45°		25°		43°		60°		47°		52°		55°		57°		46°	
Monthly mean	75°.3		73°.0		65°.5		54°.7		42°.4		29°.0		25°.1		24°.3		35°.9		43°.0		58°.6		65°.6	

Maximum, minimum, and mean temperatures—Continued.

STATION, ESCANABA, MICH.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	73	56	84	63	79	64	63	58	44	26	38	19	16	1	18	11	32	10	37	19	46	30	52	39
2	72	55	84	62	72	62	69	48	45	28	37	24	4	—5	26	8	30	—7	20	14	52	31	61	37
3	78	55	83	63	68	61	64	47	50	25	36	26	8	—6	28	19	33	—8	28	15	54	32	64	42
4	81	54	81	56	73	52	61	42	36	24	34	28	17	2	28	12	46	15	31	18	59	39	66	48
5	85	59	78	64	77	60	52	37	45	30	33	26	25	11	27	9	32	10	38	20	44	35	57	41
6	84	63	79	63	76	64	58	33	43	28	34	22	18	6	25	4	43	22	44	30	44	35	55	38
7	83	64	81	55	75	69	56	46	39	26	29	18	19	14	28	7	38	15	42	28	53	32	61	34
8	87	68	89	68	77	63	57	42	41	34	33	14	14	3	32	3	40	32	44	25	53	31	65	47
9	82	60	77	59	76	63	54	39	46	30	31	24	18	—1	24	7	53	35	51	28	56	44	69	56
10	70	58	76	59	66	47	55	32	45	32	30	27	21	—1	36	24	57	32	45	32	54	44	80	55
11	70	57	77	54	56	40	62	43	45	34	27	17	23	8	27	15	42	23	41	24	63	44	74	58
12	79	65	77	52	59	36	59	44	43	31	26	10	26	14	16	4	32	23	41	22	65	50	69	55
13	81	64	76	58	57	37	58	51	38	28	26	16	26	15	8	—3	31	25	48	32	65	45	72	54
14	89	68	75	59	68	46	61	47	40	24	24	18	19	7	6	—9	21	9	41	26	49	40	62	56
15	82	71	77	59	69	45	60	48	44	32	23	17	23	—1	17	—6	17	—2	45	27	59	37	57	46
16	90	73	72	53	77	61	60	52	46	38	25	14	25	12	18	—5	17	—4	38	30	59	35	51	41
17	88	69	73	51	67	54	52	38	44	39	25	9	25	13	22	—14	20	—10	41	25	65	42	63	38
18	88	65	74	52	67	50	41	33	44	36	21	11	22	6	25	—4	24	—9	45	23	55	37	72	41
19	86	68	77	61	70	60	46	27	45	33	21	6	14	3	29	16	30	—5	45	27	60	40	69	51
20	92	67	74	58	63	39	55	41	43	34	21	2	20	6	18	1	28	—2	50	28	68	47	68	53
21	74	61	77	57	51	35	55	49	39	31	24	13	27	14	27	—1	31	5	50	27	58	38	72	59
22	75	58	78	55	61	30	51	29	38	30	20	10	20	12	33	4	28	14	56	30	59	38	71	53
23	76	50	72	66	63	54	49	24	39	32	15	2	26	5	12	0	37	7	57	37	62	44	77	64
24	81	61	77	60	58	44	45	29	39	31	19	4	35	23	18	—4	34	19	52	39	64	48	77	64
25	78	62	72	49	61	47	43	33	34	28	26	13	29	9	20	10	34	5	57	37	60	41	70	64
26	73	58	77	52	52	38	36	27	36	25	23	13	34	5	15	—12	37	32	55	41	59	42	71	62
27	74	54	72	57	53	31	38	26	38	26	19	14	45	32	7	—19	40	32	58	40	65	48	76	59
28	73	53	73	58	57	48	35	17	42	32	21	12	34	22	30	—1	42	33	51	35	61	42	72	54
29	79	65	75	49	62	46	35	29	41	29	19	3	35	17	.....	.....	40	33	41	35	69	52	75	51
30	78	65	76	52	65	57	42	30	35	24	18	6	35	18	.....	.....	35	26	46	31	82	55	73	58
31	78	65	77	57	.....	.....	30	18	.....	.....	23	3	28	12	.....	.....	39	19	.....	.....	64	42	.....	.....
Range	42°		40°		49°		52°		26°		36°		51°		55°		67°		44°		52°		46°	
Monthly mean	71°.1		67°.6		58°.4		44°.5		35°.9		20°.5		16°.8		12°.9		25°.2		36°.7		50°.6		60°.7	

Maximum, minimum, and mean temperatures—Continued.

STATION, FATHER POINT, CANADA.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	79.7	58.8	67.5	50.4	67.2	51.3	57.1	46.0	39.7	32.3	25.7	18.8	18.2	5.8	24.2	3.4	17.4	−4.1	35.0	22.1	44.5	36.0	59.7	45.2
2	68.0	51.5	67.1	49.8	60.1	47.0	53.1	41.1	44.1	31.2	35.0	10.4	17.9	−0.6	37.9	22.1	19.1	8.9	23.2	13.0	44.7	35.7	60.9	42.1
3	66.9	51.2	57.4	47.1	54.5	46.4	53.3	40.4	40.2	28.0	36.5	32.4	30.8	16.3	30.0	18.5	25.3	11.0	20.4	10.5	47.1	32.3	62.0	41.9
4	71.1	51.8	54.0	44.0	62.5	42.4	55.7	34.6	32.2	21.3	35.7	30.5	32.0	22.4	23.9	14.5	40.9	21.7	28.7	15.3	46.8	35.3	58.0	45.2
5	74.2	53.2	56.7	42.1	65.4	51.8	50.0	38.3	32.0	23.3	34.2	25.1	30.7	23.5	21.8	10.5	35.0	0.1	35.7	22.9	43.1	36.5	61.0	43.4
6	57.9	46.9	66.0	44.4	62.5	43.8	46.4	34.1	32.9	26.8	26.4	15.4	27.0	20.5	20.9	13.2	16.2	−12.4	34.0	27.3	42.2	35.6	52.8	42.3
7	70.6	47.9	65.1	44.9	57.8	35.6	51.1	33.4	29.0	26.3	26.1	15.6	22.2	13.3	22.9	11.7	18.9	−1.6	37.7	29.0	47.2	35.8	44.6	35.1
8	77.4	51.9	60.1	44.6	65.4	52.0	54.0	41.5	36.4	26.6	25.5	16.3	24.9	14.2	20.8	7.6	21.1	−5.4	33.8	26.1	50.3	35.9	45.6	34.5
9	75.3	58.2	62.5	48.2	67.1	54.9	50.1	37.3	34.8	29.0	19.5	4.9	26.3	16.2	19.9	8.1	29.1	3.5	33.2	23.3	56.8	33.4	62.2	40.1
10	61.8	52.3	60.8	49.6	69.2	49.7	50.1	39.8	36.8	27.6	32.0	6.3	19.2	5.3	16.8	0.8	37.4	25.1	33.3	16.4	58.5	37.9	52.4	42.1
11	65.0	52.1	62.1	53.2	69.4	51.8	43.5	29.8	36.9	27.6	42.9	29.3	18.1	5.0	26.0	4.9	40.1	22.6	31.5	18.1	53.4	33.1	57.4	42.1
12	66.4	50.0	62.9	51.6	55.7	49.5	47.6	28.7	39.1	24.3	33.4	25.1	22.0	11.8	21.0	12.2	24.6	15.2	31.0	24.1	57.4	39.6	59.0	41.6
13	68.3	51.9	64.7	53.6	74.5	49.5	47.2	35.0	39.5	29.8	27.7	18.6	24.1	13.4	13.8	3.7	26.6	13.7	34.3	26.0	53.5	40.3	56.5	42.1
14	56.2	47.6	71.0	54.8	74.3	48.9	48.2	35.2	32.2	26.3	21.9	17.6	25.3	−7.1	6.4	−2.7	35.0	11.8	34.3	20.6	47.1	38.1	57.3	44.2
15	64.0	46.9	71.4	56.8	54.1	44.2	56.1	36.9	29.4	19.7	31.0	19.4	*	−11.2	5.4	4.1	31.5	14.0	39.1	27.9	42.9	37.8	57.1	41.1
16	61.6	51.6	71.6	53.9	60.4	39.1	46.3	38.3	33.0	15.0	27.8	17.6	−1.4	−11.4	18.3	−1.1	16.6	1.6	38.9	30.0	42.7	37.8	51.8	38.1
17	65.0	50.2	67.1	51.7	68.1	52.5	45.4	37.6	30.8	15.0	23.1	17.6	13.7	−10.7	11.6	−17.0	20.9	1.4	42.5	27.3	58.5	37.5	49.3	42.4
18	59.4	47.3	64.4	48.2	64.4	46.7	67.7	36.0	31.2	11.3	22.5	16.8	21.2	12.2	10.3	−18.9	24.8	12.2	38.2	27.0	50.5	36.5	50.2	42.2
19	61.2	46.9	54.1	49.2	63.2	38.3	46.6	42.3	36.8	21.8	20.9	3.4	18.4	−1.8	12.4	−5.0	26.7	4.9	40.2	26.4	44.1	36.3	62.0	44.1
20	57.5	47.5	61.5	50.0	73.5	55.6	47.6	40.4	35.2	27.3	14.9	4.1	3.8	−15.7	13.5	−5.6	26.6	9.8	43.4	25.1	46.8	35.7	63.7	53.0
21	66.1	46.3	62.4	45.9	71.0	50.0	48.0	40.1	36.0	31.8	22.0	11.0	2.1	−10.4	14.0	2.2	28.3	6.2	44.4	26.4	50.8	39.1	68.7	54.0
22	50.6	43.3	70.7	40.9	51.6	44.4	45.4	30.5	37.9	31.0	29.3	20.1	5.7	−9.6	15.4	−0.5	25.1	15.3	46.1	30.5	44.6	33.2	69.0	51.5
23	63.0	43.8	65.7	42.4	56.5	35.8	56.3	32.4	39.9	34.9	24.5	14.0	9.2	−8.4	21.2	5.9	29.8	20.2	40.2	32.7	52.8	32.5	67.0	47.1
24	67.4	51.6	78.6	53.9	55.2	37.0	47.8	40.9	40.1	35.6	16.3	10.6	28.0	−5.8	16.1	−1.3	35.2	11.0	47.0	29.1	51.8	32.2	66.9	50.5
25	67.3	52.2	66.4	52.0	53.3	43.3	44.6	39.6	38.4	29.6	15.7	5.1	27.8	−6.1	13.4	0.1	35.0	26.6	45.4	27.0	50.5	34.7	59.2	45.0
26	59.2	50.2	60.5	46.0	60.3	39.3	44.7	39.3	35.0	29.2	20.1	10.7	−0.2	−11.6	25.3	4.2	27.0	6.9	46.6	36.0	45.2	34.2	50.7	43.1
27	65.1	50.2	60.7	47.6	47.2	41.1	54.1	45.1	37.2	23.6	17.1	13.0	6.4	−5.4	31.0	−0.4	28.5	5.2	45.1	34.5	59.4	36.1	46.4	42.1
28	61.0	51.4	58.8	40.6	50.0	39.0	50.3	31.6	68.9	22.1	15.3	9.8	17.9	4.9	4.0	−7.7	37.3	26.4	43.6	37.6	64.4	43.6	49.2	40.1
29	65.6	48.4	62.7	51.3	50.5	41.8	36.0	27.5	36.7	27.3	5.4	−1.4	18.7	−3.6	.....	.....	40.1	33.2	54.8	36.3	61.5	41.8	59.9	41.7
30	67.7	43.4	68.8	47.0	55.0	38.9	43.3	28.9	28.9	22.1	12.3	0.8	14.7	−8.9	.....	.....	42.2	32.3	43.4	30.7	59.5	41.1	62.0	46.5
31	71.5	53.9	65.1	49.7	.....	.....	41.7	37.0	.....	.....	17.3	6.9	19.0	4.9	.....	.....	37.2	30.2	.....	.....	66.7	41.1	.....	.....
Range	36°.4		38°.0		38°.9		40°.2		32°.8		44°.3		.....		56°.8		54°.6		44°.3		34°.5		34°.5	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

* Maximum thermometer out of order.

Maximum, minimum, and mean temperatures—Continued.

STATION, FLORENCE, ARIZ.

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	109	68	98	76	100	71	87	52	84	49	66	35	60	40	58	36	76	52	73	54	101	60	102	57
2	109	81	104	75	85	69	91	55	80	46	70	34	60	40	68	46	83	49	75	54	99	60	101	70
3	105	75	105	75	87	70	92	57	86	50	76	36	55	44	71	54	77	50	81	51	95	63	104	69
4	103	72	105	77	90	66	92	62	82	60	75	41	60	42	54	47	76	46	86	51	91	61	106	72
5	103	78	108	75	95	67	92	61	80	52	76	42	63	41	54	41	79	45	75	53	90	59	105	67
6	106	62	110	74	95	65	92	61	56	49	71	44	62	42	55	32	80	48	79	44	90	55	102	67
7	108	67	107	83	95	64	92	59	66	47	65	39	54	36	57	32	75	48	77	50	91	54	95	61
8	108	67	100	74	95	64	91	58	65	52	63	30	46	28	64	36	65	41	72	45	94	55	95	57
9	108	76	103	73	95	62	90	57	64	47	69	29	53	30	62	45	69	40	77	42	95	54	99	59
10	106	76	100	68	94	57	86	47	66	42	67	36	50	30	64	39	73	38	86	45	90	60	99	60
11	102	74	98	68	95	69	89	54	69	42	59	34	53	30	67	41	78	37	77	54	79	50	96	62
12	103	72	103	77	95	66	86	55	74	49	53	28	61	30	69	41	80	39	60	45	88	45	91	56
13	106	77	105	72	96	62	89	56	67	46	50	27	58	40	72	44	82	41	70	40	95	53	96	58
14	106	77	107	78	95	61	82	54	68	42	52	23	55	35	75	50	85	43	73	49	97	55	102	60
15	97	76	102	70	95	61	77	56	68	45	55	30	52	31	71	45	82	53	78	51	95	59	103	60
16	102	76	100	70	94	60	76	49	68	38	55	25	54	29	70	43	78	46	77	48	98	56	103	62
17	102	83	101	72	95	60	85	43	70	39	55	23	50	29	69	42	77	45	88	46	96	56	102	65
18	106	72	101	74	91	57	91	67	71	43	59	24	60	28	72	44	78	46	93	68	95	59	102	62
19	100	79	104	69	85	49	86	61	71	41	55	24	64	30	80	43	76	45	90	59	95	60	101	63
20	106	83	97	77	91	52	85	54	70	42	57	20	68	34	79	47	79	47	83	53	99	60	104	64
21	103	74	91	70	93	55	82	50	81	42	59	26	66	44	77	47	76	49	74	48	92	65	107	65
22	105	79	90	69	90	52	86	45	78	46	65	23	65	35	75	46	76	45	80	50	98	60	106	72
23	108	79	90	64	95	54	83	46	74	46	61	36	73	36	76	44	80	48	84	52	93	57	106	75
24	108	77	95	68	96	59	83	52	65	46	63	38	74	38	76	43	83	47	87	54	93	52	107	70
25	106	78	96	70	97	58	81	49	60	35	57	39	74	44	77	46	85	49	89	52	95	51	107	70
26	103	83	100	70	95	60	80	46	60	40	55	34	73	44	78	46	89	57	91	53	99	52	108	72
27	106	81	99	69	95	60	77	38	71	37	51	32	60	37	81	46	86	55	93	55	99	58	109	71
28	110	72	100	69	95	59	78	38	70	41	53	39	64	37	83	50	89	54	95	56	93	59	110	69
29	110	74	97	78	87	64	74	40	66	36	52	42	65	40	.....	.....	95	58	99	62	92	56	109	65
30	113	75	94	74	85	55	78	42	66	41	51	41	56	42	.....	.....	87	63	97	59	93	57	105	61
31	105	80	96	72	.....	.....	85	42	.....	.....	59	40	64	32	.....	.....	77	59	.....	.....	95	55	.....	.....
Range	51°		46°		51°		54°		51°		56°		46°		51°		58°		59°		56°		54°	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, FORT CRAIG, N. MEX.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	(*)	(*)	100	63	76	60	83	46	75	27	(‡)	22	53	14	54	20	77	36	58	40	(†)	(†)	85	47
2			101	66	86	62	86	44	72	34	(†)	(†)	60	17	59	28	75	32	75	39			84	53
3			105	66	87	63	90	42	64	31			45	23	62	30	75	49	81	39	91	43	86	50
4			101	62	85	63	90	45	69	37	(‡)	23	52	33	54	38	79	39	82	43	87	53	93	47
5			104	66	82	60	75	49	(†)	(†)		23	51	21	49	27	81	35	82	42	87	46	97	53
6			104	68	85	59	83	44				23	46	18	45	15	83	34	82	45	84	45	96	57
7			99	66	85	56	85	42				29	51	25	53	14	80	37	80	39	91	43	87	64
8			99	65	90	56	89	42				32	35	10	59	20	73	36	78	43	91	44	92	49
9			97	67	84	57	86	42				15	35	— 2	54	29	71	30	73	46	91	48	94	50
10			83	68	76	52	85	43				21	37	1	64	25	76	27	79	35	93	51	95	50
11			82	66	77	55	84	41	58	33		28	39	11	67	25	80	29	81	40	77	50	93	48
12			75	65	80	47	85	39	61	27		29	42	0	73	27	78	35	70	45	84	46	88	62
13			80	60	82	45	84	39	65	32		21	37	14	82	43	74	35	73	35	85	48	89	54
14			93	65	87	44	83	45	62	33		11	56	30	78	43	80	29	70	40	91	46	94	52
15			95	63	87	48	80	49	61	25	44	7	50	27	75	36	75	38	68	45	93	52	96	53
16			94	58	89	46	63	42	56	38	40	8	49	15	71	37	80	39	68	39	91	59	95	55
17			96	64	88	52	71	28	59	27	45	6	50	18	61	32	76	46	77	31	90	49	95	53
18			90	64	86	48	77	27	63	22	52	11	49	21	71	23	79	35	80	33	92	57	98	56
19			93	60	84	57	83	32	65	24	50	11	50	13	74	27	79	38	72	45	92	57	96	58
20			92	67	80	43	85	41	71	28	41	14	50	15	78	29	80	43	81	42	94	50	97	60
21			94	69	84	41	71	42	66	30	49	9	55	15	81	31	76	50	61	38	96	52	95	63
22			90	66	85	43	71	23	67	27	49	11	59	16	75	30	75	37	66	45	95	56	93	56
23			84	65	90	42	77	28	74	26	50	11	63	21	73	26	84	37	70	40	95	52	88	59
24			92	64	91	44	79	33	57	28	50	10	66	23	80	27	80	48	78	39	93	55	98	62
25			94	66	86	45	73	35	39	24	36	12	68	23	80	37	84	49	82	46	94	57	98	64
26	100	65	85	66	85	56	62	30	42	14	49	10	53	23	68	27	88	42	88	44	95	55	100	67
27	94	55	89	64	85	46	60	28	53	17	47	9	64	35	79	29	85	45	90	48	92	57	(§)	(§)
28	94	60	80	65	88	44	71	22	57	19	47	25	63	25	82	33	79	40	94	44	92	53		
29	98	63	85	65	86	46	74	23	(‡)	22	54	18	52	41			89	40	97	48	90	55		
30	98	62	92	60	84	50	70	28		26	55	23	61	36			89	38	97	51	88	58		
31	90	65	84	60			71	28			56	17	59	22			79	43			60	83		
Range			47°		50°		68°						70°		68°		62°		66°					
Monthly mean																								

* No record. † No observations. ‡ Maximum thermometer broken. § Station discontinued June 27, 1879.

Maximum, minimum, and mean temperatures—Continued.

STATION, FORT DAVIS, TEXAS.

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	77	68	86	70	82	62	81	58	76	54	62	19	66	30	46	27	74	40	43	40	80	51	74	50
2	76	65	86	71	79	64	83	57	73	58	67	19	62	40	42	30	57	39	74	32	92	50	72	52
3	79	68	88	71	80	(*)	83	62	72	57	68	31	66	34	53	36	73	37	78	32	84	65	79	50
4	81	67	87	72	75	.....	82	63	73	56	65	26	55	33	58	41	72	46	76	40	84	65	94	50
5	84	66	87	69	69	.....	69	63	72	53	68	30	50	25	47	32	77	40	84	55	85	52	89	56
6	87	67	87	69	77	.....	77	55	70	57	72	30	56	23	42	25	80	44	81	53	74	55	94	60
7	90	70	87	73	74	.....	73	57	68	56	66	30	61	39	55	74	82	53	78	45	89	57	91	67
8	86	70	87	71	77	.....	75	58	72	55	55	39	41	16	64	27	73	51	83	54	92	61	94	57
9	86	70	85	75	71	.....	82	54	70	54	55	29	49	16	60	36	74	36	73	48	94	63	95	66
10	87	70	88	69	67	.....	83	58	70	53	69	25	62	24	61	44	78	37	77	38	94	62	93	66
11	87	71	79	68	65	.....	73	55	65	45	58	42	53	29	68	45	71	43	84	47	80	62	92	65
12	86	71	79	68	69	.....	83	55	67	47	49	30	65	22	75	46	66	46	82	56	81	55	84	65
13	86	69	85	69	78	.....	83	65	68	53	38	20	72	35	79	50	70	36	70	46	77	52	90	62
14	82	72	86	67	80	.....	86	66	66	52	28	16	75	34	62	37	67	36	73	50	77	61	90	64
15	87	68	85	64	82	.....	85	65	69	45	45	4	63	46	75	36	77	48	70	53	90	55	92	60
16	92	72	84	72	83	.....	77	65	61	52	40	21	60	30	73	44	71	53	65	46	90	62	92	66
17	92	73	85	67	84	.....	69	55	63	49	54	8	60	45	63	39	63	30	62	38	90	57	90	66
18	87	73	84	67	84	.....	76	58	68	43	62	28	50	30	73	35	70	30	73	34	91	69	83	58
19	86	64	81	71	85	.....	80	55	66	42	58	22	56	15	75	34	78	39	81	45	95	59	75	62
20	80	64	78	67	77	.....	81	64	73	51	32	21	65	34	77	37	78	47	84	45	98	66	82	61
21	85	66	82	67	76	.....	74	54	62	39	53	11	70	31	77	48	74	42	80	54	96	66	72	60
22	87	70	82	68	85	.....	74	52	72	34	55	14	67	48	72	44	77	53	70	46	94	66	89	62
23	84	71	80	72	86	.....	77	55	74	43	61	23	65	31	73	36	82	41	73	39	95	71	86	65
24	85	71	85	68	87	.....	79	59	62	33	39	17	75	35	75	36	72	50	76	43	94	69	87	65
25	85	69	87	67	86	.....	70	47	34	26	30	11	71	37	73	53	84	44	76	44	90	65	85	64
26	80	68	88	69	78	.....	70	48	48	17	51	11	70	39	63	25	83	47	85	47	86	63	90	66
27	78	67	89	71	83	.....	67	38	54	30	50	23	70	37	75	34	82	50	80	59	88	58	92	65
28	78	65	83	71	86	.....	73	52	69	37	45	36	70	37	79	39	70	53	91	53	91	63	87	68
29	75	66	74	66	87	.....	73	56	65	33	57	28	66	35	.....	.....	78	47	95	62	91	57	93	62
30	80	66	77	63	83	.....	72	44	59	28	49	34	71	48	.....	.....	87	47	93	64	92	58	96	70
31	83	66	81	62	.....	.....	70	51	.....	.....	63	36	58	44	.....	.....	85	55	.....	.....	76	54	.....	.....
Range	28°		27°		.....		48°		59°		68°		60°		55°		57°		63°		48°		46°	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

* Minimum thermometer out of order.

Maximum, minimum, and mean temperatures—Continued.

STATION, FORT GARRY, MAN.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	82.4	44.0	85.0	53.4	75.5	56.3	53.4	44.0	43.4	20.0	40.5	23.4	−20.4	−28.3	22.5	− 9.3	9.4	−19.3	21.4	5.3	68.5	38.4	76.5	33.0
2	83.3	56.4	86.3	54.5	69.5	49.5	56.4	33.3	42.5	13.3	31.5	13.3	−10.4	−29.3	24.0	6.3	20.3	− 8.5	17.3	− 8.6	68.5	38.0	80.0	47.3
3	84.3	57.5	85.5	53.3	84.6	54.4	57.5	42.0	33.5	20.4	30.5	18.6	− 7.4	−18.3	21.5	− 8.7	34.7	12.4	23.5	−10.3	56.5	43.5	88.3	54.3
4	87.3	61.6	86.5	58.4	66.0	54.5	51.3	32.5	45.6	18.3	26.5	13.4	− 7.4	−17.3	12.0	−10.8	25.5	− 2.2	37.3	− 3.2	48.0	34.5	67.5	44.2
5	88.4	62.4	83.5	54.5	59.5	51.4	54.3	23.0	46.0	29.5	22.0	11.0	3.2	−25.4	10.0	−16.3	38.3	− 4.2	51.5	21.4	45.5	33.3	63.5	42.4
6	90.5	68.5	83.5	56.4	60.0	50.5	46.5	33.4	40.3	27.0	17.5	8.5	13.0	− 1.4	14.0	− 8.3	24.4	4.2	41.5	25.0	57.5	28.3	72.0	36.3
7	78.5	62.2	86.0	60.5	71.5	49.4	52.3	35.5	46.5	12.4	22.0	11.4	14.5	− 5.3	7.4	− 8.7	38.5	16.4	52.0	21.4	59.5	30.4	77.5	49.4
8	81.7	53.4	77.0	54.5	70.0	48.3	53.0	28.4	42.0	17.4	28.5	17.3	2.2	−15.3	1.5	−16.3	43.5	18.5	61.5	33.3	57.0	36.3	85.4	58.5
9	77.0	52.5	80.3	51.5	52.5	41.0	56.5	23.2	43.5	30.0	26.5	4.4	6.0	−16.6	17.5	−25.3	42.5	26.4	62.5	38.4	68.5	40.0	81.5	50.3
10	81.0	49.4	76.4	53.3	55.0	38.5	56.0	35.4	37.5	26.5	17.5	3.4	6.3	−14.4	15.3	−12.3	29.5	6.4	58.5	37.3	74.5	50.0	74.0	53.0
11	83.5	53.4	76.3	53.6	62.0	29.4	59.5	26.4	46.5	24.6	16.0	5.3	14.5	− 2.2	− 2.2	−16.3	18.5	0.2	60.5	29.0	74.5	45.5	78.3	52.5
12	87.4	63.2	78.5	49.3	67.4	35.0	61.5	27.4	41.3	28.0	15.5	− 4.2	8.3	−12.6	−12.4	−26.3	25.5	9.4	52.5	40.0	66.5	44.3	82.5	54.0
13	93.3	61.2	81.5	54.3	71.5	45.3	64.5	38.4	36.5	19.6	10.5	−10.4	− 2.3	−26.4	−12.4	−35.3	15.5	− 8.3	52.4	34.3	64.5	36.0	71.0	61.4
14	94.5	63.2	68.5	51.4	67.4	44.0	52.0	35.5	41.5	21.4	9.5	− 8.7	−12.4	−34.3	6.4	−34.0	2.4	−18.5	53.0	30.4	72.5	33.3	62.5	54.0
15	78.3	64.6	66.4	48.0	60.0	44.3	45.3	30.5	45.7	29.3	16.5	3.4	− 1.2	−24.6	12.5	−10.6	2.5	−20.3	52.5	28.4	77.5	45.0	80.0	52.4
16	82.5	63.4	69.5	42.3	64.4	36.5	44.5	29.0	46.5	24.4	14.5	4.4	8.4	−15.3	− 6.4	−29.3	10.5	−22.4	55.3	29.5	74.5	44.0	83.4	55.0
17	86.6	54.4	73.0	47.5	54.5	42.4	37.5	24.3	53.3	27.5	9.2	− 2.4	12.4	− 5.6	13.5	−18.5	7.5	−20.3	62.5	30.4	64.5	34.4	80.5	55.4
18	80.4	58.3	82.0	58.5	56.5	42.0	45.5	19.4	43.5	35.3	6.4	−10.3	− 5.6	−20.5	8.0	− 4.3	9.6	−17.6	61.4	28.7	63.5	40.4	75.0	54.3
19	80.0	54.5	81.4	50.4	55.6	37.4	58.7	35.4	42.5	24.3	4.5	− 6.3	7.3	−24.7	− 4.0	−24.3	11.4	−16.5	62.5	31.4	60.5	42.0	77.0	57.4
20	76.5	52.4	86.5	58.3	45.5	32.3	50.3	36.0	39.5	21.4	12.3	− 5.5	7.5	−16.5	4.0	−33.5	16.0	−20.3	68.5	42.4	69.5	38.4	74.5	56.3
21	78.5	51.4	87.5	69.4	55.5	25.0	37.5	26.4	38.5	23.5	− 2.4	−18.5	6.5	− 7.3	28.5	2.4	16.5	−16.6	71.5	46.3	72.5	47.3	70.0	47.4
22	76.4	57.3	88.5	68.5	64.5	43.4	34.0	23.0	41.5	19.3	− 6.4	−24.3	14.5	−13.3	− 1.4	− 8.3	28.5	− 5.3	50.5	41.0	71.5	46.3	81.5	48.3
23	84.4	59.3	75.5	58.4	54.8	36.5	33.6	22.4	35.5	26.4	2.5	−12.5	23.4	− 3.4	− 1.4	−24.3	34.0	3.4	53.5	39.3	68.0	50.4	70.0	57.3
24	90.3	65.8	74.4	48.0	57.5	29.4	32.3	20.5	30.0	19.5	7.7	−13.6	20.3	− 5.3	8.5	− 6.2	29.0	− 9.5	61.5	42.0	70.4	52.0	65.7	54.5
25	77.3	62.5	80.3	43.5	51.8	25.4	32.3	20.5	26.5	11.4	14.0	− 7.5	8.3	−20.4	−22.4	−31.5	43.0	24.5	48.5	37.3	68.0	43.4	74.5	48.0
26	76.5	51.3	81.4	50.0	57.5	24.0	22.5	16.3	29.0	19.5	10.5	− 3.4	29.5	6.3	−17.7	−43.6	42.5	18.3	37.5	34.0	70.5	42.0	69.5	54.0
27	83.4	48.4	82.3	60.2	68.5	42.3	23.6	13.5	32.5	18.4	8.3	− 3.4	27.3	− 5.3	− 5.4	−35.5	48.3	28.0	46.5	29.3	73.5	40.3	71.5	51.3
28	85.6	49.4	84.6	51.5	74.3	50.5	26.5	18.4	35.5	10.4	10.0	−11.4	14.5	−18.7	5.5	−12.3	43.0	29.0	43.0	28.4	78.5	56.4	74.0	49.4
29	80.4	60.2	87.5	54.3	63.5	42.3	25.5	17.3	26.5	12.3	8.5	− 8.3	16.0	− 7.4	.....	.....	43.5	29.0	58.5	27.0	77.5	57.0	83.0	51.0
30	82.5	59.3	84.5	62.4	64.5	50.2	26.5	9.3	27.5	10.3	15.5	− 7.3	27.0	4.2	.....	.....	50.0	22.4	66.4	32.3	58.4	38.0	81.0	53.0
31	84.6	55.5	84.4	56.4	.....	.....	40.7	14.5	.....	.....	−11.6	−23.6	14.0	−11.3	.....	.....	33.5	12.5	.....	.....	57.6	35.5	.....	.....
Range	50°.5		46°.2		60°.6		55°.2		43°.0		64°.8		63°.8		72°.1		72°.4		81°.8		50°.2		55°.3	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, FORT GIBSON, IND. TER.

Day of month.	1878. July. Max.	1878. July. Min.	1878. August. Max.	1878. August. Min.	1878. September. Max.	1878. September. Min.	1878. October. Max.	1878. October. Min.	1878. November. Max.	1878. November. Min.	1878. December. Max.	1878. December. Min.	1879. January. Max.	1879. January. Min.	1879. February. Max.	1879. February. Min.	1879. March. Max.	1879. March. Min.	1879. April. Max.	1879. April. Min.	1879. May. Max.	1879. May. Min.	1879. June. Max.	1879. June. Min.
1	80	67	99	71	92	59	85	61	69	38	43	33	42	17	42	30	59	33	64	47	71	55	69	57
2	81	63	96	72	94	65	83	49	68	48	59	24	17	6	47	24	36	27	71	31	74	50	69	48
3	82	62	91	72	95	67	85	59	71	37	63	35	14	— 1	56	27	53	27	56	34	79	60	81	47
4	83	70	95	70	94	64	70	59	77	55	56	32	15	4	52	39	55	50	63	28	74	59	87	56
5	85	71	94	70	93	66	66	59	75	51	62	26	15	5	40	31	73	51	73	42	71	57	89	58
6	89	68	95	69	90	69	73	56	75	56	56	45	28	— 5	38	27	79	58	77	60	77	58	89	57
7	91	69	95	70	89	72	78	53	78	55	45	40	36	21	46	21	80	61	70	54	76	52	87	66
8	91	73	98	73	78	70	86	64	65	52	44	35	33	13	55	29	74	61	73	51	78	56	90	69
9	95	73	98	74	75	67	85	64	65	51	49	32	29	0	58	30	79	64	73	59	81	60	94	70
10	96	74	96	72	72	58	83	63	72	53	58	23	29	16	57	45	82	64	68	47	89	67	96	69
11	95	75	78	71	70	47	74	50	56	43	45	32	35	25	52	35	71	55	68	49	86	70	95	74
12	96	75	84	68	70	40	75	43	63	28	41	32	29	12	41	28	72	52	73	51	80	68	98	72
13	96	76	87	63	76	41	86	61	66	31	41	29	46	22	28	18	67	48	71	54	78	59	95	74
14	98	75	90	65	84	59	84	68	63	44	33	24	52	32	29	18	48	29	73	54	67	58	100	71
15	92	75	87	68	85	59	84	70	60	47	35	18	50	31	31	19	45	31	76	50	72	57	94	67
16	96	76	88	69	85	57	78	54	61	34	39	21	42	21	41	31	43	29	63	54	80	48	93	62
17	94	76	92	71	87	58	64	39	64	34	29	17	42	28	36	32	43	24	66	42	83	57	94	69
18	94	75	94	72	88	67	65	32	65	30	30	13	41	21	44	25	54	26	73	36	88	62	91	72
19	94	73	95	73	87	68	73	43	62	32	34	29	38	17	49	29	61	25	84	44	87	70	88	71
20	96	73	99	73	75	55	74	52	61	36	36	28	53	24	56	30	65	47	82	55	88	63	94	69
21	96	73	96	72	73	45	65	43	55	36	43	14	62	29	69	42	72	41	78	63	93	61	79	68
22	93	76	97	71	75	47	64	30	67	32	34	17	61	42	64	49	59	43	78	59	92	67	90	71
23	92	74	97	72	85	57	78	45	74	48	45	15	55	29	65	29	73	32	77	58	92	72	95	76
24	92	71	97	71	90	66	78	57	58	48	20	10	64	35	77	42	68	41	74	61	93	72	97	77
25	86	76	98	74	89	62	68	49	48	30	29	6	68	48	64	25	79	49	78	58	90	70	93	78
26	90	73	91	72	73	51	54	37	43	35	33	12	66	53	36	14	77	62	80	56	92	67	98	75
27	83	72	92	73	65	54	49	31	55	26	29	3	71	52	54	26	88	48	76	57	92	65	98	65
28	83	73	88	70	80	62	48	25	61	22	35	10	58	43	63	40	82	69	78	49	92	65	84	65
29	86	72	85	63	87	69	50	38	66	41	38	28	49	41	.....	.....	88	43	82	56	93	70	88	68
30	94	69	84	61	87	71	60	35	56	39	37	30	49	43	.....	.....	76	52	69	62	92	69	85	69
31	99	72	89	58	.....	.....	57	26	.....	.....	39	30	49	39	.....	.....	84	51	.....	.....	74	59	.....	.....
Range	37°		41°		55°		61°		56°		60°		76°		63°		64°		56°		45°		53°	
Monthly mean	81°.9		80°.4		71°.5		60°.8		52°.1		32°.6		34°.3		39°.7		56°.4		62°.2		72°.4		78°.4	

Maximum, minimum, and mean temperatures—Continued.

STATION, FORT GRIFFIN, TEX.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	83	65	96	75	95	66	88	68	78	39	55	33	70	26	(*)	.....	61	36	65	44	84	61	78	56
2	84	66	96	76	95	66	93	58	78	47	75	27	38	16	.....	.....	51	32	73	34	78	61	78	54
3	85	64	98	74	95	65	93	66	70	57	72	40	29	14	55	30	74	38	62	46	89	67	85	48
4	87	69	99	76	93	67	92	65	76	47	65	34	23	16	53	32	75	46	70	35	88	62	93	56
5	90	72	95	72	91	67	74	62	75	48	69	30	32	8	36	27	82	55	80	46	75	59	92	56
6	93	68	96	73	89	72	82	50	81	52	63	38	42	7	40	25	87	53	89	62	74	56	96	56
7	91	69	96	73	88	70	90	59	79	51	61	42	45	26	55	16	84	60	74	51	73	61	94	68
8	92	70	97	72	85	70	89	62	78	61	54	30	37	12	64	26	81	62	86	54	80	59	97	72
9	93	69	97	72	75	62	88	59	69	52	59	36	39	6	68	29	85	58	77	52	88	64	100	73
10	95	71	98	71	75	57	96	61	70	48	76	26	45	15	73	47	87	62	78	40	90	66	90	70
11	94	70	82	70	74	49	83	63	60	42	59	40	38	17	66	39	80	54	79	44	88	69	98	79
12	95	73	86	66	78	46	94	54	67	35	42	35	55	10	58	32	78	55	81	52	89	64	89	74
13	97	74	90	67	89	51	94	67	68	35	38	27	67	27	58	23	71	53	83	58	84	56	98	80
14	94	69	94	67	90	54	91	71	58	45	40	25	70	37	38	18	54	31	78	56	81	57	103	75
15	96	69	98	69	87	53	92	75	66	45	50	22	66	40	56	19	84	33	78	53	85	53	100	75
16	98	76	97	71	87	52	81	55	68	41	58	22	49	28	57	29	65	40	60	53	93	66	95	68
17	96	74	95	70	88	52	71	40	58	49	40	16	49	35	41	28	49	26	68	46	90	67	97	74
18	96	71	95	71	92	65	81	38	68	39	42	16	52	23	58	18	56	30	77	40	97	68	96	74
19	95	70	94	72	90	67	82	42	67	36	33	27	59	23	73	28	71	30	84	45	104	73	93	76
20	94	70	95	71	79	55	90	48	67	39	34	25	66	25	67	31	69	53	91	61	103	67	76	70
21	97	73	95	71	81	45	74	46	64	41	56	23	72	25	82	48	86	39	87	61	99	70	78	67
22	101	76	95	69	86	46	75	36	79	38	53	21	71	40	68	47	68	47	74	57	(*)	.....	88	74
23	98	75	98	71	96	60	86	40	80	47	63	22	62	32	73	33	81	41	61	54	.....	.....	93	74
24	99	74	99	71	95	65	89	58	57	44	34	18	77	33	88	41	78	57	75	49	96	76	94	78
25	100	78	100	72	92	72	64	45	51	33	29	14	72	38	75	38	87	55	77	56	94	70	95	74
26	99	78	98	73	77	58	55	44	45	25	35	15	73	45	48	24	91	64	89	53	90	68	96	73
27	89	71	100	79	72	62	50	35	58	25	44	15	82	48	63	24	93	62	76	62	89	65	96	73
28	76	70	86	73	89	65	50	40	73	28	38	26	72	45	75	34	67	61	85	53	93	63	92	71
29	88	72	88	69	91	69	65	42	69	39	50	33	59	45	.....	.....	85	49	87	59	101	73	93	71
30	95	73	88	61	92	69	70	37	56	37	38	27	53	44	.....	.....	93	52	98	64	102	76	91	69
31	96	75	93	59	.....	.....	70	35	.....	.....	52	33	(*)	.....	.....	.....	98	60	.....	.....	84	68	.....	.....
Range	37°		41°		51°		61°		56°		62°		.....		.....		72°		64°		.....		55°	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

* No observation taken.

Maximum, minimum, and mean temperatures—Continued.

STATION, FORT McKAVETT, TEX.

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	77	67	97	72	93	61	93	63	70	50	59	34	70	32	57	24	(*)	(*)	71	43	77	64	80	54
2	82	63	100	73	94	66	93	60	77	54	69	35	51	21	48	39	.....	.....	75	35	83	61	81	48
3	88	63	99	71	94	68	88	66	75	50	73	43	38	24	53	38	67	42	80	40	90	64	88	48
4	88	62	96	68	94	78	88	64	73	48	70	36	32	21	62	39	73	49	75	38	90	63	92	52
5	93	62	98	71	89	67	81	57	73	50	67	49	28	18	47	28	78	52	73	53	85	60	91	57
6	94	69	98	72	96	65	85	60	80	58	72	48	40	18	38	26	81	51	86	62	81	56	97	62
7	94	68	99	72	80	67	90	63	80	61	73	53	52	19	60	29	80	56	82	55	81	55	95	66
8	92	66	99	72	86	70	88	60	78	55	60	34	43	16	66	36	72	58	91	60	85	61	95	68
9	94	69	99	73	81	55	85	63	72	42	58	38	50	6	64	40	79	56	81	54	88	61	97	71
10	95	70	102	71	73	52	93	61	74	40	72	44	51	13	72	51	82	60	83	42	89	63	100	72
11	95	70	97	69	72	47	85	61	64	36	65	49	52	30	74	37	82	56	85	49	89	64	98	71
12	97	69	90	64	77	50	89	64	65	36	56	39	62	17	78	39	71	54	81	54	89	61	85	73
13	95	72	95	64	82	52	86	66	65	45	42	27	71	36	57	32	73	42	82	63	85	59	95	70
14	95	69	98	66	84	52	87	65	69	38	35	22	74	42	43	20	70	42	83	51	88	54	94	73
15	97	73	97	66	87	60	87	71	68	41	54	28	73	53	60	27	77	45	83	57	94	58	99	71
16	102	73	98	67	85	57	80	41	75	47	55	25	61	39	76	40	83	57	68	52	95	62	97	68
17	(*)	(*)	96	72	87	63	73	36	57	38	53	21	63	40	56	35	61	28	70	42	99	65	98	70
18	99	72	92	72	90	67	77	44	68	37	57	25	55	25	63	24	65	29	80	36	100	68	96	71
19	95	69	93	68	88	67	77	50	70	37	50	29	60	15	73	33	70	36	82	46	100	68	91	71
20	92	70	93	60	72	46	85	55	75	40	36	24	64	30	74	40	85	56	89	55	105	68	89	70
21	96	70	90	71	82	49	70	31	65	38	.....	.....	68	33	75	49	88	51	88	60	107	65	88	69
22	101	71	94	67	90	65	73	40	72	40	.....	.....	75	44	75	50	77	52	80	53	102	66	96	69
23	101	71	98	67	95	69	80	52	80	43	.....	.....	65	35	73	37	81	49	67	56	94	68	96	72
24	97	73	99	70	92	70	86	56	66	34	.....	.....	73	31	82	48	80	56	69	49	91	67	98	71
25	98	74	92	70	94	65	78	50	41	23	44	19	72	45	85	45	82	55	(*)	(*)	92	66	100	68
26	97	71	100	70	85	62	75	34	50	27	40	21	70	48	.....	.....	89	63	.....	.....	91	67	100	71
27	81	70	98	71	89	63	48	35	60	26	44	16	78	47	.....	.....	90	64	84	65	92	67	99	71
28	82	71	(*)	(*)	90	69	60	40	70	38	53	33	75	53	.....	.....	78	60	89	54	91	65	100	72
29	89	71	.....	.....	89	70	80	47	70	37	62	43	74	53	.....	.....	86	52	89	60	96	64	98	70
30	93	71	98	56	91	68	70	40	53	34	52	32	70	61	.....	.....	92	52	92	65	97	69	98	70
31	98	71	95	66	.....	.....	70	45	.....	.....	53	35	64	49	.....	.....	91	61	.....	.....	83	65	.....	.....
Range	.....	.....	.....	.....	49°		62°		57°		.....	.....	72°		.....	.....	.....	.....	.....	.....	53°		52°	
Monthly mean	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* No observation taken.

Maximum, minimum, and mean temperatures—Continued.

STATION, FORT SILL, IND T.

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	79	68	96	76	96	68	86	65	73	37	52	32	39	19	45	29	34	25	61	48	72	55	72	51
2	81	61	97	79	96	70	88	58	71	47	64	29	28	10	50	28	49	21	71	34	75	53	73	47
3	84	61	91	61	93	64	91	67	76	50	67	37	17	7	57	28	64	35	61	35	80	62	86	53
4	84	64	90	70	91	68	84	63	76	49	62	37	15	8	48	30	66	45	64	31	79	59	91	56
5	87	64	93	68	90	65	70	55	73	51	63	32	23	5	36	26	79	48	80	46	69	58	90	56
6	89	67	95	73	88	68	74	54	79	52	55	37	28	9	40	22	85	50	84	62	74	50	90	58
7	89	74	93	73	93	66	83	52	80	53	54	35	37	23	49	26	83	51	72	53	74	57	87	64
8	93	73	97	72	86	71	88	62	60	50	50	31	31	18	57	30	78	56	78	49	78	60	91	69
9	93	73	96	74	76	59	86	62	62	52	55	35	32	9	60	38	81	51	71	55	84	65	97	73
10	93	74	95	72	76	53	91	67	64	50	65	29	37	21	67	45	85	54	77	45	87	64	96	69
11	95	73	83	69	72	44	79	57	64	40	48	37	36	17	57	36	76	48	74	43	82	68	97	75
12	94	72	85	63	77	45	85	53	63	34	37	30	34	4	44	26	76	53	78	51	83	69	92	78
13	96	73	88	61	89	50	91	64	63	37	34	22	44	16	31	17	66	50	81	56	81	56	95	74
14	95	76	91	67	91	51	87	68	56	47	30	18	46	32	30	16	41	25	75	49	79	58	98	75
15	93	78	91	70	88	55	91	73	59	48	39	14	48	31	45	22	65	30	71	48	80	53	94	64
16	96	75	92	68	88	54	79	52	57	43	37	24	39	22	39	31	48	29	62	50	84	63	96	64
17	87	73	92	71	89	52	69	40	63	46	26	13	43	30	38	30	45	22	66	44	80	64	96	71
18	94	77	92	74	91	66	75	39	65	38	33	14	43	23.3	48	25	54	29	74	44	88	67	87	74
19	94	75	93	71	88	69	80	40	61	40	30	20	46	22	56	29	65	29	83	44	95	71	84	68
20	93	71	95	72	76	50	81	51	69	41	32	22	57	28	60	28	63	44	83	60	88	61	77	69
21	97	73	95	71	78	46	66	49	61	40	48	20	62	32	79	38	75	39	80	61	90	64	78	69
22	98	73	93	71	82	48	70	35	76	37	45	24	61	32	63	44	64	43	61	58	89	68	87	73
23	92	75	96	70	93	55	80	38	74	42	47	18	56	34	67	34	77	37	66	55	88	70	90	73
24	94	76	98	71	94	56	74	48	56	42	22	10	69	33	76	32	73	51	74	49	91	74	93	76
25	90	75	97	69	85	67	57	44	45	30	29	12	69	42	64	28	85	45	74	56	89	72	94	73
26	86	74	92	69	76	51	49	36	39	28	30	20	66	48	43	22	84	57	80	53	90	67	93	74
27	79	70	96	72	75	57	50	25	60	26	39	14	70	50	58	23	91	60	72	55	88	63	94	75
28	80	70	92	71	88	66	50	35	66	30	38	27	58	43	68	35	72	60	78	53	87	68	86	61
29	88	70	86	64	89	66	56	38	63	33	37	29	52	40	.....	.....	82	47	82	62	94	70	86	69
30	94	72	88	57	89	66	68	32	43	36	34	22	52	40	.....	.....	80	51	81	66	96	60	81	64
31	97	73	91	59	.....	.....	65	33	.....	.....	44	31	55	38	.....	.....	95	54	.....	.....	78	62	.....	.....
Range	37°		41°		52°		66°		54°		57°		79°		63°		74°		53°		46°		51°	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, FORT SAINT MICHAEL'S, ALASKA.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	58	42	58	45	48	41	36	25	22	15	22	8	43	27	12	−12	8	−11	35	24	31	9	46	33
2	59	49	55	49	52	32	40	32	29	16	21	1	35	28	30	2	4	−20	33	18	15	4	42	30
3	58	42	55	49	53	37	39	30	27	22	14	−4	32	24	30	11	−5	−18	32	9	14	2	55	34
4	61	46	55	45	50	38	36	28	28	20	20	4	31	24	22	6	14	−15	22	3	19	−2	51	35
5	59	48	53	47	48	34	37	29	25	15	23	11	30	10	22	−13	15	−12	36	16	21	4	51	32
6	58	46	55	46	50	40	35	26	21	12	18	2	32	15	30	−12	4	−18	33	22	33	1	50	31
7	60	46	61	43	52	44	39	30	20	12	8	−12	32	22	28	13	−2	−20	30	19	40	26	43	32
8	62	45	61	50	58	46	38	27	27	15	5	−15	30	22	27	14	2	−18	35	22	44	33	45	32
9	58	42	63	48	55	45	36	27	30	21	−7	−20	29	18	20	2	12	−10	32	10	40	28	43	34
10	55	38	64	56	55	38	34	28	26	7	−10	−31	30	21	17	−1	16	−1	30	10	40	28	45	34
11	58	45	61	54	51	42	31	20	25	7	11	−30	32	10	20	−1	13	−5	30	12	41	28	45	35
12	62	46	65	51	52	46	30	17	32	22	15	5	32	21	25	4	18	−10	24	11	40	31	47	30
13	73	52	66	52	58	48	29	20	27	20	21	10	31	20	28	19	20	−5	16	−4	41	32	40	31
14	62	50	57	48	55	47	28	17	23	15	30	17	28	14	20	−3	20	−7	12	0	40	29	48	32
15	55	46	58	48	53	46	28	20	20	4	31	15	25	7	2	−12	25	0	12	−10	38	39	(*)	(*)
16	55	46	58	49	52	44	27	10	9	−1	30	14	10	−12	−4	−19	30	15	11	−10	41	32	.....	.....
17	57	45	52	45	51	42	28	19	9	−5	27	13	0	−18	−10	−23	37	24	10	−20	39	31	.....	.....
18	64	45	48	42	56	46	28	13	14	−1	25	12	7	−20	−4	−30	30	18	24	−13	39	29	.....	.....
19	59	50	54	44	56	47	29	20	13	5	28	10	10	−20	−2	−18	31	8	32	4	39	31	.....	.....
20	57	51	54	48	58	50	27	21	15	8	18	3	28	8	−3	−15	40	23	33	4	35	29	.....	.....
21	60	51	58	48	56	45	27	16	16	12	10	−10	23	−5	−2	−16	31	12	32	7	39	27	.....	.....
22	59	50	64	47	51	43	25	11	17	2	9	−5	0	−19	0	−18	30	11	30	5	38	24	.....	.....
23	59	49	59	46	51	34	26	16	12	−8	25	5	−2	−21	−2	−23	30	15	37	27	39	23	.....	.....
24	58	48	60	49	47	35	32	16	16	−5	35	20	−1	−15	−2	−22	32	20	34	8	38	21	.....	.....
25	54	46	58	47	47	35	41	26	12	−12	42	27	19	−10	−2	−15	28	14	31	15	51	30	.....	.....
26	54	46	54	47	47	31	41	32	17	6	40	31	22	4	4	−19	20	0	32	24	53	28	.....	.....
27	54	41	52	44	48	38	40	33	15	2	41	31	17	1	2	−18	28	13	27	8	45	28	.....	.....
28	51	36	58	48	47	37	36	30	15	−5	42	32	8	−3	5	−14	21	−2	24	−3	39	28	.....	.....
29	53	37	56	45	43	34	35	28	22	10	45	34	18	1	.....	.....	25	0	25	15	37	30	.....	.....
30	58	43	56	44	37	26	33	28	22	3	43	29	16	5	.....	.....	39	22	30	10	40	29	.....	.....
31	55	46	51	42	.....	.....	30	16	.....	.....	33	26	12	−3	.....	.....	39	25	.....	.....	41	30	.....	.....
Monthly mean	52°.1		52°.4		46°.0		29°.1		15°.6		16°.6		14°.9		3°.5		13°.6		19°.0		31°.5		.....	.....
Range	37°		24°		32°		31°		44°		76°		64°		60°		60°		57°		55°		.....	.....

* Records not received at time of publication of this report.

Maximum, minimum, and mean temperatures—Continued.

STATION, FREDERICKSBURG, TEX.

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	80	63	94	68	92	57	90	62	70	37	68	28	75	33	58	32	76	40	(*)	(*)	83	54	80	45
2	84	69	96	70	94	61	92	65	75	50	70	25	55	21	50	30	65	32	.....	.....	78	52	80	49
3	88	63	98	70	(*)	63	87	65	75	47	80	37	40	15	55	30	70	32	90	40	85	52	82	46
4	90	65	94	68	.....	.....	90	62	71	43	72	29	35	15	63	37	70	33	75	40	82	49	85	34
5	87	65	93	68	.....	.....	90	62	70	40	68	33	35	13	57	25	75	45	75	45	85	52	85	35
6	88	66	94	69	.....	.....	87	60	77	54	71	45	47	19	45	25	80	50	75	50	75	53	95	40
7	87	64	(*)	67	.....	.....	86	60	76	58	71	45	51	20	68	23	79	50	83	55	77	52	92	34
8	89	65	94	(*)	91	.....	77	60	78	59	65	40	47	15	68	24	73	50	85	53	80	50	95	45
9	90	65	93	66	86	60	84	66	73	57	60	33	51	10	63	30	72	52	83	57	83	50	92	45
10	90	66	93	66	87	67	90	62	77	43	71	25	50	20	73	31	77	53	83	51	86	46	94	42
11	90	66	95	67	75	55	94	65	65	44	81	25	58	28	79	30	81	52	83	47	85	47	93	42
12	92	66	93	68	75	53	90	65	70	39	64	45	60	17	82	37	75	50	80	46	80	38	90	40
13	89	67	96	63	80	49	90	60	62	30	65	25	66	30	69	30	76	45	82	47	(*)	(*)	93	39
14	91	68	94	65	82	49	85	65	61	50	44	20	67	40	58	20	77	44	87	45	.....	.....	93	45
15	91	66	(*)	67	85	53	85	65	72	40	60	10	72	51	53	20	78	40	84	50	.....	.....	93	43
16	93	68	(*)	.....	85	55	87	65	73	40	60	10	63	41	70	30	77	46	72	46	92	39	93	42
17	95	67	96	65	85	53	87	40	66	46	58	20	65	40	60	35	77	28	73	40	87	62	94	43
18	94	66	87	65	87	50	75	35	70	41	58	9	65	29	63	21	66	29	80	30	85	62	85	40
19	90	67	91	65	90	64	75	37	78	30	50	30	62	22	70	25	69	28	80	42	95	63	93	39
20	88	63	91	66	95	60	78	45	80	31	45	25	64	31	70	36	85	51	85	46	102	60	80	42
21	93	66	81	66	83	60	75	54	67	41	60	22	65	35	77	51	88	53	83	52	104	63	89	40
22	96	71	90	65	80	54	75	35	73	32	55	20	73	42	75	50	79	51	78	44	95	62	91	42
23	95	67	92	64	88	47	75	35	75	40	63	29	70	35	75	36	79	40	66	43	92	64	91	41
24	92	67	95	67	90	57	81	50	67	38	52	20	71	30	78	39	79	40	65	42	89	56	93	40
25	92	66	94	68	(*)	65	78	55	54	30	35	10	69	49	88	34	80	55	75	45	87	42	93	41
26	92	70	(*)	67	90	(*)	77	55	58	20	50	15	65	40	58	25	85	58	85	40	85	42	91	40
27	83	65	94	(*)	85	62	60	35	68	20	47	20	72	50	63	25	85	55	90	40	87	42	93	45
28	87	65	93	69	86	60	55	37	65	25	47	25	70	46	69	37	82	54	85	55	90	40	95	42
29	90	66	90	66	86	73	84	43	68	30	60	33	72	55	.....	.....	83	56	82	50	90	59	93	42
30	94	68	91	58	87	65	73	45	61	39	53	30	72	54	.....	.....	91	55	83	55	92	55	95	40
31	95	70	90	58	.....	.....	70	35	.....	.....	53	28	70	50	.....	.....	90	58	.....	.....	.....	.....	.....	.....
Range	33°		.....		.....		59°		60°		72°		65°		68°		63°		.....		.....		61°	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

* No observation taken.

Maximum, minimum, and mean temperatures—Continued.

STATION, GALVESTON, TEX.

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	92	78	94	80	87	78	86	79	64	54	56	43	52	45	69	52	67	59	78	61	81	71	80	71
2	85	75	90	79	85	76	85	77	72	62	57	44	51	41	53	44	64	59	67	56	79	70	80	64
3	85	76	86	76	84	76	86	76	69	61	67	50	43	36	56	45	66	53	73	59	81	72	76	64
4	90	76	88	74	80	74	85	77	69	59	64	51	40	28	65	55	68	57	66	59	82	73	80	69
5	89	75	90	73	82	78	85	76	71	62	63	53	34	25	65	48	70	61	72	62	82	74	83	71
6	81	73	91	79	87	78	84	75	75	64	67	60	39	23	49	40	72	62	76	67	80	64	88	74
7	89	73	91	81	88	79	85	76	74	68	69	62	56	38	51	39	71	62	78	69	76	64	84	74
8	91	80	93	81	89	79	86	77	73	69	71	48	60	34	57	45	72	63	79	69	78	68	87	77
9	92	82	91	81	89	79	86	74	74	69	56	42	41	26	57	47	75	65	79	69	81	71	87	77
10	93	81	92	82	83	74	85	74	73	65	63	41	48	35	66	55	73	66	79	67	82	73	88	78
11	90	79	86	76	77	68	86	75	72	64	69	62	62	42	71	56	74	67	80	61	81	73	87	79
12	93	82	88	78	73	62	83	75	63	52	69	64	46	35	68	57	68	65	76	66	81	72	88	78
13	85	78	89	79	77	61	85	78	66	54	68	54	55	40	65	55	68	58	76	70	82	71	89	78
14	93	80	90	81	77	62	85	77	69	61	54	40	63	49	55	41	72	62	80	72	88	71	88	80
15	94	81	91	80	79	68	86	76	65	58	45	35	64	53	56	41	73	62	81	71	85	71	90	80
16	94	81	91	81	83	68	87	77	69	59	53	42	61	55	67	55	75	66	82	67	84	73	89	79
17	95	82	89	77	86	78	81	67	61	55	51	43	65	55	66	50	70	46	70	59	85	75	90	80
18	91	81	88	80	85	77	70	60	59	53	57	47	62	51	54	42	56	45	74	57	85	75	91	80
19	91	77	89	80	84	78	70	59	65	53	57	54	54	39	59	48	65	50	74	62	85	76	90	79
20	92	81	89	80	87	78	77	60	71	58	56	44	57	42	60	51	75	63	77	66	84	76	91	80
21	94	82	90	80	81	70	82	59	64	58	53	36	62	47	66	54	76	67	77	68	85	75	87	80
22	87	80	90	80	79	69	69	59	66	51	50	40	65	45	70	59	78	69	78	71	89	77	89	79
23	89	78	90	79	86	69	74	58	72	60	61	44	61	55	67	59	73	62	78	71	85	76	90	80
24	90	78	90	81	86	77	79	59	74	67	58	38	61	51	67	56	72	62	75	61	86	76	89	80
25	90	81	90	81	86	77	80	59	70	45	39	29	65	54	69	60	73	63	75	62	83	75	89	78
26	90	83	87	75	86	76	74	68	46	42	34	29	62	57	66	48	77	67	78	66	84	74	89	76
27	93	83	87	78	84	73	68	52	55	37	40	29	69	60	53	44	76	68	79	70	85	73	89	79
28	93	83	89	78	86	75	56	50	61	45	50	36	71	62	64	52	77	69	81	70	85	75	90	80
29	91	83	89	77	85	78	69	51	67	57	61	48	67	60	.....	.....	81	69	81	70	86	76	94	80
30	94	82	89	75	86	78	67	60	68	48	60	46	68	61	.....	.....	85	70	80	71	87	77	91	80
31	91	77	88	78	.....	.....	64	55	.....	.....	59	45	71	63	.....	.....	78	69	.....	.....	86	70	.....	.....
Range	22°		21°		28°		37°		38°		42°		48°		32°		40°		26°		25°		30°	
Monthly mean	84°.7		83°.8		78°.5		73°.6		62°.2		51°.5		51°.2		55°.6		66°.8		70°.6		77°.4		81°.4	

Maximum, minimum, and mean temperatures—Continued.

STATION, GRAHAM, TEX.

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	(*)	.....	95	77	(*)	.....	88	71	74	44	54	33	68	30	47	33	67	31	(*)	.....	74	59	78	56
2	.....	.....	96	79	.....	.....	95	62	75	54	69	25	35	16	51	30	54	30	.....	.....	78	59	77	52
3	83	63	91	76	.....	.....	93	73	74	55	71	34	24	13	57	30	73	42	63	31	89	66	85	44
4	85	68	95	77	.....	.....	90	72	75	44	64	37	20	15	54	33	79	52	73	33	87	64	91	52
5	86	70	93	72	.....	.....	72	65	76	51	68	29	24	5	35	27	83	57	82	50	77	59	92	57
6	88	70	95	73	.....	.....	78	51	80	56	64	49	35	3	40	25	87	56	91	65	75	57	96	59
7	89	70	95	76	.....	.....	90	61	79	52	69	41	42	14	54	17	(*)	.....	72	52	74	59	94	69
8	91	75	96	75	.....	.....	92	69	79	63	51	33	33	17	66	33	.....	.....	87	52	81	57	98	73
9	90	73	96	75	.....	.....	92	64	71	57	57	31	38	−4	66	39	.....	.....	78	57	87	67	101	75
10	92	73	98	75	.....	.....	95	69	70	52	75	23	38	23	73	46	90	56	80	37	88	67	100	68
11	92	74	78	72	.....	.....	82	61	58	43	(*)	.....	35	21	68	33	81	57	80	38	87	67	102	79
12	94	73	85	70	.....	.....	93	55	62	33	.....	.....	53	0	55	31	82	55	80	55	88	67	95	76
13	96	78	88	66	.....	.....	94	71	65	33	35	26	67	28	38	23	72	55	84	62	84	57	101	79
14	92	71	91	70	.....	.....	93	70	56	51	34	23	69	35	39	18	57	30	80	47	81	54	105	78
15	94	76	95	72	.....	.....	94	74	61	47	47	20	64	40	56	18	85	33	81	56	85	49	103	76
16	95	78	94	74	.....	.....	(*)	.....	65	46	53	23	48	25	55	33	68	37	62	53	90	66	100	66
17	93	77	93	71	.....	.....	71	42	60	46	34	12	(*)	.....	42	32	49	25	71	46	90	69	102	75
18	93	74	93	75	.....	.....	78	37	66	38	37	15	40	21	56	19	55	30	77	36	93	70	100	78
19	94	74	93	74	.....	.....	83	41	66	36	31	26	52	19	78	31	70	31	85	40	104	72	99	76
20	92	73	94	74	.....	.....	87	60	69	36	30	24	64	25	67	29	71	55	87	66	100	60	83	71
21	96	73	94	74	.....	.....	75	50	60	41	53	23	66	25	81	44	84	41	90	64	(*)	.....	84	72
22	98	75	95	73	.....	.....	72	33	75	37	50	20	69	41	68	48	69	48	75	57	.....	.....	93	75
23	96	79	97	73	.....	.....	85	40	82	48	62	23	63	32	70	32	80	39	67	54	.....	.....	96	77
24	95	77	(*)	.....	.....	.....	87	58	55	43	(*)	.....	74	32	88	38	81	54	75	46	.....	.....	98	78
25	97	78	.....	.....	.....	.....	65	46	47	34	.....	.....	69	49	78	36	87	56	78	55	98	72	97	78
26	97	80	.....	.....	72	56	52	43	38	25	33	15	69	47	47	23	91	64	86	56	93	72	(*)	(*)
27	90	74	.....	.....	72	62	51	34	57	19	41	13	81	51	62	23	92	67	76	60	91	65	.....	.....
28	86	75	.....	.....	90	68	49	40	70	25	41	29	72	52	73	42	81	62	87	51	94	63	92	69
29	89	74	.....	.....	91	71	65	45	67	42	45	33	59	46	.....	.....	87	46	85	63	98	74	95	70
30	94	74	.....	.....	90	73	69	37	60	37	36	27	53	46	.....	.....	94	47	94	66	100	76	97	68
31	95	78	.....	.....	.....	.....	69	34	.....	.....	49	33	59	43	.....	.....	97	58	.....	.....	85	68	.....	.....
Range	.....	.....	.....	.....	.....	.....	.....	.....	63°		.....	.....	.....	.....	71°		.....	.....	.....	.....	.....	.....	.....	.....
Monthly mean	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* No observation taken.

Maximum, minimum, and mean temperatures—Continued.

STATION, GRAND HAVEN, MICH.

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	77	61	79	67	79	58	77	65	51	33	40	29	29	15	23	18	37	25	36	26	47	32	55	46
2	73	58	80	70	74	63	66	58	51	35	41	32	16	0	30	18	31	20	33	20	45	33	57	45
3	75	60	82	63	72	61	65	60	47	26	42	32	13	4	32	29	39	5	30	18	57	30	59	47
4	80	66	81	69	70	59	61	50	45	32	37	30	18	9	31	23	42	33	30	26	55	48	70	48
5	80	65	80	65	75	55	60	49	55	26	39	29	28	15	33	23	41	24	37	25	52	43	62	52
6	85	68	75	63	78	61	63	35	55	37	37	30	26	15	33	27	47	36	53	30	47	38	55	48
7	82	67	79	60	82	63	66	50	41	32	32	18	28	17	30	18	38	29	43	32	48	33	60	40
8	80	70	83	71	85	64	69	47	46	37	30	15	28	18	40	13	62	35	50	26	57	36	74	48
9	80	65	79	71	77	67	63	42	49	35	37	28	22	14	32	20	62	44	60	33	61	44	80	63
10	77	66	79	65	67	60	60	35	55	43	37	32	28	18	45	27	60	38	50	35	75	48	73	62
11	80	64	77	60	61	50	56	48	54	44	34	30	26	18	41	20	44	34	40	29	78	58	73	55
12	79	66	77	54	63	48	61	40	50	40	34	27	26	14	25	15	50	33	45	30	81	65	70	58
13	83	70	80	58	58	49	64	45	50	37	35	28	34	22	18	10	43	32	51	41	75	57	75	58
14	84	69	78	58	66	50	73	48	44	28	31	23	35	25	13	2	33	23	46	36	65	52	77	62
15	90	72	77	67	67	41	68	59	48	29	26	15	25	16	30	10	24	14	42	32	55	48	75	55
16	90	75	73	60	72	58	70	58	46	36	26	21	32	16	30	18	25	17	48	33	62	42	63	49
17	90	79	75	59	78	60	58	44	50	43	33	19	32	25	25	12	27	17	47	31	65	42	63	41
18	85	73	80	61	73	60	46	38	50	45	30	24	29	19	26	6	29	18	41	32	61	48	64	42
19	82	69	77	70	76	63	50	35	53	44	27	20	19	15	26	10	33	23	45	34	72	52	69	53
20	83	71	74	62	71	52	62	40	50	41	30	20	18	7	23	10	36	26	52	38	70	54	75	52
21	79	63	76	60	57	45	66	47	42	35	27	21	35	16	29	8	35	24	60	35	57	49	70	54
22	70	60	76	60	66	41	57	42	41	31	25	19	35	26	37	29	34	28	70	41	60	45	70	54
23	72	55	72	59	68	52	50	30	43	34	19	12	32	22	33	16	42	29	73	52	70	51	81	59
24	74	53	75	68	63	51	52	39	45	32	20	13	39	30	22	14	42	32	78	48	75	52	86	65
25	72	65	69	55	70	49	50	40	40	33	30	17	38	19	31	18	46	22	64	48	70	50	82	70
26	74	63	72	46	57	44	44	35	40	28	28	20	41	10	26	12	40	36	71	53	61	45	79	68
27	72	55	74	53	56	37	36	33	34	22	29	19	43	38	19	3	43	35	60	47	60	50	77	64
28	76	55	70	60	63	41	41	31	43	32	25	20	38	29	36	8	55	35	54	40	70	42	70	59
29	78	63	72	57	70	55	50	40	43	38	28	20	38	22	.....	.....	48	38	54	41	83	64	66	58
30	72	57	76	55	78	66	46	37	44	30	27	21	38	30	.....	.....	38	30	48	36	77	61	71	57
31	80	62	76	62	.....	.....	37	30	.....	.....	31	20	34	23	.....	.....	38	25	.....	.....	72	55	.....	.....
Range	37°		37°		48°		47°		33°		30°		43°		43°		57°		60°		53°		46°	
Monthly mean	73°.0		70°.4		62°.9		51°.2		41°.6		27°.5		25°.1		23°.5		35°.8		44°.0		58°.0		64°.0	

Maximum, minimum, and mean temperatures—Continued.

STATION, HALIFAX, NOVA SCOTIA.

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	92.7	64.9	73.8	54.0	72.1	54.0	64.7	41.1	54.9	37.1	34.0	22.4	25.8	10.0	28.0	16.1	26.2	4.8	43.9	32.3	58.9	40.8	76.0	51.5
2	79.3	55.7	62.7	57.3	74.9	64.6	77.4	47.6	50.1	32.1	41.2	20.3	31.0	12.7	34.0	19.0	33.0	16.8	46.4	27.8	59.4	37.5	60.7	50.5
3	68.6	55.0	73.9	59.9	73.1	60.4	64.7	50.8	55.0	38.4	51.8	41.0	32.3	20.1	35.2	25.9	29.2	14.0	39.8	29.2	57.1	39.0	57.3	44.0
4	85.0	57.0	74.8	60.0	68.5	55.4	70.8	47.0	43.2	28.9	44.9	35.0	30.7	20.8	31.5	25.0	36.1	14.0	37.8	25.7	57.3	38.0	50.0	43.0
5	76.0	50.9	70.1	60.0	70.0	54.7	69.5	43.7	32.0	21.3	46.5	37.0	31.4	20.4	37.2	16.8	42.0	13.0	34.8	24.4	47.8	37.7	68.0	46.7
6	62.9	47.0	69.8	60.3	78.2	55.2	61.8	43.1	38.3	27.4	39.3	28.0	33.0	18.1	34.4	20.0	21.8	5.0	35.8	27.8	51.7	41.3	68.4	47.1
7	72.3	47.0	72.1	60.8	68.1	46.2	64.0	45.2	43.0	24.9	29.2	21.6	32.3	26.7	31.2	16.9	22.2	14.3	39.9	27.9	64.8	41.0	61.3	45.6
8	70.2	53.1	77.3	59.9	67.5	41.2	61.4	42.9	42.5	32.0	28.8	22.8	36.1	25.9	26.7	11.4	26.0	13.0	45.0	30.5	65.8	39.2	58.4	38.6
9	78.6	54.8	77.6	57.8	71.7	43.5	65.5	46.0	40.4	31.5	30.0	19.2	33.8	22.8	26.2	2.4	38.6	15.4	49.9	26.4	63.8	39.9	63.5	37.3
10	82.0	58.9	79.1	62.3	75.0	52.4	63.6	44.1	42.4	31.1	42.7	21.1	32.3	11.7	25.2	11.0	35.2	21.8	48.4	23.5	65.5	37.0	69.1	40.3
11	81.8	58.1	79.1	60.5	73.9	55.0	56.4	38.4	45.1	33.9	48.2	37.9	20.3	8.0	37.3	9.0	36.4	31.2	42.9	31.0	71.0	41.0	58.7	42.1
12	77.0	54.6	81.3	58.0	72.7	64.1	52.2	37.6	56.5	35.8	41.1	29.5	23.1	9.1	43.8	35.3	36.8	24.9	42.2	31.0	61.8	41.2	56.0	46.1
13	76.1	53.0	81.4	54.0	75.6	65.5	63.5	46.1	53.7	39.0	30.4	25.0	32.6	9.0	36.5	27.7	38.4	20.2	47.1	27.1	79.8	46.8	62.7	47.8
14	75.0	53.6	73.6	55.2	75.3	58.1	60.9	42.1	44.0	27.2	36.0	25.1	33.2	17.0	28.2	15.9	45.2	30.8	42.0	32.1	59.0	44.0	71.7	48.1
15	65.4	47.5	78.0	60.3	70.0	54.0	64.9	37.7	38.4	25.6	38.0	33.0	17.2	−1.0	19.4	7.3	44.8	31.4	50.0	29.0	73.8	40.2	68.8	44.8
16	75.0	44.8	84.0	63.4	68.2	45.1	65.0	51.3	39.2	20.1	41.1	24.9	8.7	−3.1	25.4	5.4	35.2	25.6	45.0	32.1	71.8	47.5	58.2	47.9
17	65.8	47.9	76.2	62.2	65.8	48.9	59.5	53.1	43.2	28.3	25.3	20.1	17.6	−0.7	25.7	18.2	42.4	24.1	52.6	32.8	68.7	52.2	52.1	47.0
18	67.2	56.4	72.3	63.1	73.7	47.8	62.3	53.9	39.0	24.1	29.2	24.0	32.9	13.0	21.2	14.3	45.3	29.2	55.1	32.0	74.3	50.9	52.6	43.7
19	78.2	55.8	70.3	60.9	72.3	53.0	64.0	58.0	45.8	37.0	25.8	15.4	29.7	15.8	24.0	7.9	37.2	24.2	37.8	30.1	73.0	53.2	69.4	40.3
20	76.1	53.4	70.1	60.4	70.9	53.1	58.2	44.3	47.5	41.2	19.8	11.7	18.9	8.8	24.0	4.1	35.2	22.8	45.6	29.7	71.3	47.4	69.8	41.0
21	71.2	56.9	67.7	56.8	69.0	59.0	53.4	42.2	44.9	39.8	28.4	14.1	15.0	1.0	25.5	13.2	34.8	19.9	58.6	28.0	63.8	48.4	76.3	46.1
22	76.8	59.0	65.4	50.7	74.9	52.6	58.4	37.4	46.0	37.0	45.0	24.5	34.7	−0.3	18.4	8.9	40.2	29.0	57.2	28.8	57.7	34.6	73.5	45.2
23	60.9	51.3	74.4	47.3	61.3	41.9	49.6	35.8	56.8	45.6	37.8	21.6	30.9	11.6	33.8	14.8	45.8	29.0	51.4	32.9	49.9	30.5	73.0	51.1
24	77.8	51.0	71.1	46.1	70.7	38.0	53.0	48.0	48.3	36.9	27.0	13.0	31.8	12.1	36.0	16.6	37.3	27.1	39.8	28.7	50.3	36.0	75.3	51.5
25	77.2	54.1	70.9	51.4	71.1	39.1	57.0	47.0	44.8	34.5	25.8	12.1	37.5	24.0	23.6	10.0	37.4	27.0	53.9	28.3	57.3	38.3	81.7	53.7
26	74.0	58.0	74.7	51.8	69.4	47.4	55.0	45.5	49.4	32.6	31.8	15.0	24.1	1.0	44.0	15.1	38.1	27.0	58.9	31.7	55.8	34.0	80.7	59.1
27	69.0	59.9	75.9	47.6	62.2	44.1	58.6	43.2	39.8	28.1	26.6	11.7	18.2	0.7	46.7	27.2	36.2	20.1	68.1	33.0	65.0	32.1	78.1	57.9
28	81.2	53.3	70.2	50.4	58.2	35.8	53.0	43.9	54.3	28.0	20.1	10.5	34.2	18.0	28.2	6.0	38.9	24.7	62.9	35.5	62.0	43.1	82.0	55.4
29	76.2	49.2	68.6	52.1	66.2	40.8	52.9	35.3	48.0	34.3	19.9	8.5	33.6	20.0	.....	.....	38.0	30.0	63.4	41.4	63.4	43.0	71.7	56.8
30	68.9	55.0	77.0	54.6	67.1	39.6	51.1	33.7	45.5	29.3	24.0	6.1	22.1	16.0	.....	.....	38.1	33.8	54.9	42.0	66.0	43.3	69.0	54.9
31	73.7	56.9	79.3	51.4	.....	.....	57.7	50.8	.....	.....	24.1	12.0	25.8	17.1	.....	.....	48.5	33.4	.....	.....	66.7	45.3	.....	.....
Range	47°.9		37°.9		42°.4		43°.7		36°.7		45°.7		39°.2		44°.3		43°.7		44°.6		49°.3		44°.7	
Monthly mean	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

Maximum, minimum, and mean temperatures—Continued.

STATION, HAVANA, CUBA.

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	88	79	90	79	91	79	87	80	78	76	79	73	77	70	75	69	77	70	81	69	82	74	84	79
2	84	78	89	80	88	82	87	80	80	75	77	73	77	71	73	65	77	70	81	73	83	77	85	78
3	85	78	90	81	89	82	84	80	77	73	73	68	77	70	68	64	76	71	81	75	83	76	86	78
4	94	80	91	80	89	82	84	80	77	74	73	68	75	70	74	60	77	71	78	73	86	75	86	79
5	90	82	92	77	90	84	85	79	78	73	72	70	78	70	80	65	76	69	73	69	85	76	86	79
6	91	82	86	79	88	83	88	78	79	73	73	68	74	59	84	69	77	67	77	69	86	75	88	60
7	89	82	89	79	83	80	87	79	81	75	76	65	70	60	84	74	77	69	79	68	86	76	89	79
8	90	82	89	80	87	80	86	78	80	73	78	66	75	63	85	71	78	69	81	70	83	76	94	80
9	91	81	89	79	86	81	87	80	78	74	83	71	77	70	71	67	78	69	82	72	81	75	92	81
10	90	80	90	79	87	80	87	81	80	70	76	71	78	73	78	70	78	70	83	73	81	74	88	79
11	89	82	90	81	88	80	86	80	81	71	77	71	80	72	78	70	78	69	82	76	80	76	88	80
12	89	80	89	82	87	80	82	78	82	73	76	71	78	71	72	69	78	69	78	74	81	74	85	80
13	89	80	90	84	87	80	85	77	79	75	79	72	74	70	74	66	80	70	83	70	85	75	86	81
14	89	80	88	80	86	79	84	77	81	76	79	72	74	69	74	68	79	71	83	73	83	77	88	78
15	92	83	86	78	87	79	82	75	87	75	82	73	76	68	75	65	76	73	90	78	83	76	88	78
16	88	83	90	78	87	81	83	75	83	75	79	77	78	68	76	65	79	69	89	79	(*)	(*)	88	80
17	89	80	89	79	87	79	83	75	82	75	76	70	80	83	83	68	81	71	89	78	85	77	87	78
18	89	79	87	79	87	79	82	76	82	73	72	68	80	71	80	70	77	72	78	73	84	79	88	77
19	90	79	89	81	86	80	82	77	83	76	78	71	78	62	77	71	75	72	74	70	83	77	85	76
20	91	81	89	82	87	79	82	77	79	74	81	73	63	59	71	67	81	70	78	66	83	78	84	76
21	88	80	87	82	86	78	78	75	79	74	81	72	67	61	71	67	81	70	82	71	84	78	85	76
22	88	81	88	80	86	80	82	78	77	73	75	68	73	61	75	65	85	73	81	76	86	78	86	78
23	89	81	87	80	87	82	83	78	75	70	72	67	78	67	77	66	82	73	81	75	85	77	88	79
24	90	80	85	78	88	81	79	72	82	68	76	68	78	69	74	70	83	74	80	72	83	77	88	80
25	88	84	86	78	88	82	81	76	81	71	78	71	78	71	77	63	83	74	81	71	80	77	89	78
26	89	83	85	79	89	82	83	76	83	73	81	71	78	72	79	68	81	75	84	73	83	78	89	76
27	90	81	84	78	87	82	82	73	81	75	78	69	79	70	75	71	81	72	84	74	83	77	84	76
28	92	80	85	79	88	82	82	74	76	73	74	65	80	71	79	71	82	72	83	76	85	78	86	76
29	89	80	86	79	85	81	84	75	77	70	74	67	78	72	.....	.....	80	70	80	75	86	78	82	76
30	86	81	87	80	85	80	84	77	78	72	76	68	77	70	.....	.....	81	73	79	76	87	78	87	78
31	89	80	89	80	.....	.....	81	77	.....	.....	78	68	78	67	.....	.....	79	75	.....	.....	85	79	.....	.....
Range	16°		15°		13°		16°		19°		18°		21°		25°		18°		24°		.....		34°	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

* No observation taken.

Maximum, minimum, and mean temperatures—Continued.

STATION, HENRIETTA, TEX.

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1																	59	28	(†)	(†)	73	57	74	54
2																	50	25			80	58	75	50
3																	71	35	57	40	86	64	89	49
4																	75	46	65	32	86	65	96	56
5																	78	42	82	46	71	58	95	57
6																	84	52	91	62	72	54	97	58
7																	84	54	71	50	72	55	91	66
8															(*)	(*)	78	60	83	50	80	56	96	68
9															62	36	85	58	76	52	86	62	100	74
10															71	50	86	59	78	45	90	74	99	71
11															64	31	81	48	76	43	86	65	98	76
12															43	27	80	54	78	51	89	66	94	75
13															35	21	69	53	85	57	82	52	96	75
14															55	19	52	29	78	50	80	55	101	76
15															52	18	73	32	81	51	84	53	92	66
16															49	32	59	32	63	52	84	62	96	66
17															37	33	49	24	70	42	90	62	96	73
18															51	23	56	28	80	40	93	65	96	74
19															63	29	69	29	87	49	98	71	89	71
20															(†)	(†)	68	48	87	49	94	61	79	68
21																	81	38	82	62	95	66	77	70
22																	68	46	71	57	94	65	(†)	(†)
23																	78	40	64	56	94	67		
24																	76	50	(†)	(†)	94	71	94	77
25																	87	49			93	70	92	76
26																	88	60			95	68	(†)	(†)
27															59	22	92	64	82	50	94	63	93	73
28															70	39	(†)	(†)	88	54	94	61	(†)	(†)
29																			85	59	99	73		
30																			91	65	99	73	87	67
31																					84	64		
Range																					47°			
Monthly mean																								

* Observations of maximum and minimum temperatures began February 9, 1879.

† No observation taken.

Maximum, minimum, and mean temperatures—Continued.

STATION, INDIANAPOLIS, IND.

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	88	70	86	69	82	68	81	65	50	25	43	37	32	25	31	22	50	35	49	35	58	37	72	51
2	73	66	86	68	85	68	74	61	56	40	44	34	26	−10	37	17	37	31	53	30	64	36	60	49
3	80	66	88	68	80	65	77	52	49	32	48	38	1	−22	38	28	40	26	34	21	70	47	66	49
4	86	69	87	68	78	60	68	52	52	31	40	34	6	−15	47	26	45	35	42	26	70	47	80	54
5	88	69	87	69	79	60	56	49	56	32	43	29	8	−14	44	33	54	25	48	27	63	53	84	68
6	91	72	87	69	82	61	63	39	65	50	41	32	19	− 4	36	29	54	44	67	30	61	44	71	60
7	87	71	86	65	86	65	70	47	57	42	34	21	30	7	42	26	56	33	57	45	60	39	75	53
8	88	73	92	71	88	67	75	44	47	34	43	27	30	11	46	26	74	46	61	36	64	40	80	54
9	89	73	89	70	84	71	70	55	54	41	43	33	19	4	42	26	71	57	66	48	74	43	85.5	57
10	90	75	80	72	72	60	66	47	54	35	33	28	21	− 7	53	32	69	51	61	47	81	53	87	67
11	94	75	83	65	68	55	62	51	52	46	39	27	32	14	50	28	62	41	52	38	85	62	84	67
12	92	77	83	63	68	48	64	38	53	42	35	29	27	14	34	16	60	36	58	35	85	63	83.5	66.5
13	92	76	83	64	66	50	67	46	52	40	33	26	33	12	17	8	53	44	70	48	82	63	78.5	62
14	92	73	83	63	68	45	76	56	49	32	37	32	35	25	11	− 1	44	23	61	47.5	78	65	87	65
15	92	76	85	63	73	44	77	64	57	36	33	26	37	30	28	5	31	20	51	42	70	58	81	67
16	93	76	86	67	77	55	76	65	56	48	31	23	37	28	36	25	30	20	55	38	72	52	73	55
17	96	78	81	66	79	57	65	48	54	50	32	23	40	21	34	25	29	19	48	37	76	51	71	47
18	96	79	90	71	82	62	50	38	51	44	24	12	37	15	30	14	32	15	56	34	80	52	73	50
19	90	69	91	74	85	65	54	35	57	33	26	17	25	− 2	33	18	34	22	57	39	84	55	76	52.5
20	94	72	82	73	75	56	64	39	54	41	30	14	26	8	31	17	41	30	64	37	86	58	81	56
21	85	68	81	63	63	45	68	45	48	42	33	26	46	16	34	20	42	33	68	40	75	61	80	64
22	79	61	82	60	69	44	62	40	45	33	27	8	53	36	47	34	45	36	78	49	72	51	86	63
23	81	58	83	62	75	52	57	32	50	32	19	1	45	31	37	31	50	33	81	54	77	53	87	70
24	84	65	90	68	74	63	64	38	53	40	10	−12	47	27	46	29	45	41	82	57	87	58	91	66
25	89	67	77	64	82	63	70	50	47	41	16	− 5	48.5	36	58	35	51	32	74	63	87	69	87	70
26	80	72	78	53	68	52	50	44	41	32	17	2	47	29	35	10	60	44	74	61	72	59	80	69
27	80	65	82	56	65	44	44	31	40	34	20	11	57	43	26	3	56	42	70	60	72	60	87	72
28	82	60	85	66	68	52	43	23	41	33	20	9	56	42	45.5	24	73	40	64	46	81	56	75	65
29	78	60	74	62	78	62	51	31	46	29	29	9	51	36	.....	.....	63	51	71.5	44	86.5	68	79	59
30	85	67	84	62	81	64	47	35	45	28	28	16	45	30	.....	.....	52	36	60	44	86	66	84	59
31	88	71	80	70	.....	.....	35	29	.....	.....	29	13	42	30	.....	.....	48	31	.....	.....	84	65	.....	.....
Range	38°		39°		44°		58°		40°		60°		79°		59°		59°		61°		51°		44°	
Monthly mean	79°.6		75°.7		67°.1		54°.2		45°.2		27°.0		26°.9		30°.4		42°.7		53°.1		66°.7		71°.4	

Maximum, minimum, and mean temperatures—Continued.

STATION, INDIANOLA, TEX.

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	n.	Max.	Min.	Max.	Min.	Max.	Min.
1	96	80	91	80	89	79	91	77	69	60	60	39	56	47	61	50	77	61	84	62	84	70	82	69
2	90	79	87	79	85	77	87	77	74	62	61	40	54	42	50	45	66	55	68	52	85	70	80	63
3	89	77	92	80	84	75	85	78	71	63	71	47	43	39	56	45	64	51	73	58	83	71	78	63
4	91	76	94	80	84	73	87	77	71	62	64	54	40	31	69	55	69	61	73	61	84	72	80	69
5	91	78	92	79	90	79	86	73	73	66	65	55	33	27	66	45	73	62	75	65	86	72	81	68
6	90	76	92	78	91	78	86	71	81	68	73	60	37	22	46	36	78	62	80	69	82	67	86	72
7	84	72	94	78	88	78	86	74	76	69	76	63	50	37	53	38	77	62	85	69	78	67	87	72
8	89	76	95	80	93	78	84	76	76	69	77	54	52	33	58	40	78	63	83	67	80	71	87	75
9	89	80	93	77	91	78	84	76	83	71	59	46	40	25	58	50	78	65	87	71	86	70	92	75
10	90	79	96	80	84	76	88	75	81	66	67	42	48	35	74	54	79	66	83	65	86	69	89	76
11	86	77	89	75	79	69	87	76	73	60	75	61	64	46	75	55	81	68	86	65	85	71	87	78
12	90	79	90	76	76	60	87	75	65	52	74	67	51	35	75	52	72	66	77	65	84	71	87	77
13	88	78	88	79	77	64	88	75	67	55	75	48	53	40	64	49	75	64	79	70	90	70	92	77
14	92	78	89	80	81	68	88	75	69	61	48	38	70	46	53	40	77	61	80	72	90	71	93	78
15	95	80	91	79	81	69	87	77	68	55	49	34	72	53	54	44	76	62	86	72	91	70	93	79
16	96	80	91	76	82	68	87	78	75	61	53	39	65	53	70	50	76	66	89	68	90	72	93	77
17	92	80	85	78	85	75	80	61	66	56	52	38	73	52	66	50	70	46	73	59	87	74	93	78
18	90	79	87	78	85	77	72	60	65	55	53	38	62	47	56	40	60	47	77	53	87	74	89	78
19	86	77	88	80	88	76	73	63	72	51	53	46	54	41	61	49	66	55	79	59	89	75	88	77
20	91	79	90	78	88	78	79	64	73	56	47	41	62	37	63	55	78	63	79	63	89	75	88	76
21	94	81	86	74	82	69	86	71	67	55	56	34	68	47	74	55	81	68	82	70	95	74	90	77
22	94	75	91	78	83	73	72	58	71	50	50	41	72	56	74	62	84	69	80	72	87	76	86	77
23	88	76	93	78	91	78	77	53	75	53	61	45	63	56	70	59	73	63	81	72	84	75	92	79
24	92	79	91	79	92	78	82	68	79	66	52	38	61	53	73	55	73	65	76	63	85	75	92	77
25	92	80	90	79	90	76	84	72	71	43	38	30	61	53	74	62	78	66	77	63	87	75	90	77
26	93	81	93	77	87	77	79	70	49	39	34	30	70	56	67	50	83	69	83	64	83	73	91	76
27	94	76	92	79	85	75	70	50	58	37	41	31	75	64	56	47	81	70	83	70	82	71	93	78
28	94	80	92	79	90	77	55	50	64	44	48	38	75	63	64	54	83	70	84	67	87	72	94	79
29	92	79	89	75	86	76	63	51	69	55	64	48	67	62	.....	.....	87	71	85	69	90	74	91	79
30	93	80	89	76	90	76	70	58	67	49	52	47	75	63	.....	.....	90	69	82	70	91	77	93	78
31	90	81	88	78	.....	.....	67	56	.....	.....	50	46	75	60	.....	.....	83	70	.....	.....	90	74	.....	.....
Range	24°		22°		33°		41°		46°		47°		53°		39°		44°		37°		28°		31°	
Monthly mean	84°.5		84°.3		80°.1		73°.9		63°.2		51°.4		52°.4		56°.2		68°.6		72°.1		78°.6		81°.8	

Maximum, minimum, and mean temperatures—Continued.

STATION, JACKSBORO', TEX.

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	82	67	96	75	95	69	88	70	75	38	53	32	64	31	49	31	62	28	70	49	75	59	84	54
2	83	67	95	78	94	70	92	61	80	50	68	30	42	14	52	31	75	26	73	33	85	60	85	50
3	83	63	92	72	92	70	94	69	79	52	71	42	34	11	57	31	66	32	63	45	86	65	85	46
4	84	65	93	73	92	70	90	67	85	49	62	35	29	12	53	32	78	47	70	33	87	65	90	58
5	85	68	94	72	88	68	80	59	77	47	67	32	28	0	40	27	80	56	81	46	77	57	92	60
6	88	68	95	73	87	70	78	49	80	55	65	46	33	−2	41	24	83	54	88	62	77	55	93	60
7	92	70	97	75	90	72	87	59	78	58	70	42	41	23	52	23	85	57	73	50	74	56	90	61
8	91	72	97	74	82	71	89	66	81	61	51	34	38	17	64	32	80	59	86	50	82	57	94	70
9	94	72	97	74	76	63	89	64	77	53	56	34	37	2	63	37	85	55	75	60	86	64	100	73
10	95	74	99	75	75	58	93	65	(*)	(*)	72	33	45	22	72	49	85	58	77	45	90	64	100	71
11	95	74	77	72	72	47	93	63	(*)	(*)	56	37	45	18	67	40	80	58	77	45	86	64	99	61
12	94	74	85	67	75	47	94	58	67	34	45	34	47	11	53	29	80	55	80	51	87	65	98	73
13	95	73	89	68	86	54	91	68	65	40	45	25	60	29	41	21	71	55	83	50	86	56	97	76
14	92	72	90	69	89	58	91	69	55	49	43	22	65	37	40	16	57	29	80	50	80	60	103	75
15	95	74	94	72	86	57	91	69	65	48	45	20	67	39	50	18	78	35	83	57	83	52	96	69
16	96	76	93	72	87	55	82	54	68	44	52	25	47	23	53	19	78	33	83	52	84	64	96	67
17	91	76	92	72	88	58	71	42	62	49	40	10	48	31	45	31	49	22	70	43	89	64	97	73
18	95	75	93	74	90	72	77	42	66	41	37	10	48	22	56	23	56	30	76	39	91	65	97	74
19	95	75	93	73	92	68	80	48	67	41	37	19	50	21	71	34	70	54	85	50	103	67	92	70
20	93	71	93	72	80	55	84	51	74	42	43	24	63	31	70	38	71	53	85	60	98	71	82	70
21	98	72	93	73	77	44	73	52	60	41	32	21	65	32	79	29	84	42	83	63	95	70	80	69
22	98	75	94	70	84	52	73	37	81	42	52	21	70	42	68	47	68	47	80	56	92	68	95	73
23	94	74	96	73	95	62	84	48	82	47	60	27	63	31	68	32	78	42	67	55	96	72	98	74
24	96	75	99	76	93	71	86	53	54	44	59	15	73	40	85	49	75	54	74	48	95	72	99	70
25	98	77	97	75	90	73	65	45	53	33	30	10	67	47	78	34	86	55	76	55	93	67	98	75
26	98	76	100	72	74	56	54	42	45	27	35	15	69	49	76	21	90	55	84	54	90	67	97	73
27	86	71	99	73	73	60	53	33	58	23	44	13	80	52	59	23	90	66	84	55	90	60	99	75
28	84	72	92	74	91	68	49	39	67	33	45	25	75	53	70	39	82	61	84	52	91	65	98	66
29	87	72	88	70	91	68	57	42	66	42	46	31	59	42	.....	.....	85	49	85	64	97	65	90	65
30	96	72	88	62	91	69	68	40	58	39	47	26	54	47	.....	.....	89	55	90	64	99	72	93	67
31	98	79	93	63	.....	.....	67	38	.....	.....	47	31	59	38	.....	.....	96	57	.....	.....	84	64	.....	.....
Range	35°		38°		51°		61°		.....		62°		82°		69°		74°		57°		51°		57°	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

* No observations taken.

Maximum, minimum, and mean temperatures—Continued.

STATION, JACKSONVILLE, FLA.

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	85	73	96	78	88	77	79	69	60	41	74	59	69	52	66	49	56	48	80	53	88	66	85	66
2	86	72	97	78	88	77	81	68	69	48	68	45	67	52	52	35	68	46	68	54	77	66	86	66
3	86	73	95	77	89	76	81	67	70	51	61	39	52	35	59	36	75	48	75	46	77	60	90	71
4	94	74	91	78	88	76	79	66	73	46	68	48	40	30	63	39	63	49	67	43	86	64	86	71
5	86	76	88	77	92	76	81	64	72	54	59	42	35	30	74	46	64	44	63	41	87	68	87	69
6	87	76	88	77	87	76	83	64	76	53	61	36	40	26	79	59	71	48	71	39	90	67	93	73
7	89	74	94	76	87	75	84	67	79	54	66	40	52	25	59	53	76	51	78	49	88	63	83	74
8	89	75	90	76	86	72	82	68	79	60	71	44	65	41	53	44	78	53	67	60	72	65	85	74
9	90	75	90	79	84	72	85	70	62	51	74	54	69	45	56	38	79	53	77	57	71	64	83	73
10	91	76	95	76	82	72	80	73	71	46	64	43	51	33	66	46	81	56	78	64	71	65	86	72
11	87	72	96	78	81	75	78	70	76	51	62	36	66	41	69	60	82	62	79	61	69	65	86	72
12	90	73	96	76	82	74	75	64	73	60	66	40	67	49	71	54	75	61	69	56	76	67	92	73
13	92	77	94	76	84	69	76	61	68	48	70	44	59	41	72	52	79	58	79	58	80	67	95	73
14	96	77	94	78	82	72	77	61	73	49	72	56	67	41	66	53	75	62	78	66	82	68	93	74
15	88	79	90	78	81	72	80	65	75	62	70	61	69	42	53	48	74	56	85	64	86	69	96	76
16	88	76	90	76	79	74	82	64	80	67	65	48	73	52	57	47	76	52	88	63	82	69	96	77
17	86	73	91	77	82	69	80	64	74	66	62	46	71	51	74	46	74	60	79	69	86	69	95	76
18	90	72	96	76	82	67	72	58	69	66	54	38	74	55	74	53	67	56	69	55	80	67	90	74
19	94	76	97.5	79	82	71	64	48	73	60	54	36	68	42	54	44	69	51	74	50	85	66	83	73
20	96	76	98.5	80	84	68	75	50	66	56	64	42	54	32	61	41	78	45	81	56	89	70	79	68
21	94	74	96	77	85	69	75	63	70	53	72	60	64	40	55	38	81	63	77	59	91	71	81	69
22	96	78	86	74	85	71	75	69	59	46	61	43	65	43	66	38	81	62	77	62	90	68	83	62
23	97	75	86	74	82	72	70	53	69	46	49	36	72	45	70	52	77	62	77	60	77	70	86	63
24	91	77	84	72	86	71	70	46	71	47	61	35	72	46	65	47	76	59	80	57	75	62	85	65
25	89	77	87	68	85	73	75	58	75	48	55	46	74	46	72	45	73	55	80	57	80	61	87	69
26	91	75	94	71	85	73	77	61	77	60	62	46	68	50	76	55	79	51	81	60	85	60	85	68
27	94	78	94	74	84	72	77	64	71	61	64	34	73	56	58	47	82	62	81	68	84	63	87	69
28	89	80	95	77	77	70	77	60	61	46	46	27	77	58	52	48	83	65	82	67	83	68	92	70
29	93	78	95	78	78	69	77	59	65	41	54	34	80	57	.....	.....	86	63	83	65	84	69	94	76
30	96	77	95	76	78	70	80	68	65	50	70	43	75	56	.....	.....	81	62	86	63	86	70	88	76
31	95	78	96	77	.....	.....	72	50	.....	.....	57	52	72	51	.....	.....	72	54	.....	.....	84	68	.....	.....
Range	25°		30°.5		25°		39°		39°		47°		55°		44°		42°		49°		31°		34°	
Monthly mean	83°.4		82°.8		77°.9		69°.4		61°.6		52°.7		53°.8		54°.9		64°.6		67°.5		74°.0		79°.6	

Maximum, minimum, and mean temperatures—Continued.

STATION, KEOGH, MONT.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	45	10	12	−25	61	23	79	44	78	40
2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	37	27	45	−15	51	25	77	53	84	43
3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	32	13	42	15	66	24	60	38	83	43
4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	26	1	50	7	70	29	60	37	73	44
5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	28	6	45	19	68	42	65	30	71	47
6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	30	1	50	13	68	39	56	36	84	46
7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	37	8	50	30	75	44	65	37	80	47
8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	25	− 3	49	27	61	42	64	42	71	49
9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	43	11	52	27	60	39	68	44	75	47
10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	21	2	43	21	67	26	67	42	81	47
11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7	− 9	55	25	62	42	67	46	76	50
12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11	−15	59	33	69	26	67	43	75	54
13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	13	−12	33	4	72	39	76	40	69	56
14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*6	−*5	26	−15	22	0	68	40	81	50	80	54
15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	15	−17	33	−12	22	5	52	40	80	57	86	57
16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	27	− 5	30	9	22	3	53	36	70	39	87	58
17	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	30	− 2	29	− 5	27	1	63	26	73	38	87	59
18	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	32	1	18	− 1	33	1	60	35	59	48	81	57
19	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	45	10	9	−12	30	7	75	46	68	49	67	57
20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	51	26	39	1	36	2	72	46	75	51	86	49
21	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	50	32	43	20	45	18	52	42	76	44	89	54
22	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	45	18	41	16	57	18	50	40	70	54	90	56
23	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	48	25	52	22	47	31	50	40	71	45	72	54
24	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	48	30	26	7	63	30	72	38	72	45	70	47
25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	47	11	15	−10	60	36	70	45	62	49	79	46
26	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	38	27	34	− 3	76	33	53	37	75	48	82	49
27	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	35	9	37	15	58	43	70	35	85	56	80	47
28	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	30	7	6	− 7	62	32	64	38	72	58	94	57
29	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	40	9	.....	.....	64	47	76	43	67	35	87	59
30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	39	11	.....	.....	69	37	74	53	66	37	67	45
31	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	41	7	.....	.....	51	36	.....	.....	66	43	.....	.....
Range	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	67°		101°		53°		55°		54°	
Monthly mean	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

*Observations of maximum and minimum temperatures began January 14, 1879.

Maximum, minimum, and mean temperatures—Continued.

STATION, KEOKUK, IOWA.

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	76	63	86	67	91	67	82	64	66	34	38	31	28	5	30	17	47	23	47	33	67	42	62	50
2	76	62	89	73	83	70	81	56	57	40	45	26	5	—19	43	15	36	23	54	29	70	50	67	48
3	76	61	88	73	81	65	77	52	55	32	52	40	1	—20	40	23	40	17	40	20	72	54	76	50
4	84	68	89	74	84	65	69	51	60	33	43	34	3	—18	44	31	51	34	45	23	72	50	86	60
5	89	70	89	71	86	67	64	50	64	39	43	30	7	—18	37	26	53	31	54	27	63	45	83	65
6	90	73	90	74	86	66	64	43	65	55	40	26	15	— 8	38	26	55	42	61	37	60	35	76	59
7	90	79	92	73	87	67	67	51	61	38	34	16	30	13	46	25	76	43	57	42	61	40	85	47
8	91	74	95	76	86	70	79	52	52	32	34	24	26	3	49	29	74	57	63	35	65	44	88	64
9	91	76	91	75	74	59	67	49	56	33	37	26	13	— 8	42	20	70	54	60	49	75	49	89	66
10	88	76	79	72	68	53	76	51	52	41	37	28	28	0	55	36	73	46	51	42	86	57	88	68
11	93	77	84	66	62	47	66	47	50	40	38	19	30	18	46	28	55	33	54	35	89	68	81	67
12	99	81	84	65	62	45	67	47	58	33	32	23	34	4	33	13	63	36	59	35	86	71	88	68
13	97	82	87	72	66	48	75	50	50	35	25	19	33	11	13	2	53	29	69	51	81	63	82	64
14	97	79	89	67	74	47	83	65	49	30	27	19	28	13	20	— 4	33	7	55	43	70	57	88	70
15	99	78	78	70	82	57	80	65	48	32	28	17	36	18	41	13	28	18	57	36	66	51	73	63
16	98	83	79	65	85	63	78	51	49	41	33	19	33	18	36	28	24	19	57	35	71	40	72	57
17	98	84	84	63	84	65	51	43	48	41	31	9	32	12	33	22	30	8	53	36	78	49	73	54
18	96	79	92	75	87	67	50	36	61	40	20	1	27	7	34	20	31	18	63	37	80	56	75	48
19	94	77	94	78	89	71	60	36	54	39	18	0	16	—11	34	21	39	14	63	48	85	58	79	50
20	94	79	86	70	71	52	73	49	55	40	30	13	39	10	28	9	35	30	63	40	83	62	83	58
21	85	74	84	69	68	45	61	46	45	33	30	11	45	19	44	18	40	31	72	45	75	54	81	65
22	83	67	86	70	71	46	54	33	51	33	11	— 5	44	30	49	35	41	32	81	53	74	49	88	67
23	84	66	92	74	76	49	61	39	53	30	18	— 4	35	16	40	29	60	31	82	58	82	51	83	67
24	89	70	97	74	71	49	55	39	49	34	6	—13	48	26	50	30	51	38	75	60	81	60	84	65
25	88	72	77	66	72	65	55	40	42	31	18	— 3	46	33	42	11	57	37	77	57	84	69	81	68
26	79	73	76	61	64	45	45	35	37	30	23	6	47	27	11	— 5	64	43	79	59	79	58	84	70
27	83	71	84	63	64	43	39	24	43	22	17	1	50	35	27	3	72	44	67	52	78	54	79	68
28	82	70	81	68	67	53	50	29	47	29	24	— 3	39	33	55	25	69	56	69	44	89	60	77	63
29	86	69	80	64	84	61	53	39	47	29	30	10	46	28	.....	.....	69	47	72	54	87	67	80	59
30	89	68	80	65	85	70	47	29	37	31	24	2	40	26	.....	.....	56	40	62	42	80	63	85	60
31	90	73	82	68	.....	.....	40	23	.....	.....	31	18	37	27	.....	.....	48	40	.....	.....	77	62	.....	.....
Range	38°		36°		48°		60°		44°		65°		70°		60°		69°		62°		54°		42°	
Monthly mean	81°.8		78°.1		68°.5		54°.7		44°.1		23°.3		21°.8		29°.9		42°.8		5_°.9		67°.4		72°.5	

Maximum, minimum, and mean temperatures—Continued.

STATION, KEY WEST, FLA.

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	92	79	92	81	89	81	88	80	75	70	75	70	82	69	73	64	74	66	81	66	87	74	84	75
2	82	74	92	81	90	78	87	79	78	70	72	66	78	69	70	59	73	66	83	72	84	74	84	76
3	86	79	91	81	91	81	85	78	75	70	67	60	71	63	62	56	72	66	85	73	85	73	85	76
4	91	79	93	81	88	81	85	77	75	70	71	62	68	61	70	58	73	67	76	69	84	74	85	78
5	92	82	94	82	90	81	85	78	75	70	68	63	79	64	79	68	73	66	70	66	83	76	86	76
6	92	82	92	77	87	81	85	78	75	70	67	59	69	49	80	70	74	66	74	65	85	75	87	79
7	93	82	94	81	83	76	86	78	79	71	70	63	65	48	82	72	74	67	79	66	87	74	89	80
8	92	78	93	82	85	78	87	77	77	71	74	64	72	62	77	65	77	68	78	68	84	70	88	80
9	86	73	92	77	83	77	88	79	77	70	79	71	79	68	65	60	76	68	81	70	79	69	86	79
10	89	80	89	77	82	77	90	80	79	70	72	65	70	63	74	62	76	70	83	72	81	68	82	72
11	89	79	91	81	86	77	87	80	75	71	68	63	77	67	77	66	77	68	79	72	80	73	86	76
12	91	80	92	82	89	81	82	78	81	71	71	62	79	69	69	64	79	70	82	69	85	71	85	75
13	92	81	90	83	91	79	85	76	78	73	75	67	69	62	72	63	78	70	80	70	88	72	88	76
14	93	82	89	82	92	81	82	76	79	72	77	68	74	61	72	65	77	71	87	74	88	76	89	78
15	91	78	87	81	90	80	83	75	81	73	78	70	71	62	77	63	74	69	83	75	88	76	94	79
16	93	79	89	80	86	80	84	75	85	74	74	67	74	68	76	67	77	68	84	76	90	77	92	80
17	92	80	90	82	85	77	84	75	81	75	68	62	78	67	78	69	77	71	86	71	91	77	89	79
18	91	80	89	82	86	79	87	73	82	75	64	60	81	70	80	70	77	70	76	68	86	77	92	73
19	89	78	90	81	87	78	81	76	81	75	70	62	75	56	74	64	76	67	72	66	86	76	91	79
20	89	81	93	81	88	78	78	72	81	73	75	66	57	51	66	61	80	70	78	64	86	76	84	74
21	91	81	94	82	86	80	75	70	82	70	79	71	62	53	65	60	80	71	80	70	88	78	88	76
22	93	82	92	83	92	78	80	74	75	66	75	62	69	58	72	61	81	72	79	71	88	76	84	78
23	93	81	89	80	89	81	77	69	74	65	64	60	69	63	79	67	81	73	78	71	85	75	84	77
24	93	82	84	76	88	80	75	66	77	67	71	61	71	65	71	67	81	72	79	70	80	73	85	77
25	92	78	92	76	88	80	80	73	79	72	76	64	74	66	76	65	81	73	79	70	80	73	86	77
26	87	77	91	77	87	80	79	72	83	73	79	67	75	66	77	68	81	73	82	73	81	74	86	75
27	85	78	91	81	86	77	80	73	79	69	73	59	76	68	75	69	83	71	83	75	80	74	82	74
28	89	79	91	82	85	77	80	72	73	66	64	55	78	70	75	65	81	70	84	76	85	76	85	76
29	91	81	92	81	86	78	84	74	71	63	68	60	76	69	.....	.....	79	71	83	73	83	75	82	76
30	90	79	94	82	88	79	82	77	74	69	77	64	74	68	.....	.....	78	71	83	72	82	75	87	79
31	89	78	94	82	.....	.....	78	74	.....	.....	76	67	72	64	.....	.....	77	70	.....	.....	83	76	.....	.....
Range	20°		18°		16°		24°		22°		24°		34°		26°		17°		23°		23°		22°	
Monthly mean	84°.9		85°.3		82°.6		78°.6		73°.7		68°.1		67°.6		68°.7		73°.0		75°.0		78°.6		80°.9	

Maximum, minimum, and mean temperatures—Continued.

STATION, KINGSTON, CANADA.

Day or month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	85.4	69.8	76.9	63.5	74.0	66.0	70.8	59.5	45.9	26.6	43.6	25.6	28.3	19.7	30.3	2.4	42.4	0.8	45.7	19.7	46.4	32.7	61.8	54.7
2	87.0	68.3	80.1	64.3	75.9	68.1	67.6	55.3	47.9	34.7	45.7	33.7	37.3	9.8	22.7	1.8	24.0	5.8	37.4	22.4	46.1	34.9	62.5	53.9
3	76.6	70.0	77.0	63.7	79.0	65.7	66.9	50.7	42.7	29.6	44.0	32.7	20.8	2.8	34.2	11.1	35.0	1.8	36.0	15.7	49.8	33.7	66.9	53.9
4	84.7	71.6	77.1	66.7	77.9	64.7	64.9	46.8	43.6	21.6	43.4	26.6	29.3	7.6	33.3	21.0	37.6	12.7	31.9	10.7	59.3	36.1	66.7	49.7
5	88.1	67.3	77.4	62.6	76.0	65.1	62.0	44.6	41.2	19.2	42.1	19.6	20.7	12.8	29.0	19.8	38.5	0.7	36.5	16.3	58.9	37.1	69.2	51.7
6	84.3	64.6	75.2	65.5	76.0	63.5	55.9	40.9	35.3	24.6	35.4	15.2	13.7	4.8	27.3	11.6	36.8	0.7	40.0	19.7	47.6	41.7	61.4	44.3
7	80.5	65.0	77.3	61.0	76.5	60.3	55.9	38.8	33.4	23.0	27.6	14.7	35.6	− 1.2	32.0	10.9	33.5	15.7	44.0	25.6	46.3	36.7	62.2	37.0
8	78.9	70.5	75.8	57.0	77.5	66.4	60.1	51.7	36.4	22.6	33.4	15.1	29.4	21.6	30.2	11.0	33.6	11.2	42.3	23.6	61.3	39.7	63.3	43.7
9	81.0	71.5	79.0	63.7	73.6	66.0	64.0	53.9	42.1	24.0	39.0	26.1	26.6	5.8	28.5	14.2	42.8	28.1	48.8	31.4	62.3	38.9	62.1	49.8
10	80.3	67.9	77.3	63.6	77.7	64.0	54.1	40.8	45.5	29.6	44.3	27.3	26.5	0.7	27.8	0.8	45.6	28.5	47.7	26.0	65.1	45.6	72.6	52.6
11	75.5	62.0	75.1	59.7	70.3	56.9	56.9	38.7	48.1	41.2	44.6	26.1	25.4	12.1	43.8	5.8	42.5	27.7	44.0	27.6	66.0	47.4	72.8	54.6
12	77.1	63.5	73.9	57.9	71.3	50.9	56.3	43.8	47.9	39.5	36.3	22.6	25.5	5.2	27.6	5.5	43.7	27.1	46.0	28.6	67.4	50.8	71.2	55.9
13	83.2	63.0	73.9	62.0	74.1	56.9	60.3	39.7	46.9	27.6	38.6	24.2	37.5	11.3	14.8	− 1.2	44.0	26.9	42.6	25.6	68.9	51.8	68.0	52.0
14	86.1	62.6	80.1	64.6	62.8	52.8	65.7	56.2	47.8	19.7	40.4	17.7	39.4	4.8	8.0	− 5.2	44.8	24.4	46.1	27.5	73.0	57.9	62.9	50.9
15	84.2	64.0	77.9	68.0	62.9	51.3	70.8	59.9	47.9	28.1	32.3	14.0	12.8	−10.2	14.7	− 8.8	33.5	13.7	45.8	29.1	68.3	52.0	57.7	54.9
16	81.1	64.6	79.6	66.0	66.8	50.6	69.8	59.9	47.9	29.0	26.3	7.8	3.5	− 3.2	29.1	17.1	24.5	12.7	45.7	32.7	58.7	48.8	67.9	49.8
17	93.1	67.0	77.6	65.8	72.3	64.0	71.6	60.6	46.4	33.7	37.5	13.3	31.2	− 5.2	18.8	2.8	22.6	13.6	48.7	31.7	63.3	39.8	62.9	42.9
18	86.9	73.0	71.6	58.9	71.7	56.3	61.6	41.6	46.0	38.5	39.0	15.7	39.1	18.6	17.0	3.6	29.8	8.8	47.4	35.1	71.6	41.4	62.9	47.9
19	90.1	70.0	77.4	60.0	71.8	53.7	46.3	34.7	48.0	37.7	32.0	6.8	32.2	4.2	17.4	− 0.3	26.4	8.5	53.3	36.9	77.5	52.1	65.7	47.8
20	85.1	68.0	78.0	60.0	76.0	66.5	56.0	31.8	47.0	38.7	35.0	19.7	9.2	−11.2	23.2	4.8	36.4	8.8	57.4	35.8	74.3	54.4	67.6	52.4
21	81.9	65.2	76.0	62.0	72.3	51.4	60.4	46.3	42.6	37.3	35.3	18.0	19.4	− 8.2	15.5	− 6.8	33.8	18.7	56.3	38.2	64.3	51.3	71.2	51.4
22	68.4	62.0	77.0	61.5	62.0	41.8	67.0	41.8	39.8	34.7	30.0	17.4	35.7	− 7.9	29.7	− 8.8	33.7	19.5	57.8	33.2	57.7	42.1	71.2	59.5
23	74.6	60.5	77.0	63.0	64.2	47.6	58.5	46.8	44.0	31.7	21.3	10.4	47.6	11.7	32.9	8.8	41.4	22.2	58.3	39.2	62.3	41.1	70.0	58.1
24	76.6	57.9	71.9	68.4	64.0	51.3	53.5	34.9	47.0	29.7	18.8	8.1	47.6	11.8	14.2	− 0.2	42.6	22.6	56.3	34.7	61.3	42.8	78.6	58.6
25	77.8	61.3	71.9	55.9	62.9	44.8	54.4	35.7	43.0	28.0	27.7	11.3	35.4	− 0.2	20.8	− 9.2	37.8	24.6	59.1	41.1	72.5	49.8	82.0	65.4
26	67.9	64.6	70.8	51.4	66.9	44.8	52.6	39.3	40.6	19.4	42.3	18.3	2.2	− 9.2	43.6	8.1	35.2	21.6	57.7	43.0	57.6	34.7	80.5	66.0
27	75.0	63.6	71.9	62.5	53.5	38.1	53.9	33.7	42.2	29.2	28.4	17.4	43.9	− 0.2	9.6	− 8.2	40.6	26.8	63.0	43.1	57.0	39.4	75.8	64.9
28	72.1	58.1	76.9	58.5	55.4	37.2	45.0	31.7	45.2	31.3	18.3	6.0	49.7	30.0	12.5	−18.2	42.8	29.6	59.7	43.8	59.7	43.8	72.0	65.6
29	74.0	60.0	76.9	65.4	67.5	48.8	46.2	33.4	48.1	30.7	24.3	3.3	39.8	11.6	.....	.....	43.4	33.7	53.3	37.6	70.6	46.1	73.8	63.6
30	69.0	65.0	77.8	62.8	64.9	52.4	48.1	39.7	49.0	27.7	30.1	14.7	30.3	8.1	.....	.....	43.7	26.4	54.9	41.3	69.4	57.1	74.5	57.5
31	73.7	63.5	80.1	66.0	.....	.....	48.1	31.6	.....	.....	30.3	14.7	35.1	20.6	.....	.....	39.6	18.5	.....	.....	74.3	55.5	.....	.....
Range	35°.2		28°.7		41°.8		40°.0		29°.8		42°.4		60°.9		62°.0		44°.9		52°.3		44°.8		45°.0	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, KITTY HAWK, N. C.

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	84	71	97	76	91	76	73	67	49	36	59	50	50	41	42	29	41	34	52	43	65	51	86	70
2	82	73	94	76	90	77	73	69	63	43	64	49	44	30	37	24	45	29	53	44	56	50	86	72
3	87	71	82	71	86	72	73	68	58	46	53	41	30	16	45	28	41	39	65	35	61	45	84	70
4	86	73	84	74	85	75	72	69	52	44	54	45	26	11	42	31	43	39	48	31	74	54	73	65
5	80	73	86	74	87	75	70	63	48	42	46	39	29	17	51	33	45	39	48	38	79	66	85	65
6	81	74	91	72	79	71	65	59	64	42	50	36	31	18	48	38	57	34	55	35	68	57	91	69
7	88	70	85	76	79	74	69	62	70	53	47	35	31	17	39	36	59	41	67	44	58	50	71	59
8	88	75	84	75	79	73	72	62	55	44	48	35	52	27	38	36	47	39	51	42	55	54	74	59
9	92	73	95	72	78	74	84	64	50	38	66	48	61	38	47	30	70	41	57	36	55	52	84	64
10	92	75	94	77	84	74	74	67	61	38	64	43	38	27	41	35	77	54	68	44	54	52	86	67
11	93	75	92	71	84	75	67	63	67	46	49	40	48	25	61	39	78	47	62	45	59	52	86	69
12	95	75	80	72	84	75	66	54	67	53	49	39	50	39	56	49	51	41	48	40	66	53	86	71
13	86	69	82	70	88	74	65	51	61	45	47	43	39	34	49	37	62	39	66	40	73	56	75	67
14	74	65	84	74	72	69	74	52	57	48	53	43	48	36	37	31	57	46	71	54	72	57	83	60
15	85	64	83	74	73	65	74	56	55	47	64	43	43	36	32	27	53	42	77	43	73	60	89	70
16	86	67	84	72	74	69	81	60	61	55	45	37	60	42	39	30	52	41	72	49	75	59	92	76
17	88	71	90	72	76	68	75	62	67	57	41	31	42	34	41	36	69	42	70	50	76	59	79	66
18	95	75	91	71	84	61	73	50	63	51	42	29	51	38	39	35	44	37	65	43	67	61	69	60
19	97	76	91	76	86	67	59	45	56	49	37	26	40	31	37	33	47	36	56	43	77	60	67	63
20	93	77	83	70	82	69	63	44	58	50	39	27	31	19	39	30	61	36	61	40	71	60	66	62
21	93	77	80	71	87	70	68	49	65	49	59	39	41	23	35	25	72	54	67	45	82	63	72	62
22	83	70	79	70	76	67	71	63	57	43	55	40	60	40	51	25	67	46	70	46	72	56	77	60
23	77	69	74	70	72	68	71	54	53	39	40	30	62	43	50	40	69	43	82	52	60	53	81	68
24	83	67	74	69	80	71	64	49	67	40	40	32	43	39	52	34	57	40	59	50	65	53	85	67
25	86	72	89	67	78	70	63	53	69	50	38	26	64	40	67	42	58	45	74	48	85	58	81	67
26	89	71	75	71	89	70	65	58	58	53	36	24	50	35	67	52	58	42	82	61	75	60	82	65
27	96	70	75	70	76	64	75	51	67	52	36	25	56	34	56	30	73	47	80	61	72	59	88	74
28	86	73	76	69	69	64	64	52	56	43	32	22	68	53	35	31	50	44	82	55	73	61	88	72
29	90	73	82	68	72	67	61	52	54	37	37	25	56	38	.....	.....	68	40	68	54	74	60	91	68
30	91	77	82	73	71	68	67	59	53	40	40	31	41	36	.....	.....	52	41	72	52	83	65	73	68
31	93	76	86	75	.....	.....	62	43	.....	.....	43	36	45	31	.....	.....	54	38	.....	.....	91	70	.....	.....
Range	33°		30°		30°		41°		34°		44°		57°		43°		49°		51°		46°		23°	
Monthly mean	78°.7		77°.7		74°.2		62°.9		51°.8		41°.8		38°.9		39°.2		48°.9		55°.5		62°.1		72°.1	

Maximum, minimum, and mean temperatures—Continued.

STATION, KNOXVILLE, TENN.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.
1	90	68	94	70	84	68	81	58	52	24	56	39
2	90	71	94	69	86	67	78	55	62	27	45	34
3	89	69	88	67	86	65	79	65	64	40	52	31
4	89	71	93	68	87	68	84	49	62	34	43	37
5	92	70	91	71	84	66	81	49	65	30	47	34
6	94	73	93	70	86	64	65	56	68	36	49	35
7	94	71	94	71	86	70	71	55	69	46	44	30
8	89	70	94	67	83	66	81	56	59	39	56	35
9	86	70	93	69	87	62	73	58	57	38	57	41
10	89	71	94	71	87	66	68	62	56	32	47	31
11	91	71	83	70	78	63	71	59	67	36	46	26
12	93	72	81	70	65	59	67	51	52	40	52	26
13	94	74	79	71	71	57	71	42	64	32	50	31
14	92	72	85	66	74	47	74	44	61	36	51	36
15	94	72	87	65	74	46	76	48	58	40	46	32
16	96	73	87	71	81	47	79	52	58	49	40	31
17	94	73	89	68	84	51	73	47	64	53	38	30
18	97	73	92	69	86	53	52	40	63	48	35	24
19	93	75	94	73	86	56	56	38	54	38	36	18
20	94	76	87	72	84	57	66	32	54	40	36	23
21	93	74	87	71	70	60	70	35	49	41	40	31
22	85	72	84	64	78	59	63	44	47	37	35	21
23	87	64	88	64	65	60	59	38	55	34	38	14
24	92	66	87	68	76	61	71	35	67	34	38	14
25	91	69	81	71	80	57	73	41	66	47	30	6
26	89	73	86	69	79	64	75	44	56	40	28	13
27	89	73	86	71	77	59	59	39	54	35	26	12
28	90	73	89	73	81	58	49	31	43	34	32	12
29	81	71	77	69	78	60	47	35	52	28	40	17
30	90	71	85	68	82	58	63	46	54	31	40	30 5
31	91	71 5	84	68	.....	....	47	32	.....	.....	36	27
Range	33°		30°		41°		53°		45°		51°	
Monthly mean	80°.5		77°.3		68°.9		56°.2		48°.2		34°.1	

Day of month.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	42	33	43	26.5	59.5	28	50.5	41.5	66.5	51.5	89	66.5
2	42	9	39	20	63.5	32	55	38	65	43	79	58.5
3	14	— 1.5	49.5	26.5	51	36	47	32	74	38	71	56.5
4	20	— 3.5	51	26	60	30.5	47	24.5	73	48	79	48
5	22	6	56	40	64	47	55	32	77.5	62	86	54
6	23	2	44	35	71	47	64	30.5	68	53	84.5	59.5
7	31	6	45	31.5	76	53	52	45.5	77	51	88	61
8	36	22	51	28.5	78	34.5	62	41	74	50.5	89	68
9	39	14.5	53	27	76	48	71	39	73	53	89	67
10	33	11	50	30	78	54	67.5	54	75.5	49.5	85	65
11	31	23	54	40	74	49	57	42	81	49	84	70
12	43	33	45	32.5	65	39	62.5	34.5	81.5	59.5	87.5	67
13	44	35	40	23	70	38	74	42	78	63	87	62.5
14	50.5	33	30	13	65	39.5	73	58	77	62	91	65
15	53	31	42	11.5	50	28.5	75	57.5	76.5	58.5	86	69
16	58	36	42	28	55	40	75.5	55	76.5	58 5	85	68
17	42	28	42.5	36	54	30	60	44	78.5	58.5	86	66
18	46.5	32.5	39.5	31	48	27.5	58	43	78	57	78	62
19	32.5	16.5	49	29	53	28	55	43.5	83	58	78	55
20	41.5	16	39	27	57.5	33	63	35	88	57	84	57.5
21	58	30.5	42	21.5	71	49	76	39	89	60	85	58
22	58	41	46	32	60.5	49.5	83	45.5	84	65.5	80	67
23	55.5	39	55	38	55	42	85	48.5	83	57	88.5	62
24	61	35	62	32	65.5	32	87	49	79	61	88	67.5
25	62.5	48	67	48	61.5	38.5	82	56	85	60	76.5	64
26	62	39	63.5	24	58.5	43	81	57	88	65	88	63
27	63	40	34	15	73	47.5	72	61	91	63.5	92	65
28	72	52.5	37	22	77.5	42	74	52	91.5	65	91	69
29	67	59	.....	.....	68.5	56	80	53	91	66 5	85	69
30	62	47	.....	.....	57	41	80	49.5	90	63.5	85	61.5
31	49	41.5	.....	.....	56	34	.....	.....	89	69	.....	.....
Range	75°.5		55°.5		50°.5		62°.5		53°.5		44°	
Monthly mean	37°.2		37°.8		51°.9		56°.7		69°.2		73°.9	

Maximum, minimum, and mean temperatures—Continued.

STATION, LA CROSSE, WIS.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	73	60	82	68	83	66	73	62	52	31	40	22	21	−12	30	11	41	13	43	26	64	39	61	43
2	78	57	82	69	76	66	71	53	45	37	42	27	−10	−26	41	14	32	12	35	21	66	37	69	45
3	80	60	86	67	76	58	65	50	49	27	40	35	2	−20	35	24	44	11	32	16	59	53	78	53
4	82	60	84	68	82	69	66	45	51	31	38	32	3	−13	35	27	45	36	41	23	65	47	79	64
5	86	70	88	67	85	65	60	46	59	37	37	25	14	− 2	27	16	44	29	53	25	51	39	73	58
6	90	70	84	70	86	68	64	46	52	37	32	20	23	− 7	26	16	47	36	62	42	52	35	69	54
7	90	77	87	67	82	69	61	47	44	27	31	15	30	17	23	10	46	34	59	38	61	42	72	52
8	84	68	90	72	79	72	61	52	52	33	30	20	19	− 1	40	20	56	36	65	40	61	41	88	63
9	81	65	82	64	74	60	56	43	54	33	35	25	11	−10	36	11	58	48	58	48	76	53	81	68
10	80	63	79	65	64	50	62	46	48	44	37	25	25	3	45	34	57	42	49	42	81	54	84	65
11	76	68	77	63	60	44	63	46	47	41	35	28	28	15	35	18	45	32	55	30	84	62	84	68
12	84	70	81	59	60	40	69	48	55	38	33	21	38	12	21	9	54	32	58	39	84	68	80	64
13	89	73	82	65	64	40	67	53	44	33	26	19	29	16	9	− 11	37	24	54	38	81	55	81	69
14	90	73	81	65	70	42	73	53	48	28	29	19	21	3	6	−14	26	1	56	38	60	48	85	68
15	90	71	75	64	77	52	63	52	53	36	28	22	22	2	31	− 4	20	4	56	33	70	46	73	59
16	92	77	73	59	70	59	66	49	47	31	28	21	29	15	19	0	20	6	54	35	75	46	69	48
17	86	74	74	56	72	57	49	40	51	37	25	18	24	5	24	− 8	25	9	55	33	75	52	71	51
18	87	68	74	67	77	50	49	36	56	41	20	10	20	5	31	7	25	10	62	38	79	59	77	51
19	81	73	77	72	76	61	58	34	53	41	21	9	14	−10	30	17	34	14	62	47	73	63	78	56
20	85	73	79	72	61	46	69	48	49	36	30	12	22	8	22	2	39	26	69	40	67	56	71	64
21	77	63	82	65	56	43	61	38	44	33	24	12	43	8	42	18	38	21	73	49	68	48	84	66
22	77	60	77	71	70	40	49	34	43	37	12	0	35	27	38	22	36	26	82	54	75	55	88	65
23	77	67	86	72	63	55	54	39	45	37	8	− 9	35	14	22	3	47	25	83	61	81	58	88	69
24	74	63	80	64	64	45	46	37	40	35	10	− 5	46	32	35	15	44	36	73	62	84	67	82	71
25	73	69	73	54	61	51	46	36	35	26	21	2	38	26	23	12	54	34	75	59	74	57	83	69
26	78	67	76	59	57	42	40	30	36	20	20	3	50	29	23	−11	55	42	80	53	59	45	85	69
27	79	62	81	67	62	38	33	28	37	28	20	9	50	35	15	−21	67	39	66	44	69	53	76	61
28	82	70	75	63	63	49	42	28	42	28	22	0	40	27	42	12	63	52	72	41	70	60	74	60
29	75	66	80	63	72	59	45	37	40	31	29	10	45	26	.....	.....	58	45	60	47	83	67	79	58
30	79	67	79	62	79	68	44	26	35	24	20	3	43	23	.....	.....	48	37	62	38	77	65	83	61
31	82	64	83	61	.....	.....	36	22	.....	.....	30	9	34	22	.....	.....	47	38	.....	.....	68	53	.....	.....
Range	35°		36°		48°		51°		39°		51°		76°		66°		66°		67°		49°		45°	
Monthly mean	74°.8		73°.8		62°.5		48°.9		40°.4		22°.1		18°.6		19°.7		36°.5		50°.5		61°.8		69°.2	

Maximum, minimum, and mean temperatures—Continued.

STATION, LA MESILLA, N. MEX.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	95	71	98	65	96	68	91	47	80	36	69	24	54	26	50	30	78	37	64	46	93	52	88	48
2	93	67	102	71	94	69	93	49	77	43	70	24	56	31	52	36	75	40	72	39	97	52	86	60
3	94	65	90	69	94	63	94	49	64	39	72	30	50	29	52	35	75	51	80	42	93	50	92	54
4	93	71	101	66	86	68	96	50	72	43	74	30	59	40	54	35	78	50	82	48	88	52	98	50
5	89	69	107	64	91	63	76	56	75	40	75	33	59	32	55	40	81	41	82	41	87	48	100	48
6	98	70	99	71	95	62	80	49	59	38	71	32	52	27	50	24	84	40	83	37	92	52	99	59
7	102	65	97	70	95	64	82	50	60	48	74	34	51	40	57	24	84	41	83	38	92	45	99	66
8	105	71	98	71	97	62	91	50	60	45	62	36	32	9	65	27	73	45	74	40	92	45	93	46
9	102	69	99	65	96	56	90	49	58	37	65	24	38	5	56	39	70	45	78	36	101	51	96	50
10	99	68	101	70	79	59	86	48	70	38	72	20	42	13	66	43	76	29	85	35	95	50	97	48
11	100	69	86	67	78	57	88	43	71	35	60	26	47	20	67	29	81	34	83	45	81	52	98	52
12	99	63	94	66	86	49	91	46	76	33	42	31	46	17	78	33	78	41	75	43	90	42	91	60
13	97	70	99	69	88	47	87	47	66	40	35	30	46	29	81	37	79	40	68	34	91	43	91	52
14	101	68	98	65	94	50	88	50	70	36	50	23	50	38	80	52	82	36	71	44	94	56	96	49
15	97	67	97	68	94	50	89	49	70	31	41	13	50	31	75	40	83	42	73	44	91	50	97	48
16	99	68	98	67	96	52	80	48	67	37	50	16	54	24	72	38	76	45	77	38	89	44	97	53
17	99	68	98	70	95	55	80	34	70	34	55	14	55	28	65	34	79	37	73	33	91	46	97	56
18	100	68	97	66	93	51	83	37	72	30	53	19	50	27	75	31	80	38	81	40	92	52	100	66
19	99	68	91	70	86	63	89	39	76	29	53	21	53	21	75	34	80	39	85	45	94	51	99	64
20	94	67	92	67	87	47	86	50	82	30	52	26	56	26	79	35	80	45	82	40	96	47	101	66
21	94	70	95	70	92	44	76	41	78	35	52	19	58	26	80	39	75	44	66	44	98	50	96	61
22	91	67	91	70	93	46	76	31	75	35	64	20	55	27	73	39	78	39	71	37	98	56	95	61
23	94	69	91	68	92	45	85	33	75	34	64	20	65	29	76	35	84	39	82	35	99	54	101	65
24	96	67	93	67	96	46	84	37	47	34	50	20	72	31	79	34	84	43	84	43	95	51	104	63
25	104	70	99	68	97	51	85	41	33	27	52	16	74	35	80	35	88	39	90	42	101	45	105	67
26	98	66	99	68	89	65	84	38	43	15	52	18	65	33	64	37	90	45	90	43	100	52	105	70
27	93	66	99	71	94	55	66	41	60	21	52	22	65	35	78	33	85	44	93	45	96	59	106	68
28	92	62	94	68	94	46	72	32	63	24	48	34	63	39	82	35	84	53	99	46	92	56	107	65
29	99	64	92	68	90	50	75	31	68	25	50	31	59	46	.....	.....	88	45	100	46	90	51	104	76
30	93	66	93	65	93	46	76	34	60	28	60	35	58	43	.....	.....	90	43	98	54	89	53	101	55
31	96	72	90	64	.....	.....	79	32	.....	.....	60	30	59	33	.....	.....	82	52	.....	.....	90	44	.....	.....
Range	43°		43°		53°		65°		67°		62°		69°		58°		61°		67°		59°		61°	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, LAREDO, TEX.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	95	75	95	80	94	74	94	77	78	64	68	34	58	51	69	54	83	60	82	63	96	72	95	68
2	90	73	98	78	95	76	93	78	86	66	69	35	56	44	55	46	81	64	80	45	95	72	90	64
3	95	74	100	83	92	73	92	77	78	68	74	34	44	37	58	44	77	57	85	53	99	70	96	60
4	90	73	100	82	94	73	90	76	78	56	78	38	40	33	71	51	80	61	83	57	97	74	90	56
5	95	75	100	82	96	79	91	74	83	65	73	54	39	32	62	50	80	60	82	65	99	75	96	67
6	94	76	(*)	81	90	78	90	74	85	64	75	54	44	26	50	38	82	64	88	67	88	69	100	67
7	92	78	.....	.....	90	78	90	75	86	69	77	55	64	35	53	36	83	64	90	65	90	71	102	70
8	87	76	99	80	93	78	86	77	86	73	77	55	50	35	66	34	84	67	95	64	94	68	102	72
9	94	76	98	82	(*)	.....	91	74	86	74	65	47	46	25	64	46	82	66	95	67	95	69	104	75
10	94	76	100	81	.....	.....	93	75	83	70	74	37	60	30	71	60	82	69	92	53	95	68	104	73
11	94	78	99	82	.....	.....	97	76	77	65	76	45	70	50	77	50	80	68	93	52	95	71	99	76
12	93	79	99	82	80	60	91	75	72	58	76	58	62	33	80	48	76	64	89	63	94	69	104	74
13	92	77	100	82	85	54	91	75	74	49	70	50	68	40	71	53	81	65	92	72	94	67	96	76
14	95	79	100	82	87	59	93	78	74	62	50	39	73	52	58	41	82	58	94	70	96	70	98	75
15	96	79	97	80	86	60	93	79	74	49	55	31	79	64	57	50	81	61	92	68	100	69	104	74
16	100	80	99	76	88	65	95	77	81	56	60	29	67	57	70	48	86	66	90	58	106	73	100	73
17	99	80	94	76	88	65	85	66	72	52	55	29	73	61	72	51	79	56	82	57	100	76	98	73
18	99	81	91	77	93	76	78	50	69	52	50	33	70	55	62	40	70	42	82	48	103	75	95	74
19	96	80	87	76	93	77	78	44	78	45	53	48	60	34	71	42	71	48	84	58	107	74	85	72
20	97	79	89	75	96	78	83	54	79	45	51	42	65	34	73	59	85	66	90	62	110	76	97	69
21	96	77	84	74	84	62	89	64	72	50	62	34	69	44	80	60	90	64	89	65	111	75	98	70
22	99	80	92	77	90	68	76	49	73	44	62	36	72	52	78	62	93	71	88	72	105	80	99	76
23	95	82	93	78	92	76	80	49	78	51	67	37	69	47	76	56	83	59	92	72	103	72	100	73
24	98	80	94	80	94	78	86	58	80	52	50	36	71	43	82	53	84	69	80	64	100	74	103	76
25	99	81	93	79	93	78	86	61	64	43	36	30	73	54	87	54	89	70	88	61	98	72	103	79
26	98	75	95	77	93	78	85	67	55	39	36	29	80	64	71	50	90	73	95	69	96	71	102	76
27	86	74	96	78	93	78	75	51	66	34	50	28	80	60	67	41	92	73	100	73	100	62	105	79
28	90	78	97	79	92	77	61	49	67	34	45	35	82	64	75	54	88	73	90	71	99	79	108	76
29	93	78	94	74	93	77	78	58	72	46	53	45	83	71	.....	.....	86	62	95	71	99	74	101	75
30	96	80	90	77	93	76	78	54	66	53	52	47	83	71	.....	.....	90	68	98	72	102	75	106	78
31	95	80	94	78	.....	.....	75	60	.....	.....	55	44	74	68	.....	.....	92	72	.....	.....	97	73	.....	.....
Range	27°		.....		.....		53°		52°		50°		58°		53°		51°		55°		49°		52°	
Monthly mean	84°.3		†85°.5		‡81°.0		75°.4		64°.6		50°.5		56°.2		59°.1		73°.6		(§)		.....		.....	

* No observation taken. † Monthly mean for twenty-nine days only. ‡ Monthly mean for twenty-seven days only. § Computation of monthly mean temperature ceased Apr 1, 1879.

Maximum, minimum, and mean temperatures—Continued.

*STATION, LEAD CITY, DAK.**

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	75	41	81	50	75	45	55	37																
2	90	63	85	60	85	59	54	49																
3	92	70	80	53	86	58	54	33																
4	90	67	77	60	65	46	50	27																
5	85	64	85	55	49	44	62	29																
6	75	57	85	65	64	42	56	38																
7	68	49	85	58	76	44	64	35																
8	73	46	85	61	49	35	53	32																
9	72	49	73	54	46	33	70	29																
10	80	53	72	48	42	32	64	35																
11	85	55	71	55	56	27	67	36																
12	86	67	75	53	69	37	72	46																
13	91	62	71	48	76	45	57	36																
14	92	65	75	49	53	37	54	33																
15	91	63	73	46	41	34	53	33																
16	79	56	85	60	55	40	35	26																
17	91	65	75	61	63	35	47	27																
18	81	64	67	56	72	49	65	38																
19	80	59	80	60	49	34	68	40																
20	77	62	82	55	56	31	60	32																
21	80	64	82	66	66	32	36	31																
22	71	61	85	66	62	42	46	31																
23	74	55	80	65	55	34	35	29																
24	74	57	65	47	56	39	29	18																
25	67	57	76	49	48	35	20	12																
26	65	56	78	58	66	38	21	6																
27	75	53	70	48	78	48	34	14																
28	72	48	70	49	68	41	38	29																
29	82	52	83	55	72	46	37	30																
30	75	48	76	55	54	42	36	25																
31	73	56	80	56			55	29																
Range	51°		39°		59°		66°																	
Monthly mean	67°.1		65°.8		49°.1		39°.6																	

*Observations discontinued October 31, 1878.

Maximum, minimum, and mean temperatures—Continued.

STATION, LEAVENWORTH, KANS.

Day of month.	July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	78	64	93	77	91	59	78	61	71	30	37	32	30.5	4	34	22	39	21	50	30	71	44	63	52
2	80	61	89	72	85	64	82	52	57	40	44	27	5	−12	46	23	38	23	60.5	29	74.5	48	69	46
3	80	64	93	71	90	60	69	50	61	30	52	41	0	−14.5	48	26	48	27.5	41	19.5	74	57	86	54
4	84	66	92	72	92	67	68	53	69	39	44	34	7	−14	44	32	56	40	55	21	75	50	91.5	60
5	89	69	92	73	93	69	64	51	71	53	47	31	5	−10	36.5	24	70	41	68	28	63	44	87	66
6	90	71	95	74	90	71	63	49	69	53	40	26	20	−13	40	21	61	49	61	49	66	41	91	63
7	87	70	95	75	86	69	73	47	56	42	33	25	30.5	13	46	24	82	48	62	48	67	50	87.5	65
8	90	67	96	75	76	68	86	57	52	35	31	27.5	26	5	46	27	70.5	61	62	44	74	52	87	70
9	90	70	96	74	70	57	70	49	58	30	37	29	21	−8	53	24.5	71	52	59	45	80	59	93	66
10	94	75	79	69	67	48	84	60	56	45	36	29	31.5	2	51	33.5	74	48	54	43	88.5	64	86.5	68
11	94	74	84	65	65	43	67	49	45	37	35.5	27	31	21	41	26	61	38	59	41	85.5	68	88.5	63
12	97	76	86	61	63	45	73	47	61	36	34	26	30	7	35	10	67	41	70.5	41	80.5	71	90	69.5
13	97	76	87	66	71	41	81	59	58	40	26.5	21.5	30.5	13.5	16	4	63	27	74	47	75	57	89	69
14	100	76	86	63	83	49	84	67	53	39	25	14	31.5	20	31	8	36	9	57	47	61.5	55	86	67
15	98	79	84	70	85	58	79	67	53	38.5	28	19	35.5	18	42	18.5	34	21	56	45	74	54	78	65
16	97	78	83	63	85	61	76	49	54	42	28	14	27	9	39	26.5	28	20	60	48	77	53	71.5	60
17	96	75	92	68	86	62	56	43	60	35	14	3.5	29	18	33	26.5	34	12.5	63	43	81	50	69	58
18	90	77	93	72	89	66	57	33	65	37	18	−3	28.5	8	40.5	26	39	19.5	72	38	86	63	79	60
19	94	76	95	74	86	66	73	41	55.5	39	25.5	6	30	1.5	35	23.5	49.5	15	72	52	86	63	79	64
20	94	78	97	76	66	48	74	52	55.5	40	30.5	12	43	7.5	37	22	44	21	74	51	83	59	72	65
21	92	76	98	77	70	46	62	41	50.5	39	28	2	45.5	26	58.5	29	47.5	27	73.5	57	83	63	84	64
22	87	70	97	76	76	51	62	34	58.5	41.5	21	−0.5	41.5	32	50	36	49	27	81.5	63	77	62	77.5	68
23	86	71	98	75	71	55	64	42	64	42.5	22	4	37.5	19	53	31.5	72	32	80	60	80	65	86.5	71
24	90	74	99	79	79	47	55	44	49.5	36	11	−2.5	47	28	69	37.5	55	36	68	56	90.5	69	90.5	72
25	84	73	82	65	77	52	50	37	38	32.5	21	2.5	47.5	33	54	10	73	42	74	63	92	72	80.5	76
26	84	72	85	63	64	44	43	29	40.5	26	20.5	6	53	39	20.5	0	70.5	50	83	55	84	67.5	78	68.5
27	86	69	87	64	63	47	41	20	46	26	19	1	56	37	50	10	84	44	68	48	87.5	64	72	64
28	81	69	82	64	76	59	56	28	53	25	28	1	39	34	60.5	27	71.5	55	69.5	43	87.5	66	77.5	64.5
29	84	70	82	62	87	66	57	37	47	29	31	21	41	34	.....	.....	79.5	45	72	55	88.5	61	78	66.5
30	91	65	82	59	87	72	47	32	42	32.5	27.5	1	44	31.5	.....	.....	66	43	63	53	78	63	78	67
31	94	67	87	58	.....	.....	51	24	.....	.....	32	23	39	33	.....	.....	61	47	.....	.....	75	56.5	.....	.....
Range	39°		41°		52°		66°		46°		55°		70°.5		69°		75°		63°.5		51°		47°	
Monthly mean	80°.3		78°.9		67°.8		55°.2		45°.7		23°.3		23°.6		32°.9		46°.4		55°.4		69°.0		73°.3	

Maximum, minimum, and mean temperatures—Continued.

STATION, LOS ANGELES, CAL.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	83	64	85	63	77	62	75	53	74	47	80	50	57	51.5	67.4	40	70.5	49	64	53	76	49	100	62
2	81	60	83	61	78	63	80	55	68	47	85	51	67	52	72.5	41.6	63	50	68.5	51	73	50.5	103.5	67.5
3	80	60	80	59	81	63	75	53	69	51	88.2	59.5	67.2	52	57	49.1	62	45	67	50	72	54	99	65
4	79	54	80	54	79	63	72	60	68	49	80	48	60	45.5	57.5	48	65.5	44	63.5	49.5	72.5	55	86	58.5
5	76	59	83	58	78	62	71	54	64	53	64	43	63.6	52.2	61.1	38.6	65	43	66.5	51	69.5	54	79	61
6	77	54	82	59	77	60	75	51	67	53	66	50	63.6	46.5	63	38.8	63	50.2	66.5	47.3	70	48	71	60.5
7	80	58	84	58	78	62	77	52	69	48	71.8	44.5	59	46.2	58.5	39.3	60	45	64	48	73	53.5	74	57
8	80	57	89	63	80	62	75	58	70	50	78	42	59.1	36	61	45	60.5	46	69.5	44	72	43	72	57.5
9	80	59	87	63	88	54	74	56	68	50	73.4	53	56.1	37.1	61.6	46.5	62	47	74	46	71.5	44	72	50.5
10	77	59	84	63	103	63	75	53	71	46	66	39.5	62.5	38.2	63.6	52.5	64.5	48	69	44	70	47.5	71.5	51
11	79	52	82	62	102	65	76	51	71	45	63.5	39	60.5	38	60.5	51.3	71.8	45	60.5	42.2	76	48.5	72	58
12	81	54	86.5	63	101.5	71	73	58	66	44	62	34.1	58.6	40	63	54.4	75.5	42.5	64.5	47.5	84	49	74.5	60
13	85	57	87	66	95	64	72	49	70	45	62.5	38	55.2	41	61.5	53	75	46.5	62.5	53.5	70.5	51	72.5	53.5
14	88	63	84	65	90	64	70	53	72	44.5	61	30	56.8	41	64	48	74	48.5	67	51	70.5	53	76.5	59.5
15	81	61	84	64	86	60	70	54.5	70	53	66.4	35.5	56	36.2	67.2	51	61	54	75.5	49.5	69	53	78	59.5
16	80	63	84.5	62	77	58	86	48	78	45	70.5	39.4	59	36	67.2	47.1	62	54.5	84.5	49.5	73	46	73.5	60
17	76	61	85	60	73	59	88	49	81	53	66.8	38	59.5	36.5	75	48	60.5	54.5	88.5	53	72	47	75	55
18	78	59	81	60	72	53	81	48	81	50	65	36.5	72	41	72.4	52.5	64	54	81	50	71	50	77.5	54.5
19	77	60	77	60	76	52	73	44	81	48	68	36.5	73.7	48	80	54	63	52.5	66	55	67.5	54	75.5	58
20	78.5	61	78	59	85	54	74	45	79	45	67	38.4	70.9	48.6	73.5	47.5	63	47	67	50.5	71	45	74.5	55
21	81.5	61	79	62	79	55	87.5	48	76	46	72	42.5	68	42	65	45.5	62.5	52	82	52	70	47.5	73.5	53.5
22	79	63	75	60	76.5	56	91	52	67	53	72.8	41.5	65.6	40.8	62.1	50	68	45	79.5	44.5	70	44.5	74	58.5
23	78	61	77	54	78	55	90	55	66.5	50.5	69.2	40.4	66.1	42.5	61.5	47	68.5	45.5	82	47.5	71	46	77	56
24	78	57	76	57	76	58	84	50	71	50	59	40	73.4	50.1	64.1	44.5	68	48	76	45.5	77	45.5	77.5	60
25	81	59	73	63	75	54	76	50	68.5	40	60	35	60.3	50	63	50.5	78	50	74	46.5	76	47	76.5	60
26	81	61	78	63	78	60	75	47	70	45.5	65.1	38.6	56.2	39	65.8	50	77	48.8	71	50.5	72	47	73.5	58.5
27	81	61.5	77	59	76	59	89	45.5	68	39.5	60.4	40	57.5	45	59	47	88.5	51	75	49	76	47	73.5	58.5
28	80.5	60	75	58	74	51	82	49	67	38	54.1	46.2	56.7	42.4	58.4	52	90	55	72	48	69	50	74.5	57
29	86	59	75	58	72	50	80	43	78.2	37	56.3	43.6	52.6	46.5	.....	.....	99	61	74	49	76	57	76	59.5
30	83	57	76	61	72	52	77	45	77	40	55	45.4	60	39	.....	.....	77.5	57	76.5	46.5	91.5	54	76	56.5
31	83	56	76	61	.....	.....	80	48	.....	.....	55.6	48.6	62.1	42	.....	.....	69	54.5	.....	.....	97	65	.....	.....
Range	36°.0		35°.0		53°.0		48°.0		44°.0		58°.2		37°.7		41°.4		56°.5		46°.3		54°.0		53°.0	
Monthly mean	67°.0		68°.2		65°.5		62°.1		57°.5		53°.0		51°.1		54°.8		57°.7		58°.2		61°.8		65°.8	

Maximum, minimum, and mean temperatures—Continued.

STATION, LOUISVILLE, KY.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	91	69	93	74	82	72	83	66	52	30	51	43	34	27	37	24	61	41	52	40	62	43	78	60
2	77	70	90	73	89	69	77	64	62	43	49	37	32	— 3	36	22	51	35	55	33	66	45	62	53
3	85	70	91	72	85	71	79	54	54	35	52	42	5	—10	46	30	43	31	48	26	75	49	70	53
4	92	72	90	70	82	65	80	55	54	36	46	38	12	— 4	53	32	50	39	45	31	73	60	83	56
5	91	73	92	72	82	64	63	48	59	35	49	37	11	— 3	46	37	59	30	51	34	74	54	86	67
6	94	73	93	74	88	64	66	42	72	50	42	33	19	5	37	35	65	49	65	37	65	50	87	67
7	91	73	89	71	91	67	75	50	61	43	39	30	33	13	44	33	69	51	53	45	65	44	79	62
8	89	75	95	68	89	72	82	55	54	38	50	30	35	24	48	29	78	52	63	36	64	46	83	58
9	93	74	95	76	88	70	75	64	53	42	50	34	24	9	45	34	74	60	72	48	76	47	90	64
10	93	75	82	72	77	63	68	60	55	38	36	30	23	— 1	56	34	77	60	57	50	84	54	92	70
11	96	76	85	71	63	55	68	53	57	49	48	34	36	19	55	36	65	46	52	43	86	60	90	67
12	95	78	86	68	64	55	63	44	55	45	41	32	33	29	38	23	63	37	58	38	88	61	85	69
13	91	77	86	69	70	53	74	45	58	44	40	29	38	30	25	15	63	49	73	45	85	65	83	67
14	92	74	88	68	71	52	78	60	53	37	43	32	39	34	19	6	52	30	75	54	82	66	91	68
15	92	76	89	69	77	51	80	64	57	39	35	30	47	33	31	10	43	27	61	48	79	63	87	72
16	93	76	91	74	79	53	79	65	57	48	34	29	47	35	39	25	39	26	53	45	70	59	78	66
17	97	78	87	73	83	56	74	50	55	49	36	27	42	26	34	27	33	24	51	41	79	60	76	54
18	97	80	94	72	85	61	50	41	54	43	27	19	41	29	30	20	36	22	56	39	84	58	75	58
19	92	80	96	77	88	65	56	40	57	37	30	21	33	6	36	26	43	28	54	45	80	59	78	56
20	94	77	82	75	81	65	65	40	54	43	37	23	39	17	32	23	54	33	63	41	90	63	89	59
21	93	76	83	69	68	53	71	47	49	42	40	30	55	28	40	25	52	39	71	42	85	65	88	67
22	82	64	83	65	72	48	59	38	47	37	30	15	57	43	48	39	53	39	80	47	75	54	87	71
23	82	64	85	67	78	53	59	36	54	38	28	14	55	35	46	35	52	36	83	54	81	54	89	68
24	87	65	90	68	74	66	71	46	63	46	15	4	50	34	58	38	60	42	84	57	86	60	94	70
25	92	69	80	67	84	61	73	50	52	43	21	5	57	42	65	45	51	36	75	66	89	70	90	71
26	87	74	81	59	70	57	72	54	45	40	22	10	56	35	45	18	64	46	81	61	80	67	86	70
27	83	70	84	63	68	50	55	34	49	37	23	17	63	48	30	14	65	48	72	63	85	67	87	72
28	86	70	87	65	66	56	45	27	45	36	22	11	66	48	51	27	79	44	69	53	86	63	78	68
29	86	76	81	66	81	63	51	34	51	35	34	18	48	41	.....	.....	67	56	74	51	92	72	80	65
30	90	75	80	66	83	64	53	40	50	34	34	25	48	39	.....	.....	57	40	69	54	90	72	84	64
31	92	73	84	71	.....	.....	41	32	.....	.....	33	20	45	36	.....	.....	51	36	.....	.....	88	71	.....	.....
Range	33°		37°		43°		56°		42°		48°		76°		59°		57°		58°		49°		41°	
Monthly mean	81°.8		78°.7		69°.0		57°.1		47°.6		31°.5		32°.1		35°.4		48°.8		55°.6		69°.5		74°.1	

Maximum, minimum, and mean temperatures—Continued.

STATION, LYNCHBURG, VA.

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	86	71	93	74	89	72	78	61	52	33	48	35	38	30	44	27	51	23	57	40	66	53	92	67
2	86	72	92	70	88	70	82	58	65	35	52	42	41	16	36	24	53	30	57	42	68	44	89	68
3	89	74	89	73	90	68	80	59	60	39	52	36	12	5	47	23	41	33	49	33	69	42	73	68
4	89	69	88	67	88	70	80	53	59	32	49	41	22	3	50	30	58	35	46	31	65	53	78	59
5	92	68	91	70	86	65	76	52	53	32	42	37	24	11	48	32	65	43	52	37	79	60	87	60
6	91	71	89	68	86	65	68	53	65	35	45	33	27	15	46	40	61	32	62	34	76	55	87	65
7	93	70	89	72	83	65	55	47	68	49	43	30	38	15	46	35	72	53	52	43	70	50	76	60
8	94	74	88	67	76	68	72	50	52	40	39	26	41	30	43	28	61	43	60	37	68	50	75	54
9	92	74	92	70	73	64	79	61	52	36	45	33	45	27	52	26	74	38	69	34	71	43	87	61
10	92	75	94	74	80	64	76	62	64	36	52	41	34	21	43	25	79	55	66	54	72	44	86	64
11	95	76	85	73	81	69	65	55	66	39	49	37	40	22	50	36	74	54	62	47	74	54	87	68
12	95	76	82	73	76	71	70	52	62	48	52	35	38	33	51	38	62	44	56	38	77	59	84	67
13	90	77	77	70	77	64	71	43	65	40	48	30	36	29	46	31	70	38	74	38	79	63	84	69
14	91	74	86	70	73	57	75	43	53	35	49	30	46	33	37	24	68	51	63	56	82	59	85	68
15	92	73	88	72	76	51	78	45	53	32	45	41	39	34	36	17	54	37	76	54	69	65	90	70
16	92	74	79	74	76	50	76	53	50	41	41	34	56	30	38	19	57	39	63	52	79	64	86	70
17	94	73	89	70	79	52	76	58	57	48	35	30	41	29	34	30	62	42	53	48	81	63	79	66
18	97	75	89	71	82	56	58	48	58	44	39	28	51	35	45	26	49	34	55	43	76	63	74	54
19	97	77	92	73	84	58	58	42	58	38	36	23	39	21	39	31	49	29	55	44	76	62	75	60
20	93	73	84	71	84	59	63	36	62	45	37	21	31	15	36	26	60	26	62	38	84	62	77	53
21	96	75	86	68	76	63	67	36	57	46	38	30	51	24	37	23	71	42	68	38	89	63	82	55
22	86	72	82	64	69	60	62	46	50	43	38	29	62	41	47	26	55	43	76	40	74	60	85	66
23	83	69	83	67	68	55	61	51	53	40	31	17	58	40	55	40	54	43	86	43	72	53	86	63
24	82	61	84	60	68	56	66	43	66	35	31	22	51	32	56	34	62	33	71	54	74	45	88	64
25	88	60	83	68	76	64	68	42	66	41	31	18	67	42	57	36	61	43	81	48	85	56	84	67
26	92	73	79	62	83	64	72	42	60	43	32	19	50	32	56	35	55	38	84	58	79	66	91	63
27	92	77	73	62	68	53	72	46	46	38	29	23	54	29	37	22	64	45	83	56	74	62	93	71
28	86	73	83	67	68	47	53	39	47	41	33	19	72	46	41	22	67	40	75	61	89	60	94	73
29	91	73	84	68	71	50	51	36	51	32	37	22	54	46	.....	.....	66	43	76	58	82	64	84	70
30	89	74	78	70	71	56	66	43	49	30	44	30	53	38	.....	.....	55	43	76	53	90	66	84	63
31	92	73	78	66	.....	.....	56	38	.....	.....	37	28	52	32	.....	.....	54	35	.....	.....	91	67	.....	.....
Range	37°		34°		43°		46°		38°		35°		69°		40°		56°		55°		49°		41°	
Monthly mean	83°.0		78°.1		70°.6		59°.0		49°.0		36°.3		36°.7		38°.3*		51°.3		56°.9		68°.6		75°.7	

*For twenty-seven days only.

Maximum, minimum, and mean temperatures—Continued.

STATION, MADISON, WIS.*

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June Max.	June Min.
1	.....	.....	.....	.....	.....	.....	75	58	54	31	38	30	22	— 6	26	13	40	18	43	29	62	38	59	42
2	.....	.....	.....	.....	.....	.....	73	51	46	39	39	30	— 6	—22	37	16	33	22	33	19	65	38	63	48
3	.....	.....	.....	.....	.....	.....	67	50	50	35	38	34	— 2	—17	38	24	44	10	31	12	59	47	75	53
4	.....	.....	.....	.....	.....	.....	67	48	52	36	36	32	4	—10	35	28	46	36	40	21	67	50	81	60
5	.....	.....	.....	.....	.....	.....	60	51	58	37	39	28	18	— 4	31	22	44	33	50	25	52	38	73	58
6	.....	.....	.....	.....	.....	.....	63	47	55	35	32	22	20	0	37	20	48	33	64	38	55	35	64	51
7	.....	.....	.....	.....	.....	.....	60	49	46	37	30	17	28	13	37	13	43	35	55	32	59	39	70	45
8	.....	.....	.....	.....	.....	.....	69	54	45	36	32	25	28	2	42	25	68	39	64	36	66	39	83	55
9	.....	.....	.....	.....	.....	.....	65	47	54	36	33	28	12	— 3	34	15	63	50	55	46	75	49	83	64
10	.....	.....	.....	.....	.....	.....	61	49	52	36	34	28	28	1	46	34	65	40	49	36	82	53	82	62
11	.....	.....	.....	.....	.....	.....	62	45	47	40	33	25	30	16	40	18	49	32	53	30	84	61	80	64
12	.....	.....	.....	.....	.....	.....	67	48	54	36	31	23	30	8	21	10	58	35	58	36	83	68	79	61
13	.....	.....	.....	.....	.....	.....	64	48	48	34	25	21	31	20	10	— 4	48	28	55	43	82	62	79	60
14	.....	.....	.....	.....	.....	.....	76	53	49	32	28	21	24	13	5	—11	28	5	52	36	64	51	83	65
15	.....	.....	.....	.....	.....	.....	70	54	52	35	29	22	28	12	30	0	21	6	51	32	66	44	74	56
16	.....	.....	.....	.....	.....	.....	73	48	44	36	31	23	32	17	24	10	24	11	48	35	75	47	68	47
17	.....	.....	.....	.....	.....	.....	48	40	48	42	30	18	27	7	26	5	27	10	51	29	79	50	70	42
18	.....	.....	.....	.....	.....	.....	44	37	52	42	22	10	18	2	34	12	29	13	58	34	76	50	75	48
19	.....	.....	.....	.....	.....	.....	56	36	50	39	17	8	14	— 8	30	23	34	16	59	41	82	52	78	52
20	.....	.....	.....	.....	.....	.....	69	45	44	38	29	10	21	9	23	8	39	29	66	40	73	59	76	56
21	.....	.....	.....	.....	.....	.....	62	38	42	33	26	18	41	7	37	14	43	29	69	42	67	46	82	63
22	.....	.....	.....	.....	.....	.....	47	33	42	37	21	5	36	23	37	27	35	24	81	46	72	49	86	66
23	.....	.....	.....	.....	.....	.....	54	38	41	31	9	— 7	36	23	27	8	48	24	82	56	77	55	86	68
24	.....	.....	.....	.....	.....	.....	48	41	40	34	10	— 8	45	28	33	17	47	36	79	59	86	57	84	69
25	.....	.....	.....	.....	.....	.....	47	39	36	27	18	3	40	29	31	19	51	33	77	59	68	52	82	72
26	.....	.....	.....	.....	.....	.....	39	30	37	24	18	6	43	27	19	— 8	48	40	79	56	56	46	81	70
27	.....	.....	.....	.....	.....	.....	32	29	34	25	19	9	46	36	15	—12	60	37	68	50	67	50	74	60
28	.....	.....	.....	.....	.....	.....	41	26	42	30	22	4	40	28	40	9	60	44	71	44	74	56	74	58
29	.....	.....	.....	.....	69	59	49	39	45	29	27	13	45	27	.....	.....	57	44	62	47	84	63	75	59
30	.....	.....	.....	.....	79	66	44	29	43	27	18	4	42	26	.....	.....	49	36	61	38	80	62	81	59
31	.....	.....	.....	.....	.....	.....	32	20	.....	.....	30	7	33	24	.....	.....	49	33	.....	.....	69	48	.....	.....
Range	.....	.....	.....	.....	.....	.....	56°		34°		47°		68°		58°		63°		70°		51°		44°	
Monthly mean	.....	.....	.....	.....	.....	.....	49°.6		40°.2		22°.1		19°.7		22°.0		36°.7		48°.2		60°.7		67°.4	

* Station opened September 29, 1878.

Maximum, minimum, and mean temperatures—Continued.

STATION, MARQUETTE, MICH.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	75	58	80	65	84	60	70	60	48	18	40	24	17	4	18	10	25	12	32	17	45	30	52	38
2	73	51	83	65	69	62	72	52	42	30	40	27	8	−6	39	10	44	6	21	12	57	34	66	32
3	74	45	83	62	66	60	63	49	50	28	40	26	10	2	28	21	48	25	27	13	51	40	67	43
4	77	48	80	61	76	53	63	43	42	24	35	30	22	7	35	23	40	18	30	18	49	35	73	47
5	78	52	76	58	72	67	51	37	47	30	38	27	23	15	29	12	31	15	45	21	35	33	62	32
6	88	60	76	57	78	65	62	35	45	30	33	23	23	8	31	7	39	23	45	34	45	33	57	37
7	90	71	81	58	82	64	58	48	38	28	29	20	27	17	30	8	41	15	47	28	56	33	67	41
8	81	63	86	69	78	63	51	47	40	35	40	18	20	8	24	13	45	32	65	32	58	32	83	51
9	80	63	74	61	76	58	55	41	59	35	27	16	20	5	26	7	63	35	54	39	70	47	80	62
10	70	56	76	60	68	47	55	35	56	42	33	27	23	3	38	20	61	32	42	32	68	49	80	61
11	73	53	76	57	55	45	66	45	46	36	27	20	35	9	28	18	42	22	42	23	67	50	72	60
12	78	63	77	56	63	39	76	48	43	34	28	14	37	21	20	7	32	24	52	22	64	48	67	53
13	96	60	84	56	58	39	70	52	40	30	26	22	30	15	10	−4	32	22	46	32	51	39	68	46
14	89	69	79	61	70	50	78	50	51	27	28	20	20	11	10	−10	30	7	41	27	48	37	62	47
15	92	69	71	57	74	50	55	47	47	35	27	20	27	7	25	−6	13	−6	46	31	59	37	51	42
16	100	76	65	53	70	57	72	52	51	36	24	15	31	15	30	0	25	−6	38	30	71	39	50	39
17	82	71	70	56	70	51	61	38	50	35	27	15	31	21	23	−6	19	−2	39	27	62	38	63	37
18	85	63	78	57	75	48	38	34	50	33	23	14	23	12	30	10	29	−2	49	25	47	36	63	43
19	90	63	76	64	69	56	56	32	50	33	23	10	19	4	34	13	30	5	48	32	65	38	84	51
20	87	66	75	58	56	45	58	40	43	34	22	3	28	9	13	0	34	5	56	25	60	43	79	61
21	72	63	73	54	55	38	64	38	41	34	27	15	30	13	28	5	36	7	61	32	63	38	74	62
22	78	56	83	60	66	39	47	35	40	28	20	10	26	8	28	10	40	15	80	41	60	39	64	52
23	85	54	80	69	69	53	49	31	40	32	16	2	39	6	10	−3	49	20	52	40	67	47	95	51
24	90	66	74	65	67	47	40	33	38	32	21	7	40	20	20	−5	35	20	65	44	85	54	87	74
25	71	61	78	57	55	45	44	35	33	28	27	18	38	10	23	12	40	10	57	45	54	38	79	63
26	75	58	80	57	52	38	38	30	42	24	27	18	38	14	12	−12	39	26	75	41	57	36	73	60
27	65	51	72	61	60	35	32	24	39	25	22	14	45	33	16	−20	50	35	65	43	68	44	74	56
28	76	48	74	56	62	46	34	18	42	32	28	12	37	26	28	4	49	37	49	34	78	47	68	55
29	77	63	81	54	70	52	42	25	38	32	21	6	42	24	.....	.....	40	32	44	34	92	62	70	53
30	80	62	86	66	78	63	38	30	42	25	18	5	45	22	.....	.....	33	25	45	31	80	57	85	53
31	80	65	83	64	.....	.....	32	20	.....	.....	29	7	32	12	.....	.....	52	20	.....	.....	57	40	.....	.....
Range	55°		33°		49°		60°		41°		38°		51°		59°		69°		68°		62°		63°	
Monthly mean	70°.2		68°.7		59°.4		46°.6		38°.4		23°.1		21°.2		15°.9		28°.4		39°.3		50°.4		61°.1	

Maximum, minimum, and mean temperatures—Continued.

STATION, MASON, TEX.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	83	67	98	72	92	65	90	71	70	41	57	33	64	34	45	35	75	45	69	45	78	63	79	58
2	85	68	99	74	98	62	91	65	78	54	66	31	53	22	46	33	(*)	(*)	66	38	79	60	78	51
3	85	64	98	73	82	65	86	66	76	55	70	31	33	18	51	37	.....	.....	75	39	87	64	83	46
4	86	65	96	73	91	64	90	67	72	43	67	33	27	18	62	25	.....	.....	69	41	87	61	88	47
5	85	64	97	69	91	70	84	64	72	43	65	35	28	16	43	27	77	32	74	50	82	59	90	60
6	95	67	99	69	88	67	83	60	78	59	71	48	40	11	36	27	80	54	80	64	74	56	95	59
7	93	71	99	70	80	67	85	59	78	64	72	45	51	29	48	27	79	58	79	56	76	54	94	66
8	93	69	99	71	87	70	82	63	77	65	61	38	31	18	63	29	74	62	87	57	82	58	95	69
9	95	64	100	72	82	62	83	60	72	51	58	36	42	12	63	31	74	60	82	59	86	63	96	73
10	96	71	101	74	73	57	88	65	75	44	69	33	46	25	72	52	80	61	79	42	88	64	98	75
11	95	69	101	68	72	55	86	65	62	47	67	44	51	33	75	46	79	54	83	45	87	65	98	73
12	97	72	88	69	75	51	90	62	61	39	54	41	52	22	77	45	77	57	80	46	83	59	88	75
13	94	71	93	67	81	46	85	67	62	34	39	29	63	30	60	31	73	45	84	55	85	57	96	75
14	89	71	(*)	(*)	84	55	87	69	61	46	36	23	71	41	61	20	65	43	84	51	85	52	98	76
15	97	71	97	67	83	51	85	73	64	43	51	20	74	58	53	27	78	39	84	54	92	54	99	72
16	98	71	96	68	83	53	84	63	72	42	51	16	61	41	70	43	82	60	76	53	94	60	92	68
17	99	72	95	69	88	51	72	46	59	49	43	21	61	43	58	34	63	30	69	46	90	65	97	71
18	98	74	89	71	90	69	73	39	64	43	47	22	57	27	56	21	59	30	77	39	93	65	96	71
19	93	70	89	73	88	68	75	38	70	39	46	31	51	23	(*)	(*)	69	29	81	37	99	69	92	69
20	93	70	92	70	80	63	81	47	75	40	35	26	61	31	70	30	85	58	85	54	105	72	88	71
21	97	72	86	70	78	48	75	55	63	42	57	23	65	35	73	50	86	47	85	61	101	65	93	73
22	98	73	94	72	88	46	70	57	68	36	50	23	71	41	77	54	75	52	77	58	96	72	97	72
23	97	71	96	68	92	59	87	35	75	41	62	25	63	36	70	40	80	45	66	52	95	74	97	75
24	97	73	98	70	(*)	(*)	84	55	62	43	46	22	70	33	79	38	71	56	64	48	92	68	98	73
25	95	75	97	71	91	65	79	50	48	34	29	19	67	41	86	52	81	53	78	52	91	67	98	71
26	99	74	(*)	(*)	(*)	(*)	74	48	47	27	41	19	66	45	63	27	85	64	86	52	89	67	98	73
27	90	73	95	69	.....	.....	54	36	60	28	40	15	73	48	60	26	88	65	85	64	90	62	98	74
28	93	72	(*)	(*)	.....	.....	53	41	62	26	47	30	73	46	68	42	81	63	84	52	92	68	99	70
29	94	71	93	70	87	65	79	48	67	34	56	38	75	57	.....	.....	83	54	85	59	96	67	94	71
30	97	75	88	61	89	69	68	50	60	39	49	32	70	63	.....	.....	87	55	89	59	95	74	98	72
31	100	74	93	61	.....	.....	67	38	.....	.....	49	34	66	51	.....	.....	89	62	.....	.....	85	67	.....	.....
Range	36°		.....		.....		56°		52°		57°		64°		.....		.....		52°		53°		53°	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		†67°.3‡		77°.7		82°.2	

* No observations taken. † Computation of monthly mean temperature began April, 1879. ‡ Monthly mean temperature for twenty-eight days only.

Maximum, minimum, and mean temperatures—Continued.

STATION, MEMPHIS, TENN.—(Readings made daily at 11 p. m.. Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	91	72	96	78	87	69	84	67	56	30	47	42	38	33	43	33	67	44	60	49	68	53	82	61
2	76	70	95	79	89	69	78	65	66	40	52	37	37	15	41	26	58	39	61	41	71	50	66	55
3	80	69	91	75	92	73	88	59	61	45	63	42	15	6	54	32	42	33	55	36	79	52	75	54
4	87	73	90	73	89	72	80	59	61	39	57	46	16	8	51	39	61	32	52	36	71	64	84	58
5	88	75	92	70	87	68	74	58	70	50	55	35	22	11	51	39	70	45	60	36	75	62	88	64
6	87	73	93	76	88	66	72	52	71	51	56	46	26	7	39	35	75	54	71	44	68	55	88	64
7	90	74	95	77	89	68	77	62	76	52	46	39	39	18	44	30	77	55	68	54	72	51	87	63
8	92	75	96	75	89	73	82	61	61	46	56	42	39	27	49	30	78	58	68	46	74	54	92	70
9	90	75	95	76	89	73	74	69	62	39	46	34	27	14	56	32	77	62	76	59	78	51	90	70
10	92	75	92	75	69	58	71	65	70	48	47	35	29	10	56	45	80	61	67	54	84	60	97	73
11	95	75	84	75	68	59	73	59	62	51	59	38	37	28	63	46	68	53	61	51	84	64	95	76
12	94	78	84	71	68	51	69	52	63	46	49	34	38	31	62	36	68	44	65	42	85	63	96	76
13	96	78	85	72	69	52	75	48	66	40	61	38	37	30	44	24	69	47	74	48	82	63	93	75
14	96	79	88	70	77	53	79	58	66	45	57	34	44	35	25	17	51	43	77	59	78	61	95	74
15	96	81	91	69	82	58	83	64	54	48	35	28	55	39	36	16	45	32	76	56	76	65	90	76
16	97	80	93	71	81	57	79	61	54	48	37	23	54	36	49	33	51	35	66	49	68	59	85	71
17	96	78	94	74	82	58	64	52	55	41	41	29	43	37	40	37	37	26	60	46	76	62	83	64
18	95	80	94	77	87	56	56	45	61	41	32	20	42	32	39	33	45	26	64	44	85	62	83	63
19	97	79	95	79	85	56	58	39	63	39	37	24	34	23	52	31	52	33	77	47	88	65	83	61
20	96	81	95	80	78	59	66	39	55	42	36	31	53	27	48	32	62	45	72	53	86	69	93	63
21	96	82	90	80	68	56	72	49	51	43	39	33	60	38	57	34	63	52	82	54	89	67	90	71
22	87	74	91	76	78	50	55	47	64	39	36	23	64	47	58	46	67	50	85	57	85	69	79	72
23	88	68	91	69	81	61	65	40	69	40	49	23	59	41	59	38	59	39	84	63	89	64	81	70
24	88	67	93	71	83	63	72	52	61	49	33	20	61	32	69	46	67	44	82	61	89	72	86	71
25	92	70	87	76	86	67	73	55	49	41	25	11	66	51	67	53	66	46	72	64	88	69	80	71
26	94	76	82	72	65	58	75	55	43	40	27	20	70	48	53	26	76	55	70	61	90	70	89	70
27	90	78	87	75	76	54	45	37	46	36	31	20	64	57	37	22	79	53	75	61	92	67	92	70
28	93	76	89	71	80	63	48	29	52	36	31	16	69	60	58	28	85	63	72	55	92	72	82	75
29	92	76	84	71	81	67	52	42	59	34	36	21	64	51	.....	.....	76	57	78	57	96	69	82	67
30	92	75	77	69	85	66	64	45	60	42	35	31	54	43	.....	.....	72	59	81	62	93	73	85	65
31	95	76	84	66	.....	.....	46	35	.....	.....	38	29	48	42	.....	.....	66	46	.....	.....	80	72	.....	.....
Range	30°		30°		42°		55°		46°		52°		64°		53°		59°		49°		46°		43°	
Monthly mean	83°.7		82°.1		72°.0		61°.3		52°.0		37°.0		38°.7		42°.0		56°.1		61°.5		72°.7		77°.0	

Maximum, minimum, and mean temperatures—Continued.

STATION, MILWAUKEE, WIS.—(Readings made daily at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	74	60.5	84.5	71	86	62	77	62	52	31	41	38	18	-2	26	14	42	23	41	32	48	33	47	41
2	67	56	83	66	78	66	74	54	46	36	43	29	-2	-19	40	13	32	23	34	22	54	32	56	40
3	68	58	85	66	71.5	60	67	53	50	31	44	33	-6	-20	35	25	40	15	31	13	50	39	64	48
4	74	61	83	68	73	57	64	48	45	37	35	30	0	-10	40	31	45	33	40	22	66	44	79	54
5	80	63	88	68	84	62	60	48	50	38	35	29	17	-4	34	22	45	29	44	27	61	40	70	47
6	75	66	80	65	84	67.5	63	42	53	36	33	23	24	1	39	17	47	35	62	35	47	35	57	44
7	81	67.5	85	65	81	69	61	50	43	26	31	17	30	14	40	17	42	32	45	35	50	33	52	42
8	84	70	87.5	69	79	67	70	53	43	33	38	28	28	4	45	28	65	37	53	34	59	36	68	47
9	80	65.5	81	66.5	77	61.5	66	46	53	31.5	36	31	14	-1	38	16	65	51	52	40	58	45	73	60
10	78	63	82	64	65	51	62	45	52	41	34	28	34	7	48	33	68	43	47	34	72	49	81	66
11	73	64	77	60	61	43	61	45	48	41	33	21	35	18	44	19	47	33	40	33	80	54	77	64
12	76	66	77	61	59	46	66	44	53	34	29	17	32	11	22	12	54	36	48	31	83	58	69	55
13	81	67	83	60	57	47	67	50	48	32	31	18	37	19	13	-4	45	30	46	40	75	54	64	54
14	86	71	82	61	71	47	73	52	47	31	32	25	33	19	13	-11	35	10	40	35	59	42	82	53
15	89	76	76	63	70	51	70	51	50	37	27	20	34	18	31	9	22	8	42	33	53	43	75	54
16	95	77	74	56	81	62	73	50	51	42	28	16	43	24	27	13	22	13	40	35	63	41	56	46
17	95	79	73	57	82	66	50	39	51	44	33	13	35	15	28	20	27	11	41	33	65	47	60	43
18	86	66	73	68	71	60	46	35	50	41	22	8	20	8	40	18	28	14	47	31	59	40	63	47
19	80.5	69	79	69	83	64	48	32	51	38	16	0	20	3	35	25	36	18	48	33	61	44	68	48
20	88	72	74	69	67	45.5	68	42	49	36	29	0	21	7	26	9	38	28	45	36	80	45	72	56
21	79	65	75.5	63	57	42.5	64	42	43	35	26	22	40	17	35	12	36	26	51	36	53	42	74	64
22	73.5	60	79	61.5	70	50	43	33	45	33	22	6	37	26	39	29	35	27	63	39	59	46	82	64
23	76	58	84	69	65	54.5	51	32	44	30	6	-5	42	21	30	9	46	29	70	48	62	48	85	68
24	80	60	79.5	68	61	50	45	38	43	36	8	-8	45	29	34	14	45	35	72	48	81	54	74	65
25	75	71	72	58	71	51	49	41	37	31	16	2	41	31	32	20	45	32	73	54	73	44	73	63
26	74	66	75	56	55	44	42	34	43	25	14	3	40	32	20	6	46	36	72	54	50	41	80	62
27	74	61	79.5	60	56	44.5	35	25	39	28	18	7	46	37	21	12	45	35	66	48	64	45	74	60
28	77	62	73	63	60	52	40	22	41	29	20	-1	43	28	38	19	58	39	68	39	63	52	72	58
29	76	69	73	59.5	65	56.5	51	38	41	29	31	10	46	33	.....	.....	52	39	63	39	85	53	68	55
30	75	68	76	56	81	60	48	32	40	27	23	3	44	29	.....	.....	40	34	47	36	81	65	71	55
31	86	68	76	60	.....	.....	38	24	.....	.....	32	4	35	25	.....	.....	45	30	.....	.....	72	43	.....	.....
Range	39°		32°		43°.5		55°		28°		52°		66°		60°		60°		60°		53°		45°	
Monthly mean	72°.7		71°.1		63°.4		49°.6		41°.0		21°.6		21°.6		23°.7		35°.8		43°.9		53°.8		62° 0	

Maximum, minimum, and mean temperatures—Continued.

STATION, MOBILE, ALA.—*(Readings made daily at 11 p. m., Washington mean time.)*

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	93	74	94	79	90	74	87	71.5	59	38	65.5	45	62	50.5	68	45	67	44	82.5	58	86.5	64	87.5	74
2	90	76	91	78	92	71	88.5	69.5	65.5	38	55.5	44	50	35	46.5	35	68.5	48	69	52	78.5	61	84	64
3	81.5	72.5	86	74	89	74	88.5	72	71.5	42	60.5	38	38	26	52.5	34	66.5	53	76.5	48	78.5	55	77.5	61
4	89	73.5	82.5	73.5	91	75	89	69.5	69	48	68	46.5	30	23	58.5	42	68	43	64	40	82	67	80	61
5	91	75	91	74	91	74	86.5	73	72	47	59.5	41	30.5	21.5	68	56	70	45	68	41	83	69	88	64
6	94	76	97	73	92	73.5	85.5	70	72	50	61	38	31	15	60	47.5	71	49	69	43.5	78	66.5	82.5	69
7	96	77.5	94.5	75	88	74.5	86	68.5	77	59	66.5	46	43	20	52.5	43	72	47	77	54	71	64	82	71
8	95	75	95	78	91	75	86	71.5	81	59	69	58	57.5	41.5	60.5	39	70	52	79	62	81	61	88	75
9	96	75	95	78	90	74	79	71	67	51	64.5	38.5	53	32	60.5	40	73.5	50.5	78	66.5	82	64	91	76
10	92	76	95	78	89.5	72	78	69	72.5	48.5	54.5	38	47	24	62	43	73.5	60	81	65	81.5	65	93	76
11	93	77.5	94	78	79.5	67	83	68	76.5	62	61.5	41	62	33	67	55	70	59.5	78	57	83.5	57	93	77
12	86	76	95	78	80	64	78.5	66	64	51	68.5	54	59.5	41	67	48.5	73.5	61.5	75.5	51	84	64	93	75.5
13	91.5	74.5	93	72	79	57	80	58	65	44	68.5	49	45	39.5	69	51	66	60.5	77.5	54	87	67	96	75
14	96	75.5	87	74	81	56.5	82	61	66	45.5	63.5	55	54	42	53	38	75	55	75	60	86.5	69.5	94	75.5
15	98.5	80	88	77	86	61	84.5	69	66.5	51	55	39.5	58.5	46	56	34	69	51	73.5	65	87	68.5	92.5	77
16	98	80	81.5	75	87	64	85.5	71	71	59	45.5	32	66	53	61	48	73	53	86.5	67	81	68	93	77
17	97.5	79.5	92	74.5	90	69	78	61	62.5	55	50	32	68.5	55	75	59	68	43	67	56	83.5	63.5	95.5	76
18	94.5	79	93	78	89	74	68	50	68.5	57.5	50.5	32	72	49	60	41	62	39	70	50	90	64	94	75
19	95	78	95	77.5	89	68	63.5	47	65	56	54	36	49.5	34	57	37	67.5	41	74.5	48	91	70	95	73
20	96	78	94	76	88.5	74	68	43.5	65.5	49	55	42	56	29.5	61	39	70	46.5	79	54	92	73.5	90	76
21	93.5	76.5	95	75	82	74	78	49	62.5	48.5	62.5	41	56	39.5	59.5	40	66	61	78	55	80.5	69	89	69
22	94.5	78.5	93	76	85	72	67.5	50.5	61.5	42	50	37	66	40.5	66.5	49	71.5	61	82.5	60	90	68.5	91	68.5
23	96	77	90	75	84	71	68	42	65	47	48.5	31	67.5	54	64	52	71	56	79	65	92	70	95	72
24	96.5	76	91	72	85	67	74	45.5	70	55	49.5	36	69.5	48.5	62	42.5	75	49	77	59	86.5	69	92.5	74
25	95.5	79.5	93	74	86.5	67.5	77	50	73	63	39	27	69.5	49	67	53	76.5	53	79	67	88	64	89.5	75
26	97	81	92	75.5	90.5	71.5	79	58	75	58	39	32	70	50	61	44	73.5	55.5	73	65	90.5	65	89.5	75
27	96	81	92.5	72.5	90.5	72	77.5	53	57.5	41	38.5	27	65	56.5	52	35	82	66	77	63	91.5	68	90.5	73.5
28	94	79.5	92	77	86	72	68	47.5	58.5	37.5	44.5	26	71	60	61	35.5	78	66	79	65	90	71	91.5	73
29	96.5	77	85	74	83	70	64.5	53.5	58.5	36	56.5	35	73	59	.....	.....	85	69	83	63.5	89.5	72	86	76.5
30	93	80	83	75	86.5	70	74.5	55	59.5	39	57	48	72	58	.....	.....	83.5	64.5	84	58	91	75	92	74.5
31	93	78	89	74	.....	.....	58.5	46	.....	.....	53	47	73.5	57	.....	.....	73	55	.....	.....	89	75	.....	.....
Range	26°		25°		35°.5		47°		45°		43°		58°.5		41°		46°		46°.5		37°		35°	
Monthly mean	84°.5		82°.7		77°.8		68°.4		58°.1		47°.6		49°.0		51°.7		62°.0		66°.0		74°.6		79°.7	

Maximum, minimum, and mean temperatures—Continued.

STATION, MONTGOMERY, ALA.—(Readings made daily at 11 p. m., Washington mean time.)

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	91	74	94	75	90	73	83	62	58	33	57	46	55	47	57	40	63	39	83	52	82	61	93	73
2	88	74	89	77	90	73	86	66	63	35	50	41	47	30	46	30	71	44	65	48	77	52	86	66
3	87	75	92	75	89	74	85	72	71	41	63	36	32	18	55	31	63	47	66	43	81	50	85	61
4	88	76	89	73	90	73	85	68	69	44	62	45	26	18	61	36	65	38	56	36	86	57	86	58
5	92	75	86	76	90	75	85	60	70	45	56	38	32	20	63	52	71	43	62	36	78	66	91	62
6	92	75	92	75	86	75	85	64	74	45	63	35	33	14	55	45	73	49	72	38	81	62	80	69
7	93	76	95	76	86	72	84	68	74.5	59	65	45	42	19	57	40	76	48	71	50	73	60	82	66
8	93	75	97	78	86	73	86	65	73	54	67	53	61	39	58	41	77	48	70	50	82	58	81	71
9	92	74	97	78	84	71	78	71	67	44	68	37	62	27	61	38	79	51	75	59	80	63	87	72
10	94	74	94	79	88	73	74	66	69	43	44	34	46	20	56	40	78	56	77	63	79	59	88	73
11	94	77	94	78	88	72	77	67	77	52	66	33	62	37	63	52	76	56	68	53	81	55	94	73
12	88	76	93	78	77	64	74	62	62	48	70	43	63	42	72	43	73	57	74	46	82	63	93	74
13	93	73	87	75	77	58	76	53	68	39	68	44	44	38	69	45	63	58	78	56	82	64	94	72
14	95	76	89	74	80	57	78	56	68	42	64	54	44	38	45	32	73	58	73	58	88	68	98	71
15	97	78	91	76	81	57	78	62	63	54	61	35	50	38	54	28.5	66	45	73	63	86	66	96	76
16	94	75	95	74	81	58	82	64	69	56	47	30	64	44	53	44	76	49	83	60	78	64	94	77
17	94	74	89	72	85	63	76	57	62	50	47	30	70	49	72	44	64	40	71	55	80	61	93	74
18	96	74	94	74	85	62	65	48	70	54	48	31	65	47	54	39	60	33	65	47	87	63	93	72
19	99	77	95	78	86	63	62	41	63	55	46	28	47	32	54	35	64	40	72	46	90	66	89	71
20	97	81	94	79	85	68	67	39	64	50	45	37	53	27	56	38	73	42	78	55	92	69	85	68
21	98	77	91	77	85	68	76	44	58	45	51	38	63	39	56	34	69	60	82	56	82	68	89	64
22	100	79	92	74	86	68	68	45	58	38	44	34	66	41	72	39	75	56	81	63	92	69	91	65
23	96	75	90	75	81	72	65	38	71	44	51	29	68	54	65	50	66	49	79	59	87	71	90	67
24	96	74	89	74	82	71	75	43	72	46	46	31	71	53	68	40	72	44	84	56	82	65	85	74
25	92	76	91	73	82	67	77	47	74	62	38	26	73	48	73	47	72	50	83	59	88	61	77	68
26	95	75	92	76	85	72	78	51	68	65	37	31	70	40	60	42	80	52	80	62	91	64	90	67
27	94	80	93	77	87	69	75	51	65	41	33	24	71	55	49	30	82	65	80	63	95	69	95	69
28	94	76	93	77	78	68	65	42	55	36	43	22	75	64	56	31	85	61	80	64	96	71	95	73
29	88	75	87	70	81	66	60	48	58	34	47	35	72	63	.....	.....	79	65	85	62	93	72	88	73
30	91	79	78	70	83	64	67	53	61	36	50	41	73	58	.....	.....	74	60	87	58	93	73	93	70
31	92	76	86	72	.....	.....	55	41	.....	.....	50	43	72	57	.....	.....	70	48	.....	.....	94	73	.....	.....
Range	27°		27°		33°		48°		44°		48°		61°		44°.5		52°		51°		46°		40°	
Monthly mean	85°.0		82°.0		76°.8		64°.9		56°.4		44°.7		48°.3		49°.4		60°.8		64°.3		74°.4		79°.3	

Maximum, minimum, and mean temperatures—Continued.

STATION, MONTREAL, CAN.—(Readings made daily at 11 p. m., Washington mean time.

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	90.5	78.6	75.1	62.7	74.0	63.0	73.8	53.5	43.1	29.3	32.0	23.2	25.6	11.2	17.7	1.9	27.8	— 5.4	35.1	22.6	48.8	39.8	73.7	52.7
2	90.7	76.0	77.0	64.1	79.6	66.3	74.2	56.7	44.5	37.8	39.4	23.3	25.8	10.6	22.5	2.3	24.1	8.5	29.1	15.2	44.9	34.6	57.0	49.8
3	82.9	73.0	79.9	64.0	75.0	63.0	68.0	53.3	39.2	28.4	39.7	31.1	14.5	6.1	29.0	16.8	28.5	7.4	26.5	13.7	53.4	37.8	63.4	50.0
4	83.2	66.0	80.1	64.9	75.1	59.9	64.6	50.6	33.5	18.5	33.2	25.3	24.4	10.0	34.4	22.2	41.2	18.7	25.0	8.5	63.8	35.9	64.0	53.6
5	80.3	67.0	81.0	65.0	74.7	61.9	58.5	45.2	28.5	20.3	34.0	22.1	23.8	11.2	29.0	19.3	35.8	1.5	30.7	18.8	63.0	48.0	68.4	53.0
6	78.1	61.9	75.1	64.3	71.0	58.6	53.6	46.3	35.0	23.5	23.5	15.3	13.0	6.4	26.0	13.2	21.3	— 4.2	38.8	24.4	52.1	42.2	59.5	41.9
7	86.9	58.6	70.6	59.0	70.9	50.2	57.3	42.9	30.3	23.5	23.0	17.1	18.6	3.5	30.0	16.6	29.6	10.6	40.0	27.4	57.4	41.1	57.0	38.2
8	85.2	70.9	75.1	59.9	74.9	62.0	60.8	49.2	37.0	24.5	26.0	13.7	28.5	15.4	26.2	12.7	31.9	8.2	39.6	23.7	63.3	42.1	66.8	42.0
9	88.2	72.5	76.3	64.4	77.0	61.5	64.0	48.6	40.2	27.0	26.9	15.6	27.4	15.5	21.9	4.5	36.9	22.9	49.4	30.2	69.0	40.2	66.2	47.6
10	81.0	66.8	74.8	61.0	77.2	60.4	54.2	45.2	39.2	32.9	39.1	25.7	17.0	0.7	8.2	— 6.2	49.2	34.3	33.0	24.5	69.7	48.7	68.8	53.8
11	73.1	59.7	75.6	59.8	68.1	61.8	58.7	43.1	35.3	32.0	47.3	22.6	24.0	9.3	22.5	2.2	46.0	27.2	33.6	28.6	73.8	52.7	78.8	55.1
12	77.3	56.4	71.2	57.8	80.9	59.8	53.0	46.5	45.4	33.7	26.0	19.5	22.1	11.1	23.8	1.7	35.8	23.3	44.5	29.1	75.4	55.0	76.2	61.7
13	83.0	59.7	76.0	60.2	81.1	60.0	60.3	41.8	39.9	28.3	26.2	18.6	31.4	12.2	8.8	— 3.3	27.8	19.9	42.0	26.0	80.5	57.7	69.0	52.1
14	86.0	64.6	80.0	60.8	61.7	53.3	67.6	45.7	36.4	26.7	23.0	15.6	28.2	— 1.9	5.7	— 8.4	36.6	22.6	42.0	26.1	78.8	55.9	71.4	53.0
15	74.2	55.8	81.6	64.2	63.3	49.3	62.9	56.2	40.0	26.5	24.9	7.7	0.0	—15.4	12.0	— 9.3	34.3	11.7	46.5	27.5	66.7	48.9	62.6	50.6
16	76.8	60.4	81.6	65.3	68.9	47.4	64.3	51.9	44.0	28.3	16.1	9.2	3.2	— 8.1	25.6	3.0	24.2	5.7	46.6	35.1	62.0	46.9	62.0	48.8
17	88.4	66.2	74.1	62.2	72.5	55.5	74.2	50.0	42.3	28.2	27.0	12.1	18.0	— 3.6	15.0	— 4.1	20.0	9.4	49.1	30.8	74.8	48.3	55.0	46.6
18	84.3	71.9	72.3	62.5	70.5	59.0	64.0	42.5	38.3	32.1	27.8	12.3	35.9	10.0	13.0	2.0	29.0	10.5	41.8	32.9	80.0	52.8	63.0	48.8
19	82.1	68.8	73.2	60.7	71.1	55.0	44.0	36.8	38.0	33.5	16.0	5.7	26.2	6.0	18.3	— 3.3	28.8	9.5	52.3	33.9	74.6	44.8	68.1	47.8
20	82.0	64.7	74.1	63.9	84.0	65.4	45.6	34.8	37.1	34.1	25.8	9.4	9.4	— 7.8	17.3	0.9	33.9	17.6	55.9	35.5	79.3	49.9	73.0	54.9
21	76.8	64.8	76.2	62.0	71.0	53.4	64.0	43.4	40.3	33.8	25.6	18.7	7.2	—10.4	12.7	2.0	32.5	16.5	60.1	40.1	66.8	47.0	78.0	59.3
22	65.5	57.8	76.0	62.7	59.6	44.5	66.7	41.1	40.0	33.0	26.0	12.7	18.7	1.7	14.6	— 4.1	28.1	12.6	60.3	42.0	60.3	40.1	76.5	64.0
23	76.9	60.0	76.0	57.0	62.8	42.4	56.4	47.1	38.2	32.7	22.1	9.5	22.9	6.7	22.8	11.0	37.0	22.9	58.3	39.5	58.2	36.9	70.4	55.0
24	78.1	61.2	74.3	63.3	59.9	49.0	55.6	42.0	38.9	32.3	16.2	8.6	31.1	12.4	17.8	0.6	34.5	12.7	53.3	34.1	65.9	40.0	84.3	57.6
25	81.9	66.4	67.5	55.8	60.1	48.0	51.8	37.2	34.8	28.3	20.3	7.4	32.1	— 0.2	14.9	— 9.7	38.1	27.3	53.8	42.1	67.3	43.1	87.1	67.7
26	68.6	64.0	71.0	54.1	67.0	46.9	48.6	37.0	36.0	25.6	27.9	14.5	1.0	—12.5	37.3	8.6	34.0	16.9	60.8	39.1	58.3	33.1	81.0	67.9
27	76.2	63.0	74.3	58.5	53.2	40.6	53.1	36.3	32.4	26.7	20.8	9.5	6.8	— 9.3	23.0	— 8.4	36.0	16.7	60.9	43.8	65.9	41.9	80.7	66.0
28	72.0	54.2	75.1	58.8	58.0	40.3	43.4	31.0	40.9	31.9	18.8	5.7	32.5	5.9	8.9	—14.5	48.0	32.4	65.8	49.6	70.8	48.1	72.1	64.8
29	75.1	62.0	78.0	59.1	62.9	42.3	47.0	27.8	38.0	31.3	17.5	— 1.2	26.0	4.6	.....	.....	38.0	34.3	62.0	40.3	76.0	54.4	69.9	63.4
30	74.2	63.3	78.3	60.7	66.0	47.7	42.8	35.3	37.0	26.0	25.3	9.7	21.7	— 1.5	.....	.....	36.0	24.0	65.5	42.1	85.6	59.8	71.0	56.4
31	68.2	62.2	82.0	62.3	.....	.....	49.7	37.8	.....	.....	22.3	10.6	25.8	15.8	.....	.....	32.8	16.9	.....	.....	82.2	66.3	.....	.....
Range	36°.5		27°.9		43°.7		46°.4		26°.9		48°.5		51°.3		51°.8		54°.6		57°.3		52°.5		48°.9	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, MORGANTOWN, W. VA.—(Readings made daily at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	88	66	86	70	83	69	80	51	40	29	49	34	43	33	31	16	58	31	52	33	57	33	88	64
2	92	67	85	70	84	66	72	57	59	38	46	39	40	4	33	12	42	31	45	31	56	33	74	67
3	91	69	84	64	80	67	76	58	46	34	46	35	15	5	38	25	47	32	43	22	63	41	74	53
4	93	70	86	66	79	66	72	46	47	29	40	34	12	3	45	30	57	33	39	27	58	47	74	51
5	87	70	89	67	76	63	62	44	43	25	36	28	16	1	42	30	54	32	38	25	74	47	80	55
6	90	68	85	69	79	62	59	45	57	31	40	30	24	4	39	29	54	32	55	32	60	45	75	51
7	94	66	81	64	84	60	55	36	52	37	36	22	41	16	47	26	52	37	51	37	56	36	66	41
8	89	73	85	66	80	66	72	51	44	36	44	18	46	33	46	25	73	37	56	30	63	34	72	39
9	86	73	90	73	85	66	77	60	44	31	54	38	43	23	38	24	74	46	69	29	72	38	78	48
10	90	73	83	66	84	63	64	46	53	34	53	35	33	20	52	23	72	54	65	51	77	46	81	60
11	91	69	81	67	77	64	68	49	54	36	36	31	39	13	52	42	60	40	55	32	84	53	80	66
12	90	69	82	61	72	66	61	49	51	40	38	27	43	26	47	32	56	35	49	26	88	54	78	66
13	84	72	84	62	67	56	66	39	48	35	33	17	43	34	37	23	64	35	63	33	88	60	76	66
14	89	66	85	65	67	53	74	47	48	29	46	28	43	33	32	18	59	34	59	47	86	61	78	54
15	89	68	87	64	72	49	75	56	58	26	41	29	41	26	35	12	40	28	64	44	76	62	80	66
16	93	70	85	66	75	51	76	50	58	39	32	26	48	27	46	22	45	28	59	39	68	55	75	63
17	95	72	85	67	76	52	77	52	57	48	35	23	46	26	42	25	41	28	53	40	75	55	68	49
18	95	73	82	67	79	56	52	44	53	46	33	20	46	32	39	27	41	23	49	36	78	60	68	45
19	94	72	79	68	80	57	46	41	57	44	28	19	35	21	46	31	42	24	53	38	82	59	71	47
20	95	69	82	64	84	58	58	37	54	44	39	18	35	17	41	21	48	27	58	33	86	56	76	50
21	88	70	78	62	67	53	67	36	53	42	41	26	48	19	38	13	48	32	62	39	81	54	80	53
22	78	64	79	59	66	49	71	38	47	37	38	18	54	41	46	18	55	36	71	43	68	47	73	66
23	83	56	82	60	68	44	55	43	41	33	26	15	50	31	44	30	48	31	78	39	69	46	83	62
24	86	57	86	62	73	59	60	38	59	29	21	9	50	29	44	29	50	34	80	53	75	43	86	60
25	89	59	78	60	79	53	71	39	58	44	24	7	54	31	60	39	48	35	78	54	75	56	85	65
26	91	73	79	56	69	50	71	45	44	36	26	15	39	20	59	24	58	31	82	58	67	59	85	66
27	80	68	78	62	65	43	60	40	46	40	29	18	58	32	31	19	51	36	82	60	75	57	81	66
28	82	63	80	65	68	41	45	34	44	36	30	18	60	41	46	19	60	36	71	56	75	52	83	72
29	89	68	87	62	72	55	52	27	42	36	36	14	43	33	.....	.....	59	45	71	42	84	52	76	68
30	85	72	86	62	78	51	51	43	44	25	38	19	48	28	.....	.....	48	31	63	43	85	65	77	58
31	86	68	80	69	.....	.....	44	33	.....	.....	41	18	44	29	.....	.....	44	30	.....	.....	86	64	.....	.....
Range	39°		34°		44°		53°		34°		47°		65°		48°		51°		60°		55°		49°	
Monthly mean	78°.9		74°.3		66°.9		54°.2		43°.5		31°.4		33°.9		35°.3		45°.0		51°.4		64°.8		69°.9	

Maximum, minimum, and mean temperatures—Continued.

STATION, MOUNT WASHINGTON, N. H.—(Readings made daily at 11 p. m., Washington mean time.)

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	68	56	54	48	59	51	54	43	19	10	22	9	5	-3	-1	-6	9	-2	14	3	32	20	60	51
2	67	57	51	47	55	52	54	42	25	16	34	22	10	-3	14	-1	10	-1	9	7	24	17	52	48
3	64	57	51	46	56	49	45	33	24	6	34	24	-2	-17	11	1	15	1	7	3	21	15	51	45
4	59	53	59	46	52	45	39	31	15	-8	32	25	0	-17	3	-1	20	12	6	-7	31	19	47	36
5	54	43	60	49	62	45	32	26	-2	-10	32	16	7	-1	9	-2	18	-10	16	-2	33	29	44	35
6	51	38	53	48	52	47	32	26	3	-4	16	0	11	0	11	8	9	-5	17	11	35	28	41	19
7	59	41	50	40	52	45	34	25	12	0	2	-4	15	9	10	-3	10	-7	15	9	30	23	23	15
8	65	54	47	41	57	45	33	28	12	3	-1	-7	12	4	2	-6	12	0	11	4	32	23	29	15
9	58	55	51	46	53	44	46	28	10	3	14	-3	12	5	6	-11	34	11	19	9	40	26	38	25
10	64	45	48	44	53	44	30	22	17	7	28	13	12	-15	3	-17	33	24	19	10	35	31	51	35
11	49	41	47	43	56	46	30	22	30	17	28	17	-1	-9	10	3	32	9	19	11	45	33	52	47
12	56	40	44	40	57	49	30	23	33	18	19	2	7	-5	13	7	10	0	13	7	46	33	52	44
13	60	44	50	42	58	49	29	22	21	4	4	-2	13	4	8	-7	14	1	12	6	59	45	44	34
14	52	46	56	45	57	34	40	27	6	2	15	-3	7	-9	-5	-17	23	12	14	10	62	50	44	31
15	59	39	57	47	37	30	48	36	15	3	17	12	-8	-29	-5	-17	22	13	20	11	62	45	46	40
16	52	43	60	49	45	36	49	42	22	14	16	-7	0	-9	-2	-17	16	10	20	14	52	45	46	35
17	60	49	57	50	51	35	53	41	35	22	4	-8	8	-2	6	-2	22	10	22	14	52	33	35	28
18	59	53	51	39	46	34	45	40	37	31	1	-3	13	2	8	4	18	3	21	15	62	43	32	25
19	55	46	45	40	50	34	43	21	34	28	-2	-15	9	1	9	1	11	1	16	11	52	47	39	31
20	63	44	48	44	57	47	24	13	36	30	-1	-10	9	-15	12	-1	10	7	18	14	58	45	47	35
21	54	47	46	42	57	38	41	23	33	27	11	-2	3	-18	2	-20	15	2	18	13	49	25	59	42
22	47	38	48	41	38	23	48	38	34	27	15	3	5	-5	5	-22	13	-3	25	15	32	20	51	46
23	44	35	51	35	45	23	41	29	34	24	4	-1	14	-6	5	3	18	9	26	20	36	16	49	43
24	51	41	50	44	42	33	38	29	24	11	2	-7	10	-7	5	-20	17	13	24	10	41	23	64	41
25	57	43	49	33	47	31	34	28	28	12	-4	-12	14	0	-3	-23	18	13	35	18	44	31	70	55
26	55	48	45	30	49	29	42	29	25	7	1	-5	3	-23	13	-3	19	15	37	31	33	13	62	51
27	55	45	51	40	29	20	43	29	23	9	4	-2	21	-11	13	-19	21	16	39	35	44	20	60	51
28	45	35	51	43	30	14	42	11	29	16	0	-5	26	13	-2	-21	26	19	42	36	44	32	60	51
29	54	39	52	45	38	28	22	10	16	8	3	-1	17	1	.....	.....	32	22	41	33	52	38	51	36
30	48	42	52	43	45	33	32	17	16	8	9	-5	8	0	.....	.....	35	20	39	29	60	45	40	36
31	58	42	57	47	.....	.....	31	19	.....	.....	1	-8	4	-1	.....	.....	27	14	.....	.....	60	52	.....	.....
Range	33°		30°		48°		44°		47°		49°		55°		37°		45°		49°		49°		55°	
Monthly mean	50°.4		47°.0		43°.5		33°.3		17°.1		6°.5		2°.1		−0°.7		13°.7		17°.5		37°.5		42°.8	

Maximum, minimum, and mean temperatures—Continued.

STATION, NASHVILLE, TENN.—(Readings made daily at 11 p. m., Washington mean time.)

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	91	71	95	73	85	69	84	62	55	28	53	42	41	37	45	28	61	37	58	44	67	52	80	66
2	81	72	97	71	87.5	66	82	67	68	38	49	39	38	7	42	23	58	37	58	36	69	42	69	55
3	87	71	88	68	91	68	82	55	60	43	54	37	10	— 2	51	26	41	33	51	31	76	43	73	50
4	91	71	92	71	86	70	83	53	62	35	52	40	17	— 3	52	31	60	32	48	28	74	63	82	53
5	90	73	93	73	85	65	80	56	66	37	51	34	17	5	51	39	64	44	56	34	79	58	85	60
6	86	73	93	73	88	65	67	50	71	45	49	38	23	5	41	37	73	44	67	32	68	55	86	62
7	91	73	95	74	91	69	77	57	69	52	43	29	37	13	47	33	76	47	62	50	72	50	87	63
8	89	73	95	74	88	70	84	61	57	40	54	37	42	30	50	27	76	51	68	41	70	51	90	66
9	91	74	95	74	88	68	79	69	58	39	55	34	30	13	53	31	74	54	69	50	78	47	89	72
10	91	73	94	74	77	64	70	65	62	35	41	31	32	9	57	35	79	57	63	53	81	53	91	70
11	95	74	81	75	64	59	74	57	64	52	54	30	41	26	62	40	69	50	57	46	83	58	93	67
12	96	75	82	71	69	57	70	47	55	43	48	33	40	33	48	33	68	40	62	37	86	59	90	71
13	95	74	86	73	73	53	77	41	65	35	53	35	42	31	40	20	68	41	76	42	82	62	91	68
14	97	78	88	69	74	49	79	54	64	43	56	33	43	36	24	11	57	36	76	57	79	59	93	68
15	97	74	89	68	77	49	81	57	60	43	38	30	50	37	38	12	47	26	74	57	78	58	82	71
16	97.5	75	91	68	81	50	82	66	61	51	35	29	53	36	39	33	49	37	62	50	75	58	85	70
17	96	77	92	72	82	55	76	50	60	43	38	28	47	32	40	35	39	28	59	46	78	61	81	65
18	93	78	94	73	83	57	52	42	59	40	34	19	47	31	36	31	42	22	60	40	83	58	78	60
19	96	74	96	75	87	59	58	35	60	36	36	20	31	21	45	28	50	28	73	45	83	60	80	58
20	95	77	93	75	84	65	66	35	61	36	37	27	50	23	40	28	58	39	67	43	87	61	86	56
21	97.5	77	88	74	67	56	73	44	52	43	39	33	62	32	39	25	58	46	77	43	90	61	86	63
22	85	71	86	67	77	47	62	41	54	37	36	21	60	42	53	42	64	48	83	50	80	62	87	71
23	87	67	88	64	74	59	62	34	61	34	47	18	57	36	56	34	57	39	81	53	85	59	86	70
24	90	63	91.5	65	77	58	72	42	68	50	29	11	58	29	67	40	65	39	82	51	83	66	86	70
25	94	67	79	71	84	59	73	45	52	45	26	8	65	49	67	53	60	40	83	59	88	64	74	66
26	94	77	85	67	74	62	76	53	51	44	28	17	66	41	62	25	70	48	78	64	90	68	85	69
27	87	75	86	69	77	52	47	38	53	36	29	16	64	53	35	17	72	45	70	59	89	68	88	69
28	88	75	87	63	73	61	50	30	44	36	33	8	74	60	53	25	81	45	74	58	91	66	91	72
29	91	74	83	69	81	61	57	41	53	30	45	28	69	53	.....	.....	72	56	77	48	93	65	82	67
30	91	75	81	70	84	61	59	44	53	36	38	31	57	47	.....	.....	66	46	78	53	91	69	86	62
31	93	72	83	70	.....	.....	49	35	.....	.....	41	28	52	41	.....	.....	58	32	.....	.....	87	70	.....	.....
Range	34°.5		34°		44°		54°		43°		48°		77°		56°		59°		55°		51°		43°	
Monthly mean	82°.8		80°.6		70°.3		59°.6		49°.7		35°		37°.4		39°.1		53°.1		58°.9		72°.5		77°.2	

Maximum, minimum, and mean temperatures—Continued.

STATION, NAVASSA ISLAND, WEST INDIES.—(Readings made daily at 11 p. m., Washington mean time.)

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	84.5	83	88	84.5	86	84	86	83.5	80	78	82	78	83	79	80.5	76	81	77	83	77.5	77	75	78	77
2	83	82	86	83.5	90	84	86	83.5	83	80	79	77.5	84	78.5	81	76	81	77	83	80.5	78	75	86	77
3	85.5	83	86	82	89	84	87	80	86.5	82	80	76	83	77	79	76.5	80	77	83	81	82	78	85	78
4	84	83	83.5	83	84	81	84.5	83	86	81	76.5	76	84	77.5	80.5	77	81	75.5	85	80.5	81	79	82	76
5	84	83	88	84	81	79	83.5	81	86.5	81	77	77	84	79	84	79	82	75.5	85	80.5	83	78.5	82	78
6	86	82	87.5	84.5	83	82.5	86	83	84	81.5	80	77.5	78	76	83	79	81	75.5	80	71	83	78	86	78
7	85	84	87	84.5	85.5	82.5	89	83	85	80	77	75	81	77	82	79	76	73	83	78	81	77	86	79
8	87	84	84	83.5	85	83	89	84	78	78	80.5	76.5	84	77.5	81.5	79	78	70.5	84	79.5	82	77	87	80
9	87	84.5	87	83.5	85.5	83	89	84	80	78	82.5	79.5	85	78.5	80	77.5	75	72	84	79.2	82	78.5	87	80
10	81	80	86	84	85	83	89	82.5	81	78	78	75	85	77.5	82	77	83	75.5	83	78.5	83	75	88	80
11	85	82	87	83	86	84	88.5	84	80	79.5	78	77	84	79.5	81	78	80	76	81	77.5	82	78	87	79
12	86	83.5	84	79	85	83.5	87	83	85.5	79.5	84	79	84	78.5	78	76.5	81	77.5	83	79.5	81	78	87	79
13	87.5	84	80	80	83	82.5	86	82.5	88	80.5	83	80	84	77	74	71	79	77.5	84	80	81	78	85	80
14	88	84.5	84	81	86	83	86.5	83	86	83	82.5	77	85	79	80	73.5	80	77.5	84	80.2	83	79	90	79
15	86	84	84.5	82.5	84	80	82.5	81	86	81	81.5	78	85	79.5	83	76	82	78	84	80.5	83	78	81	77
16	86	84	82.5	82.5	87	83	85.5	80	87	81.2	83	79	84	78.5	84	76.5	83	77.5	83	80.2	83	78	83	79
17	86	83	87	82	88	84	84	80.5	86.5	81.5	82	78	84	77	84	78	80	77.5	82	80	83	78	86	75
18	86.5	83.5	88.5	83	88	85	84	78.5	83	81	85	76	84	79	81.5	78.5	81	78.5	83	80	83	79	86	80
19	87	83	87	83.5	87	84	83	80	85	79	85	79	84	78.7	83	78.5	82	78.5	83	79.5	84	78	88	81
20	87	84	87	83.5	88	84.5	81	80	86	79.5	84	79	78	76.5	82	77.5	84	78.5	82	78	84	79	88	81
21	87.5	84	87	84	87	85	85	80.5	87	80	83	79.5	79	74	80	77	82	76.5	80	79	83	79	86	80
22	87.5	84.5	84	83.5	90	85	85	82.5	85	79.5	83	79	83	76	81	75.5	82	78	83	79.5	77	75	85	80
23	88	84.5	85.5	82.5	88	85.5	86.5	82	85	81	83	79	82	78	78	74.5	84	79	82	77.5	81	79	89	80
24	84	83	86	83.5	88	84	88.5	83	85	78.5	84	79.5	82	79.5	80	77.5	84	78.5	83	77	83	79	89	79
25	81.5	81.5	86	83.5	87	84.5	80.5	77	87	82	86	79	83	79	74.5	74	82	78	84	77.5	78	74.5	89	79
26	82.5	80.5	86	84	82.5	82.5	80	79	86	81	83	79.5	85	78.5	78	76	83	78	84	77	86	78	83	81
27	86	83.5	86	83.5	86.5	81	85	80.5	85	80.5	84	78	84	78.5	77.5	75	85	78.5	81	76	86	79	88	75
28	88	84	87	83	84	82.5	87.5	81	85	79.5	84	78.5	84	78	77	75.5	84	79.5	79	78	87	80	88	80
29	86	84	86.5	84	82.5	80.5	88	82.5	84	79.5	82	78.5	84	77.5	.....	.....	82	78.5	79.5	76	86	79	87	80
30	85	83	86	84	84	83	87	82	83	79	84	77	83	77	.....	.....	83	78	80	76	80	78	90	79
31	87	84	86	83	.....	.....	87	82	.....	.....	84	78	83	77	.....	.....	82.5	78	.....	.....	78	76	.....	.....
Range	8°		9°		11°		12°		10°		9°		11°		10°.5		14°.5		14°		12°.5		15°	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, NEW HAVEN, CONN.—(Readings made daily at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	87	67	72	65	83	71	68	48	50	36	49	29	35	17	34	18	35	13	55	25	60	45	90	66
2	84	70	81	64	85	72	73	60	59	38	56	35	35	13	27	9	40	28	50	35	55	37	87	66
3	89	69	85	66	83	68	75	61	53	35	52	43	22	4	41	24	44	26	47	26	59	37	70	54
4	90	69	84	66	74	66	72	52	48	27	48	36	30	16	40	24	45	25	36	25	59	43	68	54
5	88	71	82	67	71	63	65	51	41	25	38	31	30	20	38	23	48	26	40	22	70	52	80	57
6	81	64	79	70	75	65	62	47	40	29	43	28	26	15	39	25	40	15	47	23	69	49	79	53
7	81	55	81	64	67	56	65	41	47	33	43	25	34	12	40	22	42	22	57	35	64	42	65	48
8	87	67	83	68	68	53	67	52	42	32	40	22	41	24	35	18	38	15	49	35	66	46	72	48
9	85	72	85	69	72	52	72	52	46	30	40	26	42	26	43	17	45	33	66	35	64	42	72	54
10	83	72	79	69	75	57	64	47	53	33	57	34	33	15	35	14	55	34	52	35	63	42	77	57
11	81	68	81	67	80	64	60	42	56	39	51	41	34	16	50	32	60	36	43	31	62	38	84	57
12	77	66	79	62	76	66	53	45	61	48	44	35	28	19	50	35	52	32	48	31	66	47	71	61
13	79	65	81	60	82	70	65	48	55	40	42	31	38	21	41	23	52	29	52	33	75	56	75	62
14	83	64	79	62	72	59	64	43	44	32	45	29	39	18	28	14	54	34	59	41	77	57	74	53
15	85	67	77	65	66	55	71	51	45	24	48	32	25	10	29	10	47	28	52	38	73	58	78	63
16	75	60	78	70	68	48	69	56	45	27	34	23	20	3	38	15	47	26	57	36	73	61	73	59
17	78	62	80	71	71	49	72	58	46	38	34	20	31	13	33	25	39	26	49	36	74	59	68	52
18	92	71	81	68	77	60	72	63	46	40	38	27	43	26	30	20	38	21	43	34	76	60	68	48
19	92.5	76	78	62	74	62	64	46	54	39	37	25	33	11	25	11	41	17	42	33	72	61	68	47
20	85	71	79	63	78	67	61	44	44	37	38	22	22	8	27	16	48	27	54	35	74	58	73	46
21	82	67	78	65	81	64	69	46	54	42	49	19	32	7	24	13	47	33	62	37	78	58	73	53
22	78	66	70	63	64	51	65	41	53	44	52	34	42	29	31	8	41	28	66	45	67	50	72	59
23	79	61	70	55	63	43	65	51	52	43	38	25	44	27	42	20	43	31	65	49	61	45	82	58
24	82	61	72	52	70	48	60	48	53	39	29	19	38	18	30	18	42	26	59	39	66	40	82	62
25	84	64	71	62	74	63	60	42	49	33	32	16	54	29	27	15	49	31	56	43	69	52	80	63
26	82	69	71	52	77	55	60	41	50	31	32	17	31	5	51	18	46	26	60	42	64	52	77	65
27	83	72	75	56	62	47	62	51	55	26	33	20	47	10	35	13	44	33	56	41	66	41	88	66
28	83	62	75	58	57	40	61	39	55	42	33	25	52	35	22	8	44	33	61	45	74	53	88	69
29	81	64	74	58	66	43	52	34	50	36	38	17	42	25	.....	.....	48	35	63	50	76	53	83	63
30	73	60	80	60	67	55	55	49	48	34	35	22	35	13	.....	.....	52	33	71	52	75	52	77	60
31	72	60	78	63	.....	.....	57	45	.....	.....	36	17	43	22	.....	.....	38	27	.....	.....	83	60	.....	.....
Range	37°.5		33°.		45°.		41°.		37°.		41°.		51°.		43°.		47°.		49°.		46°.		44°.	
Monthly mean	75°.1		72°.0		65°.6		57°.0		42°.9		34°.4		27°.5		27°.6		37°.7		46°.2		61°.4		69°.3	

Maximum, minimum, and mean temperatures—Continued.

STATION, NEW LONDON, CONN.—(Readings made daily at 11 p. m., Washington mean time.)

Day of month.	1878. July.		1878. August.		1878. September.		1878. October.		1878. November.		1878. December.		1879. January.		1879. February.		1879. March.		1879. April.		1879. May.		1879. June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	85	67	68	62	81	68	68	44	49	38	44	29	34	19	37	17	32	15	51	27	60	44	86	61
2	84	68	78	64	82	71	73	60	59	39	57	37	39	10	28	9	42	29	47	33	57	38	86	63
3	87	67	84	64	80	68	77	60	56	37	53	43	18	0	39	22	45	29	49	27	58	39	71	54
4	87	70	83	65	71	65	76	54	49	29	49	38	33	14	38	28	44	27	34	23	61	43	67	57
5	89	70	76	66	73	65	69	51	43	26	41	30	36	20	38	24	49	30	36	20	70	49	78	56
6	81	64	75	68	72	64	64	50	38	30	40	28	25	13	39	29	41	19	43	20	68	50	76	54
7	79	60	80	65	68	56	63	45	45	33	38	27	32	12	42	22	50	23	52	33	65	44	64	47
8	86	67	81	63	69	53	67	55	42	30	37	24	38	27	42	19	39	19	50	33	65	49	72	49.4
9	81	70	82	69	72	52	70	55	46	30	46	28	43	29	40	21	40	30	60	34	64	43	71	52
10	81	70	77	66	75	59	65	47	50	34	56	43	33	17	31	13	56	36	49	38	65	43	74	57
11	82	67	78	66	79	65	59	44	56	39	54	40	31	17	48	30	59	35	44	34	58	41	72	59
12	71	64	81	63	72	68	54	44	59	49	44	34	32	18	49	33	46	32	49	32	66	45	70	60
13	77	63	78	62	77	68	66	45	55	38	38	29	38	25	42	23	47	28	50	32	72	54	77	59
14	78	61	76	63	72	60	63	45	45	31	41	26	42	23	28	16	49	36	57	40	75	55	75	55
15	87	61	74	65	68	56	70	54	46	28	47	35	34	14	29	11	48	32	50	38	67	54	76	61.3
16	70	58	75	68	67	49	69	58	49	29	39	25	24	9	35	16	43	27	58	38	69	57	69	55
17	75	61	77	68	71	52	74	60	50	41	36	22	35	17	35	27	48	32	50	38	70	57	69	51
18	92.5	68	81	66	77	63	68	60	51	43	41	23	40	28	36	23	40	25	45	35	69	57	68	49
19	93	74	78	60	75	63	64	43	53	39	37	23	33	17	32	15	42	23	42	34	65	57	69	48
20	86	69	81	63	80	65	61	42	49	39	38	21	24	9	29	21	45	27	58	33	67	55	69	46
21	78	63	79	64	80	67	69	47	52	38	50	22	32	3	29	11	43	34	63	39	75	59	73	54
22	77	65	73	59	70	52	67	45	54	45	54	33	42	29	31	8	42	29	67	40	67	51	73	58
23	79	60	70	54	64	46	65	54	51	42	42	21	44	25	39	19	44	32	67	46	63	45	80	59
24	82	61	68	52	68	49	65	49	50	41	33	12	37	23	27	20	41	28	62	38	68	43	81	63
25	83	63	73	61	77	63	65	45	52	37	28	12	45	29	31	16	52	35	54	43	71	46.3	78	61
26	80	68	72	55	76	56	63	43	51	34	31	16	34	8	48	25	46	30	60	43	67	50	75	62
27	80	70	74	58	65	50	60	46	53	28	36	23	38	12	41	14	42	36	52	42	65	43	84	63
28	82	65	73	58	61	43	60	40	55	41	39	21	48	36	28	11	44	36	57	46	74	52	85	67
29	80	65	72	58	63	44	52	35	50	36	32	19	42	26	.....	.....	45	35	61	48	74	56	78	65
30	72	60	81	60	67	48	60	45	49	34	39	21	36	17	.....	.....	53	35	70	53	73	55	79	63
31	72	60	75	64	.....	.....	56	46	.....	.....	37	17	40	25	.....	.....	44	26	.....	.....	78	58	.....	.....
Range	35°		32°		39°		42°		33°		45°		48°		41°		44°		50°		40°		40°	
Monthly mean	72°.3		69°.5		65°.0		56°.6		42°.6		33°.1		26°.6		26°.7		36°.7		44°.3		57°.7		65°.8	

Maximum, minimum, and mean temperatures—Continued.

STATION, NEW ORLEANS, LA.—(Readings made daily at 11 p. m., Washington mean time.)

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	90	76	89	79	87	76	86	72	60	42	62	47	62	49	67	52	64	48	82	62	83	64	80	73
2	88	75	91	78	89	77	86	73	67	46	57	45	52	44	52	40	69	48	67	53	75	59	78	72
3	83	76	89	76	87	77	86	73	69	49	65	43	53	34	57	40	69	57	73	52	78	58	75	65
4	85	75	83	76	87	74	86	73	70	54	67	46	41	28	67	49	70	54	64	46	80	64	76	66
5	87	75	88	75	87	76	87	70	71	53	64	48	37	25	70	60	70	46	66	49	82	66	78	69
6	87	76	89	75	89	74	86	71	75	60	69	45	36	20	61	50	70	48	72	48	79	67	79	70
7	91	76	91	77	89	78	85	70	74	61	66	55	52	24	53	45	72	48	78	56	74	66	78	72
8	92	79	92	77	85	77	86	72	76	61	68	59	67	52	60	44	75	49	78	65	78	64	85	73
9	91	78	92	78	88	76	79	72	71	58	65	45	66	34	59	43	76	52	77	62	80	66	87	74
10	91	78	89	78	89	78	78	69	75	57	57	40	43	27	67	46	75	57	79	66	79	68	88	75
11	91	77	90	78	85	71	81	68	75	62	69	44	58	38	67	54	75	61	76	57	78	64	86	75
12	89	78	89	78	77	64	79	71	64	57	70	52	57	41	71	50	73	61	72	54	81	63	87	74
13	88	75	90	77	75	61	81	64	66	50	69	53	48	39	73	58	70	60	78	56	82	70	88	74
14	91	76	89	77	78	62	82	68	67	52	67	50	56	42	60	48	72	57	79	62	83	69	89	75
15	93	77	91	77	82	65	79	69	72	60	59	44	65	47	51	38	74	53	78	63	80	69	87	75
16	92	77	84	77	82	66	84	69	64	55	54	37	70	53	72	49	75	56	85	65	81	67	88	76
17	90	79	88	77	85	71	78	70	64	56	54	38	73	55	75	58	66	48	69	61	83	68	91	76
18	88	78	91	79	85	73	71	61	66	56	52	37	70	48	58	45	59	45	69	54	86	70	91	76
19	89	77	91	77	86	71	67	52	68	57	51	42	57	38	58	38	63	47	72	54	85	68	90	75
20	92	77	92	78	86	72	69	53	71	53	57	43	58	36	62	43	75	51	74	55	85	69	85	76
21	91	77	93	77	81	75	76	60	65	55	59	45	64	43	66	43	77	61	75	55	86	77	85	71
22	90	75	94	78	82	73	70	57	64	47	59	41	68	46	70	51	80	65	78	60	81	72	86	70
23	92	80	91	78	87	73	67	49	71	48	57	35	68	52	66	54	71	59	75	65	84	71	87	72
24	93	81	91	78	87	73	72	53	76	55	57	40	69	53	69	45	73	55	77	61	81	73	86	72
25	92	81	90	79	85	71	75	59	75	58	44	33	72	49	74	51	77	56	75	62	81	67	86	73
26	91	78	89	76	86	71	77	63	67	48	45	32	70	52	64	48	79	55	70	63	81	67	87	73
27	92	80	89	73	87	74	74	59	57	43	41	30	73	57	56	38	80	61	78	60	83	68	86	74
28	91	79	89	76	85	74	66	50	61	42	44	27	78	67	58	38	82	62	75	66	85	66	88	73
29	93	78	86	74	83	72	70	59	64	41	61	38	74	63	.....	.....	83	68	79	65	85	68	89	76
30	88	80	86	74	85	72	70	62	65	49	62	49	71	59	.....	.....	84	65	82	64	82	72	87	77
31	90	80	88	74	.....	.....	66	53	.....	.....	55	46	76	62	.....	.....	75	58	.....	.....	82	74	.....	.....
Range	18°		21°		28°		38°		35°		43°		58°		37°		39°		39°		28°		26°	
Monthly mean	84°.1		83°.5		78°.7		70°.6		60°.8		51°.2		53°.1		55°.8		64°.7		67°.9		76°.5		80°.9	

Maximum, minimum, and mean temperatures—Continued.

STATION, NEWPORT, R. I.—(Readings made daily at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	76	65	71	61	75	67	68	53	48	39	42	30	33	21	32	18.5	36	16	47	27	59	44	77	57
2	76	65	74	64	76	68	70.5	61	55.5	43	56	38	37	13	27	11.5	39	29.5	45	34	56	40	76.5	59
3	81	64	78.5	66	80	66.5	76	63	54	37	52	42.5	19	3	36	25	41.5	29	45	26	56	40.5	63	54.5
4	84	66	80	66	71	64	73	57	48	31	48.5	38	27	17.5	39	29	42	29	32.5	22.5	56	42	64	56
5	89	68	76	67	70	65	67	51.5	40	26	39	29	30.5	19	34	25.5	47.5	22.5	38	22	60.5	47	66.5	56
6	77	62	77	67	73	63	62	52	37	30	39	28.5	26	15	36	27	40	17	47	27	66	46	69	54.5
7	76	62	79	66	68	56	63	47	44	34	37	22	30	12	37	25	40	20	48	36	61	45	65	49
8	76	66	77	64	69	54	64	54	40	31	35	24	37	27	33	23	38	19	52.5	34	62.5	48	72	50
9	75	66	77	67	73	53	67	60	43	30	44	25.5	39	29	37	22	40	29	56	37	65.5	46	68	53.5
10	75	65	74	67	76	59	63	51	47.5	34	55	44	30	18	31	14.5	51.5	36	47.5	39	60.5	46	67.5	56
11	79	67	77	66	77	62.5	58	45	53	41	52	39	32	19	45	31	55.5	35.5	44	33	57.5	42.5	69	56
12	75	64.5	78	65	75	67	53	43	57	48	42	34	31	20	44	35	43	32.5	46	31.5	60.5	46	67.5	59.5
13	75	62	79	65	78	68	64	42	53	40	39	31	37	23	38	24	44	29	47.5	35	60	52	75.5	59.5
14	73	61	78	65	71	62	60.5	47	44	35	38	27.5	37	26	25	15	48	36	52	39.5	63	51.5	70.5	56.5
15	79	59	73	64	68	55	65	54	44	30	46	34	32	11	29	11	47	30	50.5	38	71	52	67	60
16	71	56.5	74	68	69	49	66	58.5	49	35	37	24	30	8	32	18	40	27.5	58	38.5	61	54	65	53
17	73	62	72	67	68	54.5	67	60	48	41	32	21	33	16	35	27	46	32.5	46	38.5	67.5	54	70	51.5
18	92	66	80	66	74	63	66	60	49.5	43	37.5	25	39	31	36	20	38	28	42	34.5	69	55	66	52
19	88	73	78	64	74	61	60	44	47	37	34	25	32	23	28	16	41	24	38	32	67	56	65.5	52
20	84	68	81	63	75	64	59	43	44	38	35	22	27	13	32.5	17	44.5	28	58.5	34	69	56	67	51
21	75	65	78	65	74	67	67	51	51.5	37	48	23	30	5	25	14	41.5	33	61.5	37	64	57	69	56.5
22	75	65	70	57	69	52	64	49	54	45	53	33	40	29	32.5	11	42	30	64.5	41	63	52	69	58
23	81	60	72	54.5	64	45.5	63	53	50	43	34	22	40	27	37	20.5	44	33	64	45	57	44	72.5	59
24	81	62	69	56	67	53	63.5	49	49.5	42	25	19	38	24	37.5	17.5	43.5	31	62	39	65.5	44.5	76.5	62
25	76	65	71	62	76	63	60	49	51.5	37	28	14	44	32	34.5	17.5	51	35.5	53	43	66.5	50	76	62
26	77	66	70	56	73	58	61	47	50	35	31	19	32	11	48	26	46	34	50	41	67	51.5	71	63
27	77	68	72	60	64	49	58	51	51	30	33	23	37	10	42	14.5	41	36	53	38.5	62.5	46.5	77	63
28	81	65	73	59	59	43	57	42	54	41	33	23	44	36	28	10.5	41.5	35.5	55	45	76.5	53	74	64
29	78	65	74	60	62	50	51	36	47	36	32	19	42	22	.....	.....	43.5	34	59	48	74	56	71	63
30	70	59	79	62	66	52	60	46	47	32	33.5	23.5	35	16	.....	.....	53	36	67	49	67	55.5	79	62.5
31	68.5	59	76	64	.....	.....	54	45	.....	.....	34	19	39	26	.....	.....	40.5	27	.....	.....	69	58	.....	.....
Range	35°.5		26°.5		37°		40°		31°		42°		41°		37°.5		39°.5		45°		36°.5		30°	
Monthly mean	70°.7		69°.2		64°.9		56°.9		43°.3		33°.6		28°.0		28°.3		36°.6		43°.6		56°.3		63°.5	

Maximum, minimum, and mean temperatures—Continued.

STATION, NEW YORK, N. Y.—(Readings made daily at 11 p. m., Washington mean time.)

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	86	67	71	64	86	70	72	56	46	36	48	35	30	25	32	17	35	19	53	34	57	44	89	69
2	87	68	85	65	85	71	76	60	59	37	58	35	33	5	26	13	41	31	44	34	50	40	86	68
3	88	70	88	68	83	71	78	62	51	38	48	39	8	−3	(*)	26	46	30	48	28	59	40	69	59
4	88	71	85	69	74	65	75	58	47	32	49	39	26	7	(*)	27	43	30	33	25	58	46	72	60
5	92	71	78	68	76	64	72	53	42	28	39	30	26	14	(*)	27	48	34	34	24	70	52	79	62
6	85	73	79	65	79	66	63	50	44	33	40	29	30	16	(*)	29	38	26	46	24	67	53	79	55
7	83	67	82	64	71	62	63	48	46	33	41	29	31	19	40	26	39	30	53	35	63	48	66	47
8	88	67	84	67	72	57	67	51	40	31	38	28	38	22	37	23	39	24	54	34	70	47	74	54
9	88	67	86	69	75	58	77	55	42	30	48	31	39	27	36	25	44	30	62	37	67	49	72	59
10	86	69	79	70	76	64	67	51	50	40	58	45	28	20	33	18	72	36	53	39	65	49	84	60
11	84	70	80	67	82	67	59	47	57	38	45	38	31	17	47	29	62	41	45	37	63	47	83	67
12	73	65	80	67	77	67	59	49	58	45	39	34	29	24	47	33	45	34	47	33	69	47	79	66
13	82	66	80	67	77	66	68	48	54	40	41	31	35	28	34	21	50	34	52	34	77	58	79	65
14	80	65	81	67	72	57	68	48	48	35	46	30	37	24	25	14	56	38	54	41	73	57	74	60
15	93	67	76	68	72	56	75	55	49	32	42	33	33	16	24	8	42	33	50	42	72	57	83	65
16	75	62	77	69	71	55	74	56	51	37	35	25	25	13	32	17	44	31	58	41	75	61	79	62
17	76	65	80	69	73	56	76	60	50	45	37	24	27	19	33	28	47	31	48	42	72	61	69	57
18	93	71	83	71	81	59	67	46	48	43	35	27	40	22	31	27	42	27	41	37	74	59	72	53
19	94	76	81	67	80	67	54	42	57	43	35	22	32	21	31	21	40	29	44	37	71	61	70	56
20	87	73	82	64	82	64	61	40	50	43	34	22	23	11	34	23	43	29	57	37	71	61	72	55
21	81	70	83	66	78	65	73	46	53	43	48	26	27	5	27	13	47	36	64	40	77	62	76	59
22	76	64	74	61	69	55	73	46	56	46	48	31	49	22	24	11	39	32	71	46	71	55	67	59
23	85	62	75	62	66	49	66	55	47	41	31	17	43	26	41	20	42	32	66	49	66	50	82	60
24	82	66	74	60	69	56	64	45	52	37	24	13	37	24	33	20	40	30	67	46	72	48	85	66
25	83	66	72	64	78	62	65	44	54	41	20	12	47	28	30	23	46	32	56	46	72	58	79	65
26	81	68	75	59	77	58	65	44	51	37	24	13	30	14	49	27	43	28	71	46	73	58	82	64
27	82	71	77	61	68	50	61	51	57	33	32	20	39	15	40	17	48	33	54	44	64	52	89	69
28	85	66	76	64	65	45	55	40	57	40	29	21	50	36	31	12	57	38	65	46	77	55	88	71
29	79	68	76	63	69	51	54	39	49	40	28	16	44	30	.....	.....	42	36	67	53	77	58	81	67
30	69	62	81	64	70	59	63	45	48	34	32	22	43	20	.....	.....	51	38	72	52	75	59	82	64
31	69	61	78	67	.....	.....	54	41	.....	.....	30	18	39	25	.....	.....	40	32	.....	.....	86	59	.....	.....
Range	33°.		29°.		41°.		39°		31°		46°		53°		.....		53°		48°		46°		42°	
Monthly mean	74°.7		71°.8		67°.0		58°.0		44°.0		33°.3		27°.3		.....		38°.4		46°.1		60°.5		69°.2	

* Thermometers broken.

Maximum, minimum, and mean temperatures—Continued.

STATION, NORFOLK, VA.—(Readings made daily at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	87	69	98	76	92	75	73	65	49	34	56	43	45	35	42	29	46	29	57	41	63	51	96	70
2	90	71	92	77	93	75	79	63	60	35	63	48	44	25	37	22	48	33	58	42	60	49	93	70
3	91	73	90	73	89	73	75	61	55	45	54	38	25	13	48	26	41	37	63	28	66	48	83	67
4	88	72	94	74	92	72	75	63	53	41	55	42	26	8	45	29	47	35	47	30	76	49	77	59
5	92	73	94	70	85	72	70	62	47	39	46	36	25	10	50	34	50	39	49	37	80	62	89	60
6	86	75	90	71	80	70	66	58	66	37	48	33	33	11	47	37	62	33	57	34	73	60	92	67
7	95	70	88	76	78	70	69	52	71	48	45	35	36	16	42	34	59	42	67	41	64	52	72	59
8	94	74	90	72	75	70	74	57	53	43	45	35	50	23	36	30	52	37	49	40	61	51	80	55
9	94	73	95	71	78	70	81	64	48	36	65	37	68	36	49	28	73	43	67	37	61	48	89	59
10	97	74	98	75	81	71	72	64	57	34	64	43	36	24	46	30	79	56	69	50	58	49	91	68
11	100	76	95	70	84	72	62	56	66	42	49	37	46	24	60	36	79	54	61	45	65	53	92	68
12	99	76	80	70	87	74	63	54	65	52	50	37	45	34	58	45	55	43	51	31	76	52	90	72
13	88	73	80	71	85	75	67	52	62	42	47	35	41	32	48	33	66	40	69	39	78	57	81	71
14	88	71	85	72	73	65	73	51	52	42	51	34	46	33	39	30	59	53	67	56	80	60	92	64
15	93	70	85	74	74	61	75	53	55	40	54	39	42	32	33	23	57	42	77	56	79	60	94	68
16	91	73	89	74	75	60	79	58	65	46	41	33	57	36	37	24	54	39	69	50	85	64	93	72
17	94	71	89	72	76	61	78	62	66	46	36	32	43	31	39	33	71	39	67	45	86	65	78	66
18	98	75	89	74	82	60	73	47	61	49	41	31	47	31	42	33	40	35	52	42	74	65	72	61
19	101	77	90	74	86	63	59	44	55	47	36	25	41	25	36	31	48	32	55	39	80	63	70	58
20	97	76	84	72	86	65	60	44	54	49	38	25	29	20	38	30	64	36	61	43	81	65	71	58
21	98	76	83	72	86	67	67	44	62	49	59	32	45	24	35	25	70	54	64	44	87	64	78	56
22	83	74	79	70	67	63	69	51	56	44	47	36	62	38	52	25	69	46	71	45	75	55	87	57
23	83	70	75	68	73	63	71	54	52	42	37	26	62	39	53	40	65	43	80	51	63	51	86	67
24	89	66	78	65	76	67	63	49	62	37	36	29	46	34	56	32	62	39	62	49	74	49	86	67
25	90	74	89	65	79	67	61	51	70	49	35	23	65	41	66	39	55	43	79	46	80	54	85	68
26	92	70	78	68	84	68	66	48	60	48	38	24	51	31	70	41	58	40	84	61	77	61	94	67
27	99	74	77	63	69	57	72	48	66	49	32	22	55	28	41	26	67	50	86	61	75	59	96	70
28	92	75	82	68	69	57	60	45	56	40	33	18	71	53	31	26	51	43	79	63	74	62	94	70
29	92	74	83	69	73	60	58	45	51	36	34	21	60	40	.....	.....	72	41	66	56	81	61	92	66
30	92	75	79	70	73	63	69	55	52	36	42	31	43	34	.....	.....	53	42	75	53	88	60	79	68
31	94	76	90	72	.....	.....	58	43	.....	.....	36	28	48	31	.....	.....	52	33	.....	.....	96	69	.....	.....
Range	35°		35°		36°		38°		37°		47°		63°		48°		50°		58°		48°		41°	
Monthly mean	81°.9		78°.3		72°.6		60°.9		50°.5		39°.2		37°.5		38°.9		49°.3		56°.3		65°.7		75°.9	

Maximum, minimum, and mean temperatures—Continued.

STATION, NORTH PLATTE, NEB.—(Readings made daily at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	79	53	88	65	86	54	72	40	72	25	53	17	12	−14	27	− 1	29	13	58	23	69	45	64	40
2	83	58	93	66	95	55	75	39	50	33	67	24	6	−19	36	1	46	11	43	26	81	50	76	38
3	85	59	97	65	96	62	69	42	72	28	51	33	10	− 9	43	6	54	26	57	16	66	50	87	44
4	84	59	90	65	91	65	54	40	75	26	52	27	10	−10	30	15	56	26	75	25	66	34	80	54
5	87	64	91	66	66	58	68	31	72	27	53	25	16	− 5	23	− 3	58	39	78	36	66	39	86	56
6	88	65	97	67	80	56	72	42	70	26	40	27	40	− 3	26	− 5	48	31	63	42	63	41	83	59
7	83	62	103	69	87	55	84	34	47	36	41	26	31	8	30	− 3	78	41	67	26	50	43	90	66
8	82	62	101	70	70	47	66	41	50	40	44	22	30	− 3	28	6	56	33	70	45	56	47	88	65
9	84	61	89	69	60	39	70	33	48	39	51	18	37	− 1	34	3	66	30	46	36	85	55	81	60
10	91	70	85	64	60	33	67	36	41	32	52	21	31	6	32	16	56	33	60	34	86	53	89	53
11	98	67	83	60	62	32	79	27	53	28	42	16	37	2	36	5	68	28	67	27	80	59	90	58
12	100	72	87	61	74	41	80	44	69	27	31	14	49	6	12	0	56	35	66	43	60	49	89	66
13	99	70	83	63	83	45	87	37	50	32	28	14	44	10	12	− 4	56	14	62	43	67	47	82	63
14	99	71	87	54	88	44	74	43	56	31	28	− 4	30	5	28	−13	49	13	57	41	70	40	78	53
15	98	72	78	57	59	46	76	45	59	25	34	11	26	6	35	− 1	36	15	56	35	72	43	85	51
16	83	70	81	58	74	43	50	37	59	25	28	− 4	42	0	27	18	29	17	56	33	66	54	76	52
17	89	67	97	64	80	49	64	29	64	26	16	−16	34	8	30	11	29	13	65	30	73	53	74	59
18	92	68	87	64	92	51	75	29	58	32	17	−11	31	3	33	− 8	37	16	77	39	80	55	81	56
19	93	66	90	67	73	39	82	34	53	25	25	− 5	51	6	29	10	48	19	75	45	83	55	83	60
20	94	73	93	68	64	33	79	40	49	30	34	1	50	20	36	4	47	15	83	46	78	55	81	58
21	93	72	101	71	75	42	54	30	62	24	35	14	62	16	47	13	53	25	75	50	78	62	86	58
22	96	70	100	70	86	48	74	25	72	29	36	8	50	29	45	23	59	20	64	50	90	61	93	65
23	89	70	100	69	68	44	53	38	56	25	26	3	57	23	44	17	55	35	61	46	86	64	98	66
24	90	69	80	58	82	47	47	31	36	21	17	− 4	68	32	46	30	70	23	67	38	78	60	83	64
25	81	70	81	58	61	44	33	23	37	19	16	− 8	56	37	39	9	77	35	78	42	74	57	87	57
26	80	64	95	60	69	36	29	19	50	17	23	5	65	30	23	4	78	35	67	48	80	51	83	57
27	81	62	80	61	74	45	48	11	51	19	30	2	48	23	43	13	86	49	65	39	86	57	78	61
28	84	59	80	54	80	57	51	30	51	19	26	2	53	23	47	16	67	39	72	47	93	64	82	50
29	87	59	86	55	92	56	57	34	36	17	29	−10	50	14	.....	.....	77	36	75	44	82	56	89	62
30	89	63	90	58	72	46	51	28	46	20	24	− 7	40	23	.....	.....	80	36	60	51	66	52	86	63
31	90	67	94	58	.....	.....	67	21	.....	.....	32	− 3	33	11	.....	.....	60	39	.....	.....	61	45	.....	.....
Range	47°		49°		64°		76°		58°		83°		87°		60°		75°		67°		59°		60°	
Monthly mean	75°.8		74°.5		60°.3		47°.8		38°.8		20°.5		22°.2		19°.6		40°.9		51°.4		62°.1		70°	

Maximum, minimum, and mean temperatures—Continued.

STATION OLYMPIA, WASH. TY.—(*Readings made at 11 p. m., Washington mean time.*)

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	67	52	73	52	78	44	59	52	54	42	54	43	40	19	42	27	48	33	60	41	59	49	76	50
2	62	52	75	60	67	53	60	48	53	48	54	47	39	20	49	29	42	34	59	42	53	44	71	55
3	67	47	77	53	69	44	58	39	49	38	54	46	36	27	45	32	42	32	60	49	53.5	43	69	43
4	67	53	78	48	73	45	58	35	55	46	49	45	37	20	43	24	45	37	59	40	60	40	71	42
5	72	48	68	52	73	43	58	46	54	44	46	43	38.5	26	46	24	46	29	56	46	61	45	64	50
6	78	48	70	45	71	45	60	52	49	36	52	43	41	31	42	33	46	35	56	38	51.5	42	62	50
7	82	50	76	48	68	41	55	51	53	44	50	42	36	24	42	33	43	35	53.5	39	51	38	63	45
8	79	50	73	52	72	38	57	49	50	42	48.5	44	40	33	45.5	33	38.5	34	70	36	56	41	63	45
9	74	55	79	47	78	40	53	47	48	37	47.5	42	43	33	42	34	40	34	49	39	66	35	60	49
10	66	53	78	48	78	45	52	46	48	32	48	39	42	36	40	34	41	33	53	36	61	41	67	46
11	65	54	75	49	67	49	56	45	47	34	46	38	42	35	38	33	52	39	59	32	56	46	71	46
12	68	55	78	51	68	46	51	44	49	33	46	34	43	35	50	35	57	38	53.5	43	60	49	75	45
13	73	54	79	49	62	47	49	39	54	44	41	29	43	36	48	37	56	35	54	46	56	49	75	47
14	73	45	78	50	61	41	47	38	58	51	36.5	34	37.5	28	45	39	55.5	38	54	43	58	48	67	52
15	67	52	78	50	64	37	54	37	52	46	36.5	32	40	28	45	36	51	42	51	38	55	43	64.5	48.5
16	60	52	70	56	67	39	53	39	56	50	36.5	33	38	31	41	37	50	33	50	36	61	35	66	38
17	67	54	73	51	66	40	64	48	54	46	42.5	33	44	36	44	37	57	36	53	39	66	36	71	39
18	64	56	70	52	64	39	60	50	49	41	42	35	46	35	45	36	58	38	55	35	57.5	49.5	64	41
19	77	47	68	55	59	41	53	48	51	45	43	36	48	41	54	40	56	46	60	35	54.5	48.5	69	48
20	69	52	70	49	59	51	55	42	58	48	43.5	37	48	33	54	42	49	40	56	43	58	48	64	48
21	75	45	68	47	55	52	50	45	58	48	41.5	36	47.5	35	48	38	57	32	55	43	69	44	62	47
22	77	46	73	43	60	52	50	46	53	41	42	33	43.5	32	47	41	46.5	39	64	37	60	45	58	49
23	77	47	75	53	55	49	52	35	45	32	45.5	38	47	35	54	45	47	37	60	50	61	44.5	61	49
24	78	47	76	52	62	43	49	31	47	31	43.5	39	44	34	51.5	38	59	44	53.5	44	62	49	67	52
25	74	51	68	56	59	44	49	30	46	32	39	34	45	33	49	37	58.5	48	57	35	76	41	64	52
26	71	49	78	49	58	52	52	28	44	33	38	33	41	32	53	42	54	45	56.5	38	67	47	72	54
27	74	56	82	48	59	52	52	29	45	35	42	28	42	29	48	40	52	42	57	34	59	50	74	46
28	77	49	81	52	57	48	48	32	48	42	36.5	25	39	28	46	34	54	45	55	38	63	47	66	51
29	69	48	74	51	57	48	52	37	47	35	36	23	41	29	.....	.....	55	49	61	40	61	49	71	42
30	72	47	69	53	55	50	53	40	49	35	43	25	47	31	.....	.....	56	49	62	43	66	43	67	41
31	80	49	73	45	.....	.....	55	35	.....	.....	42	22	43	25	.....	.....	65	40	.....	.....	76	50	.....	.....
Range	37°		39°		41°		36°		27°		32°		29°		30°		36°		37°		41°		38°	
Monthly mean	61°.0		62°.5		54°.4		47°.4		44°.2		39°.6		36°.2		40°.2		44°.8		48°.6		52°.4		57°.8	

Maximum, minimum, and mean temperatures—Continued.

STATION, OMAHA, NEB.—(Readings made at 11 p. m., Washington mean time).

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	75	59	83	66	86	64	78	56	67	37	43	20	19	−13	34	15	21	8	44	28	71	48	60	45
2	79	57	88	68	83	58	74	47	57	34	59	25	−4	−19	40	20	38	18	42	27	76	53	69	45
3	80	59	90	69	86	61	71	49	60	31	59	38	1	−22	43	25	45	27	35	14	72	59	84	55
4	83	66	91	70	89	68	68	46	62	34	46	29	6	−17	42	25	52	35	49	21	74	48	83	58
5	90	72	90	70	88	67	64	45	71	50	47	28	2	−19	30	12	50	38	67	34	58	40	83	63
6	91	72	91	72	83	68	65	48	67	53	35	23	27	−6	38	14	56	34	56	46	60	35	84	64
7	90	72	94	76	80	65	69	40	54	37	35	17	30	11	46	19	72	42	61	38	59	47	88	60
8	85	63	97	70	77	59	81	52	51	29	32	27	14	1	36	23	75	51	63	45	67	52	88	69
9	85	65	88	67	63	50	63	39	56	30	34	27	23	−4	50	16	64	46	58	42	82	55	90	68
10	88	67	80	64	62	44	82	52	55	38	33	24	27	9	47	27	60	43	51	40	89	67	93	60
11	93	75	82	62	60	42	68	39	49	34	34	28	31	13	33	17	56	30	60	40	83	67	88	65
12	95	76	85	63	61	39	73	47	63	34	29	16	37	15	32	−1	63	40	71	45	82	64	77	68
13	95	77	85	66	67	41	80	54	52	34	24	20	32	12	8	−7	49	12	65	47	73	55	86	66
14	96	78	86	64	75	51	72	57	54	34	26	13	23	7	27	−5	35	3	50	44	68	52	81	63
15	96	79	74	63	85	56	80	52	56	35	28	14	20	11	36	16	28	9	57	35	74	47	69	63
16	96	78	76	57	81	52	73	44	56	32	25	9	24	2	31	20	26	13	58	39	77	53	76	55
17	91	71	93	70	74	53	52	36	58	32	10	1	34	12	30	15	25	6	62	40	82	58	75	58
18	90	78	92	71	85	58	55	28	60	37	16	−2	25	0	40	25	25	17	72	40	80	63	80	58
19	88	77	92	73	79	53	76	35	56	37	22	5	43	−5	35	12	45	12	68	45	78	60	70	63
20	92	75	87	73	59	44	74	50	52	38	29	12	48	28	33	13	39	29	72	50	74	59	73	63
21	87	70	87	76	70	44	60	39	50	34	22	2	49	25	53	28	40	28	75	56	75	57	84	62
22	83	70	93	76	75	55	64	30	56	36	17	−5	38	22	50	35	45	27	80	63	82	56	87	67
23	83	70	96	74	68	53	57	47	54	41	16	−3	38	15	49	31	61	34	76	62	86	63	93	72
24	79	70	91	66	71	43	47	36	41	30	10	−8	62	32	60	36	50	33	71	60	89	63	89	72
25	83	72	76	59	65	47	43	33	34	26	20	−1	47	35	36	1	65	41	76	52	87	69	86	65
26	80	69	83	59	62	36	35	21	39	18	17	4	59	35	11	−9	69	41	72	57	73	63	85	65
27	81	65	80	67	65	44	43	15	45	27	19	−4	53	36	33	10	82	50	62	45	80	61	79	68
28	86	64	78	62	67	55	54	32	51	23	26	6	43	28	60	18	73	50	61	48	91	70	77	61
29	83	64	79	57	88	64	56	39	45	23	27	12	46	33	.....	.....	75	44	70	45	88	70	84	61
30	85	64	82	58	85	70	46	29	41	30	25	0	44	25	.....	.....	58	37	64	49	79	58	86	66
31	90	63	88	62	.....	.....	53	26	.....	.....	30	19	36	28	.....	.....	52	42	.....	.....	61	48	.....	.....
Range	39°		40°		53°		67°		53°		67°		81°		69°		79°		66°		56°		48°	
Monthly mean	79°.1		77°.9		64°.3		52°.5		44°.0		21°.8		21°.8		27°.1		41°.6		54°.2		67°.0		72°.7	

Maximum, minimum, and mean temperatures—Continued.

STATION, OSWEGO, N. Y.—(Readings made at 11 p m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	100	69	85	66	81	67	78	56	48	32	44	34	33	18	28	11	44	17	42	31	40	34	74	58
2	90	71	80	65	80	68	77	59	54	36	50	35	30	11	29	7	34	16	38	28	45	36	70	50
3	81	73	81	68	79	67	74	54	43	35	47	39	20	9	33	24	39	14	31	21	59	37	62	47
4	80	71	80	66	78	65	67	50	41	29	42	31	25	13	36	27	46	26	26	15	66	44	63	53
5	83	68	86	67	75	64	60	49	37	28	35	28	25	19	39	28	39	13	33	22	68	45	66	52
6	86	66	79	66	77	64	57	49	43	31	31	24	26	19	38	22	41	12	48	30	49	40	58	43
7	90	63	77	66	85	67	60	41	43	32	35	25	33	22	37	28	36	28	42	35	51	38	58	42
8	93	70	85	62	81	65	64	49	37	30	35	28	38	28	40	27	42	24	48	32	56	39	62	45
9	87	72	80	70	81	59	73	53	41	32	41	29	35	17	33	21	48	33	54	36	62	40	69	45
10	83	69	74	63	82	63	55	48	51	37	53	33	29	15	35	10	57	41	48	30	76	49	85	56
11	76	66	77	64	69	63	60	43	54	44	42	32	33	14	45	32	46	33	40	29	82	54	74	62
12	76	65	77	63	80	64	57	50	51	45	39	30	34	23	43	16	38	30	43	32	88	62	73	57
13	81	63	81	60	79	59	62	43	46	35	39	31	35	15	23	13	48	32	52	33	87	62	64	53
14	81	64	85	65	65	52	73	52	40	32	38	30	36	20	29	8	45	30	46	33	78	64	65	48
15	80	67	84	66	64	53	73	59	46	33	35	25	23	1	28	9	31	22	44	35	76	61	72	51
16	94	61	83	64	75	47	79	62	49	34	29	18	23	8	36	9	33	20	51	33	64	49	63	49
17	95	74	79	68	80	47	79	54	54	42	34	25	31	13	29	20	31	22	50	37	67	46	54	46
18	84	74	78	66	71	60	55	44	53	45	37	28	37	27	21	12	36	22	44	36	67	50	62	47
19	87	72	73	60	81	55	45	39	53	46	33	19	33	14	32	6	38	24	51	38	73	53	65	48
20	93	68	75	65	84	67	58	41	53	45	33	22	16	7	36	17	49	27	50	37	84	54	75	50
21	80	69	76	66	73	55	65	43	52	46	35	23	32	8	21	6	38	30	55	37	69	48	83	55
22	71	60	81	64	61	48	70	45	48	39	36	27	35	28	34	7	39	23	63	40	56	45	81	61
23	76	66	81	62	66	41	59	49	42	38	32	19	33	20	39	17	38	29	54	43	62	40	80	56
24	82	62	81	66	69	54	53	45	44	39	28	14	40	22	26	12	46	28	55	37	71	40	85	63
25	83	60	73	64	72	50	53	40	44	36	30	16	44	13	33	14	43	30	70	49	66	49	87	69
26	75	66	76	54	69	53	58	44	42	32	34	22	20	6	41	21	44	26	58	47	57	37	91	72
27	80	66	75	57	56	45	57	44	44	33	34	25	45	10	22	8	45	35	70	48	62	39	89	70
28	76	62	81	60	61	40	46	39	48	36	26	19	46	34	29	5	47	36	63	45	66	41	80	61
29	80	59	76	65	67	48	52	34	47	38	32	21	35	22	.....	.....	46	37	55	41	79	49	70	60
30	73	65	78	61	75	52	50	39	43	39	32	14	39	18	.....	.....	38	29	51	38	94	64	72	59
31	79	66	85	66	.....	.....	49	34	.....	.....	33	23	37	27	.....	.....	38	22	.....	.....	93	64	.....	.....
Range	41°		32°		45°		45°		26°		39°		45°		40°		45°		55°		60°		49°	
Monthly mean	74°.2		71°.1		65°.2		54°.5		42.°4		32°.4		26°.5		25°.9		35°.1		42°.2		56°.9		62°.1	

Maximum, minimum, and mean temperatures—Continued.

STATION, PARY SOUND, CAN.—(Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	91.0	67.2	75.3	63.2	76.8	60.2	78.0	60.2	46.7	20.8	33.0	21.0	28.0	17.5	16.6	3.0	34.8	9.2	37.2	11.0	41.2	29.3	59.0	45.2
2	77.8	62.2	74.8	65.2	79.3	57.3	70.3	56.2	46.7	26.8	36.5	28.8	23.8	-1.0	22.0	-4.0	21.8	-12.2	23.3	10.5	43.0	29.8	63.8	45.2
3	81.0	62.2	79.7	57.2	78.0	62.2	70.0	45.7	42.4	21.0	34.8	27.0	10.1	-2.0	28.8	8.2	34.3	-11.2	20.8	8.2	51.8	28.8	66.8	39.2
4	85.0	64.2	76.3	59.2	79.8	61.2	57.3	45.2	33.8	14.0	30.8	19.8	18.6	5.2	27.8	7.2	36.7	23.8	22.8	9.2	58.6	28.8	64.0	49.1
5	89.2	56.1	81.3	55.0	77.3	58.0	58.8	38.2	29.3	12.5	23.8	12.5	15.1	5.2	29.8	7.2	33.5	-5.0	26.0	9.2	51.0	36.1	57.8	41.2
6	86.7	59.2	75.6	62.2	73.0	63.2	49.8	36.1	29.3	20.8	18.4	8.7	13.1	-4.0	26.8	1.2	35.8	8.2	41.0	8.2	48.8	36.0	53.8	37.1
7	85.7	58.2	71.8	57.2	79.8	63.2	55.8	38.6	35.8	22.8	24.8	11.5	24.3	5.2	25.8	13.5	28.0	5.2	38.0	21.8	52.0	29.6	57.0	31.0
8	84.7	65.7	80.7	57.2	83.0	66.5	54.8	36.6	35.3	22.8	29.0	4.2	28.8	14.5	27.8	2.0	32.0	13.5	41.0	14.5	56.8	26.8	63.0	35.1
9	80.7	63.2	74.0	64.0	80.2	63.2	61.8	45.2	37.0	17.0	29.8	22.8	17.1	7.0	28.8	10.0	52.0	29.8	54.8	25.6	62.0	28.8	76.3	52.1
10	77.6	61.2	73.8	56.1	75.8	60.0	51.8	37.1	44.8	25.8	33.8	23.8	21.8	-10.5	26.8	11.2	49.8	28.8	44.2	29.8	71.8	38.2	79.0	51.1
11	73.3	55.1	72.0	61.0	61.8	51.1	53.8	39.2	47.0	36.1	26.0	14.5	26.0	0.7	32.8	13.5	42.7	23.8	37.8	19.5	76.7	53.1	77.7	48.1
12	77.0	58.6	69.8	53.1	55.0	49.6	54.8	33.0	43.0	34.0	30.3	14.5	26.8	1.2	15.6	1.3	29.8	17.5	34.3	19.5	78.7	51.1	75.8	52.1
13	78.8	56.1	78.8	50.1	51.8	47.1	62.3	36.1	35.6	25.8	33.0	15.5	32.3	11.5	9.2	22.4	34.0	22.3	41.7	14.5	82.0	51.1	67.0	45.2
14	81.7	60.2	77.8	62.0	55.8	46.2	66.8	51.4	36.8	20.8	19.8	10.5	23.3	10.0	11.6	25.4	33.0	9.2	37.0	17.5	72.0	51.1	68.0	42.2
15	86.7	57.1	80.7	59.7	60.0	41.2	63.0	56.1	38.8	21.8	13.6	2.2	17.1	-26.4	16.0	-19.2	14.8	-5.0	44.0	27.8	53.8	45.1	58.8	52.6
16	85.7	66.7	75.0	60.2	72.8	42.7	71.8	55.1	42.7	28.8	18.1	3.2	18.6	-6.0	18.6	-12.2	15.0	1.5	43.7	32.0	59.3	40.2	62.0	46.2
17	84.7	71.1	71.3	56.1	70.8	59.2	68.0	47.1	42.5	35.0	28.3	15.5	25.0	-1.0	20.8	-22.4	22.8	4.0	49.0	32.0	70.3	35.0	61.3	43.4
18	79.7	65.2	72.8	56.1	65.3	49.1	49.0	38.1	47.5	35.0	22.8	9.2	31.3	16.0	20.8	-7.0	19.1	6.0	51.3	25.8	70.3	39.2	66.0	41.2
19	82.7	61.2	73.3	57.2	70.8	46.0	43.7	32.6	44.7	41.2	25.8	6.0	20.0	-17.2	24.8	-4.0	24.8	-7.0	51.0	35.0	72.8	44.0	69.0	40.2
20	84.2	60.2	76.8	57.7	76.8	52.1	55.1	27.8	47.8	40.2	26.8	19.5	8.2	-30.4	17.6	-7.0	22.8	-2.0	50.0	26.8	79.7	44.2	71.8	41.2
21	74.0	61.2	79.0	55.6	57.0	45.2	64.0	40.2	44.7	31.5	25.8	17.5	26.8	-5.0	8.2	-19.2	26.8	-10.0	53.8	23.5	60.8	38.1	74.8	49.1
22	77.0	58.2	78.0	49.1	54.8	27.7	65.8	45.2	39.7	32.0	23.0	5.7	23.8	-11.2	27.8	-5.0	28.3	-2.0	60.0	25.8	57.0	32.0	71.8	54.1
23	75.8	53.1	82.0	52.1	62.6	39.2	53.5	36.1	37.2	31.0	16.6	0.2	26.8	-9.0	14.6	2.2	30.8	3.2	55.3	31.0	62.8	32.0	80.0	51.1
24	76.8	54.5	71.0	65.7	59.8	49.1	50.0	31.6	35.5	28.8	16.8	7.0	32.8	19.5	6.4	-14.2	36.7	22.8	53.8	27.8	72.0	40.2	86.0	59.0
25	75.8	57.1	67.5	55.0	61.3	41.7	49.8	33.4	32.8	21.8	31.8	9.2	33.8	-8.0	17.8	-15.2	25.8	9.2	56.8	40.2	63.0	39.2	90.7	61.2
26	68.8	59.7	73.8	59.2	61.8	38.2	47.8	34.1	31.0	20.8	31.0	17.5	12.9	-19.2	18.6	-10.5	37.7	6.2	62.0	38.1	55.8	27.8	86.7	62.2
27	74.8	55.1	73.3	52.3	58.3	28.8	39.7	31.8	33.6	27.3	20.8	6.2	41.7	12.2	8.2	-28.4	41.7	22.8	64.3	50.1	62.0	32.0	78.3	64.2
28	71.8	50.1	77.8	51.1	57.8	31.0	39.3	27.0	34.6	24.8	15.8	0.2	36.0	17.0	16.0	-26.4	43.0	15.5	56.8	34.6	67.0	37.1	68.8	56.1
29	74.8	48.1	78.8	55.1	65.3	40.0	43.2	32.0	39.2	28.8	25.8	13.5	23.8	-3.0	.....	.....	38.7	33.0	54.0	28.3	84.0	42.2	75.8	55.1
30	76.0	60.2	79.0	53.6	73.0	50.6	45.2	36.6	33.7	22.8	25.3	13.5	33.3	10.5	.....	.....	36.8	22.8	44.2	31.0	84.0	59.2	71.8	49.1
31	77.0	63.2	82.7	51.9	.....	.....	40.7	20.8	.....	.....	26.0	16.5	28.3	8.2	.....	.....	34.8	13.5	.....	.....	82.2	55.1	.....	.....
Range	42°.9		33°.6		54°.2		57°.2		35° 3		42°.5		72°.1		61°.2		64°.2		56°.1		57°.2		59°.7	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, PEMBINA, D. T.—(Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	79	45	85	51	74	55	54	45	42	22	41	25	−18	−32	25	−7	8	−20	23	8	70	37	77	31
2	80	54	90	57	76	50	53	33	48	14	36	15	−13	−31	30	8	18	−12	14	−5	75	35	83	50
3	81	61	83	63	83	51	60	36	42	20	36	22	−8	−23	16	−6	36	10	20	−10	50	45	86	50
4	82	60	83	55	69	53	53	33	48	20	32	17	−6	−20	13	−6	28	2	36	2	50	34	62	47
5	85	61	83	55	60	51	60	26	47	27	25	15	0	26	16	−14	40	7	57	23	42	32	61	44
6	89	67	78	55	62	51	50	35	43	24	15	5	15	−5	15	0	28	9	43	28	61	30	72	32
7	78	63	88	59	69	44	52	30	42	13	25	3	15	−4	10	1	39	21	55	20	62	28	81	48
8	80	55	79	54	64	48	52	26	42	17	33	21	−2	−18	6	−20	43	21	65	35	51	34	86	58
9	76	51	80	53	53	39	56	20	50	30	28	9	7	−26	16	−23	37	32	62	41	65	36	75	55
10	78	48	76	51	56	36	56	37	38	25	19	11	6	−17	16	−10	32	10	62	37	76	50	80	54
11	80	58	73	48	65	28	61	30	51	21	16	12	10	−1	−4	−13	21	10	65	34	75	44	86	53
12	84	65	80	49	68	34	74	31	42	24	17	4	10	−14	−8	−27	25	17	51	39	72	43	88	54
13	88	62	72	53	72	41	68	34	40	20	9	−2	−9	−19	−10	−32	17	−10	48	37	62	37	69	61
14	89	66	65	52	68	41	54	32	43	24	9	−1	−10	−27	7	−32	0	−17	60	31	72	33	64	56
15	77	65	64	47	56	48	45	30	49	29	17	7	1	−26	10	−15	1	−22	56	28	76	45	80	50
16	81	63	72	39	65	36	41	30	48	25	11	4	14	−16	3	−30	8	−26	60	25	76	45	81	55
17	88	56	68	46	65	40	37	25	51	27	7	−1	14	−8	15	−17	10	−21	64	27	60	37	78	53
18	85	63	79	58	63	44	50	25	50	32	5	−3	−8	−25	15	−5	10	−20	58	32	60	45	74	50
19	81	60	79	45	50	39	63	38	45	26	5	−7	11	−24	−5	−27	14	−20	66	28	52	43	76	58
20	72	51	87	55	45	29	49	38	44	23	13	−5	9	−9	8	−37	15	−22	72	40	72	35	75	54
21	77	50	82	70	57	23	38	29	40	21	7	−12	8	−5	28	4	20	−18	75	45	75	48	80	45
22	84	55	89	67	63	40	34	17	44	22	0	−17	13	−6	5	−10	35	−8	55	43	65	45	93	59
23	82	63	73	61	53	33	34	25	35	29	3	−11	25	−2	3	−22	35	2	64	45	62	51	75	59
24	87	61	72	45	53	28	31	20	32	18	6	−12	21	−5	6	−4	30	−10	58	43	74	50	70	57
25	76	59	81	40	48	30	31	22	27	2	13	−11	12	−18	−3	−32	44	30	60	40	68	48	75	50
26	77	49	80	49	57	21	22	12	32	20	8	0	36	12	−15	−44	45	23	47	34	65	45	70	50
27	81	50	82	55	67	41	23	12	35	21	6	0	26	1	−3	−37	48	34	54	29	70	40	72	46
28	81	54	85	50	75	50	30	20	34	20	10	−4	21	−9	3	−4	52	33	53	28	76	53	80	47
29	82	54	86	50	63	48	28	15	26	9	10	−4	26	0	.....	.....	44	29	62	33	78	57	82	53
30	79	58	84	60	63	50	24	−6	32	8	18	−5	30	5	.....	.....	50	24	70	36	60	40	80	60
31	80	53	85	53	.....	.....	40	13	.....	.....	10	−22	12	−6	.....	.....	40	12	.....	.....	51	38	.....	.....
Range	44°		51°		62°		80°		49°		63°		68°		74°		78°		85°		50°		62°	
Monthly mean	69°.2		65°.2		50°.8		35°.2		30°.5		9°.1		−1°.0		−4°.3		15°.9		41°.0		52°.5		63°.7	

Maximum, minimum, and mean temperatures—Continued.

STATION, PHILADELPHIA, PA.—(Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1878. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	86	68	85	67	88	73	76	54	47	36	47	35	41	25	34	20	40	19	56	34	59	43	93	71
2	88	69	87	67	87	72	78	62	59	37	62	34	39	7	30	12	40	32	48	38	55	43	85	71
3	90	72	86	72	87	73	80	61	53	39	50	40	12	3	37	27	43	28	50	29	62	42	73	67
4	90	73	87	70	76	70	77	58	49	33	50	41	20	5	39	30	45	29	38	26	59	48	74	62
5	89	71	85	71	78	67	68	54	41	28	42	30	20	10	38	28	50	39	35	25	75	54	82	63
6	89	71	85	67	77	66	65	53	52	35	43	32	28	16	42	31	45	28	51	28	68	57	81	60
7	89	67	82	66	74	65	65	47	43	36	42	29	33	16	38	29	47	32	52	36	67	48	66	49
8	91	69	84	68	69	60	69	52	42	34	43	29	41	22	42	25	40	25	54	35	65	47	75	55
9	87	72	89	71	74	58	79	52	45	32	53	31	46	26	40	23	52	32	66	37	66	47	78	62
10	90	71	83	71	74	63	68	54	55	42	62	39	28	19	42	21	69	38	56	45	67	46	87	64
11	85	72	80	69	77	66	61	48	62	40	42	38	39	22	51	31	68	46	45	37	75	45	84	69
12	77	67	81	68	80	68	60	50	60	47	41	30	40	25	52	36	50	35	51	34	77	49	81	68
13	80	69	79	67	79	65	69	49	56	40	41	27	44	27	37	23	61	34	55	38	77	60	78	66
14	86	68	79	69	73	57	74	52	47	37	50	32	36	28	31	15	54	41	55	41	79	59	78	57
15	90	72	77	69	73	56	77	55	49	32	47	35	36	21	28	8	45	32	62	46	82	58	88	67
16	77	67	74	71	70	55	77	58	55	34	37	25	33	17	37	18	48	31	60	41	79	64	82	63
17	85	66	84	70	75	55	79	62	53	46	47	29	39	14	35	28	53	35	46	40	69	64	71	58
18	97	74	83	73	83	59	66	45	50	44	39	26	44	25	31	27	39	26	46	36	75	61	70	54
19	96	74	83	69	86	66	56	44	58	45	36	21	39	22	29	23	42	28	47	38	76	63	70	55
20	90	75	81	65	84	65	63	39	53	44	36	23	22	15	30	23	50	29	60	40	79	62	74	57
21	90	73	80	68	78	64	69	45	53	44	49	27	36	12	26	19	53	37	66	43	82	61	79	58
22	81	68	73	65	68	55	67	41	56	46	43	33	55	26	37	15	40	31	72	48	69	54	75	60
23	84	65	73	63	67	49	67	56	47	40	34	18	48	29	45	23	42	35	74	49	63	50	85	64
24	84	67	77	60	70	59	62	42	56	36	31	15	46	25	31	23	48	31	66	46	71	47	87	68
25	85	67	74	65	78	64	62	44	59	41	20	13	55	33	34	24	46	34	67	47	79	57	77	64
26	88	70	77	58	80	59	71	43	54	36	27	13	36	15	60	28	51	28	80	49	69	59	84	66
27	79	74	80	61	66	49	67	49	62	35	28	19	44	24	34	20	58	35	60	44	68	50	90	70
28	86	65	78	63	61	44	50	40	55	42	30	21	56	41	27	11	55	39	70	49	76	59	91	73
29	81	67	78	63	66	49	58	38	49	40	33	15	49	32	.....	.....	54	36	67	55	79	61	82	69
30	74	66	83	66	71	58	63	44	52	38	34	26	40	25	.....	.....	54	40	73	53	82	59	80	64
31	74	64	77	65	.....	.....	52	40	.....	.....	37	21	41	29	.....	.....	48	31	.....	.....	91	66	.....	.....
Range	33°		31°		44°		42°		34°		49°		59°		52°		50°		55°		49°		44°	
Monthly mean	77°.3		73°.4		67°.9		58°.1		44°.8		34°.5		29°.9		29°.9		41°.3		49°.1		63°.6		71°.7	

Maximum, minimum, and mean temperatures—Continued.

STATION, PHŒNIX, A. T.—(Readings made at 11 p. m., Washington mean time).

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1																			75	50	99	56	99	43
2																			78	54	99	57	99	50
3																			81	48	94	61	101	51
4																			89	54	90	58	104	54
5																			76	49	91	54	104	50
6																			81	41	90	56	100	55
7																			78	48	91	53	94	53
8																			76	42	93	54	93	45
9																			80	40	95	57	95	45
10																			85	41	89	62	97	49
11																			71	51	82	45	92	54
12																			62	41	89	45	90	44
13																			72	36	92	58	95	46
14																			77	48	97	52	100	46
15																			84	48	95	59	102	53
16																			81	45	95	56	101	51
17																			87	45	94	57	99	51
18																			94	53	93	57	99	50
19																			90	58	93	59	100	51
20																			82	54	95	61	103	50
21																			77	45	95	65	105	51
22																			84	45	94	54	105	51
23																			84	48	89	52	104	50
24																			89	54	94	51	104	51
25																			91	49	97	46	106	56
26																			94	53	100	51	106	62
27																	*88	*56	94	53	98	46	106	62
28																	90	57	95	53	91	47	106	56
29																	94	55	101	56	93	45	105	56
30																	86	56	100	62	95	43	102	65
31																	81	57			98	39		
Range																			65°		61°		63°	
Monthly mean																								

*Observations of maximum and minimum temperatures began March 27, 1879.

Maximum, minimum, and mean temperatures—Continued.

STATION, PIKE'S PEAK, COL.—(Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	41	27	62	40	42	31	31	−17	29	8	14	6	3	−4	6	−3	19	4	26	10	35	16	27	12
2	49	35	53	38	44	22	38	−3	32	11	25	11	4	−4	11	1	21	0	30	12	37	24	24	12
3	47	34	57	37	50	31	39	24	28	9	21	13	5	−7	13	6	20	13	30	12	30	19	38	16
4	49	33	57	38	45	30	38	23	33	11	17	9	4	−2	7	3	18	11	37	18	31	10	46	27
5	44	33	48	35	38	27	36	20	31	17	16	8	12	−5	0	21	26	11	35	8	32	12	40	28
6	50	35	48	35	37	26	36	20	26	15	20	12	15	6	3	−18	27	14	17	3	31	16	39	28
7	51	35	56	38	42	27	38	23	23	15	13	1	7	−6	8	−3	24	14	21	11	36	18	39	23
8	53	34	54	37	41	26	40	21	24	15	1	−11	−4	−20	10	−3	17	0	19	3	33	21	37	19
9	50	35	46	37	28	11	39	23	21	10	14	−6	4	−13	11	1	19	−1	12	−10	36	21	36	20
10	53	36	38	32	21	10	37	22	18	10	10	−1	−2	−13	9	0	23	7	30	8	32	22	39	20
11	50	35	45	29	29	7	41	23	14	3	−1	10	12	−13	11	2	26	9	31	11	26	13	44	26
12	50	36	46	33	36	19	36	25	23	13	−5	−14	15	6	20	9	24	10	26	10	20	11	38	28
13	50	36	50	32	42	26	36	20	21	7	−5	−18	8	−1	17	8	17	2	15	8	30	11	37	22
14	49	38	53	38	44	27	30	17	9	4	−5	−18	5	−7	9	2	18	3	24	6	27	18	35	20
15	48	36	58	37	40	26	23	3	16	6	0	−10	3	−7	7	0	21	7	23	4	36	21	44	22
16	50	34	53	34	42	26	7	−4	12	7	−10	−19	2	−5	7	−15	18	7	13	−1	36	22	37	26
17	52	36	53	33	41	27	27	4	22	3	0	−37	0	−19	−2	−19	10	1	20	−3	34	19	40	26
18	51	35	49	37	41	26	35	19	17	7	−2	−8	2	−33	7	−9	14	−2	31	14	35	19	43	27
19	53	38	48	34	30	15	39	23	18	7	−3	−18	14	−3	20	3	21	7	28	15	35	21	42	24
20	55	35	48	37	30	10	35	8	14	7	−4	−20	20	9	24	8	14	−1	24	11	39	21	39	23
21	50	35	55	38	38	19	10	−8	23	7	0	−5	21	12	20	10	12	3	16	6	39	24	45	26
22	45	36	56	37	39	19	30	10	29	19	8	−10	13	5	14	4	18	−4	21	4	38	23	48	31
23	42	35	56	38	37	19	30	16	16	−2	9	0	28	10	22	3	21	7	22	5	37	22	49	30
24	46	36	54	40	43	25	26	8	−2	−15	4	−5	30	10	20	10	24	7	20	6	37	23	42	30
25	48	33	48	36	42	19	13	−3	5	−13	7	−6	27	12	15	3	30	15	27	11	35	17	46	30
26	42	32	47	36	43	22	6	−12	19	4	4	−20	22	10	14	−3	37	20	30	17	40	20	48	30
27	38	32	47	36	43	21	18	−4	20	13	1	−10	16	0	22	9	33	20	28	10	41	25	47	31
28	50	32	38	33	40	23	12	5	21	8	−1	−12	8	−5	26	12	30	8	31	17	35	23	49	27
29	54	35	45	32	35	16	15	7	9	−6	−2	−9	10	−3	.....	.....	36	20	32	18	31	13	46	31
30	57	35	41	32	26	10	20	7	9	−8	2	−8	16	2	.....	.....	43	25	28	18	16	11	52	32
31	59	37	43	32	.....	.....	30	13	.....	.....	3	−7	5	−5	.....	.....	36	18	.....	.....	24	10	.....	.....
Range	32°		33°		43°		58°		48°		62°		63°		47°		47°		47°		31°		40°	
Monthly mean	41°.6		42°.2		29°.8		26°.7		13°.6		−0°.1		4°.7		7°.4		19°.7		17°.1		25°.8		33°.5	

Maximum, minimum, and mean temperatures—Continued.

STATION, PILOT POINT, TEX.—(Readings made at 11 p. m., Washington mean time).

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	86	65	99	72	97	63	91	68	72	35	67	29	43	18	65	45	64	40	87	43	78	40	88	60
2	83	65	99	73	96	66	91	61	77	46	72	30	40	16	60	26	68	44	81	35	78	49	78	59
3	85	62	97	63	97	66	91	60	81	45	76	25	43	14	67	30	70	43	75	40	87	50	77	46
4	(*)	(*)	96	70	96	66	91	60	80	44	75	30	40	16	60	35	71	41	74	35	87	63	96	60
5	89	64	97	71	92	64	76	60	76	45	60	28	39	15	65	33	79	40	80	43	76	56	97	58
6	90	65	98	73	91	66	81	54	80	43	76	37	40	— 5	63	29	83	44	83	53	70	52	93	60
7	92	67	99	72	90	69	87	57	79	40	71	31	40	15	64	32	85	40	75	48	76	49	86	60
8	95	68	98	73	86	71	91	62	82	45	70	30	37	15	67	35	79	43	84	47	82	49	91	61
9	95	70	99	71	79	62	90	61	79	38	74	28	45	19	65	36	(*)	(*)	(*)	(*)	85	58	97	63
10	97	70	98	70	76	58	90	60	78	42	74	37	40	19	65	37	80	49	80	42	88	62	98	66
11	95	69	98	69	74	50	89	61	73	38	69	35	41	21	68	45	86	54	75	45	85	60	99	71
12	97	71	81	62	74	45	(*)	(*)	75	30	80	31	49	19	70	47	80	50	78	46	84	62	98	70
13	98	79	87	61	84	48	.....	.....	(*)	(*)	65	29	47	20	75	30	73	49	76	50	81	53	100	72
14	95	68	92	73	88	50	.....	.....	66	36	72	28	63	23	60	28	(*)	(*)	80	54	(*)	(*)	102	70
15	97	71	95	67	89	50	91	51	75	42	69	24	70	48	63	19	75	43	83	51	80	52	(*)	(*)
16	98	70	96	69	87	52	88	59	70	39	76	28	63	21	62	35	(*)	(*)	71	52	87	55	.....	.....
17	96	70	97	68	89	56	77	41	66	48	72	19	49	35	58	28	.....	.....	70	46	(*)	(*)	103	80
18	98	78	95	68	92	67	80	37	73	38	78	19	50	23	55	29	.....	.....	76	42	91	56	100	64
19	(*)	(*)	96	69	93	63	79	41	74	35	79	19	54	25	67	29	77	40	84	49	97	65	(*)	(*)
20	97	70	97	71	79	55	(*)	(*)	72	40	33	18	(*)	24	69	38	85	40	84	53	95	68	.....	.....
21	100	72	95	69	83	45	.....	.....	76	36	53	16	55	24	70	45	85	43	77	49	95	65	101	69
22	99	72	96	67	82	45	81	36	81	36	50	19	60	27	60	39	86	41	(*)	(*)	95	63	102	71
23	99	70	98	71	92	54	(*)	(*)	83	40	64	18	61	27	59	40	87	39	.....	.....	95	68	(*)	(*)
24	98	71	101	72	94	63	.....	.....	79	38	36	15	63	30	61	43	78	49	.....	.....	93	67	.....	.....
25	99	72	100	73	93	70	80	39	71	31	35	18	65	31	64	40	87	47	.....	.....	93	65	101	62
26	100	73	99	71	77	50	68	39	72	30	23	14	63	34	61	30	90	59	84	45	92	65	100	70
27	(*)	(*)	100	70	74	58	71	32	84	22	40	15	78	35	66	38	88	50	69	44	92	61	100	73
28	99	68	93	69	89	62	66	31	79	30	41	16	80	30	68	40	84	60	73	48	95	64	90	61
29	90	69	90	67	91	65	67	36	71	30	42	18	80	33	.....	.....	87	51	75	50	95	61	95	53
30	97	71	90	61	92	67	80	39	68	21	43	20	62	41	.....	.....	88	51	81	52	96	68	(*)	(*)
31	99	73	93	59	.....	.....	78	32	.....	.....	45	18	62	40	.....	.....	90	60	.....	.....	93	60	.....	.....
Range	.....	.....	42°		52°		.....		.....		66°		.....		56°		.....		.....		.....		.....	
Monthly mean	.....	.....	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

* No observation taken.

Maximum, minimum, and mean temperatures—Continued.

STATION, PIOCHE, NEV.—(Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	87	52	90	68	92	63	70	43	65	38	56	26	40	29	33	16	50	25	55	44	78	50	72	50
2	85	63	90	66	83	60	73	46	67	42	62	37	43	24	37	16	55	40	51	31	76	54	79	49
3	81	63	89	66	80	57	74	46	66	43	63	39	42	30	43	18	53	36	57	34	58	32	84	52
4	80	52	91	70	63	46	72	47	63	41	59	35	40	19	33	14	55	32	63	42	70	38	85	56
5	80	58	90	67	72	44	75	48	50	40	59	30	41	20	29	5	59	40	50	29	69	44	82	59
6	79	51	91	70	78	50	76	49	44	32	58	42	43	17	35	10	58	42	60	35	67	46	75	55
7	84	51	89	69	83	59	79	47	56	41	46	31	35	10	37	23	51	34	52	32	67	43	70	40
8	88	59	85	71	69	45	77	49	51	42	45	20	32	7	39	20	48	27	51	30	66	41	68	42
9	87	59	90	64	66	40	71	52	49	39	46	24	23	15	40	28	49	30	55	26	65	48	73	45
10	83	60	94	65	71	43	73	49	49	33	43	24	31	14	46	30	57	27	60	40	60	41	69	55
11	83	55	94	65	74	44	71	43	50	29	32	15	35	12	48	35	64	36	54	40	56	29	69	41
12	88	58	94	62	80	49	66	50	51	33	32	14	37	21	53	37	62	40	45	34	70	40	58	46
13	93	61	92	63	80	52	65	46	47	28	29	10	39	20	58	37	63	35	56	31	74	46	64	45
14	88	68	92	65	78	55	59	44	51	29	35	11	33	20	51	31	65	36	59	38	73	51	78	49
15	85	60	82	61	73	55	49	31	52	33	44	17	32	10	48	30	67	36	51	32	70	48	83	57
16	84	66	82	55	70	53	47	24	50	29	42	18	28	11	42	26	63	37	58	28	70	40	74	49
17	84	62	77	54	64	53	62	35	55	30	44	19	34	5	51	24	65	40	68	36	68	47	63	37
18	83	52	80	54	63	41	67	37	59	32	42	22	40	14	52	32	61	35	69	46	63	44	69	43
19	87	56	84	60	70	38	69	42	62	34	35	18	49	17	62	36	58	35	59	47	61	45	73	45
20	89	59	83	60	73	45	69	42	61	37	40	16	51	19	63	38	55	37	56	33	65	38	79	50
21	89	60	81	60	76	51	53	27	62	37	41	22	53	25	59	37	53	33	54	28	67	48	83	55
22	89	64	80	66	77	50	65	36	62	38	46	24	55	28	56	33	61	39	62	35	62	37	79	60
23	88	64	76	57	78	50	69	39	55	28	48	28	50	33	63	34	64	36	64	42	64	35	76	52
24	88	59	85	56	80	58	56	29	36	18	42	28	57	38	64	38	68	40	69	38	66	40	76	47
25	88	61	86	57	72	44	52	24	44	17	28	15	54	41	57	38	70	46	75	46	71	42	85	54
26	90	61	86	66	76	50	45	19	51	26	31	10	41	24	61	35	72	45	73	47	71	52	86	54
27	91	61	85	61	74	56	53	27	52	30	37	10	30	25	69	39	61	34	76	44	70	48	89	57
28	94	63	84	61	74	54	59	35	52	24	29	12	26	21	53	39	68	32	80	49	69	47	91	60
29	98	63	87	59	63	46	63	41	44	17	32	12	27	16	.....	.....	77	43	79	56	68	46	86	63
30	95	64	88	62	59	46	64	40	47	22	33	20	34	17	.....	.....	75	47	78	49	65	38	86	61
31	96	68	89	60	.....	.....	64	35	.....	.....	35	24	34	13	.....	.....	70	47	.....	.....	73	45	.....	.....
Range	47°		40°		54°		60°		50°		53°		52°		64°		52°		54°		49°		54°	
Monthly mean	75°.6		76°.0		62°.9		53°.5		43°.5		32°.2		28°.7		38°.8		49°.1		50°.6		57°.3		66°.1	

Maximum, minimum, and mean temperatures—Continued.

STATION, PITTSBURGH, PA.—(Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	90	69	90	70	88	70	84	54	43	29	52	34	31	25	31	16	57	32	52	32	57	34	90	67
2	94	71	88	69	88	69	73	58	60	36	47	38	30	—8	25	17	41	30	42	27	53	33	70	63
3	97	72	90	65	83	64	79	49	47	32	45	36	1	—11.5	37	24	44	29	42	23	67	34	70	56
4	96	68	92	64	81	60	72	47	48	28	39	33	6	—6	39	27	51	32	34	23	59	50	78	52
5	90	68	89	69	81	64	58	45	43	24	31	27	9	—2	37	31	48	33	34	25	76	51	84	65
6	93	68	87	67	81	59	59	43	62	31	35	30	17	7	34	29	51	35	56	28	60	44	76	48
7	95	66	83	61	87	63	57	36	46	37	35	27	31	7	37	23	46	36	53	38	58	36	68	39
8	90	74	91	65	83	64	74	54	44	37.5	37	23	37	27	38	20	73	36	57	28	65	38	77	45
9	93	73	94	74	85	61	77	56	44	30	49	34	32	15	35	23	77	37	70	33	73	42	86	51
10	94	71	79	67	88	67	62	43	46	40	50	32	19	10	47	17	74	55	67	50	78	47	85	62
11	88	66	86	66	75	67	65	45	54	36	35	33	31	8	50	43	64	39	53	33	85	48	89	68
12	86	71	85	59	69	62	63	45	50	42	35	27	36	28	45	29	51	32	50	28	89	61	83	63
13	87	71	88	62	72	53	70	38	48	37	32	19	32	28	32	15	63	40	61	33	90	60	80	58
14	93	65	90	68	70	50	78	52	45	28	42	29	32	29	17	7	57	32	51	41	87	64	85	50
15	92	68	91	67	74	49	78	54	54	30	39	29	31	25	23	4	36	23	60	43	73	65	88	69
16	97	69	81	70	78	52	80	61	58	40	31	24	45	26	33	15	42	24	57	33	70	55	72	56
17	98	74	88	68	81	52	80	45	56	49	33	27	39	25	31	25	32	27	48	40	78	52	68	48
18	101	74	85	64	85	59	51	42	53	42	29	19	41	26	29	23	33	24	53	38	82	58	70	47
19	95	75	78	67	85	60	49	42	57	42	25	18	27	14	30	20	36	19	55	37	83	60	72	46
20	100	73	84	63	86	64	60	37	56	43	26	20	17	8	30	20	39	26	61	33	87	59	82	48
21	88	70	83	59	65	51	70	36	52	39	38	23	46	14	26	10	41	35	66	33	71	53	87	55
22	80	64	82	59	67	45	73	38	47	38	34	13	53	39	38	16	48	35	70	37	69	46	79	67
23	84	57	89	61	67	43	58	43	40	34	20	7	50	30	40	24	40	32	81	40	70	42	85	59
24	85	57	91	65	71	58	63	38	56	33	16	5	45	29	27	17	50	33	75	49	81	44	92	64
25	93	60	79	60	81	57	71	40	51	41	11	4	50	27	54	24	47	35	78	51	83	60	94	66
26	89	73	80	52	70	50	73	45	42	35	20	6	32	19	45	19	52	31	77	60	68	52	89	67
27	84	68	87	58	61	41	59	38	46	36	20	13	53	28	21	13	46	39	82	60	81	56	87	71
28	85	58	79	61	66	42	41	32	45	35	19	12	54	39	37	10	53	36	68	53	74	53	89	69
29	85	64	89	64	68	53	53	28	43	35	25	4	42	31	.....	.....	56	45	68	40	91	53	79	62
30	83	72	89	64	82	54	49	40	42	30	29	15	45	28	.....	.....	45	33	56	42	93	68	82	56
31	89	66	79	69	.....	.....	44	31	.....	.....	29	7	40	27	.....	.....	45	31	.....	.....	92	66	.....	.....
Range	44°		42°		47°		56°		38°		48°		65°.5		50°		58°		59°		60°		55°	
Monthly mean	78°.6		74°.2		66°.2		54°.1		42°.4		27°.4		26°.7		27°.7		40°.8		48°.5		63°.9		69°.5	

Maximum, minimum, and mean temperatures—Continued.

STATION, PORT DOVER, CAN.—(Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	94.2	67.8	80.8	65.8	77.8	71.8	73.7	60.8	44.9	28.0	41.9	31.0	27.0	15.0	25.0	10.2	39.9	21.0	41.9	26.0	39.9	32.0	67.7	55.7
2	87.9	71.8	83.8	62.8	79.8	62.8	70.7	59.8	46.9	36.0	41.9	36.0	20.1	—0.5	26.0	8.8	27.0	15.0	29.0	21.0	51.1	29.0	56.1	47.7
3	74.1	67.8	79.8	62.8	77.8	62.8	70.7	58.8	40.9	27.0	39.9	34.0	10.1	0.0	29.0	23.0	40.9	13.8	25.0	19.0	55.1	36.0	56.1	52.1
4	78.0	66.8	79.8	65.8	75.7	60.8	63.8	44.9	37.0	26.0	35.0	26.0	17.1	7.8	30.0	24.0	36.0	23.0	28.0	17.0	49.8	42.9	64.8	50.7
5	86.0	66.8	80.8	63.8	75.7	58.8	56.8	39.0	38.0	21.0	29.0	22.0	23.0	10.8	31.0	25.0	31.0	23.0	30.0	17.0	61.8	43.9	72.7	54.7
6	84.0	66.8	80.8	63.8	78.8	61.8	56.8	38.9	39.9	32.0	35.0	27.0	22.0	18.0	28.0	24.0	40.9	20.0	42.9	24.0	47.8	38.0	59.8	41.9
7	89.2	63.8	79.0	58.8	86.8	60.8	58.1	35.0	36.0	26.0	31.0	26.0	25.0	13.8	28.0	16.0	35.0	26.0	44.9	32.0	50.8	34.0	58.8	37.0
8	87.0	72.8	84.0	68.8	84.0	70.8	62.8	44.0	38.9	29.0	36.0	21.0	26.0	22.0	30.0	13.8	41.9	26.0	41.9	25.0	61.1	33.0	62.8	43.0
9	84.8	69.8	81.0	66.8	83.8	66.8	66.8	47.7	38.0	24.0	41.9	32.0	23.0	7.8	26.0	15.0	50.1	30.0	55.1	33.0	65.1	36.0	74.1	47.0
10	83.0	68.8	70.1	62.8	75.7	63.8	56.8	39.0	47.8	34.0	41.9	34.0	17.1	10.8	36.0	8.8	50.1	31.0	52.1	30.0	72.7	43.0	73.7	52.7
11	71.7	65.8	76.1	59.8	65.1	52.7	57.8	40.0	47.8	44.0	34.0	29.0	22.1	9.8	38.0	33.0	41.9	32.0	39.9	28.0	71.7	48.7	71.7	60.8
12	73.1	64.8	76.7	55.7	56.1	50.7	63.1	40.0	44.9	43.0	30.0	28.0	22.1	5.6	37.9	19.0	39.9	27.0	45.9	28.0	71.7	54.7	73.7	58.8
13	85.0	61.8	63.0	56.7	57.1	48.7	60.8	38.9	44.9	32.0	33.0	25.0	28.0	22.0	19.1	4.6	41.9	32.0	38.0	33.0	82.0	54.7	70.7	54.7
14	89.2	64.8	81.0	58.8	65.8	48.7	65.8	56.8	39.9	27.0	29.0	21.0	28.0	19.0	7.1	1.4	34.0	26.0	42.9	32.0	82.0	55.7	64.8	47.7
15	86.8	65.8	80.0	68.8	66.8	45.9	69.1	58.8	42.9	26.0	23.0	13.8	19.1	9.8	14.1	— 1.6	26.0	16.0	46.9	34.0	62.8	56.7	76.7	55.7
16	85.0	64.8	86.0	65.8	68.1	45.9	67.2	60.8	45.9	32.0	25.0	17.0	17.1	3.6	26.0	12.8	27.0	11.8	44.9	31.0	60.8	48.7	66.8	50.7
17	84.8	73.8	79.8	62.8	69.8	60.8	64.8	44.9	49.8	41.0	27.0	20.0	30.0	— 2.6	26.0	12.8	29.0	18.0	43.9	35.0	78.8	43.0	58.8	42.0
18	81.8	73.8	82.0	60.8	67.8	61.8	47.1	41.9	49.8	45.9	26.0	17.1	34.0	22.0	21.1	13.8	32.0	13.8	53.8	34.0	80.0	48.7	68.7	46.0
19	87.0	71.8	77.7	58.8	71.8	58.8	47.7	38.9	47.8	36.0	26.0	16.0	22.0	5.6	23.0	8.8	32.0	16.0	54.8	37.0	83.0	50.7	68.1	44.0
20	84.0	65.8	79.8	59.8	71.8	62.8	57.1	36.0	47.8	35.0	26.0	12.8	16.0	4.6	24.0	6.6	32.0	24.0	49.8	36.0	72.1	51.7	76.7	47.0
21	77.7	66.8	80.8	59.8	62.8	49.8	63.1	50.7	45.9	30.0	30.0	23.0	30.0	4.6	16.1	— 2.6	38.9	26.0	51.1	32.0	63.1	48.7	78.8	51.7
22	72.7	59.8	82.8	56.7	59.8	37.0	66.1	40.0	40.9	37.0	28.0	17.1	35.0	24.0	36.0	8.8	30.0	25.0	56.1	35.0	59.8	41.0	74.7	62.8
23	75.7	56.7	85.0	56.7	67.8	42.0	59.1	38.9	37.0	34.0	17.1	5.6	30.0	20.0	30.0	8.8	34.0	26.0	56.8	43.9	67.7	37.0	84.0	58.8
24	77.7	53.7	77.8	66.8	70.1	52.1	55.8	36.0	44.9	34.0	12.1	3.6	34.0	20.0	20.0	— 1.6	39.9	30.0	67.7	42.0	68.7	42.0	84.0	56.7
25	75.7	65.8	73.7	55.1	72.1	47.0	58.8	38.0	37.0	30.0	20.1	11.8	42.9	18.0	26.0	12.8	38.0	27.0	66.8	41.0	69.7	53.7	90.9	64.8
26	66.1	63.8	73.1	46.9	63.1	44.9	49.1	39.9	37.9	28.0	20.1	17.0	20.0	0.6	29.0	11.8	39.9	27.0	59.8	49.7	56.1	38.9	84.8	64.8
27	78.0	60.8	75.7	49.7	56.7	41.9	42.9	37.0	34.0	27.0	25.0	16.0	41.0	10.8	12.1	— 1.6	37.0	32.0	60.8	49.7	59.8	38.9	77.8	66.8
28	76.7	56.8	73.7	54.7	57.8	38.0	37.9	29.0	36.0	33.0	23.0	18.0	41.9	30.0	22.1	— 5.8	39.9	33.0	60.8	47.7	62.8	41.0	73.7	62.8
29	68.7	54.7	80.8	58.8	60.1	54.7	44.9	32.0	39.9	35.0	23.0	13.8	34.0	21.0	.....	.....	42.9	37.0	55.8	37.0	73.1	52.7	67.7	59.8
30	72.1	62.8	87.0	58.8	74.1	57.8	44.9	38.0	39.9	29.0	25.0	13.8	33.0	22.0	.....	.....	37.0	32.0	50.1	36.0	80.8	60.8	72.7	55.7
31	75.7	61.8	75.7	63.8	.....	.....	41.9	30.0	.....	.....	20.1	13.8	32.0	24.0	.....	.....	41.9	26.0	.....	.....	75.7	59.8	.....	.....
Range	40°.5		41°.0		49°.8		44°.7		28°.8		38°.3		45°.5		43°.8		31°.1		50°.7		54°.0		53°.9	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, PORT HURON, MICH.—(Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	88	65	80	65	76	68	79	64	44	24	39	30	27	6	21	14	45	25	38	25	38	30	50	42
2	65	59	82	64	80	63	72	60	45	35	40	34	24	— 9	27	11	26	20	30	20	48	27	51	42
3	63	61	83	64	70	63	70	52	43	29	39	33	11	—14	30	16	44	16	26	14	61	38	50	45
4	70	62	82	67	71	64	63	48	35	28	35	26	16	6	32	18	40	32	32	19	63	48	72	48
5	71	63	81	67	78	63	56	44	40	23	32	19	20	8	30	25	36	20	51	22	58	41	66	48
6	76	65	72	65	83	63	57	36	41	30	34	27	23	11	30	22	47	28	47	24	43	37	57	44
7	87	65	80	61	83	66	58	45	37	23	30	24	21	11	26	13	32	23	47	30	43	38	60	39
8	85	69	88	69	82	69	64	44	40	33	35	19	26	18	35	9	50	29	57	27	50	35	71	46
9	81	67	81	68	80	67	69	44	38	31	42	30	18	10	35	17	61	41	59	37	67	40	78	50
10	76	66	78	65	71	60	55	40	53	35	36	29	15	6	40	16	60	39	50	32	73	48	82	60
11	76	66	75	62	61	55	54	44	46	41	32	28	22	12	41	29	54	33	34	27	78	57	80	59
12	71	64	75	58	61	54	65	39	47	39	31	21	20	5	29	12	41	27	42	25	83	59	67	56
13	79	65	80	61	57	50	60	46	43	32	30	21	25	15	15	6	39	32	42	33	85	60	62	52
14	82	68	79	67	68	45	70	52	40	27	28	26	29	20	9	— 1	35	19	40	28	80	45	69	48
15	88	69	80	65	69	48	75	57	45	30	26	13	20	11	17	— 4	20	13	38	31	48	43	75	53
16	87	68	78	63	73	54	74	63	47	35	25	10	25	12	26	16	23	11	38	31	58	41	54	48
17	95	73	76	56	78	62	70	45	51	42	29	18	30	20	23	15	26	18	37	33	71	41	54	43
18	83	68	77	60	70	61	48	37	48	42	22	11	30	15	21	15	25	16	40	33	56	45	62	45
19	81	66	81	62	78	64	47	37	42	37	22	5	19	10	21	13	26	16	42	35	56	41	66	46
20	90	68	72	65	76	53	57	34	46	36	21	9	15	3	23	12	32	22	45	34	84	49	74	51
21	79	65	73	65	63	45	66	44	46	32	29	20	25	— 3	20	9	40	25	64	34	55	42	78	54
22	72	59	76	59	62	37	65	43	42	35	26	12	30	23	40	15	32	25	69	42	53	40	80	61
23	74	55	81	60	66	45	50	38	40	31	16	1	26	19	30	10	35	25	54	38	65	43	83	63
24	80	57	79	66	68	55	53	34	44	31	10	— 2	32	20	18	8	40	31	67	37	76	51	87	64
25	79	65	68	55	75	53	63	43	37	30	12	7	40	20	23	8	33	23	73	52	63	49	90	67
26	67	62	76	51	63	48	49	40	35	28	20	6	26	9	22	8	40	28	71	54	50	42	84	68
27	74	61	77	53	52	41	40	31	36	27	26	13	42	22	12	— 5	36	31	67	55	58	44	84	67
28	70	61	74	63	60	42	36	25	36	31	23	10	39	30	28	— 2	45	30	59	40	70	42	74	58
29	66	61	72	63	68	51	46	34	39	29	18	9	35	23	.....	.....	46	34	61	38	82	54	65	58
30	70	63	75	66	78	60	45	38	39	28	25	9	36	21	.....	.....	38	30	43	34	87	62	72	55
31	78	60	72	66	.....	.....	39	27	.....	.....	18	5	31	21	.....	.....	33	24	.....	.....	83	49	.....	.....
Range	40°		37°		46°		54°		30°		44°		56°		46°		50°		59°		60°		51°	
Monthly mean	71°.2		70°.9		63°.3		50°.8		37°.7		22°.7		20°.2		19°.8		31°.7		40°.9		55°.1		62°.4	

Maximum, minimum, and mean temperatures—Continued.

STATION, PORTLAND, ME.—(Readings made at 11 p. m., Washington mean time.)

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	94	71	70	60	79	63	69	42	48	40	40	29	33	18	29	16	31	10	42	29	60	46	93	66
2	96	72	67	59	72	66	65	50	54	37	51	38	32	20	33	15	35	26	45	34	58	41	74	54
3	90	72	77	58	71	61	72	55	47	34	50	38	21	12	39	24	43	24	44	29	55	42	55	49
4	83	70	69	60	62	59	72	55	42	27	42	35	31	19	39	18	43	27	37	23	63	41	59	49
5	87	69	74	60	65	59	68	52	38	22	40	32	36	21	39	19	43	15	39	25	72	47	78	53
6	80	60	69	59	78	62	58	49	39	26	33	24	29	15	38	24	24	11	49	31	66	49	63	52
7	83	57	76	61	66	54	63	45	42	25	30	19	26	15	38	22	30	16	51	33	63	45	58	44
8	90	69	82	61	73	50	66	54	38	31	30	20	36	18	33	19	40	18	50	35	71	47	69	45
9	92	73	73	64	70	53	65	52	40	33	30	20	35	25	35	12	39	27	59	35	72	48	63	47
10	85	70	81	65	69	57	63	50	42	35	50	28	25	17	30	12	50	36	45	31	66	44	58	51
11	84	66	83	64	71	63	58	45	50	34	49	36	29	12	44	22	55	36	39	30	70	49	65	50
12	80	62	78	62	67	62	52	44	56	44	39	32	30	14	45	27	41	31	43	30	71	46	67	51
13	83	63	83	62	72	63	63	43	48	36	34	25	33	18	32	21	41	30	49	32	82	60	73	53
14	85	61	82	62	72	60	60	46	42	32	38	22	40	21	22	12	41	31	53	40	75	58	81	52
15	75	61	67	59	66	56	64	48	46	28	36	29	24	3	24	8	39	28	50	35	71	55	68	48
16	72	55	82	64	68	49	67	53	47	28	34	19	10	3	33	13	36	23	56	37	63	56	54	48
17	68	62	81	66	69	51	67	55	46	39	34	16	28	4	32	20	34	27	51	38	74	55	65	51
18	88	63	74	63	81	58	66	56	43	37	35	22	39	21	25	15	43	25	43	34	70	55	63	48
19	89	67	79	60	75	57	59	48	43	35	31	18	35	22	27	9	38	16	40	30	65	57	69	51
20	74	64	78	65	74	61	54	43	42	36	33	19	26	10	23	13	40	22	58	32	64	55	75	51
21	74	64	73	65	80	64	70	49	46	38	38	22	20	5	22	13	36	29	61	39	75	55	75	55
22	74	64	76	59	68	50	69	48	46	40	48	30	36	17	30	12	41	22	62	41	67	48	76	56
23	79	61	79	55	67	47	56	44	52	39	35	20	43	21	41	21	42	26	56	42	63	43	80	62
24	86	60	71	57	68	46	55	50	52	38	23	15	39	17	35	15	44	33	59	37	67	42	76	59
25	83	62	69	58	72	58	58	49	43	36	26	13	43	24	30	9	47	35	54	42	62	49	76	63
26	72	66	73	53	70	58	58	49	42	33	33	23	25	4	43	19	50	34	61	39	59	49	75	64
27	86	64	73	55	64	48	56	50	42	27	30	22	28	3	43	14	43	34	57	40	65	44	84	62
28	83	65	66	56	65	42	55	40	50	40	31	21	39	21	20	6	46	33	54	44	69	50	84	69
29	79	61	73	60	65	42	49	35	46	36	28	15	35	17	.....	.....	44	38	60	45	73	55	73	63
30	71	59	83	60	69	43	52	40	46	32	30	18	35	8	.....	.....	45	36	56	46	70	55	75	61
31	68	57	76	61	.....	.....	50	39	.....	.....	30	19	41	19	.....	.....	40	31	.....	.....	89	56	.....	.....
Range	41°		30°		39°		37°		34°		38°		40°		39°		45°		39°		48°		49°	
Monthly mean	71°.6		66°.4		62°.0		54°.0		40°.0		30°.5		24°.2		24.°9		34°.0		42°.6		57°.7		61°.8	

Maximum, minimum, and mean temperatures—Continued.

STATION, PORTLAND, OREG.—(Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	72	55	76	56	82	51	62	52	56	41.5	56	41.5	37	26.3	45.3	28	51.9	34.5	77	50	62	53.5	81.7	57
2	67	53	77	56	69	54	63	50	53.5	41	57	48	36	25	47	29.5	50.2	37	66.5	52	54.7	45	70	59
3	70	50	81	54	72	48	62	45	50	39	59	47.5	34	26.5	47.5	(*)	47	35	64	50.7	55.7	46	69.5	52.5
4	71	53	83	52	82	48	70	44	55.3	46	54	45.3	35	20	46.3	29.5	46	37	70.5	48.7	63	47.7	73.8	49.3
5	71	53	73	57	81	52	65	44	54.8	42.5	52	41.5	36.5	23	46.2	25	48	33	62	49.5	66	44	66.5	53.7
6	76	51	77	47	75	49	66	48	47.8	37	57	44.5	45	30	46.5	37	49	40.5	65.5	47	55	45.5	61.5	51
7	85	55	81	49	71	48	62	51	53.5	39	51	43	36.7	23	45	35	44	37	57	43.5	52.3	41	64.3	51
8	83	56	73	52	79	47	63	49	50	39	50	44.5	42.7	32.5	48.5	35.3	43	35.5	53.3	39	54.7	41.3	65	51
9	78	53	82	51	79	51	59	49	49	37	48	41.5	46	37	46	35.5	45	35.5	49.3	43.3	52	44.5	66	51.7
10	70	57	80	53	86	59	56	48	53.5	36	50	41.5	44	40.3	44	35.5	53.8	38.5	52.5	40.5	63.5	44.7	66.2	54
11	75	56	79	53	76	57	58	51	56.5	32	44.5	39	45.5	36.5	43	32.7	54.5	45.2	58.7	35.5	56	46.7	70	51.5
12	80	54	80	53	68	52	54	47	49.5	32.5	45.5	33	45.3	31	56.7	36.3	57	36	63	38	67	48.5	74.8	49
13	73	58	82	53	64	54	50	42	56	41.2	44	31	42.5	36.5	52.8	36.3	62.5	36.5	59	48.5	59.8	51	75.7	51.3
14	73	49	85	52	64	49	47	42	57	49	39	28.5	40.5	30	44	34	55.8	36.5	57.6	45.3	60.5	50.3	69.3	54
15	68	54	77	53	68	46	57	41	53	47	34.7	25.5	43.3	30.5	47	38	56	44	51.7	40.3	59.4	43.5	64	48
16	65	56	71	56	73	43	58	42	62	50	41.3	26.5	40.5	35.5	49	38	56.3	44	56	37	61.5	41.3	62	43.5
17	72	55	70	58	72	43	69	49	59	48.7	40	32	50	39	48.5	39	63.5	39	55.3	41	65	48.5	72	44
18	73	51	72	57	68	44	63	50	52.1	45.5	41.8	35	50	37	49.8	38.5	61.5	51.5	61	42	62.7	47.5	71.3	48.8
19	76	57	79	56	58	47	58	47	53.3	47	40.5	32	51.5	37	59	42.3	61	46.5	63	41.5	53.8	48	71.5	57.5
20	75	55	71	57	62	53	55	43	60	51.5	42.8	31	48	32	57	46	50	41.5	59	46.5	60	48.5	74	54.3
21	74	52	71	51	61	54	59.5	42	57.5	49	44.5	29.3	48	36	51	41.3	53	37	58.3	43.5	70	46.3	66	52.3
22	77	52	77	48	63	47	60	41.5	54.9	42	43.5	33.5	41.3	33	53	34.5	51	41	68.8	40	64	53.5	55.2	48.3
23	77	52	76	59	60	47	54.5	38.5	43	35	40.5	34	52	39.8	57.5	49.2	54	41	63.3	48	61	50	63.3	52.5
24	77	52	73	58	62	45	50	34	51	34.5	42	31.5	49	39	56.5	44	59	53.5	57.2	46.3	65.7	51.3	70.2	54.5
25	77	53	72	59	65	44	51	35.5	49.5	37.5	43.5	29	47	37	50.2	38.2	63	48	59	40	79	45.3	68.5	56.5
26	70	54	81	53	69	49	56.3	35	48.5	38	37.3	25	45.8	35	56.5	44	61	49.5	56	42.5	70.3	52	71	56.5
27	74	52	86	57	60	53	56	33	47.5	38	41.5	23	45.3	34.5	60	44	57	43.5	58.8	45	67	51	76	51.3
28	78	52	87	63	61	52	53.5	35	49.7	39.5	35.3	23.5	42.6	27.3	52.5	41	66.5	47	62	45	68.3	50	67	54.8
29	74	52	80	56	58	48	55	46	48	32.5	31.3	25	41.5	30	.....	.....	66	48.5	66	43.7	64.3	49.3	71.5	51.5
30	77	52	72	57	57	51	67	42	44.5	32.5	39	28.5	42.3	32	.....	.....	61	51	74	50.7	67.7	47.5	68.7	46.8
31	81	53	78	47	.....	.....	58	40	.....	.....	39.5	28	44	27.5	.....	.....	73.5	48.5	.....	.....	81.7	52	.....	.....
Range	36°		40°		43°		37°		30°		36°		32°		.....		40°.5		41°.5		40°.7		38°.2	
Monthly mean	65°.9		67°.3		59°.1		50°.7		46°.9		39°.8		37°.8		44°		48°.8		52°.3		54°.6		60°.5	

* Minimum thermometer out of order.

Maximum, minimum, and mean temperatures—Continued.

STATION, PORT STANLEY, CAN.—(Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	85.4	64.8	80.0	63.0	75.0	65.1	75.0	61.7	47.2	26.4	43.0	29.2	29.0	8.2	34.0	12.0	42.4	23.2	43.6	25.0	48.2	29.8	68.0	46.6
2	85.6	64.9	86.0	60.6	80.8	58.8	73.0	61.4	52.0	37.0	45.5	34.7	33.2	− 7.2	25.4	11.0	32.4	18.4	31.0	21.6	50.8	26.4	58.2	44.6
3	75.0	66.6	83.8	60.7	76.4	61.6	73.0	56.1	45.0	26.6	42.8	33.4	10.5	− 9.9	31.4	20.0	39.5	7.7	31.2	19.0	55.8	30.0	64.0	52.2
4	82.0	67.1	82.0	65.3	78.5	59.0	67.0	43.3	38.0	27.4	40.8	26.8	18.4	4.5	58.0	19.8	39.2	22.6	34.6	19.0	56.8	41.2	66.0	51.4
5	84.8	66.1	82.5	64.1	79.0	60.6	56.4	39.2	44.2	22.6	33.5	23.0	24.2	6.4	34.4	25.2	36.2	24.2	34.6	19.8	64.5	44.0	73.0	56.2
6	85.2	62.6	82.2	59.5	81.0	59.5	59.0	36.2	43.8	32.2	38.0	27.6	24.2	14.8	33.0	23.4	46.0	25.0	43.0	20.0	50.0	35.2	66.4	40.2
7	86.0	62.1	82.2	57.5	81.2	63.1	61.8	36.8	38.0	25.8	35.0	25.0	26.4	15.0	33.2	9.7	36.6	22.0	47.0	29.0	55.8	32.6	61.2	34.4
8	83.4	70.1	81.8	65.6	80.2	70.1	64.0	42.2	42.0	26.0	34.8	20.0	29.8	20.0	31.0	2.9	44.6	26.6	47.0	22.6	59.0	31.8	66.0	37.6
9	84.0	66.9	84.0	66.0	81.0	67.1	67.8	46.1	43.0	21.4	43.0	32.2	26.8	11.8	36.0	10.2	48.2	36.0	53.0	27.1	70.2	32.2	73.5	42.2
10	83.0	67.1	78.8	62.2	81.0	62.1	60.0	40.0	51.0	33.6	45.2	31.0	20.8	8.5	36.0	9.9	46.3	28.4	50.8	30.0	66.2	49.4	74.0	51.6
11	76.2	60.9	79.0	58.8	62.4	53.1	58.0	39.0	49.0	33.4	37.0	28.8	26.0	4.9	38.2	32.2	51.0	30.7	45.0	27.6	69.2	48.2	87.0	55.7
12	78.8	65.1	79.0	53.2	58.0	50.6	64.8	33.2	46.4	43.2	34.5	25.4	24.4	3.9	43.0	12.0	41.0	24.0	48.0	25.0	71.0	53.4	78.0	58.1
13	80.4	60.9	80.0	54.2	59.0	48.2	64.2	35.2	48.0	30.6	34.5	23.0	32.0	14.0	20.2	1.4	44.2	30.6	43.0	30.0	80.0	53.2	79.8	52.2
14	88.4	60.2	81.2	60.6	68.8	49.2	69.0	57.8	38.0	25.6	36.0	21.0	33.0	20.0	12.0	1.4	40.0	23.0	42.4	31.0	73.0	55.2	79.0	44.7
15	86.4	62.1	82.5	68.0	70.0	45.2	69.0	60.3	46.0	24.0	27.5	10.8	23.6	10.0	18.2	− 1.3	31.2	16.0	51.4	31.4	69.2	46.9	80.0	59.6
16	86.8	62.1	82.0	60.7	72.0	47.6	70.5	60.3	49.2	32.2	28.8	14.2	23.6	− 2.3	31.0	16.6	32.0	13.6	52.0	28.5	66.0	45.0	68.0	45.3
17	88.1	71.1	79.6	60.2	75.5	64.1	66.1	46.0	51.2	42.2	32.2	19.0	31.8	− 2.3	29.8	14.0	29.8	18.0	50.0	35.7	67.0	37.4	63.0	40.2
18	88.0	68.5	85.5	56.6	75.2	60.4	51.1	39.2	49.2	44.0	28.8	16.2	39.6	20.2	31.2	11.0	31.2	17.0	56.0	30.8	76.0	44.2	69.8	44.2
19	85.0	68.1	78.2	56.6	77.0	63.1	48.8	38.6	48.2	33.2	28.8	12.0	21.8	12.5	25.0	16.2	32.2	16.2	55.8	35.2	78.0	49.4	68.0	43.2
20	87.6	61.2	81.0	59.8	75.8	61.1	58.6	32.6	50.0	32.2	28.0	11.0	18.2	4.9	28.8	9.9	35.6	21.4	63.6	31.0	73.0	48.6	72.8	43.8
21	78.0	65.5	82.0	58.0	63.8	45.8	63.0	53.7	48.0	27.2	37.5	23.0	33.0	− 4.3	24.0	0.7	41.5	24.4	60.5	27.8	66.4	43.1	79.0	50.6
22	75.0	58.2	80.2	55.2	60.8	35.4	66.0	41.8	43.8	37.6	31.5	12.5	38.2	25.0	41.2	14.5	38.0	25.2	64.0	30.0	61.2	38.0	75.0	62.1
23	83.0	56.4	83.0	55.2	69.0	37.2	51.0	37.7	40.0	33.2	26.0	5.1	34.0	19.2	36.4	10.2	40.0	26.0	72.2	35.7	66.6	34.0	80.5	56.2
24	78.0	49.4	80.0	63.1	72.2	48.5	56.2	31.0	46.0	28.2	13.6	2.4	33.0	21.0	24.0	2.9	45.2	28.8	63.2	44.8	65.0	45.2	84.0	56.8
25	78.0	62.6	74.0	49.6	73.2	46.6	60.4	39.2	39.0	28.5	17.0	7.9	49.8	18.0	31.5	13.2	42.5	27.0	62.0	47.6	68.0	49.3	84.6	66.7
26	69.0	63.1	78.0	43.2	62.4	45.8	54.1	39.8	40.5	25.1	23.5	12.8	21.0	8.9	36.2	11.0	41.8	27.0	64.5	46.2	60.0	42.2	85.0	60.4
27	79.0	59.1	79.5	49.2	60.6	45.0	45.2	33.6	37.0	27.5	24.6	13.2	37.2	18.2	23.0	−10.3	40.5	30.5	66.5	51.2	64.0	44.1	80.0	68.7
28	77.6	54.4	77.2	54.2	62.4	40.0	39.4	26.5	43.5	32.5	27.2	13.5	41.8	23.5	24.5	− 8.3	41.2	27.2	65.0	42.2	64.4	36.4	74.0	62.1
29	69.0	54.2	82.0	59.2	69.0	46.4	48.5	31.8	41.8	32.7	24.0	12.4	33.5	15.5	.....	.....	50.0	36.2	59.2	33.2	74.0	53.0	78.5	57.7
30	76.0	63.1	82.8	57.4	73.0	60.9	48.5	39.2	44.5	28.2	28.0	13.5	33.8	15.5	.....	.....	49.0	30.0	49.0	34.2	84.0	58.4	78.6	54.2
31	81.2	56.7	77.0	62.0	.....	.....	41.4	27.8	.....	.....	22.5	10.5	34.0	21.2	.....	.....	41.5	25.0	.....	.....	83.0	57.5	.....	.....
Range	39°		42°.8		45°.8		48°.5		30°.6		42°.8		59°.7		53°.3		43°.3		53°.2		57°.6		52°.6	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, PRESCOTT, A. T. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	93	50	89	62	86	59	79	35	70	28	59	16	45	15	55	22	70	38	61	43	84	39	90	41
2	98	61	92	61	72	60	82	43	70	37	62	19	47	27	54	22	70	30	66	46	82	40	82	42
3	94	63	97	66	77	61	83	41	75	33	67	21	50	24	55	30	70	35	71	33	79	43	85	43
4	89	63	99	62	78	61	85	46	68	32	65	21	48	27	43	32	70	28	77	42	76	40	90	47
5	92	64	96	64	80	52	83	45	63	31	63	20	48	24	37	19	70	36	74	35	74	40	87	58
6	94	51	97	66	80	49	84	42	50	31	63	34	50	22	40	16	72	30	75	30	74	39	80	52
7	98	50	94	70	82	49	83	42	62	23	55	25	32	19	45	19	65	28	67	39	73	36	75	50
8	100	51	88	70	86	51	80	42	53	26.5	50	21	30	5	60	23	60	32	67	26	76	36	78	41
9	97	65	89	66	79	48	76	39	51	32	56	19	40	9	80	31	67	24	71	26	75	36	82	41
10	100	64	89	60	78	40	78	37	57	26	55	25	35	10	61	21	65	22	83	29	72	53	80	41
11	89	65	86	58	78.5	39	77	39	56	24	44	13	40	9	(*)	(*)	72	26	74	35	67	35	80	50
12	94	66	91	62	81	41	76	38	59	24.5	45	12	50	12	62	18	75	29	61	30	74	31	72	39
13	96	62	85	60	90	43	72	38	58	26	39	8	47	18	68	19	75	31	66	29	81	47	82	43
14	95	65	94	64	84	50	70	35	58	22.5	40	4	43	16	72	45	75	27	67	39	84	40	87	46
15	85	63	88	61	80	47	68	47	56	29	45	6	35	7	72	35	79	36	70	40	78	42	90	54
16	91	67	92	59	79	48	61	28	59	32	45	11	42	4	70	36	90	35	64	33	80	41	81	56
17	100	65	80	51	78	44	74	28	57	23	52	16	40	9	62	25	80	38	76	27	74	39	78	54
18	94	55	81	61	76	43	80	32	62	20	49	7	43	9	75	30	77	33	79	29	75	50	82	41
19	98	57	89	61	73	36	83	40	68	23	47	10	43	10	75	29	72	40	80	42	75	53	87	42
20	99	51	83	62	77	40	77	39	68	28	43	5	47	10	72	31	70	44	66	41	75	38	90	45
21	92	64	82	61	80	42	65	36	66	28	48	8	51	23	72	32	70	41	(†)	30	76	58	90	49
22	91	57	70	60	84	39	71	31	67	27	53	11	56	24	70	31	80	32	.....	33	78	51	86	52
23	96	61	77	58	85	43	76	34	67	30	54	13	62	26	72	27	86	38	.....	35	76	33	85	51
24	98	64	82	56	82	40	73	40	47	24	53	14	68	31	71	29	77	36	.....	34	78	39	89	51
25	99	58	87	61	86	41	72	34	43	14	40	25	64	34	70	35	81	38	.....	36	83	34	91	47
26	99	57	87	60	79	45	62.5	25	53	12	48	6	(*)	(*)	70	32	87	38	.....	39	84	38	90	57
27	99	58	87	59	84	43	64	20	59	22	45	11	50	37	75	35	80	44	.....	43	79	39	90	54
28	102	57	91	56	79	46	65	21	56	20	38	29	52	30	72	44	73	38	.....	42	76	45	97	50
29	103	48	90	60	72	53	67	28	46	31	42	28	51	28	.....	.....	85	37	.....	53	80	39	89	48
30	103	58	80	61	71	51	71	31	50	14	40	27	52	18	.....	.....	87	43	.....	48	71	40	87	47
31	88	60	83	57	.....	.....	72	31	.....	.....	42	18	48	9	.....	.....	67	45	.....	.....	79	36	.....	.....
Range	55°		48°		54°		65°		63°		63°		.....		.....		68°		.....		53°		58°	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

* No observation taken. † Maximum thermometer broken.

Maximum, minimum, and mean temperatures—Continued.

STATION, PUNTA RASSA, FLA. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	84	74	90	77	89	75	88	75	73	53	76	66	73	61	71	62	75	58	76	52	82	70	86	68
2	84	73	90	75	89	75	86	72	77	58	69	54	71	63	62	49	73	59	80	70	79	73	86	68
3	85	75	89	76	90	76	84	72	77	64	61	46	67	55	58	47	72	62	76	67	82	66	84	70
4	87	78	90	77	89	76	86	71	78	61	68	50	63	44	68	44	74	55	72	61	84	69	86	74
5	88	81	88	75	90	76	85	70	78	63	64	52	55	47	70	57	75	56	65	52	85	72	89	70
6	88	79	86	76	90	79	86	71	78	63	68	45	51	41	72	63	75	58	72	48	84	70	87	72
7	85	77	87	76	84	71	87	73	79	65	72	53	65	33	72	66	74	58	76	55	84	68	89	75
8	86	76	87	78	80	69	85	73	75	64	75	58	69	51	69	57	79	59	74	59	80	65	90	74
9	86	76	89	77	83	76	87	72	75	64	72	63	67	59	64	52	79	62	79	61	79	65	87	72
10	89	75	90	76	80	76	85	75	78	58	67	61	71	48	75	51	80	64	81	68	81	64	81	71
11	88	74	91	77	81	73	83	77	78	64	66	53	74	60	69	62	78	63	74	69	78	64	85	70
12	88	75	89	78	83	77	81	71	78	66	73	51	72	62	66	61	78	61	77	63	76	67	85	72
13	91	78	91	78	84	78	82	71	75	65	75	58	64	49	68	53	78	65	82	61	81	65	85	72
14	89	78	90	78	87	75	82	69	81	61	72	61	67	51	70	57	76	69	82	66	83	68	88	73
15	88	80	88	78	88	76	83	67	81	66	71	65	71	54	71	60	80	63	81	73	83	74	88	74
16	91	75	91	77	89	78	83	69	80	67	69	62	71	60	74	57	79	58	82	74	83	75	88	80
17	87	76	90	78	87	77	84	69	80	68	63	56	75	55	75	60	77	61	79	68	85	75	91	78
18	87	76	91	78	87	73	79	71	76	70	64	46	73	64	77	63	74	68	72	62	80	75	89	74
19	90	76	92	79	85	74	79	66	75	73	72	49	67	50	70	58	72	59	69	59	81	74	89	76
20	89	76	88	79	89	75	81	66	75	69	71	57	53	41	66	45	79	59	74	56	82	75	84	74
21	89	76	88	78	88	75	76	71	75	61	71	65	60	41	64	46	79	67	82	58	82	75	87	72
22	89	78	87	76	89	76	75	71	67	54	66	56	67	48	71	47	79	64	85	65	85	72	88	71
23	90	82	83	73	89	72	73	62	71	63	60	50	77	57	72	56	80	67	80	62	89	72	87	70
24	90	79	82	75	86	74	78	54	75	56	71	48	74	64	73	61	81	68	82	62	81	69	87	70
25	89	77	84	73	85	75	80	66	78	62	73	57	79	62	75	55	81	67	81	63	83	68	88	71
26	88	78	86	75	88	76	81	66	78	66	70	57	77	60	76	60	80	62	81	64	84	67	87	73
27	84	75	88	79	86	75	82	66	73	66	66	45	75	61	77	60	79	67	81	70	85	70	85	72
28	88	76	91	79	86	73	80	68	70	54	60	38	78	65	73	55	76	65	82	70	87	72	89	73
29	91	75	89	78	84	74	83	69	72	48	68	46	76	63	.....	.....	75	68	79	70	85	72	86	76
30	90	78	89	79	87	74	83	72	73	64	71	54	73	62	.....	.....	76	70	80	68	88	71	83	74
31	91	78	89	77	.....	.....	76	63	.....	.....	74	57	66	60	.....	.....	73	65	.....	.....	88	69	.....	.....
Range	18°		19°		21°		34°		33°		38°		46°		33°		26°		37°		25°		23°	
Monthly mean	82°.6		82°.9		80°.5		75°.6		69°.6		62°		62°		63°.5		69°.9		71°.3		75°.8		78°.9	

Maximum, minimum, and mean temperatures—Continued.

STATION, QUEBEC, QUEBEC. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	93	67.5	72	63	71.5	63	71	47	40	31	24	15	15	5	18	2	18	1.5	34	17	52	35.5	76	51
2	90	60	74	61.5	76	60	73	55	43	33	35	20	18	3	25	11	19	6	20	8	45	33	56.5	48
3	77.5	56	79	58	63	57.5	64.5	53	39.5	27	47	32	28	13	31	20	28	7	20	6	52	33.5	66	47
4	87	58.5	66	57	69	58	60	44	30	16.5	37	28	34	18	28	9	36	9.5	26	7	53	34.5	59	51
5	75.5	59	72	58	75	60	59.5	39.5	25.5	18	32	17	23	15	(*)	(*)	34	— 2	35	20.5	44	37	68	48
6	76	52.5	68	59	65	53.5	52	40.5	33	25	19	13	19	11.5	(*)	(*)	14	— 9	37	23	47	36	64	38
7	80	50.5	74	60	66	51.5	52	40	29	19.5	22	13	14.5	8	(*)	(*)	21	10	38	15	57	37	52	36
8	91	66	73	58	68.5	56	56	46	34.5	21	20	9	24	8	28	9	25	2	35	22	62	37	63	33
9	88	70	74	61	78	60	55	45	39	25	23	10	25	15.5	22	7	28	11	38	24	65	35	69	35
10	75	59	70	59	77	60	53	40	36	27.5	33	15	17	— 1	21	— 5	37	26	32	15.5	67.5	40	59	49
11	77	53	72	55	66	62	54	36	39	31	45	24	13	— 3	29	5	37	20	33	27	69	42	60	51
12	77	49	70	55	68	59	50.5	41	39	24	30.5	17.5	17	5	27	12	29	16	41	25	69	50	78	55
13	83	54	76	59	77	61	57	38	36	21.5	22	14	23	3	19	0	28	13	39	22	69	51	64	50
14	83	52	78.5	56	75	54.5	57.5	37	32	22	20	9	24	— 9	6	— 6	33	21	36	21	62	43	69	45
15	76	50	80	64.5	60.5	45.5	62	45	35	23	25	13	8	—18.5	12	—10	32	15	42	23.5	49	42	63	46
16	71	60	81	65	66	41	56	46	36	22	21	11	11	—15.5	15	0	20	4	44	27	55	42	68	44.5
17	69	62	79.5	65	65	45	65	45	34	24.5	19	13	9	— 7	17	— 8	22	1	44	25.5	73	45	55	45.5
18	69	56.5	74	61.5	68	45	57	47	34	28	20	13	23	3.5	16	4	24	10	42	28	59	42	62	43.5
19	80	57.5	75	60	70	46	56.5	44.5	37	29	18	1	21	7	17.5	4	25	2.5	39.5	30	59	38	73	42
20	70	54	77	60	78.5	52	45	38	37	29	20	5	11	— 3	16	6	28	8	53	32	65	43	78	50
21	68	54.5	71	62	69	50	57	39	35	29	25	16	10	—13.5	19	1	26	6	53	31	63	42.5	80	55
22	66	53	67	57.5	55	40	55	40	40	30	26	15	12	— 2.5	19	— 4.5	28	10.5	52	34	58	33	78	61
23	80	51	75	49	57	35	57	43.5	48	32.5	19	8	13	6	20	7	35	19	49	35	59	31.5	78	50
24	77	53.5	78	57	63	38.5	50	42.5	39	31	15	7	28	7	19	1	36	15	51	30	65.5	34	87	51
25	76	59	65	51	58	47	50	38.5	37	27	16	5	29	2	15	— 6	37	23.5	57	32	65	40	91	50
26	66.5	58	66	46	58	46	49	41.5	34	25	21	12	5	—17	25	5	29	13.5	57	36	53.5	32	74	50
27	75	59	61	54	51	37	55	45	36	23	15	5	10	—14	25.5	— 5	32	20.5	58	36	68	33	68	48.5
28	70	50	68	50	57	30.5	48	27	37	27	13	3	23	2	15	—16	42	28	60	39	71	42.5	65	50.5
29	76	53	74	54	69	42	39	24	37	27.5	11	— 5	21.5	2	.....	.....	40	29	59	41	70	42	72	55
30	77	58	75	52.5	63	38	38	32	34	19	18	— 5	16	— 3	.....	.....	39	31	48.5	36.5	85	42	70	51
31	78	59	80	57	....	....	42	34	....	....	19	5	23	4	.....	.....	34.5	24	.....	.....	86	68.5	.....	.....
Range	44°		35°		48°		49°		31°.5		52°		52°.5		.....		51°		54°		54°.5		58°	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

* No observation taken.

Maximum, minimum, and mean temperatures—Continued.

STATION, RED BLUFF, CAL. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	102	71	99	67	97	67	78	52	77	43	59	41	63	41	65	39	61	41	64	55	78	61.5	102	66
2	88	64	100	68	94	67	83	61	75	43	67	43	60	36	69	43	58	47	68	56	69	50.5	104	69
3	80	54	100	68	91	69	86	62	68	43	71	43	59	35	63	37	57	38	76	53.5	79	46	96.5	69
4	82	57	97	68	94	73	91	61	59	47	66	38	61	40	57	42	54	47	66	56	81	55.5	98.5	67.5
5	90	63	95	65	100	67	90	56	61	48	59	47	63	37	62	35	55	47.5	67	52	77	52	92	65
6	95.5	64	99	67	96	65	90	58	66	45	62	51	57	33	57	31	56	45	64	51	66	48	82	59
7	96	66	98	67	93	69	89	59	75	53	59	42	52	40	51	42	53	43	64	48	65	37	80.5	56
8	97	63	101	67	92	69	88	60	68	45	56	36	54	35	52	45	56	41	64	40	70	44.5	86	56
9	97	65	104	69	97	67	78	59	69	44	57	43	54	33	54	47	60	47	66	42	65	48	81	56
10	88	63	107	70	98	63	80	50	69	43	54	36	52	33	57	47	61	47	56	49	73	39	76	56
11	91	62	110	73	96	66	77	50	70	43	56	40	49	41	59	51	69	47	71	43	78	54.5	85	58
12	101	65	110.5	76	92.5	62	67	52	60	52	56	41	47	37	61	55	75	46	71	48	83	51	92	68
13	104	70	110.5	79	88	58	68	45	56	46	54	37	48	29	60	52	78	46	61	51	83.5	60.5	97	72
14	104	72	98	76	80	55	57	48	57	51	60	35	48	33	62	49	78	48	69	49	71.5	56	100	69
15	98	75	97	77	77	53	63	47	61	43	58	29	47	29	52	43	76	48	72	42	71	42.5	93	69
16	88	63	91	67	73	56	74	46	68	48	53	30	49	27	53	36	75	47	76	45	79	46	79	56
17	84	63	93	67	72	57	78	47.5	65	46	57	29	46	36	51	40	72	52	72	53	68	53	81	56
18	93	62	99	74	76	50	79	48	67	47	63	35	52	30	60	48	64	50	64	55	68	48	90.5	65
19	96	62	97	66	80	51	77	50	66	49	65	35	58.5	30	67	44	55	47	61	50	69	49	93	72
20	100	67	93	65	84	54	69	50	73	49	61	35	60	29.5	65	51	61	44	62.5	45.5	76	47	101.5	76
21	100	68	83	62	87	57	83	59	69	47	63	32	54	34	66	47	59	48	70	42	71	53.5	96	71
22	100	66	82	61	90	57	82	52	67	49	60	32	51	36	70	44	58	49	81	51	71	51	80	55
23	98	66	85	57	91	59	78	58.5	69	52	51	30	54	42	69	44	61	51	87	61	76	53	85	58
24	98	67	90	58	81	60	75	59	67	51	56	42	57	51	70	51	69	56	86	56	82	53	94	66
25	102	67	98	62	89	59	72	57	63	39	56	39	57	42	73	45	71	57	83	60	81.5	54	98	69.5
26	103	72	97	65	84	54	74	52	63	40	53	31	52	40	76	48	69	56	83	57	75	55	101	70
27	104	73	96	66	77	58	76	48	62	37	51	25	48	30	67	47	68	41	85.5	53	75	54	103.5	71
28	105	73	94	68	66	56	82	49	60.5	36	51	34	50	32	62	45	82	49	83.5	55	71	53.5	101	71
29	104	72	105	68	60	53	77	48	64	42	51	27	54	34	.....	.....	81	52	83	52.5	77	54	92	69
30	105	73	106	72	67	52	77	48	60	34	43	36	49	30	.....	.....	71	55	80	55.5	85.5	54	92	60
31	100	69.5	103	73	.....	.....	77	45	.....	.....	54	38	59	34	.....	.....	69	54	.....	.....	96.5	62	.....	.....
Range	51°		53°.5		50°		46°		43°		46°		36°		45°		44°		47°		59°.5		49°	
Monthly mean	82°.2		83°		72°.7		64°.6		54°.7		46°.5		44°.3		53°		56°.8		61°.5		62°.8		79°.3	

Maximum, minimum, and mean temperatures—Continued.

STATION, RIO GRANDE CITY, TEXAS. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	103	77	98	75	95	73	96	73	78	59	68	44	64	52	73	(*)	85	63	88	69	97	70	89	69
2	100	76	99	76	95	73	96	72	83	58	73	35	65	45	60	.....	85	65	78	54	94	68	85	67
3	94	75	101	77	91	73	95	70	82	67	77	38	49	39	55	48	82	62	85	54	96	69	85	68
4	94	76	100	76	97	74	97	71	82	55	77	40	43	35	79	50	83	63	87	59	99	75	91	77
5	101	76	99	76	95	74	96	69	83	62	77	55	40	34	67	60	84	61	87	68	98	74	95	65
6	94	74	100	75	84	74	95	66	88	66	80	53	43	28	53	40	86	63	94	69	91	76	100	69
7	93	76	99	76	92	75	94	68	88	68	83	53	71	35	57	38	85	64	94	69	89	72	99	72
8	88	72	102	75	93	76	83	70	90	70	81	55	49	39	67	37	86	66	96	70	94	72	97	77
9	92	73	101	77	96	75	95	70	88	74	67	46	49	27	66	49	83	67	96	70	94	68	100	76
10	96	73	102	77	85	70	95	73	89	67	77	35	69	32	76	61	83	70	94	56	95	69	100	78
11	94	75	103	77	82	68	98	70	88	65	82	44	72	52	81	51	85	69	91	65	95	70	96	78
12	97	75	101	76	83	61	92	68	72	58	81	59	65	36	82	52	87	66	89	65	93	70	100	79
13	96	74	102	76	87	55	95	69	73	56	77	57	75	43	88	56	85	67	97	74	94	70	103	79
14	97	73	100	75	87	56	92	73	77	64	61	40	79	53	62	46	86	55	97	72	96	68	103	78
15	97	74	98	73	90	60	95	74	78	55	56	39	86	61	66	51	83	60	96	70	98	66	103	(*)
16	99	77	95	73	92	63	98	76	84	55	63	33	71	61	74	47	92	66	94	69	101	68	102	.....
17	100	74	95	76	91	62	81	58	68	55	59	38	79	60	77	58	82	56	83	63	96	75	99	.....
18	98	75	92	73	97	71	78	53	72	53	63	38	67	60	66	42	74	43	83	51	99	77	96	.....
19	101	76	98	74	95	72	78	48	78	43	60	50	63	37	72	46	68	53	84	50	103	75	90	.....
20	95	74	85	73	96	72	85	52	84	44	53	46	69	29	76	61	88	65	91	61	108	74	94	.....
21	94	76	(†)	(†)	83	71	92	60	77	48	62	39	76	44	83	59	97	69	94	60	112	71	99	.....
22	102	75	.....	.....	95	68	78	59	76	43	65	34	75	(*)	83	62	95	71	97	75	101	74	101	.....
23	94	78	.....	.....	98	72	82	43	83	48	75	44	75	.....	79	60	88	68	92	74	99	70	100	.....
24	97	75	98	73	96	76	87	57	88	57	66	36	74	.....	84	51	87	70	94	67	97	74	100	.....
25	98	78	94	77	95	74	87	58	60	46	41	31	77	.....	91	58	91	71	87	65	96	74	100	.....
26	100	76	95	73	94	73	89	66	58	39	43	31	85	.....	73	53	92	69	94	66	96	74	102	.....
27	85	70	97	73	98	74	76	52	68	34	49	28	83	.....	63	51	93	68	98	68	98	73	103	.....
28	93	74	97	74	96	71	62	50	72	36	51	39	90	.....	82	56	93	71	90	71	98	74	103	.....
29	95	75	99	74	95	70	75	51	78	48	58	46	86	.....	.....	.....	88	66	94	70	101	75	102	.....
30	96	76	95	75	95	72	79	54	71	55	60	52	86	.....	.....	.....	98	66	97	68	100	77	103	.....
31	95	76	98	73	.....	.....	75	62	.....	.....	57	48	84	.....	.....	.....	97	68	.....	.....	99	69	.....	.....
Range	33°		.....		43°		55°		56°		55°		.....		.....		55°		58°		46°		.....	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

* Minimum thermometer broken.

† No observations taken.

Maximum, minimum, and mean temperatures—Continued.

STATION, ROCHESTER, N. Y. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	90	71	80	65	82	68	81	58	43	31	43	31	29	17	25	9	46	17	46	21	40	30	78	66
2	91	71	81	65	84	65	73	58	53	36	52	36	28	6	27	9	30	21	34	22	46	33	68	53
3	76	71	83	63	78	65	73	52	39	32	43	35	12	—1	29	24	38	14	27	15	58	30	60	49
4	80	69	87	65	78	64	67	47	38	27	38	30	22	10	32	25	43	30	22	11	63	40	66	48
5	88	69	80	65	78	60	60	40	34	25	35	24	22	10	29	25	35	15	26	15	68	45	73	56
6	85	65	79	65	80	60	55	41	38	25	35	26	22	19	31	23	41	12	44	20	53	38	60	44
7	90	63	78	62	82	66	61	35	38	28	30	24	26	16	30	20	36	24	42	32	55	35	64	36
8	86	70	85	64	81	65	65	49	36	29	33	25	28	22	30	21	38	22	50	25	60	33	69	42
9	86	72	81	66	79	59	74	49	39	25	40	26	27	17	27	18	63	35	65	33	66	35	78	53
10	81	68	79	62	85	64	55	41	47	31	47	35	19	14	40	7	64	43	48	30	74	44	86	56
11	76	64	78	63	65	60	59	38	51	40	36	30	27	11	45	34	50	32	43	25	82	52	83	65
12	69	63	76	56	67	61	56	47	49	38	33	28	29	7	40	20	38	29	44	28	87	61	77	64
13	83	65	80	56	78	54	66	39	43	32	35	28	31	14	18	9	46	30	45	26	89	64	71	54
14	85	62	85	62	66	50	75	54	39	29	32	28	30	19	12	1	50	28	50	26	82	64	73	47
15	78	67	84	64	65	48	73	61	43	25	35	21	15	2	15	0	28	20	39	33	76	63	76	51
16	91	63	81	65	75	46	79	63	47	32	25	17	20	1	27	8	26	15	48	30	64	50	67	47
17	94	73	81	66	80	56	80	48	54	42	30	18	27	11	27	20	26	15	41	33	71	44	60	43
18	92	76	78	57	72	65	50	40	52	45	30	22	34	21	23	18	31	16	46	33	75	52	65	47
19	89	72	75	58	84	60	50	40	52	45	28	22	22	15	23	16	32	13	52	36	75	55	70	43
20	90	67	77	62	87	66	58	37	53	44	23	17	15	2	26	21	34	24	56	35	85	55	76	46
21	80	68	75	64	66	50	69	44	52	40	24	18	28	7	20	3	37	25	64	32	69	50	85	52
22	68	63	80	59	60	43	73	44	45	36	29	22	30	25	33	—2	41	23	72	38	61	42	78	61
23	78	58	86	58	65	38	61	41	41	35	22	11	25	21	33	15	35	27	55	45	62	37	77	59
24	82	54	80	67	67	55	55	38	43	36	14	8	38	20	17	6	46	25	62	33	70	36	89	62
25	84	58	70	58	74	47	53	37	40	33	20	9	40	13	36	8	31	25	75	53	77	54	90	62
26	73	65	75	52	66	48	54	45	40	30	23	13	16	7	46	15	40	21	62	52	60	36	91	70
27	79	63	78	53	56	42	54	38	40	27	27	17	48	11	16	5	42	32	73	50	61	38	86	68
28	75	58	76	57	59	34	42	33	44	36	23	20	45	32	20	—2	45	34	65	46	73	40	79	62
29	77	57	77	65	67	47	50	33	42	34	23	12	34	24	.....	.....	50	37	60	38	82	52	73	59
30	71	62	82	59	77	53	48	36	41	32	26	16	38	20	.....	.....	37	28	55	37	90	66	74	57
31	78	65	80	66	.....	.....	46	31	.....	.....	24	18	35	25	.....	.....	34	24	.....	.....	87	67	.....	.....
Range	40°		35°		53°		50°		29°		44°		49°		48°		52°		64°		60°		55°	
Monthly mean	74°.7		71°.7		64°.7		53°		38°.8		26°.5		22°.2		21°.3		32°.3		42°.2		60°.1		65°.7	

Maximum, minimum, and mean temperatures—Continued.

STATION, ROCKLIFFE, CAN. (Readings made at 11 p. m., Washington mean time.)

Name of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	92.2	58.2	76.4	61.7	81.1	63.9	83.5	52.5	42.5	21.1	27.4	19.1	24.3	6.6	18.3	− 2.4	16.8	− 1	39.8	16.7	41.8	30.6	58.8	46.6
2	87.7	62.2	79	61.2	80.2	60	74.7	49	41.4	28	36.4	24.8	20.9	5	19.9	− 4.6	23.9	− 0.8	25.5	11.5	47.2	30	68.4	45.7
3	83.7	61.5	83.7	57	80	58	64.8	41.8	36.3	21	34.9	26.2	9.8	1.2	27.2	16.1	33.3	−14.6	17.9	5.2	56.8	25	72	42
4	89	54.7	82.5	55.2	74.7	60.2	62.6	40	30.9	14.9	28.4	21	22.7	7.2	29.3	20.1	38.8	14.1	21.9	8.7	62.8	25	67.2	52.5
5	89.9	56.5	84.2	55.4	81.9	59.4	57.3	35.5	29.6	20.7	24.1	13.4	15.1	5.2	26.7	7.6	17.5	−11	33.9	13.1	54.6	43	59.6	40.2
6	90.3	51.1	76.5	56.9	73.7	57.3	53.5	32.3	30.1	18.3	21.4	12.6	10.9	−13.8	23.5	− 5.5	16	− 7.3	47.2	7.2	48.5	40.6	51.3	35.2
7	95.2	56.1	73.9	53.3	74.8	55	58.4	32	33.4	23.9	22.7	6.1	20.9	−13.8	26.7	0.2	30.4	9.1	38.1	17.1	57.8	34.8	64.2	32.3
8	94.7	58.5	77	48.1	85.6	63.4	58.4	40.2	34.2	24.2	20.8	− 2.4	29.6	17.6	24.9	7.4	24.1	2.7	46.8	6.7	64.1	29.3	71.3	32.5
9	88.7	62.7	78.4	57.5	85.1	61.2	62.8	41	36.6	22.1	26.5	11.1	20.5	− 9.3	20.9	−15.6	35.9	20.6	51.2	24	70.8	27	59.6	47.7
10	78.7	56.2	76.9	55.8	74.6	57	56.6	41.2	35.5	29.7	36.5	23.5	10.4	− 9.6	11.7	−22.6	59.1	25.1	41.8	27.4	64	36.3	72.7	52.1
11	75.7	48.1	77.2	51.9	64.3	50.8	57.8	32.4	37.8	32.3	35.3	15.8	23.5	− 5.1	25.9	9.6	40	21.9	40.3	18.4	74.6	49.4	83.7	47.6
12	79.1	48.9	76.4	50.4	57.9	50.1	58.2	41.2	40.6	32	25.1	12	24.2	− 8	15.6	0.6	33.9	17.1	40.4	18.6	79.7	45.9	75.7	50.9
13	88.7	55.2	82.1	44	61.4	49.5	62.6	32	34.9	28.8	27.7	13.4	30.9	7	3.7	−22.4	28.2	15.1	44	14.1	83.2	54.5	71.1	41.2
14	88.6	57.2	88.3	54.4	54	46.8	73	37.8	33.9	23	16.9	9.9	9.4	−17.8	9.6	−39.3	30.7	16.5	39.8	20.9	73.7	49.1	76.1	41.5
15	82.6	51.4	82.7	56.8	65.8	41.4	64.8	51.3	42.3	18.6	13.8	3.5	− 2.3	−26.6	12.9	−40.4	20.9	− 7.8	43.3	20.1	50.2	44.8	58.8	49.1
16	84.7	64.4	83	60.7	76.8	39.9	73.1	49.3	41.5	26.3	17.9	6.4	12.1	− 8.6	14.1	−19.4	19.2	− 9.6	42.8	29.1	60.2	40.2	63.8	43.1
17	93.5	69.3	75.7	57.8	74.9	57.4	70.5	46.9	41.6	25	22.9	2.5	21.9	−14.6	11.9	−29.8	24.1	−20.6	49.3	25	80.7	33	64.6	42.6
18	90.7	65.2	73.9	54.2	70	48.9	52.7	41	38.8	33	13.9	− 0.2	27.6	7.2	17.9	−21.4	22.9	−16.9	51.8	35	73.5	40.2	66.8	45.1
19	90.1	64.1	67.8	51.2	68.3	47.1	52.6	35.5	40.3	35.2	12.9	− 9.1	19.9	−12.9	15.1	−26.7	27.9	−17.2	53.8	35	78.7	42.7	71.7	40.2
20	88.8	56.9	78	56.5	83.6	61.4	59.1	31	39.8	35.8	23.9	− 5.2	0.9	−25.4	19.4	− 6	28.9	− 4.6	55.5	29.2	83.2	43.4	81.7	41.6
21	76.2	59.6	79.7	53.3	64.8	39.2	65.6	32	47.2	34	22.9	12.6	9.4	−16	7.3	−21.6	29.8	−11.3	59.5	25.5	60.8	38.5	80.9	46.3
22	77.2	56.7	85.2	50.4	56.8	37	63.7	34.4	41.3	36.2	23.9	7	11.9	− 8.6	9.9	−22.4	26.9	− 9.3	67.5	27.5	60.4	30	78.5	55.2
23	79.6	52	84.7	52.1	65.8	36.2	52.1	38	37.4	32	13.1	− 9.6	19.1	− 0.3	17.6	−11.6	35.7	10	57.6	32.6	65.1	29.2	71.1	43.6
24	84.2	44.6	71.1	62	68	40.5	52.4	31.5	36.1	30.2	13.9	−13.6	36.7	11.4	8.3	−19.4	32.3	9.9	54.4	24.5	74.5	39.2	92.9	50.1
25	81.6	55.2	65.8	44.7	54.8	36	48.8	29	32.9	25.3	22.9	7	29.1	−10.5	13.1	−27.8	30.9	3.5	45.9	40	62.7	35.3	96	56.8
26	66	57.5	67.4	41.2	54.5	41.8	48.3	35.7	30.4	20.1	28.3	− 4.6	1.2	−23.4	22.7	−10.9	31.4	−12.6	61.7	39.4	60.8	26	91.1	56.7
27	72.8	49.8	72.7	48.4	52.8	32	38	29.3	34.9	20.7	17.9	− 2.8	13.6	− 5.9	− 0.8	−30.4	36.8	19.9	53.4	43.2	70.4	30	83.7	60.8
28	75.2	45.1	77.6	53.2	58.8	28	37.8	26	33.6	26	12.5	− 4.1	31.9	− 1.1	5.1	−41.4	43.4	26.8	55.3	43	78.3	69.6	75.3	58.8
29	77.3	45.9	82	52.1	64.2	32	41.1	30	38.7	25.5	20.2	5.2	16.9	− 8.6	.....	.....	41.8	32.8	51.7	30.2	81.7	42.2	74.2	53.6
30	80.7	51.1	83.5	54.1	64.6	39.8	38.8	34.7	38.8	19.8	21.3	1.4	23.9	− 1.1	.....	.....	35.9	14.1	46.4	32	89.7	53.7	74.7	48.7
31	74.5	55.4	83.2	49.1	.....	.....	38.6	25.3	.....	.....	20.4	7.1	29.4	13.3	.....	.....	40.8	10.8	.....	.....	85.7	49.6	.....	.....
Range	50°.6		47°.1		57°.6		58°.2		32°.3		50°.1		63°.3		70°.7		79°.7		62°.3		64°.7		63°.7	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, ROSEBURG, OREG. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	76	49	81	51.5	85	50	63	50	54	39.5	62	43	38	18	38	27	62.5	32.5	74	49	63	49	80	51
2	65	51.5	77.5	53	68	51.5	63.5	39.5	58	41	60.5	52.5	43	20	41	26	47	36	60	52.5	54	40	69	51
3	60	49	83	50	71.5	46	62	38.5	52	37	62.5	50.5	38	22.5	45	26	50.5	34.5	65	52	57	34	71	55
4	68.5	52.5	83	49.5	82	44	64	39	59	45	55.5	47.5	38.5	32.5	43.5	21.5	50.5	33.5	61	46.5	64	47	74	43
5	73	56	74	54	85	47.5	73.5	40.5	59	44.5	48	41	48	30.5	46	22	53	34.5	62.5	50	64	44	66	49
6	75	55	80	44.5	79	49	72.5	42.5	52.5	40.5	50	44	46	34	47.5	27.5	47.5	39.5	62	49	54	42	60	47
7	82.5	52	81	47	72.5	47	73	43	54	37.5	53.5	36.5	46.5	25.5	45.5	35.5	47	36	55.5	40.5	51	37	63.5	47
8	80	54	78	53.5	81.5	39.5	73	50	50	38	50	36	43.5	26.5	52	40.5	46	36	55	37	53	41	66	48
9	79	50.5	83	50	88	41	62	52	49.5	36.5	57.5	40	46	38	46.5	34	48.5	37	53	38	54.5	41	66	48
10	74	55	83	52	86.5	45.5	65.5	36.5	53	32	47	35	47	38	42.5	39	58.5	41.5	47.5	37.5	59	41.5	65	50
11	74	56	83	51	88.5	51	53	40	50.5	33	42.5	35.5	48	36.5	57	39	60	45	56.5	32.5	59	45	68	53
12	84	48	84	53	71.5	50.5	54	45.5	50	34	42.5	32.5	45	27	57.5	45.5	63	35	66.5	36.5	69.5	50	74	47
13	74	55	86	53	62.5	46.5	47	38	59.5	38.5	35.5	26	45	38	55	34	66	35	50	48	58	51	78.5	47.5
14	77	52	86	53	67	39.5	53	43	62	48	41.5	22.5	43.5	32.5	50	42	64	37.5	53	42.5	58	47	76	50
15	74	51	80.5	53.5	67	41.5	57	37	62	45	41.5	24	41	34	49	38	59.5	47.5	57	41	59	43	63	50
16	65	51.5	71	54	70.5	37.5	61	35	66	54	26	27	42.5	32	49	34	58	36	56	34	64	40	64	41.5
17	71.5	54.5	73.5	55.5	74	38.5	70	38	63.5	48.5	41.5	27.5	47.5	40.5	50	39.5	66	39	59	42	61	48	68	43
18	79	56.5	79.5	50	67	42	69.5	43.5	51	40	39	33	51	34	50	37.5	56.5	47.5	59	40.5	58.5	47	75	45
19	82	53	86	53	64.5	43	63	48.5	53.5	47.5	37.5	33.5	50	27	65	49	56	40	59	42	59.5	45	76	57
20	74	50.5	71	52	63.5	45	58	44	64.5	50.5	42	31	44	27	61	44	53	38	52	42.5	64	45	79	50
21	74	57	72	52	73	38.5	64.5	35	56.5	44.5	35	29	43	32.5	51	37.5	56	40	59	35.5	57.5	49.5	67	52.5
22	79	48	72.5	48	65	44	67	41	62	39.5	35.5	28.5	56	39	57	36	55	40	69.5	38	58	49	62	47
23	78.5	50.5	70	56	66	41	55	41	41.5	30.5	44	35	56.5	38.5	66	42.5	61	42	70	40	61	48	67	50.5
24	79.5	50	77	59	65	45	55.5	29	49	35	40	30	51	28	61	49	66	54	65.5	41.5	66.5	45	74	44
25	81	52	79	49	77	37.5	52	26.5	50	27.5	36.5	29	46.5	36	56.5	39	70	51.5	58	36	73	47	73	56
26	75	50	81.5	51.5	72.5	43.5	53	27	47.5	30.5	31	26	43.5	33.5	63.5	49	64	46.5	64	36	61	52	78	52.5
27	80	51	85.5	54.5	63	55	57	28	47	31.5	32	23	37	26	59.5	43	54	37	66	37.5	64	45	84	48
28	82	50	88	57	59.5	49	57	32	51	33	32.5	17.5	38	26	51.5	35	73	48.5	71	47	62	49	72	54
29	81	50	82	50	60	46	51	33	48	34	30	17	44	30.5	.....	....	73	49	71	46	62.5	45	66	52
30	84	51	73	54.5	58.5	50.5	60.5	35	52	31	37	27	42.5	30	.....	.....	72.5	50	75	46	72	49	72	41
31	84.5	53	81	46	.....	.....	63	38	.....	.....	40	28	36.5	28	.....	.....	75	51.5	.....	.....	82.5	47	.....	.....
Range	36°.5		43°.5		51°		47°		38°.5		45°.5		38°.5		44°.5		42°.5		42°.5		48°.5		43°	
Monthly mean	64°.5		66°.5		58°.1		49°.1		45°.4		37°.4		36°.9		43°.8		49°.5		51°.3		52°.9		60°.7	

Maximum, minimum, and mean temperatures—Continued.

STATION, SACRAMENTO, CAL. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	95	62	88	55	82	59	76	49	72	41	61	38	59.2	39	64	36	62	41	68	53	77	55	95	64
2	83	59	90	57	83	55	80	51	70	42	63	40	60.2	39	62.5	37	63	48	69.5	55.5	64	54	100	68
3	77	52	89	57.5	88	59	82	49	67	44	66.3	39	57	34.4	61	37	64	38	67	56	73	55	91	69
4	82	59	86	56	90	65	84	52	66	49	65	39.2	55.5	39	59.5	40	56	49	62.5	53.5	77	48	87	62
5	85	56	88	56	91	60	84	52	62	47	63	46	57.6	33.2	57	33	62	49	66	51.8	71	49	79	56
6	91	61	91	60	89	57	86	52	67	41	65	52	53.3	34.5	59	33.5	59	48	68	49	65	52	80	55
7	87	59	89	58	89	58	86	55	68	45	62	41	54.2	37	58	41	52	44	63.5	48.5	63	47	79	57
8	87	55	92.5	57.5	87	67	82	52	67	45	58	37	55	33.6	54	41.5	56	44	61.3	50	67	43	80	52
9	86	57	96	61	92	58	75	52	68	43	62	45.1	51.3	35.8	56	47	60	48	68.5	44.6	63	44	74	52
10	80	54	99	65	92	59	75	49	67	41	56.2	38	52	32.9	61	47	63	48	62.5	46	67	47	71	54
11	82	55	99	64	90	62	71	50	68	43	59	39	49.7	38.7	61.5	53	64	49	66.5	45	73	47	84	55
12	93	57	100.5	67	92	63	66	51	62	52	56.2	36.8	48.6	39	61.5	56	65	50	69	47	76	52	88	62
13	96	67	97	70	80	56	66	46	62	42	56.7	33	51	30.6	62	52	67	50	58.5	52	82	56	93	64
14	96	66	87	68	78	54	56	51	63	48	56	32	50	38	64.5	48	71	51	68.5	51	68	53	96	63
15	86	58	87	65	76	52	62	41	63	49	55	29	48.7	30	56	46.5	72	49	64	46	67	47	84	60
16	80	55	83	57	69	51	68	44	64	43	52.7	32	49.7	29.3	55	46	71	48	71	51.7	72	45	76	56
17	77	60	84	56	69	48	75	46	65	43	55.3	28	50.5	35.2	58	49	64.5	49	69	49	62	51	81	59
18	85	54	91	56	72	48	78	47	66	43	56	28.9	47.3	30	68	48	58.5	50	73	56	66	50	87	62
19	88	56	90	58	74	48	78	51	65	43	57.3	30	54.2	30.6	67	48	59	47	65	50	68	50	90	69
20	92	58	81	57	82	52	72	48	68	46	58	33	56.1	30.9	68	50	65	49	64	49	72	49	97	68
21	95	63	73	55	85	55	79	51	68	45	58	31	54.3	32.2	66	48	64	48.5	65	49	68	51	84	64
22	91	60	74	53	84	54	79	51	66	48	57.4	29.9	56.2	37.9	66	48	63	50	75	55	69	46	78	53
23	87	58	82	54	88	55	80	51	66	44	53	32	55.8	45.1	70	47.5	68	52	80	56	70	47	83	61
24	86	57.5	85	55	80	57	77	52	67	48	58	33.1	63	51	70	49	72	56	83	57	78	51	90	60
25	92	54	88	58	84	51	75	51	63.2	40	53.2	33	56	43	69	51	73	55	77	54	74	51	94	61
26	94	57	82	55	81	53	74	44	63	38	51.9	27.6	54.4	41.1	73.5	45	68	54	75	50	72	52	93	63
27	98	64	82	54	77	58	75	44	61	36	49.8	26.9	49.9	31.8	73.5	52	65	49.5	78	52	72	53	92	59
28	95	63	82	56	72	50	73	43	61	36	52.4	28	51.5	37.2	65	48	73	50	78	56	71	55	87	57
29	96	61	90	56	64	52	74	46	63	36	52	23.5	53.3	34	.....	.....	75	55	76	48	71	49	77	55
30	97	66	96	64	69	52	75	46	61	34	57	38	52	33.5	.....	.....	71	56.5	78	53	82	55	81	53
31	84	58	92	65	.....	.....	72	40	.....	.....	48.2	35.1	57.5	34	.....	.....	63	54	.....	.....	91	59	.....	.....
Range	46°		47°.5		44°		46°		38°		42°.8		33°.7		40°.5		37°		38°.4		48°		48°	
Monthly mean	74°.3		73°.5		68°.9		62°.7		54°.4		46°.3		44°.9		54°.7		57°.2		60°.8		61°.4		73°	

Maximum, minimum, and mean temperatures—Continued.

STATION, SALT LAKE CITY, UTAH. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	93	53	97	68	91	61	60.5	43	59.5	37	43	23	39	23	32	21	44	28	73	53	78	48	71	50
2	95	66	94	67	92	63	61.5	40	59	38	53.5	32.5	33.5	20	30	17	59	34	61.5	46	74	46	77	52
3	95	70	97	72	77	58	61	40	64	37	56.5	32	39.5	19	29	10	56	33	64	41	52	37	87	54
4	76	53	95	72	62	55	62	42	68	38.5	56.5	35.5	37.5	18.5	29	18	61.5	32	74	51	64	35	86	64
5	86	61	97	74	68	55	66.5	43	64	48	53	30	36	18	28	8	63	43	61	42	67	42	89	62
6	75	53	95	74	75	50	67	42	60	44.5	50	34.5	36	18	33	13	70	54.5	62	43	72	43	84	50.5
7	90	52	97	73	82	53	73	44.5	60	43	46	35	31	15.5	43.5	28	59	37	69	43	61.5	52	56	45
8	90	63	90	72	66	47	68.5	47.5	59.5	37	42.5	27.5	26	4.5	45	33	47	31.5	48.5	35	69	40	63	42
9	90	60	90	74	60.5	43.5	78	46.5	60.5	46.5	49	28	33	22	45	36	59	40	52	30	72	55	77	43
10	94	66	93	66	65	38.5	67	44	53	38	45	29	32	20	48	38	58	38	66	37	70	52	82	50
11	94	64	93	65	71	43	75	41	55	31	36	23	36.5	15	54	40	63	38.5	66	44	60	47	72	56
12	93	62	94	62	80.5	44	69.5	57	56	32	35	22	43.5	27	54	43	54	38	62	43	65	40	67	50
13	96	65	91	64	81	51.5	64	46	49.5	36.5	34	20	36	20	50	41	55	29	62	39	75	45	68	47
14	96	70	93	66	76	59	62.5	41	51	32	31.5	13.5	39.5	17	49	36	62	34	53	42	84	53	79	54
15	86	62	90	70	73	55	52	34	49	36.5	36	14	37	21	44	33	63.5	38	44	36	71	47	86	55
16	92	60	87	63	76	53	45	31.5	47.5	33	37	15	28	18	35	28	51	37	52	31	63	39	84	55
17	92	67	85	61	79	54	53	32	51.5	32	39	17	27	7	42	24	55	36	70	36	80	44	60	47
18	88	65	89	64	73	53.5	60	36	52	33	35	23	35	20	52	37	62	32	74	44	71.5	57	62	45
19	95	65	87	66	64	48	72	42	55	37	37	20	32	11	59	46	56	36	67.5	57	76	53.5	69	45
20	89	68	90	69	72.5	46	61.5	41	57	42.5	36.5	16.5	28	8	66	39	51	37	59	34	67	41	76	47
21	95	68	91	66	76.5	51	48.5	32.5	60	38	35	16.5	31	10	56	44	48	31	51	33	75	51	90	54
22	96	73	82	66	68.5	52.5	63.5	41.5	63.5	38	37.5	16	42	22	52.5	36	61	37	53	37	67.5	56	90	67
23	85	66	80	65	73	43	61	40	53	32	39.5	18	53	32	60	35	56	38	60	40	64	46.5	75	51
24	86	62	85	60	66	51.5	44	30	38.5	26	34	22	54	43	60	39	65	41	68	39.5	64	45	73	42.5
25	88	66	90	62	63	38	40	25	42	22.5	29	18.5	54	44	50	39	66	50	73	46	73	42	80	53
26	91	66	84	63	71.5	42	40.5	22	44	24	28.5	8	51	28	56	38	74	44	62	43	78	52	86	56
27	92	64	83	60	68	52.5	48	24	47.5	25.5	30	12	38	26	68	41	65	38	72	43	80	54	83	59
28	90	64	94	66	72.5	45	53.5	29	50	25	26	15	30	19	59	34	60	33	74.5	49	73	59	91	57
29	90	62	88	69	63	48	55	37	45	29	27	8.5	31	15	.....	.....	72	39	72	56	62	50	94	71
30	96	60	88	66	53	41	59.5	36	40	22	29.5	11	31.5	19	.....	.....	77	50	71	48	60	39	80	68
31	93	66	87	63	.....	.....	60	34	.....	.....	40	17.5	32	20	.....	.....	71	57	.....	.....	66	43	.....	.....
Range	44°		37°		54°		56°		46°		48°.5		49°.5		60°		49°		44°.5		49°		52°	
Monthly mean	77°.7		78°.5		60°.5		48°		42°.7		29°.7		28°.7		39°.8		49°.8		53°.6		59°.6		66°.4	

Maximum, minimum, and mean temperatures—Continued.

STATION, SAN ANTONIO, TEXAS. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	88	71	90	75	93	67	93	75	73	43	63	37	55	48	52	44	81	62	72	55	86	63	84	67
2	87	58	98	76	95	70	93	73	79	52	68	35	50	39	49	40	68	53	72	44	82	67	82	58
3	91	58	99	77	90	68	92	70	78	58	73	42	41	34	56	37	74	47	80	45	88	66	83	56
4	94	69	97	77	89	71	92	70	78	49	72	43	37	24	62	47	76	47	76	50	90	67	86	55
5	92	69	86	74	93	73	91	67	77	53	68	47	36	23	51	39	81	46	77	59	93	63	89	56
6	81	69	96	73	91	75	88	65	82	61	78	50	40	18	39	35	83	51	80	68	80	63	94	68
7	90	72	94	75	84	71	89	67	83	68	76	57	49	32	56	34	82	62	87	66	75	61	93	66
8	86	72	96	75	93	73	79	71	83	69	67	55	49	28	64	33	80	62	89	66	84	64	96	72
9	95	71	96	77	92	75	88	66	80	65	63	44	46	20	65	37	79	63	89	68	88	66	91	75
10	94	75	96	78	79	66	91	65	80	63	72	34	53	24	71	52	84	63	88	53	89	67	94	75
11	93	72	97	78	79	64	94	73	68	56	54	40	61	40	79	49	82	64	88	49	88	67	94	77
12	97	76	84	75	80	54	92	69	66	46	75	58	58	31	82	46	79	65	85	53	84	67	92	76
13	95	73	93	72	84	53	90	67	60	40	67	43	62	34	73	43	79	60	83	69	88	64	97	75
14	95	72	94	73	86	53	90	71	65	54	43	33	71	46	56	32	82	57	89	62	86	63	93	73
15	96	71	96	73	83	55	90	74	71	46	53	26	75	61	51	32	83	50	89	63	91	61	98	72
16	98	75	97	72	86	57	89	74	75	45	57	27	67	55	70	46	78	63	80	60	92	64	95	70
17	99	76	93	73	92	60	78	58	64	54	51	31	65	50	63	47	70	45	75	55	94	70	94	75
18	97	74	87	74	90	74	76	49	69	52	52	29	65	39	60	33	70	38	78	48	89	72	90	73
19	91	75	91	74	92	73	78	45	74	46	51	44	59	29	69	35	72	42	81	47	96	73	87	72
20	92	73	92	74	90	71	82	49	76	44	45	38	63	33	73	42	83	61	84	56	101	73	87	72
21	95	74	85	73	83	58	81	62	69	53	61	29	68	37	77	57	92	62	86	66	104	71	93	73
22	99	75	94	74	85	59	75	47	71	42	55	33	74	44	76	60	92	62	80	63	96	75	91	73
23	90	73	94	70	91	73	78	41	78	46	66	33	70	48	76	49	85	55	75	62	95	71	91	76
24	95	73	96	75	93	76	84	52	74	55	57	33	71	44	79	45	86	62	64	57	91	72	93	73
25	95	73	96	74	93	75	84	58	55	43	39	25	73	54	88	50	86	67	81	57	92	71	94	70
26	90	73	94	74	92	74	85	63	52	37	46	25	70	56	75	38	89	67	88	61	90	69	93	74
27	90	72	95	73	88	71	57	48	66	31	45	25	72	62	63	37	90	69	90	62	90	62	94	74
28	93	76	96	73	90	71	57	47	65	34	48	35	79	61	73	38	85	67	84	60	91	71	95	77
29	94	76	93	73	92	72	75	50	72	40	57	46	77	66	.....	.....	88	64	85	63	92	73	96	72
30	95	76	90	68	92	72	74	52	62	51	46	41	77	65	.....	.....	92	62	90	65	95	76	95	78
31	96	76	93	67	.....	.....	73	49	.....	.....	55	39	72	63	.....	.....	92	61	.....	.....	90	77	.....	.....
Range	41°		32°		42°		53°		52°		53°		61°		56°		54°		46°		43°		43°	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		*72°		80°.9		83°	

*Computation of monthly mean temperature began April, 1879.

Maximum, minimum, and mean temperatures—Continued.

STATION, SAN DIEGO, CAL. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	75	62	79	64	74	61	71	57	74	53	73.2	45.4	63.5	50	61	44	63	54	68	56	70	54	89	63
2	74	60	76	65	73	62	71	56	66	53	79	50.5	60.4	52.3	65	42.5	62	54	66	54	71	54	93	65
3	78	63	73	63	73	62	71	58	66	57	78	55.5	63.9	51	58	51	62	51	64	51	70	57	85	66
4	75	61	75	61	74	62	70	59	66	56	69.5	49.7	62.3	49.6	59	50.5	63	46	65	48	68	54	76	57
5	75	61	77	63	72	58	68	59	64	59	65	45	60.8	51.8	61	46	62	44	66	49	69	54	70	59
6	73	59	78	63	72	61	67	57	64	56	63.5	50.8	60.4	49.5	61	38	63	52	64	46	69	56	72	59
7	73	61	77	61	72	62	68	58	69	48	63.2	50	60.8	46.4	59	42	59	52	62	52	64	55	69	57
8	75	63	79	64	73	62	69	57	70	46	73.5	45	57.4	36.3	60	46	62	52	65	48	68	49	71	57
9	73	60	77	63	81	60	68	54	66	49	72.2	47.6	58.3	37.4	61	46	62	49	68	45	68	48	68	59
10	72	61	77	61	95	62	70	55	66	46	63.6	41.5	57.4	39.3	64	50.5	61	50	66	48	66	52	70	59
11	73	60	77	67	100	68	70	56	68	47	62.5	48	59.2	37.8	60	49	61	45	59	52	67	47	69	57
12	73	59	78	65	97	70	69	56	66	51	61.5	38	56.8	40	61	54	61	45	64	52	73	50	72	58
13	76	66	80	68	92	66	71	53	66	49	62.2	36	59.8	43.7	62	50.5	62	45	62	52	70	55	70	59
14	77	64	80	69	85	62	69	56	67.5	46.5	64.4	36.3	57.3	45	63	49	62	47	63	53	67	56	70	59
15	74	64	77	66	82	60	66	57	67	50	63.5	35.4	56	38	62	50	64	49	65	53	69	57	68	59
16	74	62	77	66	72	60	72	52	71	52	69	41	58	35	63	51	64	55	82	49	71	53	72	59
17	73	62	77	67	71	54	81	53	77	50	63.7	40	57.2	38.4	63	47	62	55	82	54	69	55	72	52
18	73	57	73	64	72	57	74	50	73	49	61	35.5	65.4	40.3	65	49	63	54	77	51	68	48	72	55
19	72	60	73	63	72	54	67	52	70	46	62.3	37.7	76.3	44	74	50	65	53	72	54	69	58	71	53
20	70	62	73	65	75	57	68	55	66	43	66	37	71.3	49	67	48.5	64	47	65	57	67	50	71	59
21	72	62	74	62	74	56	80	49	64	47	66	41.8	65.4	44	62	51	64	51	67	47	66	52	70	56
22	73	63	73	64	72	58	87	56	63	50	68.7	42.3	58.5	39.3	58	49.5	62	46	69	47	66	51	70	57
23	71	63	72	55	71	59	82	57	62.5	53	65.3	40.2	65.2	40.3	58.5	50	64	48	75	47	67	48	72	60
24	73	56	67	64	72	61	69	49	68.5	52	59.6	43.6	72	46	61	49	65	51	68	55	69	48	74	55
25	76	60	72	63	72	58	69	56	67	43	60	39	63	46	62	51	72	50	67	53	70	49	72	58
26	74	62	73	64	73	62	68	55	67.5	43.5	59.6	40.6	59.5	42	60	52	65	52	64	53	69	58	71	62
27	74	62	73	63	73	59	76	50	63	39.5	59.4	40.3	60	42.5	60	47	69	54	66	51	68	55	70	60
28	75	62	72	59	69	53	79	53	62.5	44	58.7	49.3	57	46	58	52	95	52	68	54	68	50	70	57
29	77	63	71	63	71	54	74	47	65	41.3	57.4	46.6	56	45.6	.....	.....	99	61	67	54	69	59	71	61
30	76	62	72	63	69	58	69	44	70.5	44	59.4	46.7	58	44	.....	.....	74	62	69	54	88	52	72	57
31	77	63	72	62	.....	.....	72	47	.....	.....	61.3	51	57.3	39.7	.....	.....	67	55	.....	.....	94	62	.....	.....
Range	21°		25°		47°		43°		37°.5		43°.6		41°.3		36°		55°		37°		47°		41°	
Monthly mean	66°.6		68°.3		67°.2		61°.4		56°.8		52°.3		51°.7		54°.1		57°.8		58°.6		61°.4		64°.4	

Maximum, minimum, and mean temperatures—Continued.

STATION, SANDUSKY, OHIO. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	86	70	82	70	79	69	80	63	48	27	47	39	29	21	30	15	47	33	44	29	56	39	77	54
2	78	68	85	67	86	64	76	61	53	41	48	40	26	—15	30	14	34	25	39	23	53	40	58	50
3	72	68	83	67	73	63	74	58	45	37	46	36	3	—16.5	35	24	40	23	34	19	64	41	61	53
4	74	68	87	66	75	65	63	55	42	34	39	30	13	— 6	43	25	44	37	38	23	68	51	78	53
5	78	69	81	70	80	63	60	48	50	31	38	28	14	0	43	29	39	31	42	27	60	46	74	65
6	83	69	80	69	81	65	60	41	56	39	40	30	24	9	38	29	52	39	55	32	52	40	65	53
7	85	72	83	68	88	69	65	43	46	34	37	29	29	12	36	23	40	31	55	36	52	44	63	47
8	86	72	90	70	87	69	69	48	46	38	40	27	32	18	42	23	69	36	56	36	55	43	67	50
9	85	71	85	70	84	66	75	54	45	39	48	34	23	13	37	24	70	53	64	44	60	44	85	54
10	82	74	83	68	76	66	58	51	54	33	38	31	20	3	46	25	68	48	60	35	79	51	87	67
11	87	70	80	65	67	59	57	48	52	45	38	33	31	14	49	35	63	36	40	33	84	57	86	65
12	86	71	77	63	63	57	62	47	55	43	35	29	30	19	37	21	48	32	46	31	90	62	76	65
13	78	71	81	65	61	51	65	46	48	40	41	29	32	21	25	10	51	38	55	43	85	66	77	63
14	87	67	84	66	69	48	75	54	44	32	40	30	33	25	14	2	43	22	45	37	78	64	85	58
15	85	72	87	65	68	50	76	63	50	35	34	22	30	23	24	1	28	20	50	35	70	50	83	67
16	89	72	83	67	74	52	77	62	54	45	39	22	33	20	33	15	33	19	44	37	65	49	69	55
17	90	75	78	67	80	58	75	47	54	50	37	28	38	21	29	21	29	22	43	37	65	50	66	53
18	94	76	78	66	81	64	52	41	54	45	34	16	36	22	30	18	32	18	50	37	68	56	69	52
19	82	73	78	66	83	65	50	41	55	42	25	15	24	10	30	15	36	22	55	38	70	57	68	58
20	90	77	78	66	84	59	61	38	52	42	29	15	25	5	28	17	37	28	59	42	80	58	75	55
21	84	73	77	69	63	53	66	45	50	40	40	28	39	17	30	15	38	30	58	41	74	50	85	62
22	78	68	77	67	65	52	70	45	50	36	30	7	49	33	45	30	39	32	61	46	62	50	84	64
23	78	63	85	64	70	48	52	40	45	34	16	5	42	25	35	20	43	30	66	47	61	49	84	65
24	82	63	83	70	67	58	56	41	48	35	11	— 5	42	27	30	20	48	35	66	46	75	50	88	69
25	88	66	76	64	80	56	68	47	45	34	13	3	42	25	40	29	38	29	79	62	73	55	89	71
26	80	68	73	57	64	53	54	45	43	35	19	7	38	18	31	13	45	34	75	59	57	48	91	70
27	80	68	75	56	58	50	52	34	46	35	26	13	50	35	25	7	42	32	73	60	64	52	89	72
28	78	64	81	63	62	47	45	30	41	34	21	10	49	36	41	18	58	38	65	53	67	50	74	66
29	73	66	74	63	68	56	54	37	45	33	25	8	40	32	.....	.....	55	40	66	46	83	60	79	65
30	75	65	77	69	82	62	54	39	46	32	29	13	41	31	.....	.....	41	34	56	42	92	65	79	66
31	85	64	77	71	.....	.....	53	33	.....	.....	26	7	38	28	.....	.....	44	28	.....	.....	90	67	.....	.....
Range	31°		34°		41°		50°		29°		53°		66°.5		48°		52°		60°		53°		44°	
Monthly mean	75°.5		72°.8		65°.5		53°.4		42°.8		27°.8		25°.7		27°.9		37°.9		46°.8		60°.4		68°	

Maximum, minimum, and mean temperatures—Continued.

STATION, SANDY HOOK, N. J. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	83	68	73	64	86	72	68	60	47	38	48	38	32	27	37	18	33	21	53	34	59	45	88	70
2	86	69	86	66	87	73	76	62	60	39	59	45	32	6	28	13	36	31	46	35	54	41	88	68
3	90	71	88	66	82	71	76	64	51	40	48	40	9	— 3	36	27	36	29	50	29	60	42	68	62
4	92	69	83	71	73	69	76	60	48	34	50	40	26	7	37	28	41	32	37	24	61	46	72	62
5	85	69	77	70	73	67	65	57	43	30	41	32	23	15	36	28	46	33	34	25	69	52	81	64
6	82	70	79	65	75	67	65	55	43	35	41	30	29	16	38	30	38	28	44	25	70	52	79	57
7	81	66	82	66	71	64	62	53	42	35	42	31	30	19	37	27	39	31	50	37	63	46	65	50
8	90	68	85	69	66	61	68	53	42	32	37	31	38	20	35	25	35	23	54	34	65	47	74	56
9	90	73	90	71	69	62	79	58	42	31	52	34	38	28	37	25	42	31	63	37	58	47	73	59
10	90	72	80	72	70	65	68	54	51	41	57	43	28	22	34	19	60	36	50	36	57	47	87	61
11	82	71	80	69	72	68	59	51	53	41	45	37	32	19	49	30	58	41	41	37	53	46	85	68
12	72	64	83	68	75	68	59	53	58	48	39	35	30	26	48	34	45	34	48	35	63	46	77	62
13	78	66	81	68	76	66	67	51	54	42	39	32	35	28	34	23	52	33	53	36	77	57	73	63
14	80	66	73	68	73	60	65	53	45	37	39	32	36	27	25	14	54	38	51	40	73	57	74	60
15	90	71	73	68	71	62	74	57	45	36	44	36	32	17	25	8	44	35	49	41	68	55	86	66
16	72	64	74	71	65	58	74	58	50	41	37	27	28	16	33	17	46	31	55	41	70	57	80	63
17	80	64	79	70	71	58	77	62	52	47	33	26	26	20	32	29	47	32	48	40	66	57	71	58
18	97	73	82	73	82	61	68	49	51	44	36	27	37	23	31	25	36	27	40	38	68	57	69	55
19	97	76	83	69	72	68	56	44	58	44	34	23	37	22	28	20	39	29	52	38	69	58	67	57
20	84	72	80	67	81	65	61	44	48	42	33	25	26	12	31	24	46	29	63	40	66	58	71	56
21	82	68	76	68	82	67	68	50	52	44	51	25	31	9	26	14	45	37	68	44	80	62	77	58
22	77	66	71	64	68	58	61	50	55	46	51	32	39	24	35	12	40	32	64	49	65	55	69	57
23	83	64	68	64	63	54	67	56	49	42	33	19	40	27	40	22	42	33	59	43	62	52	82	61
24	85	67	72	63	70	62	59	47	52	38	26	16	35	24	32	21	42	31	59	44	68	48	81	66
25	87	69	76	65	73	66	57	47	51	42	20	13	47	29	32	22	46	32	56	44	70	57	68	61
26	85	70	72	64	79	61	58	49	53	38	27	14	33	16	53	28	40	29	46	42	66	58	82	64
27	82	72	76	64	63	53	64	52	58	37	29	23	40	19	40	16	45	35	51	45	65	55	88	68
28	83	66	74	65	58	48	58	43	58	42	30	23	49	38	21	11	48	38	57	48	70	57	92	72
29	81	68	72	66	65	55	50	43	49	39	30	17	41	30	.....	.....	41	37	71	50	74	60	84	64
30	69	64	81	65	68	60	60	47	47	37	33	24	35	20	.....	.....	52	38	.....	.....	76	58	77	64
31	69	62	75	67	.....	.....	54	42	.....	.....	33	20	40	28	.....	.....	41	33	.....	.....	87	61	.....	.....
Range	35°		27°		39°		37°		30°		46°		52°		45°		39°		47°		46°		42°	
Monthly mean	75°		72°.3		67°.7		58°.6		44°.6		33°.8		27°		28°.7		38°.3		45°.5		60°.1		69°.2	

Maximum, minimum, and mean temperatures—Continued.

STATION, SAN FRANCISCO, CAL. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	64	56	61	53	62	54	68	55	59	51	60	48.5	62	(*)	62	46	61.5	49.3	64	55.5	62	53.8	81	58
2	64	52	63.5	53	64	56	72	56	57	51	63	50	59	47.5	61	46.5	57	48.7	64.8	53.7	59	52.5	85	62
3	66	52	62	54	75	55	76	57	62	52	67.5	51	53	46.7	56.5	45.5	59.5	46.7	63.7	54.8	61 7	48.5	75	61
4	65	55	63	54	78	58	64	55	63	54.5	68	55.8	51	46	58	44.7	58	53	62	56.3	59	49.5	62	55
5	66	54	66	54	63	55	68	53	59	52	62	56	56	44	50.5	43.5	58.5	55.5	62	52.8	58.8	48	63	53
6	66	54	65	53	62	55	77	57	65	50.5	66.7	55.5	52	45	55.5	43.5	58.7	49.3	65.5	52	62	50	63.5	50.5
7	62.5	53.5	64	53	68	52	65	53	65.5	57	59	50.5	54	42.8	56	46.6	55	47	65	50	57.7	45	64	50.5
8	63	53	71	54	77.5	56	61	53	61	52	59.5	48.5	52	43	59	50.7	59	48	57	46.8	56.2	47	62	49
9	61	53	72	55	73	54	62	55	61.7	55	59.5	52	54.7	47.8	59	52.3	60	51.2	57.5	47	60.3	48	60.5	49
10	62	51	63	54	68	54	65.5	52	64	52	57	47.7	53	44.5	60	50.5	59.7	50.7	56.8	47	57	47.3	64	52.5
11	62	53.5	63	53	68	54	61	53	63.5	52	57.5	49.5	52	42.3	61.8	55	66.3	52	59.7	46.5	59.7	47.5	65	53
12	73	54	67	53	70	55	65	56	61	55.5	56	48	48.5	42	61	57	69	53	60	49.2	65.5	51	65	54
13	66.5	57	63	55	63	53	60	52	58.5	52.5	55	47	51	40.5	59	52.5	71.3	52.5	58	49.5	60	51	70	51
14	63	54	64	55	62	54	61	55	65.3	54.5	53.7	42	52.5	44	59	50	71.8	53.2	57.8	52	59	51	70	54
15	62	54	62	55	60	54	61.5	52	61.5	54	54	43	49.3	41	58.5	50	62	50.5	59	48	60	50	63	53
16	62	52	62	53	63	53	66	53	63	52	53.7	43.5	50	42.5	58.5	48	59.7	52	63.5	50.3	57.5	49	68	52
17	64	57	62	52	62	55	72	56	65	51.5	53.3	42	49	44	58.5	52	58	51.7	69.7	50.5	59	51.5	67	53.5
18	62	55	62	54	62	54	71	56	58	53	54	43.7	52	42	58.7	51	58.5	51.2	65.5	50.5	64	50	78	54.5
19	63	53	61	53	62	53	63	54.5	62	52	58.5	45.3	57	42.8	58	50	58	53	65.5	50.5	64	53	80	59
20	65	53	61	53.5	69	52	68	53	68	54.7	57.5	47.3	56.5	45	58.7	50	58.7	51.5	56.2	47	62	50.5	70	57
21	65	54	61	53	66	53	77	56	66.5	55	58	45	56	44	61	52	61.8	51	63.3	47.5	61	51	64	52.5
22	62	54	65	54	66	52	78	63	63.5	52	56	45	56	45.7	61	50	61.7	51	68.5	51	60.5	51	67.5	51
23	62	54	62	54	69	53	74	61	62	52.5	54.5	44	58	49	62	50	63	53	75.7	51.5	63	50	69	55.5
24	61	54	65	54	71	56	76	62	67	52.5	54.5	43	59.5	52	64.3	50	66	57	71	52.2	63	51	68.5	55
25	63	53	62	54	66	56	72.5	57	62	50.5	52	41	53	45	61.5	49	65.5	55.3	60.3	50.5	62	51	62	52
26	64	53	63	56	62	53	72	56	60	50.3	51	41.3	50	45.5	70	50	62.7	55.2	61	48.7	64.5	54	62	49
27	62	52	65	56	64	55	73	57	58.3	50.5	51	40	50	40.7	61	53	61.8	51	65.5	49.3	64	52	61	52
28	61	51	65	56	66	53.5	71.5	54.5	57	48	51	44.5	50.5	41.5	61	48.5	70	53	59.5	50	65.5	56	60	51
29	72	51	65	55	64	52.5	68	55	61.5	47	50	40.5	52	43	.....	.....	77	55.7	61.3	48.5	64	54	60	52
30	62	52	73	56	62	54	59	52	60.7	48	54	44	53	43	.....	.....	66	55	62.5	49.8	73	54	61	52
31	60	53	65	55	.....	.....	60	51	.....	.....	53	46	55.8	44.5	.....	.....	62.5	53	.....	.....	75	56.5	.....	.....
Range	22°		21°		26°		27°		21°		28°		.....		26°.5		30°.3		29°.2		30°		36°	
Monthly mean	57°.8		58°.2		59°.2		61°		57°		51°.6		48°.6		54°.1		56°.7		55°.9		55°.9		59°.4	

* Minimum thermometer out of order.

Maximum, minimum, and mean temperatures—Continued.

STATION, SANTA FÉ, N. MEX. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	80	60	94	60	72	52	74	45	70.5	31.5	55	13	50	14	50	18	67	36	49	32	77	48	61	38
2	86	55	88	62	73	54	78	39	77	33	55	25	50	16	54	20	78	32	68	32	84	45	68	38
3	85	56	87	63	74	51	84	45	72	27	65	25	44	18	57	22	67	45	63	38	78	47	79	38
4	85	55	89	61	74	51	84	46	74	32	61	23	45	25	39	19	68	38	72	41	75	40	85	48
5	84	58	87	59	75	49	70	42	75	34	61	25	42	15	36	10	72	33	66	43	73	42	84	54
6	82	59	92	56	75	47	75	41	61	36	62	26	55	13	39	−3	73	25	66	32	73	45	81	53
7	88	58	84	62	80	49	80	42	62	42	63	32	37	21	41	4	72	40	65	32	75	41	77	57
8	95	61	85	61	82	47	85	43	52	34	41	20	37	5	56	17	60	32	59	39	77	43	76	40
9	92	60	97	58	76	52	85	42	43	30	49	14	33	−2	43	19	63	31	55	31	81	44	78	46
10	92	65	76	58	64	40	80	42	54	30	57	24	46	9	57	26	71	28	68	28	75	53	84	46
11	89	59	68	54	61	44	72	43	50	33	41	28	43	5	56	24	71	30	66	44	68	38	81	47
12	81	57	84	52	76	42	78	42	70	27	32	17	52	10	62	29	80	33	62	35	75	39	83	61
13	87	56	89	53	79	41	80	38	55	29	31	8	49	20	68	32	74	33	45	23	74	38	74	45
14	91	59	84	58	80	45	80	43	53	25	37	0	41	28	65	38	74	30	58	30	77	50	83	48
15	84	62	90	58	78	47	73	39	52	25	40	5	45	20	58	32	74	28	53	33	79	56	80	40
16	86	56	89	59	78	48	52	27	55	29	32	7	43	8	48	28	79	35	54	30	80	44	84	50
17	85	60	82.5	60	81	51	72	29	55	26	43	1	44	14	46	18	65	25	64	23	76	48	83	52
18	87	57	84	55	78	58	80	35	62	27	52	11	36	8	58	23	72	31	69	34	79	47	84	56
19	85	59	80	58	68	46	76	36	57	27	54	9	45	8	68	27	65	32	67	43	80	41	85	49
20	79	55	83	60	74	39	80.5	35	65	37	25	5	58	16	72	30	65	39	71	38	83	43	84	49
21	81	55	85	62	80	41	59	32	67	27	41	6	57	16	72	34	59	39	52	29	81	47	75	56
22	82	53	82	60	84	41	69	30	71	28	42	11	59	19	66	32	66	35	52	31	77	53	89	50
23	85	57	82	59	85	42	76	34	71	30	59	12	60	22	62	26	68	35	52	30	83	51	88	50
24	84	58	85	58	81	50	75	36	40	24	35	10	65	27	69	30	72	33	61	29	81	51	87	50
25	86	57	75	60	76	47	55	33	44	12	22	0	76	32	68	36	74	35	74	34	84	46	91	57
26	85.5	55	73	58	62	44	64	26	52	13	39	6	72	37	58	29	75	41	81	41	80	54	91	55
27	79	52	74	59	80	38	62	18	68	23	42	6	57	28	66	30	75	46	77	41	83	53	90	55
28	86	50	80	56	88	43	72	22	60	23	31	16	57	26	75	32	72	39	84	44	79	51	86	54
29	91.5	59	78	56	81	44	68	37	60	25	41	22	42	32	.....	.....	81	40	84	45	75	46	89	61
30	95.5	59	81.5	55	73	43	81	30	50	15	46	24	52	26	.....	.....	82	42	82	45	64	45	89	52
31	93	58	74	52	.....	.....	76	31	.....	.....	46	19	55	22	.....	.....	77	41	.....	.....	68	34	.....	.....
Range	45°.5		45°		50°		67°		65°		65°		78°		78°		57°		61°		50°		53°	
Monthly mean	70°.4		68°.7		58°.4		50°.4		38°.9		25°.9		29°.3		36°.5		48°.3		48°.9		60°.9		66°.4	

Maximum, minimum, and mean temperatures—Continued.

STATION, SAUGEEN, CAN. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	87.1	64.1	76.0	63.3	76.6	60.6	80.1	63.3	46.0	30.1	35.5	24.6	30.5	20.1	22.0	6.1	39.0	17.6	37.0	21.0	35.5	30.1	51.0	44.6
2	68.2	60.8	77.0	63.8	73.0	60.3	74.0	57.7	46.0	32.9	38.0	33.0	24.0	10.1	29.0	4.1	27.0	0.5	25.0	18.1	43.0	32.1	65.0	41.5
3	75.0	61.3	79.2	60.5	76.0	58.6	65.0	46.1	44.0	28.6	39.0	32.6	20.0	10.1	32.0	20.1	40.0	—1.7	21.0	13.6	52.0	31.6	62.0	38.6
4	77.5	65.6	75.0	58.1	74.0	57.7	62.0	42.7	44.0	22.1	35.0	24.7	23.0	15.1	33.0	17.1	38.0	27.1	22.0	14.1	54.0	38.6	67.0	45.2
5	77.0	58.9	86.0	53.8	74.0	56.2	60.0	39.1	31.0	23.1	27.0	22.6	22.5	17.7	30.5	15.1	32.0	7.6	28.0	13.6	59.5	37.1	55.0	40.1
6	80.0	56.3	71.0	61.3	80.0	59.0	53.5	40.5	36.0	25.5	31.0	19.2	23.0	10.3	32.0	19.3	38.0	20.6	43.0	13.1	39.9	35.2	56.0	40.1
7	86.0	58.2	73.5	63.4	84.0	65.3	58.0	39.3	42.0	26.1	31.0	20.1	24.0	12.6	27.5	21.1	29.0	19.6	37.0	26.1	44.0	32.1	56.0	38.3
8	84.0	67.7	84.5	62.8	81.5	68.2	60.0	43.6	42.0	31.0	30.0	20.6	27.0	18.1	34.0	19.1	38.5	22.1	50.0	20.1	51.0	28.0	65.0	43.2
9	83.0	59.3	76.0	67.8	83.5	63.8	66.0	48.1	42.0	23.6	35.5	26.2	22.0	13.1	34.5	13.1	53.0	35.6	58.0	32.7	62.0	33.1	80.0	52.7
10	75.0	65.2	74.0	64.8	71.2	55.1	52.0	38.1	46.0	39.6	38.0	30.5	21.0	13.1	38.0	10.3	54.0	34.5	44.0	28.6	72.0	44.2	77.0	57.1
11	75.5	60.8	71.0	64.3	64.0	52.2	51.0	38.2	46.5	42.1	32.5	25.1	25.0	20.1	40.5	23.1	47.0	29.1	33.2	22.1	79.0	55.3	80.0	52.3
12	76.0	62.6	71.0	54.2	59.0	52.2	60.0	33.1	46.0	38.9	31.0	27.1	26.5	9.3	23.0	8.1	32.0	27.1	36.0	20.1	83.0	58.1	62.0	49.7
13	77.0	61.3	79.0	53.8	59.0	47.6	62.0	42.6	41.0	30.6	32.0	25.6	28.1	13.5	11.0	3.1	38.0	27.6	47.0	28.1	83.0	49.2	65.0	42.6
14	77.2	62.3	77.0	63.8	60.0	45.1	70.5	51.8	40.0	28.1	26.2	19.3	27.0	10.0	11.0	1.9	32.0	19.1	38.0	25.5	75.0	47.2	67.0	42.1
15	85.0	61.3	81.0	61.8	62.0	39.8	67.0	54.3	39.0	27.1	20.0	12.5	16.0	7.9	16.0	4.1	20.5	10.3	51.0	23.1	50.0	41.1	70.0	54.8
16	89.0	67.3	77.0	60.3	76.0	49.7	74.5	56.8	43.0	31.3	27.2	6.1	19.5	9.6	24.0	5.1	23.0	10.1	44.0	26.1	57.0	40.6	56.0	44.2
17	84.5	71.1	71.2	57.1	75.0	58.3	71.0	47.7	47.3	37.6	27.2	23.1	27.0	9.1	25.0	—8.4	36.5	6.9	48.0	29.6	70.0	38.6	56.0	43.1
18	80.0	61.5	71.0	55.1	67.0	47.7	52.0	41.1	48.0	40.6	27.0	20.6	29.0	24.1	24.0	—8.6	24.0	5.1	44.0	26.6	59.0	41.1	59.0	39.1
19	82.0	59.7	75.0	55.1	75.5	54.2	47.0	37.2	44.0	38.6	27.0	16.9	25.0	6.6	23.0	—1.5	26.5	7.1	43.0	29.8	69.0	42.1	65.0	38.3
20	84.0	59.6	73.1	58.7	80.0	54.1	60.0	46.2	44.2	35.2	25.0	19.1	18.0	3.6	23.0	2.4	25.5	11.6	44.5	25.1	81.0	46.1	75.0	48.2
21	72.0	65.3	76.0	58.1	60.0	48.7	68.0	43.4	45.0	32.1	25.0	18.9	29.0	12.9	16.0	—6.7	32.0	3.1	52.0	25.6	50.0	38.1	79.0	56.4
22	69.5	61.6	77.0	50.3	59.0	43.6	69.0	46.2	40.0	35.1	29.0	22.1	29.0	15.1	37.0	11.1	28.0	9.6	61.0	33.1	55.0	31.1	72.0	56.3
23	72.0	52.7	79.0	55.2	66.0	40.1	48.0	40.1	45.0	33.6	25.0	11.6	27.0	16.0	20.0	8.7	35.0	22.4	57.1	41.1	62.0	32.1	81.0	55.3
24	79.0	49.7	73.0	66.2	62.0	42.6	53.0	39.6	39.5	31.9	24.0	15.5	34.0	19.9	12.0	5.1	38.0	26.5	67.0	41.1	76.0	43.6	86.0	62.3
25	74.5	60.3	67.0	61.3	70.0	42.1	53.0	38.3	33.0	28.1	29.0	22.9	37.0	7.6	18.0	8.9	28.0	18.0	62.0	43.1	69.0	45.1	88.0	65.3
26	69.0	62.3	73.0	54.2	64.0	47.7	49.1	35.1	34.0	28.1	28.0	24.6	21.5	—3.5	12.0	2.0	40.0	18.6	69.5	40.1	68.0	35.6	84.0	61.3
27	72.0	62.3	75.0	50.2	51.0	35.2	43.0	32.3	33.5	22.9	26.0	15.0	44.0	20.2	8.0	—7.7	40.0	28.6	66.0	53.3	54.0	35.1	80.0	62.3
28	71.0	52.9	67.0	50.3	59.0	33.1	37.0	30.1	38.0	31.6	23.0	12.1	38.0	26.1	21.0	—6.9	42.0	26.1	59.0	34.9	61.6	35.3	68.0	52.8
29	74.0	51.8	75.0	53.2	66.0	41.5	44.0	29.8	39.0	34.1	22.0	15.6	30.0	12.6	.....	.....	41.0	32.6	60.0	33.1	84.5	53.3	70.0	51.5
30	69.0	61.1	75.0	51.6	76.0	55.7	42.0	36.6	39.0	30.6	25.0	15.9	34.0	20.1	.....	.....	34.8	29.1	40.0	32.1	84.0	63.3	72.0	47.2
31	82.0	63.8	80.0	57.7	.....	.....	41.0	29.1	.....	.....	26.0	17.5	33.0	20.2	.....	.....	32.5	20.6	.....	.....	87.0	46.3	.....	.....
Range	39°.3		35°.8		50°.9		51°.0		25°.9		32°.9		47°.5		49°.1		55°.7		56°.4		59°.0		50°.0	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, SAVANNAH, GA. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	88	73	91	79	93	78	78	62	57	36	69	57	60	46	59	43	62	39	80	52	88	68	86	70
2	85	72	98	77	92	78	82	68	68	41	66	44	58	41	47	31	67	38	65	49	73	62	87	71
3	82	74	97	77	89	78	83	67	71	50	60	40	42	28	57	34	69	52	74	49	75	59	87	72
4	85	72	93	77	87	75	81	66	69	49	64	47	38	24	59	40	58	44	61	39	84	63	83	67
5	89	73	84	75	90	74	81	60	68	52	55	40	43	32	71	51	64	44	61	41	86	69	86	69
6	87	74	87	73	89	76	84	65	75	53	62	40	38	29	66	55	68	49	68	44	89	72	90	73
7	90	73	97	76	85	74	85	68	77	62	62	47	49	27	55	48	76	49	73	52	77	64	86	72
8	88	75	94	76	84	73	81	67	73	59	62	45	62	34	50	40	72	54	63	55	69	60	79	71
9	89	73	97	77	85	73	82	68	62	44	73	55	66	43	57	35	76	51	69	49	72	57	82	73
10	90	76	96	76	80	73	75	67	66	43	65	42	49	28	59	40	80	58	75	62	74	58	84	73
11	87	74	96	78	79	73	74	67	75	50	62	39	59	39	68	56	80	63	74	60	71	62	86	73
12	85	76	93	80	85	75	74	62	68	56	67	46	64	50	68	52	69	57	65	52	76	66	92	74
13	93	77	92	75	82	67	73	58	67	45	64	44	63	40	73	53	66	55	77	52	76	67	90	74
14	95	79	93	78	81	64	75	57	66	46	66	45	66	45	65	47	70	60	74	65	81	68	91	77
15	87	76	92	79	79	63	78	60	67	49	70	53	68	45	52	44	66	52	81	65	83	70	94	77
16	87	74	89	76	79	64	83	65	70	59	57	39	72	47	51	40	72	52	84	65	83	65	96	79
17	87	74	91	77	81	65	82	65	71	62	57	45	60	49	58	40	74	59	75	62	83	68	94	77
18	88	74	94	78	82	63	71	55	65	58	53	38	70	52	60	47	62	51	65	56	83	69	85	74
19	94	78	99	79	82	65	61	44	60	53	52	33	62	35	54	41	64	48	70	51	83	67	78	69
20	88	72	100	82	86	65	69	45	67	51	50	40	52	29	55	41	71	46	67	55	87	68	78	61
21	94	73	90	76	86	69	72	58	68	51	69	47	64	40	53	35	79	61	71	56	87	73	79	65
22	98	79	87	74	81	70	70	65	58	46	56	43	65	45	62	40	79	63	74	57	88	71	82	64
23	91	80	86	73	80	70	66	51	67	47	49	32	70	49	67	51	74	61	79	57	74	68	85	70
24	89	77	85	70	81	69	72	47	73	46	60	38	71	49	63	45	76	51	82	60	73	61	86	70
25	88	77	89	69	83	71	74	51	74	51	52	41	75	55	71	50	71	55	81	62	84	59	87	71
26	89	72	95	75	85	72	73	54	69	59	59	41	63	49	74	54	74	52	81	66	89	66	87	72
27	96	77	90	77	84	70	75	53	70	55	45	30	71	46	54	41	77	62	77	67	88	68	86	72
28	96	81	96	77	70	63	74	59	56	43	45	24	74	59	52	35	73	63	79	68	86	66	89	74
29	94	82	95	79	79	64	70	62	62	39	52	34	80	60	.....	.....	85	57	80	67	86	68	93	74
30	97	81	92	80	70	65	78	65	65	47	56	45	66	50	.....	.....	73	55	84	65	86	71	85	74
31	97	79	93	80	.....	.....	66	45	.....	.....	51	45	65	48	.....	.....	67	49	.....	.....	86	70	.....	.....
Range	26°		31°		30°		41°		41°		49°		56°		43°		47°		45°		32°		35°	
Monthly mean	83°.0		84°.5		76°.3		67°.3		59°.1		50°.4		51°.7		51°.5		61°.8		65°.1		73°.7		79°.2	

Maximum, minimum, and mean temperatures—Continued.

STATION, SHREVEPORT, LA. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879 January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	90	74	92	79	92	70	90	72	64	40	47	41	43	40	55	42	68	52	76	56	78	67	75	62
2	85	75	94	77	92	71	82	72	70	45	59	35	42	29	50	37	63	48	70	45	76	57	75	61
3	82	71	91	77	92	71	85	65	74	48	67	40	33	21	60	34	63	42	67	46	84	59	78	56
4	89	74	89	74	90	73	86	60	74	48	65	43	25	19	61	50	74	49	66	45	77	67	84	59
5	89	74	94	75	85	72	85	61	74	48	64	37	30	16	61	39	76	55	73	44	74	64	85	62
6	84	73	95	77	83	72	74	63	75	49	70	40	28	6	44	38	78	55	76	56	69	62	80	67
7	91	74	97	77	91	73	83	63	81	56	65	54	43	17	51	36	79	61	78	65	76	59	85	66
8	89	72	98	76	92	73	87	64	80	57	63	46	40	27	56	32	79	57	82	55	81	57	89	69
9	93	76	97	79	92	74	79	72	68	56	49	37	33	17	60	36	81	64	85	67	84	61	92	72
10	92	74	96	80	74	69	84	71	76	55	62	36	35	19	61	47	78	60	76	54	87	65	94	73
11	94	77	93	77	74	61	89	68	66	51	71	45	39	35	68	50	70	61	73	52	86	66	94	73
12	92	78	89	75	72	53	79	58	61	43	58	50	36	33	76	46	72	56	74	46	84	67	96	75
13	87	79	87	75	76	52	86	56	68	39	70	45	43	32	65	40	67	60	71	54	87	65	94	76
14	93	78	92	76	89	56	86	64	67	49	45	35	56	43	42	28	69	52	85	59	79	63	96	75
15	96	79	93	73	83	58	88	65	60	52	44	28	65	55	55	25	77	49	76	58	79	62	88	71
16	96	81	94	74	84	59	90	62	67	49	48	28	61	48	51	43	75	52	74	57	81	62	93	74
17	96	79	92	76	88	62	71	54	61	52	47	34	61	49	50	42	64	40	65	52	82	60	94	74
18	95	79	93	76	90	70	69	46	65	48	49	33	49	41	49	38	55	33	70	48	88	65	91	75
19	95	77	93	78	87	67	69	45	69	44	43	35	47	31	59	34	66	38	77	49	88	69	89	67
20	97	78	95	76	87	65	71	47	67	43	40	37	62	33	62	39	80	54	76	53	91	72	94	70
21	98	82	95	77	76	57	78	52	60	48	49	33	67	37	70	45	83	61	78	60	90	75	90	73
22	95	78	94	78	77	56	65	48	72	40	43	31	71	51	68	60	77	61	80	63	92	71	90	71
23	90	77	95	74	86	62	76	45	75	49	59	31	63	54	67	48	72	46	76	62	92	72	95	73
24	92	77	94	76	89	67	78	51	76	59	50	28	68	50	74	48	79	51	66	62	89	72	94	76
25	94	80	96	78	92	74	77	59	60	42	33	22	64	56	80	57	82	56	73	62	88	69	91	74
26	95	78	91	76	85	67	81	57	42	34	30	26	67	53	67	40	83	62	77	62	87	67	94	73
27	95	79	92	78	78	64	57	42	54	34	37	23	76	57	54	34	85	66	76	60	89	69	94	74
28	95	78	88	76	89	67	46	38	61	38	39	27	76	62	64	39	88	65	76	62	89	66	83	67
29	88	77	82	74	88	69	58	43	66	38	41	35	76	65	.....	.....	84	65	82	60	89	68	91	69
30	95	77	86	68	88	70	65	50	64	47	41	37	68	60	.....	.....	86	60	83	61	91	72	91	68
31	96	79	91	68	.....	.....	59	43	.....	.....	42	37	71	55	.....	.....	86	60	.....	.....	81	74	.....	.....
Range	27°		30°		40°		52°		47°		49°		70°		55°		55°		41°		35°		40°	
Monthly mean	83°.7		83°.1		77°.6		65°.8		56°.7		43°.3		46°.1		50°.7		65°.5		65°.8		75°.9		81°	

Maximum, minimum, and mean temperatures—Continued.

STATION, SILVER CITY, N. MEX. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	(*)	.....	90	64	80	63	86	49	(†)	(†)	70	21	58	25	47	31	73	38	(†)	(†)	86	51	78	41
2	.....	.....	94	61	76	61	90	49	.....	.....	71	26	56	29	50	31	70	38	.....	.....	87	47	75	48
3	.....	.....	94	63	78	58	88	50	.....	.....	82	32	52	36	53	33	72	43	.....	.....	81	54	80	47
4	.....	.....	90	60	78	58	87	50	.....	.....	82	33	52	35	43	32	75	43	.....	.....	79	50	86	46
5	.....	.....	93	61	81	56	70	52	.....	.....	73	32	58	27	45	31	77	38	.....	.....	76	50	87	46
6	.....	.....	94	62	83	56	87	46	.....	.....	69	32	55	26	50	18	80	38	.....	.....	78	43	85	55
7	92	65	90	65	76	54	88	46	.....	.....	62	30	44	30	55	23	75	42	.....	.....	80	41	72	55
8	90	62	92	64	83	53	90	48	.....	.....	60	29	39	17	58	28	64	38	.....	.....	81	44	83	42
9	89	58	90	64	80	53	90	48	.....	.....	62	25	47	13	49	34	68	34	.....	.....	83	47	84	43
10	90	64	89	61	76	52	87	44	.....	.....	67	27	43	18	63	35	75	32	.....	.....	82	45	85	42
11	91	64	78	61	74	53	84	43	.....	.....	62	31	47	11	68	32	73	37	.....	.....	65	49	85	43
12	87	62	75	63	78	43	85	43	.....	.....	44	25	51	15	70	36	79	37	.....	.....	79	40	80	45
13	88	61	81	61	83	46	83	44	.....	.....	43	14	44	28	73	35	75	43	.....	.....	77	44	80	43
14	91	61	88	61	82	48	87	46	.....	.....	45	13	44	36	70	44	76	37	.....	.....	80	45	83	47
15	90	61	88	58	84	49	74	51	.....	.....	49	12	47	27	71	43	75	40	.....	.....	81	43	86	65
16	90	63	88	60	83	51	80	43	.....	.....	50	19	56	21	68	43	73	35	.....	.....	79	59	83	49
17	85	64	87	61	84	50	78	35	.....	.....	57	15	52	25	69	30	75	38	.....	.....	79	43	88	49
18	86	65	82	62	81	45	80	35	.....	.....	60	20	50	23	76	30	75	39	.....	.....	80	43	86	53
19	88	63	82	64	76	54	82	43	.....	.....	62	18	53	18	78	32	73	33	.....	.....	78	47	87	55
20	85	63	79	65	79	43	80	46	.....	.....	55	22	60	22	79	33	70	35	.....	.....	82	43	86	54
21	84	65	76	63	84	44	84	44	.....	.....	60	17	65	25	77	34	68	42	.....	.....	85	44	85	55
22	86	61	82	63	84	44	77	33	.....	.....	57	18	69	33	70	33	72	37	.....	.....	87	53	85	53
23	86	63	84	62	85	48	85	38	.....	.....	62	23	65	29	80	36	79	38	.....	.....	87	48	90	55
24	88	61	79	61	89	47	80	37	.....	.....	58	23	80	33	77	36	75	43	.....	.....	82	46	90	57
25	96	63	80	59	88	48	80	37	.....	.....	35	14	77	33	80	37	81	39	.....	.....	87	52	92	62
26	92	63	85	61	81	57	78	39	.....	.....	51	14	61	33	66	37	83	47	.....	.....	87	45	92	63
27	89	59	80	61	84	49	71	33	.....	.....	44	18	60	36	78	34	75	42	.....	.....	87	52	91	62
28	86	58	70	62	90	47	75	30	.....	.....	40	30	59	30	77	38	74	50	.....	.....	81	47	90	60
29	86	57	74	61	85	47	80	33	.....	.....	47	25	50	38	.....	.....	83	38	.....	.....	80	41	91	58
30	89.5	56	80	61	82	53	79	38	.....	.....	47	26	57	35	.....	.....	83	41	.....	.....	79	46	90	53
31	86	65	76	61	.....	.....	74	32	.....	.....	53	28	58	23	.....	.....	62	48	.....	.....	78	52	.....	.....
Range	.....		36°		47°		60°		.....		70°		69°		62°		51°		.....		46°		51°	
Monthly mean	72°.2		70°.8		63°.8		.....		.....		.....		.....		.....		.....		.....		.....		70°.5	

* No observation taken on maximum and minimum temperature. † Record incomplete.

Maximum, minimum, and mean temperatures—Continued.

STATION, SMITHVILLE, N. C. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	90	70	91	76	92	80	78	64	56	31	65	52	51	39	52	35	56	31	60	46	69	58	86	70
2	89	71	93	81	92	75	81	65	64	40	67	46	58	39	40	24	59	35	64	45	72	52	86	73
3	86	75	92	80	87	73	79	60	64	46	57	38	40	22	48	26	56	42	63	40	73	53	85	73
4	84	73	89	76	90	75	82	63	63	42	60	45	32	17	51	34	56	40	55	30	76	63	83	66
5	91	71	82	75	92	71	83	56	61	42	53	38	37	25	56	44	62	43	57	34	75	67	85	63
6	95	71	87	73	89	70	83	67	69	51	55	35	34	19	56	50	63	38	63	38	81	66	87	72
7	91	74	94	74	85	72	78	69	71	58	55	39	40	16	53	41	66	48	67	53	72	57	78	69
8	89	77	92	77	84	70	85	67	67	47	56	34	53	36	43	36	55	48	61	48	63	54	80	68
9	91	76	93	79	85	74	85	67	58	36	67	55	60	44	55	32	68	49	69	50	68	52	81	70
10	89	78	90	82	85	68	80	66	61	35	65	41	44	28	52	38	67	50	68	57	73	55	82	73
11	91	72	89	81	85	75	71	58	68	49	53	34	53	30	60	52	66	53	71	55	71	60	86	73
12	91	78	92	75	83	77	69	53	71	55	55	42	58	39	60	49	66	50	62	45	70	63	86	74
13	91	78	85	75	83	73	72	49	65	43	56	39	48	39	57	50	60	46	69	52	75	64	87	74
14	89	77	87	72	85	63	77	48	60	46	55	49	55	42	54	38	64	54	69	61	75	66	87	72
15	90	71	85	76	79	66	81	54	62	43	65	51	48	41	43	34	63	47	70	60	82	63	86	75
16	90	70	91	76	81	61	81	64	69	52	61	42	56	37	39	30	63	49	71	62	81	68	88	77
17	90	78	90	74	83	60	80	63	71	61	45	34	51	38	49	34	67	57	65	62	79	69	81	74
18	93	78	88	72	85	60	73	50	65	55	48	31	60	48	50	40	60	39	64	48	83	64	77	71
19	92	80	94	77	87	60	61	43	59	52	43	27	53	33	48	35	57	32	66	43	81	67	77	60
20	92	81	96	72	87	66	68	40	61	50	45	30	44	20	48	34	68	48	67	46	80	65	78	55
21	91	79	83	71	88	67	69	51	65	52	63	44	50	34	46	26	65	58	73	48	82	68	80	53
22	91	75	89	69	81	66	70	64	60	45	54	39	53	45	55	33	67	57	74	48	79	66	84	60
23	87	74	82	66	80	64	67	50	61	41	44	30	61	47	56	49	69	53	75	55	76	54	87	69
24	88	72	86	60	81	69	69	43	67	51	54	42	58	46	55	40	71	52	66	56	74	49	82	71
25	91	65	88	63	89	69	74	48	70	58	47	33	61	49	61	48	69	50	74	59	78	63	87	70
26	90	71	81	72	87	70	71	51	65	57	48	31	58	44	63	52	68	52	77	62	82	68	86	67
27	91	79	88	66	78	63	75	53	67	56	43	27	60	41	57	37	66	58	79	61	84	69	89	68
28	92	81	93	76	73	59	66	54	60	41	41	20	63	45	44	28	67	51	77	67	85	70	88	74
29	90	79	88	73	77	62	67	52	54	33	44	29	71	50	.....	.....	70	50	77	63	86	67	84	72
30	88	80	87	78	78	64	73	58	59	38	45	35	53	41	.....	.....	61	46	78	60	87	71	86	69
31	83	75	93	79	.....	.....	66	39	.....	.....	45	36	54	42	.....	.....	63	40	.....	.....	85	72	.....	.....
Range	30°		36°		23°		46°		40°		47°		55°		39°		40°		49°		38°		36°	
Monthly mean	81°.3		80°.4		75°.6		64°.5		55°.1		45°.7		44°.5		44°.5		54°.7		59°.7		69°.0		75°.8	

Maximum, minimum, and mean temperatures—Continued.

STATION, SPRINGFIELD, MASS. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	92	69	72	62	86	69	71	51	47	37	41	24	31	13	32	15	32	10	46	27	56	41	93	67
2	91	69	80	65	84	71	75	56	58	34	58	31	31	12	26	8	37	30	44	35	55	38	81	65
3	92	69	84	64	86	66	77	55	50	36	50	42	19	3	37	22	42	21	46	28	59	37	67	53
4	86	71	83	64	71	65	73	50	45	27	42	36	26	12	37	29	41	21	30	22	64	35	68	51
5	89	70	82	60	69	62	66	47	39	25	38	30	30	20	33	21	45	21	33	22	74	50	79	55
6	82	61	78	68	79	63	62	50	39	25	38	26	25	14	40	27	27	12	41	25	66	48	79	52
7	84	55	81	64	69	58	63	38	44	24	33	22	31	8	38	23	36	20	52	25	65	46	64	47
8	90	63	82	61	72	53	67	50	39	31	35	22	35	21	35	19	35	11	48	32	68	46	70	45
9	89	72	84	66	73	49	71	48	42	30	33	22	37	26	37	11	44	28	64	32	70	40	75	48
10	88	72	80	67	79	57	60	48	47	34	60	31	26	15	27	11	55	36	48	33	71	49	86	60
11	85	67	80	65	79	65	59	41	57	41	53	39	27	8	45	24	55	32	42	30	71	40	85	65
12	79	66	80	59	76	66	52	46	61	46	41	36	28	9	47	33	40	31	46	30	77	49	74	66
13	80	65	80	59	83	68	64	48	52	38	38	32	32	4	34	20	47	29	54	34	80	58	76	60
14	86	65	82	59	72	62	66	43	43	33	40	28	39	20	23	14	46	33	56	39	82	59	77	53
15	82	68	75	60	67	55	71	45	45	23	39	31	28	10	25	9	45	26	46	31	78	58	73	59
16	79	62	81	69	69	45	74	54	44	24	31	24	16	2	35	10	40	23	55	36	76	65	61	52
17	79	63	81	69	73	48	76	58	47	35	34	19	24	5	33	20	34	23	45	33	76	60	67	49
18	93	70	80	65	80	58	72	61	45	38	38	23	40	20	30	20	35	19	39	33	79	62	65	51
19	93	75	77	58	77	56	63	45	53	37	33	25	31	5	27	12	38	10	40	33	70	64	70	44
20	88	68	79	61	82	62	59	41	45	38	35	19	21	10	26	17	42	23	54	30	76	62	75	50
21	82	68	78	62	81	62	70	45	53	40	38	18	21	4	22	10	42	30	60	33	81	57	78	55
22	75	65	72	63	64	49	69	39	50	42	41	32	41	19	25	4	43	26	65	36	67	48	74	59
23	80	61	75	53	64	41	65	49	50	43	32	22	42	22	41	15	41	29	64	45	61	44	84	58
24	83	58	74	53	68	45	62	47	51	41	27	17	35	20	30	17	44	25	59	36	68	38	86	62
25	85	60	73	61	74	57	59	44	43	33	32	12	46	25	27	8	47	35	61	43	70	46	84	64
26	82	67	74	51	76	56	60	37	42	34	31	17	25	4	47	18	46	28	56	45	64	48	79	65
27	83	70	77	53	63	47	60	43	41	22	31	18	37	7	34	13	40	34	63	40	68	37	91	67
28	82	61	79	58	59	37	55	40	51	38	30	22	52	37	21	4	44	34	66	48	75	52	89	68
29	82	59	77	61	63	39	51	31	48	34	32	18	39	21	.....	.....	53	35	65	54	79	52	79	61
30	72	61	82	58	66	49	51	40	46	33	32	20	34	10	.....	.....	49	35	71	52	78	59	78	61
31	69	59	81	63	.....	.....	56	43	.....	.....	33	16	41	18	.....	.....	39	25	.....	.....	90	63	.....	.....
Range	38°		33°		49°		46°		39°		48°		57°		43°		45°		44°		55°		48°	
Monthly mean	73°.2		70°.5		63°.3		55°.9		40°.9		31°.8		24°.1		25°.5		34°.8		44°.2		61°.0		67°.3	

Maximum, minimum, and mean temperatures—Continued.

STATION, ST. ANDREWS, CAN. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1											(*)	(*)	25.9	6.0	21.2	7.0	28.8	− 0.5	44.1	23.4	50.8	37.2	73.6	42.6
2											43.3	21.4	28.6	8.0	38.3	10.0	28.8	16.8	37.3	20.8	52.3	33.4	57.0	43.1
3											52.7	39.1	26.0	15.0	37.0	20.8	29.8	10.0	38.0	22.9	52.1	33.4	52.9	41.6
4											42.1	29.4	26.8	10.8	29.8	18.3	39.0	17.8	29.8	12.2	57.0	33.1	51.8	42.1
5											37.7	28.4	31.6	15.5	31.1	12.0	39.3	3.0	34.8	18.8	56.3	36.4	65.7	44.9
6											33.8	20.1	26.8	14.8	32.5	18.8	21.8	− 4.4	35.8	23.9	46.8	33.4	63.7	44.6
7											25.8	15.3	28.3	16.6	28.0	12.8	27.8	9.5	47.8	27.4	54.2	37.4	53.7	39.1
8											30.0	16.8	31.3	14.4	28.5	9.9	31.0	7.0	44.8	22.3	62.7	37.2	53.7	36.7
9											26.4	10.8	32.5	17.8	29.4	4.0	35.0	11.3	48.8	26.4	59.9	39.4	66.2	37.1
10											44.6	19.4	25.8	1.0	26.8	7.0	35.1	29.4	41.1	22.3	62.7	34.4	58.3	38.1
11											45.8	30.6	22.1	− 1.5	39.5	10.6	38.0	22.6	34.0	25.2	60.6	36.4	51.8	43.1
12											41.3	22.8	23.0	6.0	43.1	27.4	36.5	20.8	35.0	23.7	54.7	38.9	52.2	42.1
13											28.0	17.0	34.0	15.0	33.2	9.0	36.3	18.8	41.5	23.5	62.8	39.4	62.7	42.1
14											29.0	15.4	32.6	2.0	15.9	− 0.3	39.0	27.8	41.8	22.6	56.7	40.9	71.6	43.1
15											35.1	23.4	7.0	− 8.5	13.9	− 4.5	43.0	23.4	45.6	24.0	70.8	41.4	60.3	43.6
16											37.2	12.8	4.0	−11.8	26.8	7.0	29.8	15.8	49.8	31.4	57.2	43.1	54.7	44.9
17											22.3	10.0	17.1	− 9.5	22.0	10.5	29.8	16.9	52.8	33.4	75.1	42.1	51.9	43.1
18											23.8	12.0	35.0	11.6	19.9	8.0	30.8	10.0	48.3	27.1	65.0	38.7	54.7	40.1
19											20.9	9.0	26.8	12.0	17.4	5.0	31.1	10.0	38.0	24.4	51.9	42.1	69.2	37.1
20											24.1	3.5	19.1	− 1.8	14.9	3.0	34.0	12.8	49.8	22.4	57.0	43.7	72.8	41.2
21											29.8	12.4	9.0	− 7.0	13.9	6.0	34.5	15.8	53.8	30.4	67.2	44.1	69.7	49.2
22											43.3	26.6	27.8	2.3	26.0	3.0	36.0	17.8	55.8	29.7	59.7	38.1	71.8	44.9
23											32.6	18.0	27.3	10.0	35.0	14.8	35.1	22.9	44.1	29.4	52.7	36.1	76.6	44.2
24											22.8	12.2	34.0	4.0	30.8	7.0	35.3	22.3	47.3	28.4	55.9	30.6	73.6	48.1
25											23.3	9.0	34.0	8.0	20.0	− 2.3	39.2	28.9	54.2	25.4	52.2	38.1	81.6	47.1
26											33.0	12.0	12.9	− 8.0	44.3	15.8	39.8	26.4	58.8	29.9	51.7	36.1	71.8	51.1
27											21.8	10.0	23.0	− 8.8	44.0	7.1	35.8	24.6	59.3	32.2	65.7	31.6	64.7	47.1
28											21.7	9.0	35.0	16.8	12.2	− 5.0	39.8	25.4	51.0	36.4	64.7	37.7	72.8	47.1
29											17.9	4.5	30.3	8.0			37.5	25.4	49.3	37.4	59.7	36.1	66.7	51.6
30											21.4	5.0	22.8	3.0			40.0	30.4	50.8	37.9	67.7	39.1	73.6	54.8
31											22.8	9.0	26.8	7.0			41.9	30.4			64.9	43.9		
Range															49°.3		47°.4		47°.1		44°.5		44°.9	
Monthly mean																								

* Observations on maximum and minimum temperature began December 2, 1878.

Maximum, minimum, and mean temperatures—Continued.

STATION, STAYNER, CAN. (Readings made at 11 p. m., Washington mean time.)

Day of month.	July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	94.7	68.2	77.7	62.2	(*)	(*)	79.7	58.2	43.7	26.5	(*)	(*)	28.0	14.5	21.9	3.5	37.7	13.5	37.7	21.5	37.7	30.5	.....	.....
2	79.7	64.2	78.7	64.2	77.7	57.2	69.8	55.2	44.7	26.5	39.7	30.5	25.0	4.5	(*)	.....	(*)	.....	29.0	19.5	46.7	30.5	64.7	43.3
3	69.8	64.2	82.7	60.2	77.7	60.2	61.7	49.2	(*)	(*)	39.7	33.1	16.9	5.5	30.0	17.5	37.0	—12.5	20.9	13.5	56.7	34.5	56.7	43.3
4	79.7	64.2	(*)	(*)	76.8	61.2	62.7	42.3	44.7	21.5	34.0	22.5	20.9	12.5	31.0	19.5	39.7	19.5	19.9	11.5	(*)	.....	69.8	49.2
5	82.7	62.2	83.7	53.2	76.8	59.2	58.7	38.3	32.0	22.5	27.0	22.5	(*)	.....	29.0	12.5	36.0	8.5	29.0	11.5	56.7	40.3	59.7	40.3
6	87.7	60.2	76.0	64.2	75.8	59.2	(*)	(*)	35.0	26.5	26.0	19.5	19.9	0.5	32.0	10.5	36.0	8.5	(*)	.....	41.7	33.5	49.7	39.3
7	(*)	(*)	80.7	58.2	83.7	64.2	57.7	33.5	37.0	27.5	30.0	13.5	26.0	7.5	29.0	20.5	28.0	16.5	46.7	27.5	49.7	32.5	64.7	34.5
8	89.7	57.2	87.7	59.2	(*)	(*)	58.7	42.3	37.0	27.5	(*)	(*)	28.0	19.5	31.0	15.5	35.0	15.5	54.0	26.5	59.0	29.5	.....	.....
9	82.7	64.2	77.7	63.2	79.7	62.2	67.8	49.2	46.7	30.5	35.0	3.5	21.9	11.5	(*)	.....	(*)	.....	60.7	33.5	69.8	31.5	81.7	52.2
10	76.7	64.2	76.8	59.2	76.8	55.2	53.7	36.3	(*)	(*)	36.0	30.5	19.9	7.5	35.0	7.5	57.7	36.3	39.7	27.5	75.8	40.3	81.7	59.2
11	76.7	62.2	(*)	(*)	62.7	50.2	56.7	34.5	46.7	40.3	30.0	23.5	26.0	5.5	39.7	23.5	51.7	28.5	39.7	20.5	(*)	.....	82.7	52.2
12	74.8	61.2	73.8	51.2	55.7	49.2	53.7	38.3	44.7	34.5	32.0	24.5	(*)	...	24.0	7.5	30.0	23.5	44.7	21.5	87.7	59.2	68.8	47.2
13	84.7	57.2	79.7	50.2	55.7	47.2	(*)	(*)	37.7	30.5	33.0	25.5	29.0	2.5	11.9	—6.5	37.0	26.5	(*)	.....	89.7	54.2	62.7	46.2
14	(*)	(*)	81.7	58.2	59.7	46.2	71.8	35.3	38.7	29.5	27.0	10.5	28.0	5.5	10.9	—13.5	35.0	18.5	39.7	20.5	78.7	50.2	69.8	42.3
15	88.7	61.2	82.7	61.2	(*)	(*)	71.8	57.2	39.7	24.5	(*)	(*)	10.9	0.0	20.9	—0.5	19.9	—1.5	47.7	24.5	52.7	45.1	.....	.....
16	91.7	67.2	82.7	60.2	74.8	44.3	73.8	57.2	42.7	28.5	22.9	1.5	19.0	2.5	(*)	.....	(*)	.....	41.7	28.5	63.7	42.3	56.7	42.3
17	93.7	72.2	72.8	58.2	79.7	58.2	67.8	46.2	(*)	(*)	27.0	20.5	28.0	6.5	29.0	—8.5	29.0	1.5	48.7	28.5	73.8	39.3	59.7	42.3
18	80.7	65.2	(*)	(*)	68.8	50.2	50.7	40.3	49.7	41.3	29.0	15.5	30.0	20.5	15.9	—4.5	20.9	—2.5	47.7	29.5	(*)	.....	63.7	45.3
19	82.7	61.2	75.8	55.2	78.7	50.2	43.7	37.3	48.7	36.3	28.0	7.5	(*)	...	24.0	—4.5	22.2	—2.5	49.7	32.5	68.8	39.3	70.8	41.3
20	89.7	61.2	72.8	62.2	79.7	52.2	(*)	(*)	44.1	34.5	25.0	15.5	11.9	—2.5	21.9	0.5	28.0	12.5	(*)	.....	83.7	45.3	76.8	43.3
21	(*)	.....	73.8	59.2	59.7	41.3	70.8	37.3	49.7	30.5	30.0	16.5	29.0	9.5	6.8	—6.5	30.0	7.5	58.7	27.5	54.7	36.3	79.7	54.2
22	74.8	61.2	78.1	54.2	(*)	(*)	62.7	38.3	42.7	34.5	(*)	(*)	29.0	11.5	34.0	0.5	28.0	8.5	68.8	31.5	57.7	34.5	.....	.....
23	74.8	56.2	84.7	55.2	63.7	36.3	52.7	40.3	37.7	32.5	25.0	7.5	27.0	14.5	(*)	.....	(*)	.....	57.7	33.5	63.7	32.5	82.7	53.2
24	82.7	49.2	73.8	64.2	64.7	43.3	52.7	34.5	(*)	(*)	17.9	10.5	35.0	22.5	22.9	1.5	40.7	17.5	57.7	31.5	74.8	38.3	69.8	59.2
25	77.7	64.2	(*)	(*)	65.7	38.3	53.7	37.3	36.0	26.5	31.0	16.5	37.0	5.5	17.9	6.5	36.0	14.5	69.8	42.3	(*)	.....	92.7	68.2
26	69.8	63.2	76.8	50.2	65.7	44.3	47.7	32.5	35.0	26.5	31.0	21.5	(*)	.....	22.9	3.5	37.0	12.5	69.8	43.3	61.7	33.5	91.7	67.2
27	73.8	58.2	75.8	51.2	48.7	34.5	(*)	(*)	34.0	20.5	26.0	11.5	47.7	—2.5	—14.2	—21.5	39.7	28.5	(*)	.....	55.7	31.5	81.7	68.2
28	(*)	.....	76.8	51.2	57.7	30.5	37.7	26.5	36.0	31.5	24.0	9.5	37.0	25.5	24.1	13.5	42.7	32.5	73.8	34.5	69.8	37.3	69.8	56.2
29	71.8	51.2	76.8	54.2	(*)	(*)	43.7	30.0	38.7	33.5	(*)	(*)	28.0	12.5	.....	.....	39.7	34.5	59.7	33.5	82.7	45.3	.....	.....
30	67.8	61.2	84.7	51.2	74.8	39.3	43.7	30.5	36.0	21.5	25.0	15.5	37.0	17.5	.....	.....	(*)	.....	46.7	30.5	90.7	59.2	70.8	45.2
31	79.7	63.2	82.7	56.2	.....	.....	40.7	26.5	.....	.....	22.9	15.5	31.0	19.5	.....	.....	34.1	20.5	.....	.....	89.7	52.2	.....	.....
Range	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Monthly mean	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* No observation.

Maximum, minimum, and mean temperatures—Continued.

STATION, STEVENSON, D. T. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1													—12	—30*	49	8	20	—28	52	22	62	37	69	31
2													—18	—32	31	10	32	0	29	12	72	46	80	43
3													—13	—33	25	11	32	10	40	13	72	36	81	51
4													—13	—32	15	— 4	33	— 3	54	22	48	36	65	49
5													9	—33	13	—15	36	19	61	28	49	29	70	43
6													(†)	(†)	15	— 5	36	9	49	30	46	31	65	43
7															15	4	46	18	65	29	50	38	84	55
8															13	— 9	36	20	69	42	62	41	76	57
9													20	— 8	30	— 4	42	21	52	35	62	45	67	48
10													20	—14	30	— 3	35	12	61	34	71	52	79	46
11													(†)	(†)	5	—25	28	7	66	33	70	46	80	47
12															— 6	—30	30	9	57	32	68	43	71	57
13															— 3	—26	10	— 9	61	29	67	41	75	57
14															10	—20	7	—12	60	32	72	40	69	56
15															10	—16	8	—16	56	37	75	50	74	49
16															15	— 2	10	—13	58	27	70	48	76	52
17															29	8	15	—14	62	31	69	43	73	55
18															16	— 2	10	—14	60	31	65	45	71	57
19															— 6	—19	11	—13	66	32	60	46	71	58
20															20	—18	10	—23	66	50	59	44	71	54
21															41	10	21	—22	65	48	71	48	84	52
22															18	5	40	10	51	39	68	57	90	60
23															27	— 7	30	15	56	39	70	50	74	58
24															20	0	43	8	61	41	74	48	71	50
25															5	—23	48	33	72	39	63	50	74	50
26															0	—33	58	29	46	34	67	50	66	48
27													30	7	15	— 5	49	37	62	31	71	49	72	46
28													20	— 4	10	—20	57	33	58	42	69	61	80	48
29													32	0			59	36	66	32	66	48	86	48
30													21	4			54	35	67	38	59	44	84	60
31													23	— 3			44	30			58	36		
Range															82°		87°		60°		46°		59°	
Monthly mean																								

*Observations on maximum and minimum temperature began January 1, 1879.

†No observation.

Maximum, minimum, and mean temperatures—Continued.

STATION, ST. JOHN'S, NEWFOUNDLAND. (Readings made at 11 p. m. Washington mean time.)

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	71	49	64	51	78	42	50	44	52.5	42	39	27	33	21	35	27	28	11	42	32	50	30	70	47
2	58	47	59	45	65	49.5	50	42.5	54	41	32	22	32	29	35	24	30	14.5	43	31	50	28	61	37
3	63.5	46	60	47	52	45	51	44	48	34	38	25	33	25	38	27	29	8.5	43	30	64	40	48	36
4	55	44	62.5	53	65	32	55	43	46	39	44	37	40	28	35	27	30	2	40	26	51	46	62	34
5	69	46	70	56	72	45	60	48	48	43	50	37	35	25	35	20	38	28	38	30	52	32.5	55	35
6	53	47	69	58	67	49	56	42	48	32	50	42	36	25	39	25	34	6	36	30	47	32.5	69	49
7	48	44	62	54	58	41	52	41.5	48	27	42	32	36	28	32	25	24	5	35	29	57.5	34	75	49
8	64	41	69	53.5	67	35	57	43	50	32	39	28	30.5	22.5	28	23.5	30	19.5	39	27	61	39	62	45
9	68	44	74	57	64	51	49	40	54	47	38	29	34.5	27	26	14	35	29	42	30	54	37	60	37
10	73	50	78	54	56	45.5	58	38	52	45	31	29	39	27	22	1	34	30	36	28	60	32	54	36.5
11	70.5	55	77	59	71	52	54	36	55	44	38	29	31	15	20	12	35	29	42	25	67	37	51.5	40
12	60.5	52	62	51	74	53	47	34	50	41	46	37	20	11	42.5	18	37	25	54	30	68	35	52	40
13	79	48	62	49	77	52	49	32.5	56	45	45	40	25	9	43	36	35	22	46	31	72	44	60	43
14	73	49	70	52	80	63	57	40	56	37	42	36.5	32	15	34	27	38	24	48	30	55	42	54	41
15	65	50	71	55	75	64	47	35	43	34	42	36.5	29	4	29	14	40	20	47	31	59	42.5	57	41
16	67	47	74	53	61	42	60	30	42	32	44	37	12	2	22	10	43	37	48	28	49	40	60	41
17	65	43	68	50	58	32	53	42	41	29	45	32	17	9	31	6.5	35	20	46	30	72	45	51	41
18	76	45	64	49	68	51	64	48	32	26.5	33.5	30	21	9	19	5.5	38	25	45	28	72	40	47	40
19	57	48	67	55	68	45	68	50	38	25	32.5	29	31	16	20	14	42.5	29	32	24	48	37	48	36.5
20	59	46	69	57	63	41	61	50	41	36	29	23	42	18	22	12	32	25	33	27	50	36	65	35
21	65	45	75	57	77	51	57	48	45.5	40.5	29	23.5	42	17	38	19	35	17	40	23	63	36	74	48
22	64	42	64	49	73	56.5	52	44	52.5	42	29	20	28	14	38	24	40	27	52	29	62	39	77.5	50
23	71	46	52	46	65	49	45.5	43	45	38	44	28.5	28	10	30	20	30	20	46	30	41	36	77.5	54
24	63	53	61	44	54	47	46.5	44	57	44	36	23.5	35	24	35	30	44	29	45	30	63	37	57	42
25	76	49	70	45	50	45	46	44	54	42	30.5	18.5	34	16	35	20	31	25	35	30	63	49	69	44
26	76	52	65	45	64	40	46	41	50	40	26	15	38	32	30	13	32	27	37	34	62	45	49.5	39
27	74	57	72	56	53	42	49.5	44	50	31.5	34	17	34	9.5	50	26	31	19	38	34	50	36	50	40
28	74	57	64	44	56.5	44	48.5	45	38	30	33	19	29.5	9.5	45	27	40	12	42	32	60	35	42	39
29	73	49.5	72	48	54	41	47	32	48	37	32	25	32	23	.....	.....	39	22	55	35	59	40	58.0	42
30	74	53.5	66	55	54	43	50	28	47	32	36	30	35	30	.....	.....	37	29	50	30	49	38	59.0	44
31	76	44	58	48	.....	.....	44	25	.....	.....	32	26	35	31	.....	.....	43	34	.....	.....	66	43	.....	.....
Range	38°		34°		48°		43°		32°		35°		40°		49°		42°		32°		44°		43.5	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, ST. LOUIS, MO. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	82	66	95.5	78	88	66	83	67	64	31	40	36	31	11	34	24	61	31	50	40	66	46	72	53
2	77	64	86	73	88	70	77	59	59	46	51	32	11	—9	40	23	42	30	61	30	76	50	66	50
3	76	65	90	73	84	67	80	59	52	37	56	44	1	—12	46	32	41	29	42	25	75	50	72	54
4	87	70	87	69	*84	66	(*)	60	59	41.5	48	38	7	—9	49	32	49	35	46	25	76	60	89	60
5	86	72	90	69	85	66	61	51	65	44	47	33	7	—4	35	30	55	35	51	30	64	54	89	65
6	85	70	92	72	85	66	65	46	72	57	44	29	18	—4	48	28	62	48	71	39	63	45	89	66
7	87	72	91	75	87	68	70	54	61	44	32	25	35	14	42	28	76	51	58	47	64	45	88	60
8	89	75	96.5	75	90	72	80	56	54	35.5	35	29	27	11	50	32	78	60	67	38	68	46	90	67
9	93	75	93	73	81	67	72	64	57	37	33	30	16	3	45	21	76	62	72	53	75	53	91	70
10	94	78	80	71	68	56	75	61	54	43.5	33	30	27	6	58	39	79	57	58	46	87	56	94	68
11	95	79	83	68	64	49	67	57	53	44	37	28	35	24	50	35	55	42	55	40	90	65	91	66
12	96.5	80	84	68	63	45	69	49	58	38	36	28	34	14	45	20	66	43	63	37	87	69	90	69
13	97	81	85	69	66	48	74	50	55	44	34	28	39	16	25	10	57	45	75	46	80	62	92	67
14	96	78	86	69	75	51	85	62	53	36	34	25	31	20	20	4	53	20	70	53	73	60	95	67
15	97	82	85	71	81	57	80	65	49	40	25	21	41	19	40	11	37	25	56	40	63	51	83	67
16	97	82	86	68	84	59	79	58	52	47	32	22	39	25	40	28	30	20	57	42	67	49	70	62
17	98.5	83	90	72	83	62	58	46	52	45	30	15	41	23	37	29	31	16	52	37	78	55	76	53
18	97	80	93	75	87	65	51	38	57	37	22	13	38	20	34	21	41	21	62	37	86	59	78	56
19	96	80	94	78	87	71	60	38	52	45	29	15	22	2	42	20	51	23	68	50	88	61	79	57
20	95	79	86	74	76	54	70	45	59	39	34	26	45	19	35	20	48	37	66	42	88	68	87	59
21	93	78	88	75	65	47	67	46	51	40	30	24	59	30	46	19	47	34	77	49	79	60	77	70
22	83	67	87	70	72	51	53	39	56	36	24	3	58	38	50	41	47	39	83	56	76	51	86	67
23	84	65	87	(*)	80	56	70	43	61	35	21	4	38	29	48	36	61	36	83	62	85	58	79	68
24	88	65	95	76	80	61	68	44	51	39	10	—3	58	31	65	40	55	45	80	60	91	63	84	68
25	90	71	86	69	87	58	64	48	48	35	20	1	53	39	58	23	60	42	73	63	91	73	81	70
26	88	74	81	60	66	49	49	38	43	34	25	13	55	35	29	7	71	51	72	56	90	68	85	70
27	84	72	86	64	66	48	38	29.5	43	31	22	8	61	54	33	11	72	49	72	56	80	60	81	70
28	85	69	88	73	69	55	49	31	45	35	26	6	58	38	57	31	82	57	69	46	91	67	76	67
29	85	67	80	66	81	65	48	33	53	32	33	22	47	36	.....	.....	72	53	79	56	91	68	84	63
30	88	71	81	65	81	66	52	36	51	34	30	16	47	35	.....	.....	61	47	67	49	81	69	85	66
31	91	76	77	69	.....	.....	41	26	.....	.....	33	20	43	33	.....	.....	57	43	.....	.....	82	68	.....	.....
Range	34°.5		.....		45°		.....		41°		59°		73°		61°		66°		58°		46°		45°	
Monthly mean	82°.0		79°.3		69°.3		56°.9		47°.4		27°.2		28°.5		34°.0		47°.8		55°.0		69°.3		73°.3	

* Minimum thermometer broken.

Maximum, minimum, and mean temperatures—Continued.

STATION. ST. MARK'S, FLA. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	85	72	90	74	94	72	86	66	58	35	68	52	69	57	63	46	68	41	75	49	85	56	86	66
2	90	70	91	74	88	71	87	59	68	36	52	39	62	44	48	33	69	39	68	49	80	60	88	62
3	87	73	87	72	88	72	87	59	72	37	57	32	44	30	56	29	72	49	75	42	80	52	80	67
4	85	74	82	73	89	71	85	61	71	41	68	42	33	28	59	33	68	49	62	41	79	55	89	69
5	89	72	81	74	91	73	84	51	74	41	59	33	36	28	71	50	69	44	62	36	80	63	90	67
6	92	75	88	72	90	72	83	51	74	47	58	30	35	22	71	55	72	40	67	34	82	68	92	69
7	93	74	90	72	90	74	83	64	75	49	64	37	54	18	58	51	74	44	71	40	80	64	89	68
8	91	72	86	75	87	74	84	64	80	54	69	46	59	36	54	42	74	47	73	58	75	64	86	71
9	87	73	89	74	88	74	81	66	68	43	65	56	63	38	59	34	73	49	76	57	78	59	77	69
10	88	75	88	73	83	73	76	70	68	39	56	36	54	27	69	38	74	51	74	59	79	55	84	69
11	91	72	88	72	82	72	78	67	74	45	59	30	62	40	64	58	75	51	76	55	81	57	87	71
12	85	72	85	73	86	70	79	62	68	51	69	38	61	44	70	49	75	58	76	51	81	64	90	71
13	90	70	88	72	81	61	77	56	67	41	70	40	60	36	70	47	70	59	77	56	83	66	89	70
14	92	74	91	74	83	58	79	58	71	38	71	56	59	34	61	47	74	58	69	63	82	63	90	72
15	94	76	89	73	86	67	81	55	72	59	67	47	58	35	58	43	74	49	73	61	82	66	88	74
16	92	75	93	71	87	69	81	62	78	65	50	35	66	48	65	47	74	44	74	63	80	67	90	72
17	88	70	90	70	87	67	80	62	76	61	55	39	69	54	67	51	69	54	78	57	80	65	88	72
18	85	73	91	74	86	64	70	51	68	62	52	31	67	52	64	49	67	50	68	50	87	63	91	70
19	89	72	92	72	85	60	65	43	71	60	57	28	63	37	54	40	68	47	72	47	89	66	87	73
20	92	74	91	76	87	63	74	39	67	51	58	42	53	27	60	34	71	43	76	48	89	68	84	63
21	87	72	90	74	86	66	82	60	73	44	67	48	62	29	57	31	73	61	78	55	84	67	88	62
22	90	75	90	73	89	71	82	54	60	39	57	38	63	34	62	33	72	60	82	60	85	67	90	66
23	90	74	89	69	87	71	66	42	69	40	48	29	67	44	65	50	74	60	81	59	84	66	91	65
24	89	77	89	69	85	71	75	39	70	44	59	30	70	40	64	39	77	53	78	57	83	62	88	68
25	86	73	89	64	88	72	78	44	72	51	52	44	73	41	66	37	76	49	77	58	86	53	84	70
26	90	76	89	67	89	69	79	51	68	62	63	44	74	44	70	45	73	49	78	59	88	59	90	71
27	91	75	88	68	87	70	79	52	68	48	45	31	71	55	57	41	77	58	77	65	90	59	91	69
28	88	77	89	70	82	71	77	55	58	37	46	25	74	51	58	41	79	63	81	62	91	66	90	70
29	89	76	89	70	81	68	77	52	59	34	55	30	73	52	....	....	80	61	85	62	90	66	88	73
30	91	75	89	73	85	65	80	63	65	40	62	40	75	53	....	....	80	59	86	60	90	68	89	71
31	92	74	89	72	....	....	64	44	....	....	58	52	71	56	....	....	72	52	....	....	87	67	....	....
Range	24°		29°		36°		48°		46°		46°		57°		42°		41°		52°		39°		30°	
Monthly mean	81°.7		80°.3		76°.9		66°.8		56°.7		48°.3		49°.6		52°.0		61°.3		63°.7		72°.1		77°.5	

Maximum, minimum, and mean temperatures—Continued.

STATION, ST. PAUL, MINN. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	84	60	88	61	86	67	72	55	60	33	38	16	14	18	32	9	20	4	43	19	72	39	68	46
2	81	57	90	63	80	57	72	48	47	31	44	21	−6	−26	30	12	32	5	35	24	68	39	77	44
3	82	58	88	70	80	58	67	44	52	25	40	33	9	−19	29	11	39	16	37	13	56	47	82	51
4	85	60	91	66	88	61	67	42	50	32	39	28	6	−16	34	10	41	28	48	19	58	41	81	62
5	86	66	92	65	94	68	62	38	64	35	36	20	14	−4	24	5	38	23	58	22	47	35	76	50
6	89	69	90	65	78	69	61	47	51	34	37	17	24	9	26	2	47	28	64	40	52	38	68	49
7	88	70	94	67	81	66	60	42	48	23	31	11	32	12	17	−6	42	27	59	34	62	35	68	51
8	89	65	92	72	82	60	55	45	50	31	34	20	13	−2	26	10	48	36	62	36	54	45	85	60
9	80	65	80	62	70	51	58	38	57	30	36	24	12	−11	25	3	61	42	51	45	74	51	76	64
10	82	62	83	60	63	42	63	44	47	41	37	28	28	1	35	10	50	37	58	41	72	55	85	56
11	77	69	83	61	62	40	67	37	50	38	39	24	30	5	27	14	44	29	59	30	71	58	91.5	63
12	87	69	84	58	67	36	72	43	57	32	29	15	34	13	22	6	47	32	57	37	70	57	82	62
13	90	70	85	59	72	36	69	49	49	30	29	16	29	7	6	−18	35	11	54	44	61	53	74	65
14	82	70	82	59	74	41	67	51	47	25	27	12	19	6	5	−16	22	0	61	37	66	46	80.5	63
15	95	69	70	55	82	53	58	41	50	31	27	18	23	3	23	−7	18	0	60	34	71	45	69.5	54
16	96	75	76	52	70	57	60	40	54	32	28	18	25	6	21	2	23	3	61	37	75	48	79	49
17	87	73	72	56	76	52	45	35	56	30	29	13	28	6	23	1	24	5	63	31	74	55	71	49
18	87	66	78	65	80	47	55	30	55	35	24	7	19	−5	26	12	25	7	72	33	76	58	73	50
19	85	73	81	68	69	64	60	34	55	31	20	5	12	15	27	11	31	5	71	43	81	58	74	53
20	90	71	79	69	60	45	70	43	48	30	25	8	27	2	13	−6	36	13	69	40	72	51	74	59
21	82	62	84	66	61	37	57	37	41	25	26	1	45	8	32	13	32	13	71	46	67	49	86	61
22	80	62	76	66	73	38	47	27	45	30	11	2	32	22	27	12	34	22	81	56	61	51	87	63
23	80	60	87	71	66	49	52	36	42	30	4	−13	33	6	20	−2	36	21	76	56	79	55	85	67
24	75	61	81	63	56	40	44	31	39	31	11	6	49	29	26	12	41	30	71	55	86	64	76	67
25	79	67	78	52	56	49	43	30	39	22	17	6	35	17	25	6	52	32	82	52	71	50	86	65
26	84	65	81	54	60	38	34	23	30	15	19	5	46	24	6	−19	59	37	75	52	53	44	85	66
27	83	60	85	63	62	39	36	17	38	28	24	0	45	28	8	−22	68	35	60	37	67	49	78	58
28	83	59	82	61	61	47	38	22	42	21	20	−2	42	18	24	5	67	44	68	37	72	56	81	56
29	72	63	87	58	74	56	39	32	40	20	24	4	43	28	.....	.....	61	39	61	41	82	63	81	55
30	80	60	84	60	81	68	36	21	39	16	20	−4	48	17	.....	.....	54	35	70	36	77	59	80	59
31	87	62	90	80	.....	.....	37	15	.....	.....	25	6	38	18	.....	.....	56	34	.....	.....	63	53	.....	.....
Range	39°		42°		58°		57°		49°		57°		75°		57°		68°		69°		51°		47°.5	
Monthly mean	73°.7		72°		60°.6		46°.3		38°.3		19°.3		16°.6		15°.3		33°.1		50°		58°.7		67°.9	

Maximum, minimum, and mean temperatures—Continued.

STATION, STOCKTON, TEXAS. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	78	70	95	63	88	66	89	59	81	43	63	34	67	33	52	32	73	47	54	47	80	(*)	80	(*)
2	88	63	96	71	88	64	91	57	81	50	71	30	54	22	44	33	52	35	85	70	92	.....	79	.....
3	88	62	95	72	89	67	86	63	68	51	70	42	38	25	61	37	79	43	82	(*)	95	.....	85	.....
4	88	56	99	68	87	68	88	62	71	51	65	31	30	25	63	40	77	47	74	.....	89	.....	90	.....
5	91	62	97	71	87	68	75	64	78	50	65	31	26	21	43	28	80	51	92	.....	92	.....	95	.....
6	95	62	96	71	89	64	82	56	76	52	71	32	40	20	44	28	86	47	87	.....	76	.....	100	.....
7	93	67	95	70	85	65	82	58	75	55	75	33	50	30	60	22	88	55	77	.....	89	.....	101	.....
8	93	67	96	70	87	65	86	59	78	61	53	35	40	9	65	35	80	53	94	.....	89	.....	96	.....
9	94	66	99	71	80	63	89	57	77	45	59	25	51	5	67	43	79	37	(†)	.....	97	.....	97	.....
10	95	68	98	71	71	55	93	59	77	47	77	38	69	22	70	43	81	42	.....	.....	97	.....	100	.....
11	93	68	87	70	71	50	78	58	70	35	59	45	47	28	71	42	79	51	.....	.....	99	.....	91	.....
12	93	68	89	64	78	44	92	51	65	32	48	35	60	22	79	41	75	50	.....	.....	90	.....	81	.....
13	94	68	93	66	89	50	92	50	72	48	44	28	71	31	69	45	75	41	.....	.....	84	.....	92	.....
14	92	67	93	65	92	58	96	65	63	39	32	20	81	35	46	25	73	41	.....	.....	90	.....	96	.....
15	94	70	93	63	87	58	95	65	72	30	48	15	64	42	70	29	78	47	.....	.....	95	.....	98	.....
16	105	70	91	63	89	55	80	51	67	44	42	25	64	28	79	(*)	77	53	.....	.....	95	.....	96	.....
17	100	71	92	63	92	61	76	36	61	40	55	12	64	45	56	.....	58	30	.....	.....	95	.....	91	.....
18	98	71	90	70	93	64	75	44	68	32	47	25	54	28	64	.....	64	33	.....	.....	96	.....	85	.....
19	95	71	90	69	96	65	84	41	65	38	40	17	58	15	75	.....	89	32	.....	.....	101	.....	86	.....
20	94	70	90	68	78	60	92	55	79	52	31	23	62	30	76	.....	82	49	.....	.....	101	.....	89	.....
21	95	70	88	68	82	46	70	51	77	36	57	20	74	28	82	.....	82	47	82	.....	104	.....	80	.....
22	99	70	83	69	93	63	73	33	77	28	55	15	74	50	75	.....	75	45	79	.....	103	.....	92	.....
23	100	72	88	70	95	57	87	42	82	43	64	20	54	30	75	.....	85	52	75	.....	100	.....	100	.....
24	99	73	93	64	98	63	90	49	53	35	36	20	78	38	83	.....	72	49	80	.....	96	.....	99	.....
25	102	71	93	70	94	65	65	44	37	32	22	15	78	33	83	51	87	45	82	.....	97	.....	92	.....
26	92	70	95	68	83	62	64	44	49	24	31	15	75	42	63	27	89	45	93	.....	93	.....	95	.....
27	91	67	96	67	90	67	44	37	55	29	45	21	75	48	70	35	86	46	86	.....	90	.....	99	.....
28	86	67	93	72	96	66	65	36	68	30	42	30	70	42	83	30	74	57	95	.....	92	.....	95	.....
29	78	66	84	69	95	68	81	44	72	39	56	32	65	50	.....	.....	82	45	99	.....	99	.....	93	.....
30	90	68	86	58	95	58	67	34	50	33	47	32	65	54	.....	.....	92	50	101	.....	99	.....	105	.....
31	92	66	90	56	.....	.....	68	45	.....	.....	50	32	53	45	.....	.....	84	58	.....	.....	81	.....	.....	.....
Range	49°		43°		54°		63°		58°		65°		76°		.....		62°		.....		.....		.....	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

* Minimum thermometer broken.

† Maximum thermometer broken.

Maximum, minimum, and mean temperatures—Continued.

STATION, SYDNEY, CAN. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	85.0	56.3	76.3	47.3	77.4	57.6	64.5	35.0	59.5	43.7	35.1	28.0	25.8	19.8	24.7	16.4	19.2	6.0	50.3	35.0	62.3	41.3	75.1	48.6
2	61.0	53.8	65.6	52.7	72.5	60.0	61.2	51.7	47.5	36.3	37.3	23.3	29.2	15.8	28.8	18.3	33.0	9.6	39.8	32.4	61.1	38.3	50.0	42.3
3	68.6	49.0	70.5	57.7	61.4	54.4	57.3	51.5	55.0	38.2	46.8	33.3	32.4	16.3	33.5	26.6	19.5	4.2	33.8	24.2	49.1	34.0	47.4	41.0
4	70.3	55.3	75.3	58.0	62.9	45.0	69.0	53.8	49.5	34.0	46.9	32.4	30.0	3.9	32.9	25.3	37.4	4.4	37.4	21.5	49.4	33.6	48.8	40.5
5	69.4	50.7	74.3	61.0	68.7	40.4	61.0	45.0	38.6	24.0	47.0	33.3	34.8	25.2	34.0	25.4	40.7	9.3	44.0	29.0	54.9	30.4	67.8	45.0
6	56.3	50.0	68.0	59.6	72.7	51.0	56.7	43.7	37.9	21.8	43.5	32.7	37.0	28.6	34.1	13.4	14.3	0.5	43.4	28.8	48.7	42.0	70.0	48.8
7	58.7	45.0	62.4	58.3	57.8	40.0	57.7	37.5	41.0	18.8	34.5	27.8	34.2	20.6	32.7	12.0	21.3	3.6	43.9	30.1	51.8	38.0	60.4	42.8
8	70.6	40.3	72.2	57.6	64.2	35.5	58.3	35.4	50.0	33.0	32.5	26.0	36.8	22.5	24.0	12.0	24.0	19.6	43.5	31.6	60.8	36.4	56.5	38.0
9	71.3	57.3	77.1	59.2	72.0	51.6	60.0	48.3	46.9	33.5	31.2	25.5	31.4	23.5	22.0	10.0	30.2	21.0	43.0	26.7	58.0	32.0	52.6	36.0
10	86.0	61.5	76.0	64.3	76.4	52.3	62.0	47.0	48.8	30.0	34.6	23.7	32.9	18.5	23.0	10.2	41.0	15.5	36.0	24.0	67.5	31.9	58.0	35.4
11	73.0	46.0	77.2	61.2	72.5	54.7	49.2	42.0	48.0	40.2	39.8	34.5	22.7	13.0	30.8	5.3	43.6	27.8	37.2	20.0	60.0	39.7	60.9	32.2
12	74.7	43.0	73.6	57.0	72.3	57.8	52.6	39.8	55.9	35.5	46.9	32.0	25.0	6.1	45.0	30.8	39.0	25.0	48.4	32.0	60.0	33.0	65.0	33.2
13	76.5	53.9	72.0	57.6	76.8	62.2	62.2	42.6	56.0	45.3	36.0	32.0	29.0	10.0	38.4	25.0	33.9	18.0	45.0	30.3	60.9	40.6	58.4	46.0
14	64.0	55.0	79.4	56.0	79.0	64.6	54.5	35.0	50.8	36.0	41.9	32.8	34.0	17.0	26.6	18.3	37.9	14.3	48.5	28.2	68.6	36.5	62.7	44.8
15	66.0	47.8	79.5	53.0	70.5	54.0	60.0	31.5	37.8	28.0	42.5	34.3	17.8	6.1	19.9	4.0	47.0	29.8	45.0	29.7	75.1	43.0	58.5	42.2
16	73.4	41.3	78.4	60.7	57.3	44.0	66.8	50.6	38.0	24.9	44.9	35.0	13.8	3.6	20.6	— 4.3	37.6	26.1	53.0	27.8	77.0	42.5	64.0	43.5
17	74.1	45.3	79.0	62.1	64.5	40.0	68.0	50.6	40.5	30.4	34.3	25.0	18.9	10.6	27.5	13.0	39.0	21.5	51.4	25.0	73.0	50.4	50.7	45.2
18	64.2	57.0	78.7	66.4	73.4	56.0	69.2	53.6	38.0	31.4	31.6	24.7	30.0	11.0	21.7	11.0	44.0	31.0	48.9	27.0	78.4	44.3	46.3	40.3
19	65.4	54.8	68.0	62.6	65.2	40.0	66.3	58.0	45.0	31.0	29.0	21.5	30.3	9.0	18.8	12.0	31.0	23.5	34.7	29.0	71.5	41.8	59.7	34.3
20	61.3	43.0	69.6	60.0	70.0	38.0	59.1	47.3	45.4	42.4	24.3	19.5	21.7	7.4	22.4	8.0	34.3	18.8	38.8	27.0	58.7	43.1	70.0	39.7
21	72.0	41.0	65.3	56.6	74.9	59.6	53.3	43.8	49.3	42.5	28.7	21.5	17.3	—12.0	35.8	22.4	36.7	15.1	44.9	24.0	67.5	46.1	78.7	50.8
22	64.2	56.3	58.0	51.9	71.4	58.0	53.0	42.5	47.0	41.0	42.8	20.8	22.8	—23.0	34.0	11.5	36.1	22.6	44.4	26.7	47.7	32.7	76.1	51.8
23	68.0	54.0	64.7	45.0	60.0	47.3	51.2	36.0	58.0	42.1	38.1	25.5	28.2	10.8	31.0	8.0	42.0	22.0	49.0	24.7	41.5	33.0	70.0	55.4
24	64.0	50.0	71.2	41.3	61.6	41.0	50.0	39.1	55.0	39.0	28.0	20.8	28.2	14.0	35.0	15.4	35.3	17.4	34.0	28.4	55.0	36.6	67.2	53.0
25	77.5	49.0	68.7	50.3	58.6	35.6	50.3	47.5	44.0	38.6	25.0	9.5	37.4	24.0	23.8	— 1.4	40.0	17.3	42.4	30.4	62.4	42.8	77.4	50.0
26	77.0	59.0	69.0	50.8	66.3	42.3	53.9	47.2	50.4	35.0	25.8	17.0	27.6	6.6	40.6	— 2.4	34.1	25.4	40.9	34.0	60.7	39.0	63.1	47.2
27	69.5	62.5	74.0	47.4	65.9	48.4	50.4	44.3	39.1	29.6	27.1	19.4	14.5	8.1	49.0	36.4	33.1	15.3	50.2	30.0	47.6	37.0	56.0	48.5
28	76.4	51.3	72.0	51.8	52.9	44.0	51.8	42.3	54.5	27.4	26.8	20.4	30.8	11.2	36.4	7.3	37.4	10.3	55.2	26.6	64.0	38.5	73.6	50.0
29	74.3	48.6	66.3	48.7	57.7	45.0	48.0	29.7	55.1	36.8	26.1	20.8	33.3	28.3	.....	.....	38.0	26.4	66.6	42.1	57.6	36.4	72.7	54.0
30	70.8	48.4	70.0	48.6	63.1	38.8	50.4	29.3	40.5	31.8	26.0	20.0	29.2	25.5	.....	.....	36.7	29.5	69.4	44.7	69.1	35.0	59.0	50.5
31	77.0	46.3	69.9	46.0	.....	.....	59.7	47.9	.....	.....	26.6	19.2	32.0	20.2	.....	.....	46.7	32.0	.....	.....	75.0	49.8	.....	.....
Range	45°.7		38°.2		43°.5		39°.9		40°.7		37°.5		60°.4		53°.3		46°.5		49°.4		48°.0		46°.8	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, THATCHER'S ISLAND, MASS. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	84	64	65	57	74	61	68	53	49	38	42	29	35	17	27	10	34	18	39	26	60	43	77	52
2	82	63	74	58	76	60	70	55	55	39	52	39	38	15	29	10	37	18	42	32	58	39	76	58
3	82	64	74	59	70	60	70	56	53	37	52	39	18	7	35	24	42	25	42	28	56	37	62	49
4	75	66	70	60	62	60	68	56	45	28	48	36	27	11	34	26	41	28	28	24	59	41	60	47
5	86	64	74	58	63	59	67	53	39	23	39	29	32	20	35	20	40	23	41	19	62	45	67	50
6	75	63	70	58	71	59	57	49	40	25	34	24	25	17	35	27	32	18	51	32	63	45	70	54
7	75	60	76	60	62	57	65	45	44	28	29	18	30	13	35	21	31	24	51	34	61	41	60	45
8	82	63	78	61	71	56	66	53	36	30	30	19	37	27	31	20	39	23	45	34	63	44	67	45
9	77	63	71	61	72	55	65	52	41	33	45	23	41	31	33	22	38	28	49	34	63	45	63	49
10	78	60	78	63	71	60	58	48	45	35	52	39	32	17	26	10	49	33	44	34	62	43	65	51
11	78	61	75	63	65	63	57	45	54	35	49	37	28	16	45	23	56	32	43	31	63	44	63	50
12	74	62	77	61	74	63	53	45	57	45	40	32	38	20	45	30	41	29	42	30	61	43	59	51
13	78	63	76	62	72	64	61	47	50	38	35	30	36	25	36	20	40	27	48	32	62	47	70	54
14	74	58	79	60	71	61	62	46	42	31	35	27	37	27	23	12	45	33	55	36	62	46	72	54
15	70	59	73	62	65	56	63	48	45	27	41	31	29	7	25	8	40	30	54	32	63	44	63	50
16	72	55	77	64	68	56	65	53	51	37	35	19	30	4	33	9	39	23	54	38	60	48	54	49
17	64	56	70	64	67	56	65	53	49	42	31	17	34	13	37	27	39	25	46	37	64	47	64	51
18	84	57	72	61	74	59	64	55	48	41	34	21	41	28	30	23	36	23	40	33	67	49	66	50
19	82	67	77	58	72	61	58	42	44	38	31	20	36	21	28	19	46	24	38	31	59	49	67	52
20	75	64	75	64	75	61	56	40	42	39	32	19	51	11	34	21	39	25	54	33	66	50	68	50
21	75	63	71	63	74	62	69	48	51	37	42	20	28	6	21	13	38	31	57	39	64	49	70	54
22	75	63	70	58	65	55	61	50	50	40	46	31	29	20	26	11	39	27	56	39	64	46	74	55
23	78	59	74	57	65	51	58	51	49	40	34	20	41	23	41	20	40	29	58	41	56	43	76	56
24	79	58	69	57	67	50	57	50	47	37	25	17	36	21	25	16	45	32	58	37	61	42	74	60
25	77	59	64	58	75	60	54	49	48	35	29	14	44	24	35	11	50	34	51	38	60	46	76	59
26	71	60	70	59	71	57	59	49	46	33	31	18	25	5	48	28	49	31	47	35	58	47	73	60
27	71	58	70	55	61	50	56	49	47	28	32	20	37	4	40	12	41	34	56	36	61	43	76	59
28	78	61	67	56	60	45	54	41	50	41	29	20	45	35	21	11	40	34	54	41	64	48	79	60
29	77	60	74	57	63	45	52	36	46	36	28	15	41	22	.....	.....	44	35	60	44	70	50	72	60
30	66	59	79	57	64	52	52	46	46	34	29	19	31	19	.....	.....	49	35	57	42	67	50	75	60
31	61	56	73	58	.....	.....	51	43	.....	.....	31	18	39	22	.....	.....	41	29	.....	.....	69	50	.....	.....
Range	31°		24°		31°		34°		34°		38°		41°		40°		38°		41°		33°		34°	
Monthly mean	67°.7		65°.3		61°.7		54°.5		41°.4		31°.0		26°.4		26°.1		34°.3		41°.7		53°.5		60°.4	

Maximum, minimum, and mean temperatures—Continued.

STATION, TOLEDO, OHIO. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	89	71	83	69	76	68	81	64	49	26	42	35	30	15	31	19	48	37	48	31	56	33	74	52
2	76	60	84	66	85	65	74	60	54	35	45	40	28	— 9	34	19	35	24	40	24	57	31	60	47
3	70	63	84	67	75	63	73	56	49	28	44	34	4	—12	38	23	39	17	32	15	63	41	57	53
4	77	65	86	70	74	60	66	54	43	28	42	29	12	— 2	41	28	44	34	41	23	66	51	76	52
5	80	66	85	70	79	61	59	47	54	27	39	27	14	2	40	29	40	28	44	25	61	48	77	60
6	84	64	82	69	83	65	61	40	60	36	41	32	25	12	39	28	50	34	55	31	54	40	68	57
7	87	72	84	65	83	68	65	43	48	30	38	29	27	12	40	23	41	29	52	35	58	42	62	43
8	87	71	89	68	85	69	69	49	47	31	36	25	31	20	45	25	59	32	60	35	56	34	67	51
9	87	72	87	71	83	67	68	47	51	37	46	25	22	11	41	25	67	53	62	42	63	43	81	55
10	83	75	79	66	76	62	60	38	55	37	41	33	21	3	47	25	65	43	57	40	76	50	84	67
11	81	72	79	62	64	55	59	48	55	45	38	33	27	15	48	37	60	38	44	31	80	60	84	65
12	86	73	79	61	60	53	63	41	53	44	36	31	27	9	37	22	51	33	52	30	86	64	78	65
13	79	73	83	64	59	50	65	45	52	34	39	29	33	19	26	15	49	41	61	44	83	65	75	57
14	88	69	81	65	69	47	76	54	43	33	41	28	32	24	17	4	41	26	49	37	77	63	80	60
15	88	74	85	65	70	48	78	63	50	35	32	19	30	21	26	5	30	21	51	32	66	51	80	68
16	90	75	84	65	75	54	77	63	52	41	35	19	33	19	33	20	33	20	50	37	65	45	69	55
17	95	78	78	62	80	57	72	47	56	48	32	25	37	19	28	20	31	20	47	34	67	48	66	45
18	93	76	77	66	82	62	55	39	54	47	29	15	37	26	30	15	32	20	52	33	73	50	76	52
19	82	71	79	69	83	65	52	35	58	43	25	15	26	13	28	18	37	23	57	35	73	49	69	50
20	91	73	76	65	80	56	62	37	57	43	28	12	22	7	30	16	35	29	58	38	84	57	77	60
21	84	68	77	58	65	50	66	46	50	40	34	24	40	17	29	15	41	27	62	39	73	52	82	62
22	78	58	78	57	65	45	59	41	46	35	32	8	42	30	45	28	37	30	66	45	62	41	83	64
23	80	57	83	61	69	48	54	36	50	32	16	6	37	25	36	23	43	31	79	49	64	49	86	65
24	83	65	80	70	70	59	54	40	46	32	11	— 2	42	25	27	20	46	37	62	46	81	52	88	73
25	87	65	76	60	78	57	69	46	43	35	15	7	45	30	35	22	41	26	76	62	73	56	91	70
26	77	67	77	53	66	49	52	36	41	29	20	7	36	17	29	17	46	34	70	59	56	49	86	70
27	79	66	77	57	57	42	43	33	40	34	26	14	47	35	19	5	46	33	73	60	65	51	88	72
28	77	62	80	62	64	45	47	27	45	33	22	14	47	38	40	12	56	38	63	52	70	53	76	64
29	70	60	75	58	71	55	56	38	45	33	25	7	39	29	.....	.....	61	46	67	48	84	58	77	61
30	77	60	77	58	79	63	52	38	44	33	27	15	41	27	.....	.....	46	36	57	40	88	70	76	59
31	85	65	73	68	.....	.....	40	32	.....	.....	24	6	38	27	.....	.....	47	26	.....	.....	87	68	.....	.....
Range	38°		36°		43°		54°		34°		48°		59°		44°		50°		64°		57°		48°	
Monthly mean	76°.5		*73°.6		66°.1		54°.2		43°.9		27°.7		25°.6		28°.6		39°.2		49°.0		62°.2		69°.4	

*Mean temperature for thirty days only.

Maximum, minimum, and mean temperatures.—Continued.

STATION, TORONTO, CAN. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	87.9	62.9	78.0	60.5	71.7	65.1	71.7	54.1	45.6	30.6	40.3	27.1	26.2	13.8	25.1	4.5	40.4	23.5	41.5	23.6	40.7	31.7	71.1	54.3
2	87.0	65.5	81.5	61.0	80.7	62.3	72.1	51.3	46.1	31.5	44.1	38.0	22.9	3.1	27.4	4.5	26.2	11.8	30.8	22.0	51.3	31.4	58.5	51.5
3	74.7	67.5	82.1	62.5	76.1	64.5	70.3	47.5	40.6	29.2	42.1	32.5	19.1	2.9	30.7	24.6	30.2	5.9	26.2	14.9	58.3	31.8	56.6	48.5
4	78.7	67.5	82.7	62.9	75.1	62.7	65.0	43.5	39.4	23.1	34.0	24.3	24.3	16.0	32.0	17.3	37.2	18.2	23.5	13.8	53.1	31.5	65.0	47.5
5	86.9	65.7	74.5	61.5	76.0	63.5	56.3	40.5	31.2	20.5	28.0	19.6	31.0	4.5	31.0	25.2	34.2	19.6	29.0	16.7	63.0	37.3	69.9	46.0
6	81.2	68.9	76.8	62.2	78.7	63.7	56.1	39.1	34.0	23.9	32.4	18.9	31.6	4.5	31.6	19.9	41.1	15.7	47.1	18.2	51.1	35.5	56.6	40.5
7	86.7	63.0	77.9	60.5	75.5	67.9	55.6	36.9	37.4	21.6	28.0	19.6	30.2	24.6	30.2	19.4	32.2	18.6	42.1	28.8	55.9	38.5	66.4	38.5
8	83.7	69.5	85.9	61.9	77.9	67.3	60.6	41.5	36.2	25.6	33.6	15.1	33.6	17.3	33.6	17.7	34.2	21.6	49.1	26.2	59.4	38.5	68.4	40.7
9	84.9	67.5	80.5	63.2	74.1	62.0	67.7	44.3	39.7	22.2	39.5	29.6	34.2	25.2	34.2	11.8	44.3	26.2	58.8	31.6	61.0	35.0	68.5	49.5
10	81.6	67.3	80.1	61.3	77.4	61.3	56.4	41.1	49.3	32.7	40.3	32.9	35.1	21.6	35.1	10.0	49.4	32.3	44.1	30.4	64.5	37.8	79.3	47.5
11	72.9	64.3	77.4	58.5	62.3	53.3	54.0	40.5	46.9	36.9	33.2	30.1	37.2	19.4	37.2	28.2	47.8	29.0	38.3	25.9	67.4	41.9	78.7	57.5
12	73.3	63.9	75.3	57.5	60.0	52.5	61.0	38.2	47.3	38.7	33.2	27.2	24.0	3.9	29.2	11.8	38.3	25.8	43.1	28.0	74.8	46.5	76.1	60.5
13	80.0	63.2	76.1	58.3	68.0	50.5	63.0	36.9	41.9	29.0	32.3	26.2	26.2	15.8	14.3	1.0	38.4	26.5	41.1	27.0	81.5	50.7	72.3	53.7
14	87.7	65.5	79.1	59.5	65.0	49.7	65.9	47.4	40.1	24.1	29.3	18.1	27.2	14.2	12.6	−3.0	36.0	25.0	48.3	28.7	75.5	53.9	70.3	44.5
15	76.7	67.8	80.3	61.1	65.4	45.5	68.4	56.7	41.3	25.6	19.1	14.0	17.3	−0.6	17.3	−2.2	27.2	16.0	44.4	28.6	66.6	52.2	62.0	51.5
16	85.9	65.7	78.5	64.3	70.7	46.7	67.6	55.9	42.1	33.7	23.7	8.3	14.3	6.8	28.2	14.6	26.7	13.7	45.6	31.0	66.0	48.1	66.9	48.1
17	95.4	67.7	77.4	60.7	74.7	59.8	63.3	47.5	46.1	40.5	29.2	20.6	30.2	0.1	22.9	12.1	26.2	16.7	48.9	32.4	70.3	40.4	61.5	42.7
18	84.3	71.9	75.6	56.5	69.0	57.7	50.5	42.7	50.1	42.5	31.2	22.4	31.7	15.0	20.3	10.2	28.6	10.6	53.8	36.5	72.5	45.3	67.5	47.0
19	88.7	67.7	75.6	60.5	74.5	57.3	45.1	37.7	48.3	37.0	29.7	15.3	24.6	9.2	24.6	9.2	31.0	14.7	54.1	38.0	74.1	48.5	67.2	46.0
20	86.0	65.4	77.1	61.7	75.6	60.0	58.0	34.5	47.9	38.5	22.5	18.1	23.3	4.1	23.3	4.1	35.7	19.6	56.4	35.5	73.5	48.2	73.3	49.7
21	78.0	65.3	78.7	62.5	61.8	45.5	61.2	43.9	46.1	30.3	30.6	19.0	14.1	−4.1	14.1	−4.1	36.6	23.9	62.2	28.1	65.0	48.0	74.7	51.5
22	73.8	59.7	78.1	61.7	57.5	38.1	60.6	42.5	42.2	36.0	29.0	17.2	32.4	8.3	32.4	8.3	31.2	24.1	65.2	37.7	60.8	42.5	76.4	61.5
23	78.1	57.7	79.1	60.3	61.0	40.8	54.0	37.5	40.6	34.3	18.3	6.7	26.2	7.8	26.2	7.8	34.2	24.1	56.4	35.7	62.5	43.5	77.0	58.3
24	78.9	52.5	73.3	61.5	69.0	48.3	52.6	32.3	42.5	33.2	12.8	7.2	17.2	4.4	17.2	4.4	37.9	29.1	50.8	35.5	61.8	39.5	83.3	54.7
25	79.5	58.5	70.7	52.5	64.4	45.0	51.7	38.5	36.0	29.6	22.0	12.4	26.7	8.9	26.7	8.9	32.4	22.8	61.0	38.7	73.1	45.5	84.3	60.9
26	67.0	62.7	75.3	48.3	63.3	44.7	50.1	39.2	35.2	29.0	24.9	16.9	22.3	0.4	28.4	2.4	34.2	21.6	61.0	45.9	53.1	37.7	84.1	61.3
27	79.9	58.9	75.1	51.5	52.3	40.5	42.1	33.1	40.3	30.1	29.0	16.7	41.1	21.6	10.3	−6.9	36.4	30.5	60.0	45.5	51.8	36.7	84.9	65.4
28	72.3	55.5	73.9	57.5	55.1	38.5	41.7	29.1	40.5	34.5	24.4	14.7	38.2	28.0	25.6	−7.7	39.1	32.3	61.0	43.3	68.0	37.1	71.9	61.7
29	70.0	54.5	77.0	61.5	61.7	44.7	45.9	29.9	41.1	32.3	22.5	14.8	30.6	21.2	.....	.....	43.1	33.5	55.0	31.9	69.7	47.3	78.4	59.5
30	71.9	62.3	78.6	57.3	69.6	55.3	45.5	37.7	39.0	29.5	25.2	13.0	36.3	19.6	.....	.....	37.2	28.0	48.4	34.3	79.8	51.3	75.4	55.0
31	78.1	63.5	76.3	64.3	.....	.....	41.5	30.7	.....	.....	22.5	14.7	35.2	23.5	.....	.....	37.4	24.3	.....	.....	80.0	57.7	.....	.....
Range	42°.9		37°.6		42°.6		43°.0		29°.6		37°.4		45°.2		44°.9		43°.5		51°.4		50°.1		46°.4	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, TUCSON, ARIZ. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		* April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	102	65	(*)	77	(*)	75	(*)	63	(*)	50	(*)	33	(*)	38	55	39	80	48	72	54	96	61	95	53
2	101	81	.....	75	.....	73	.....	60	.....	50	.....	38	.....	45	62	50	84	50	75	54	96	61	102	55
3	100	78	.....	80	.....	72	.....	63	.....	51	.....	38	.....	48	67	52	78	57	80	50	92	62	101	68
4	98	78	.....	75	.....	65	.....	67	.....	51	.....	41	.....	48	56	46	77	51	85	60	85	63	101	69
5	99	77	.....	82	.....	70	.....	66	.....	49	.....	38	.....	42	55	45	78	48	74	54	85	61	102	68
6	100	71	.....	80	.....	66	.....	69	.....	48	.....	42	.....	44	54	33	81	51	77	46	86	56	100	66
7	103	68	.....	78	.....	66	.....	64	.....	48	.....	40	.....	38	60	35	75	47	80	50	91	56	96	61
8	105	77	.....	77	.....	65	.....	64	.....	44	.....	34	.....	30	60	37	65	41	71	46	91	58	98	58
9	105	80	.....	78	.....	64	.....	60	.....	40	.....	29	.....	30	64	46	69	39	75	43	95	57	100	58
10	100	79	.....	75	.....	64	.....	65	.....	42	.....	39	.....	33	67	37	71	41	83	45	94	59	101	60
11	98	75	.....	76	.....	71	.....	66	.....	44	.....	46	.....	28	68	36	75	42	80	55	82	55	95	57
12	97	65	.....	77	.....	70	.....	61	.....	44	.....	34	.....	33	72	42	80	45	59	46	84	45	98	57
13	98	74	.....	77	.....	71	.....	60	.....	46	.....	25	.....	43	75	45	80	47	66	39	92	53	95	58
14	97	74	.....	80	.....	63	.....	60	.....	43	.....	24	.....	44	79	48	82	48	74	49	93	55	98	59
15	94	75	.....	85	.....	65	.....	57	.....	44	.....	32	54	36	74	46	80	52	73	49	92	57	100	63
16	94	73	.....	76	.....	64	.....	62	.....	40	.....	25	58	27	71	46	76	49	75	50	93	55	102	62
17	96	72	.....	73	.....	62	.....	53	.....	40	.....	30	55	29	75	41	78	48	85	46	93	59	100	64
18	97	72	.....	75	.....	65	.....	55	.....	40	.....	27	56	28	74	42	80	45	90	58	92	64	99	62
19	98	81	.....	76	.....	60	.....	65	.....	42	.....	28	59	29	80	44	77	49	88	61	92	61	101	63
20	97	78	.....	78	.....	55	.....	63	.....	40	.....	25	70	49	82	47	75	46	80	56	95	59	105	66
21	97	73	.....	69	.....	55	.....	66	.....	47	.....	25	67	43	80	48	75	55	70	56	92	63	103	65
22	96	75	.....	69	.....	58	.....	61	.....	50	.....	27	68	36	76	44	75	46	73	45	99	63	103	75
23	98	78	.....	67	.....	62	.....	58	.....	45	.....	27	75	35	80	48	83	49	80	47	94	54	105	69
24	98	80	.....	68	.....	62	.....	61	.....	47	.....	35	75	39	79	46	80	49	81	53	96	55	103	70
25	97	74	.....	74	.....	61	.....	59	.....	42	.....	40	79	42	78	44	85	51	85	50	94	53	100	75
26	100	82	.....	76	.....	60	.....	60	.....	38	.....	30	71	42	79	46	88	52	88	54	97	51	101	70
27	98	78	.....	76	.....	59	.....	59	.....	32	.....	31	63	36	82	49	83	57	91	53	95	56	102	69
28	93	78	.....	77	.....	60	.....	46	.....	38	.....	44	65	37	82	50	84	53	94	57	95	56	104	74
29	97	85	.....	77	.....	67	75	55	.....	40	.....	42	72	40	.....	.....	90	62	97	59	96	57	99	68
30	(*)	76	.....	73	.....	65	77	45	.....	28	.....	43	55	40	.....	.....	85	66	94	60	95	56	98	69
31	.....	83	.....	73	.....	.....	82	46	.....	.....	.....	36	63	31	.....	.....	73	59	.....	.....	96	53	.....	.....
Range	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	49°		51°		58°		54°		52°	
Monthly mean	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* Maximum thermometer broken.

Maximum, minimum, and mean temperatures—Continued.

STATION, TYBEE ISLAND, GA. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	85	73	97	76	93	79	75	66	55	41	67	58	57	44	56	44	.....	.....	.....	.....	.....	.....	.....	.....
2	84	73	97	76	91	76	80	70	65	42	57	43	53	40	47	31	.....	.....	.....	.....	.....	.....	.....	.....
3	85	75	97	73	86	73	80	69	68	46	59	39	45	27	57	33	.....	.....	.....	.....	.....	.....	.....	.....
4	84	74	93	74	89	74	79	69	66	54	63	44	37	24	58	36	.....	.....	.....	.....	.....	.....	.....	.....
5	87	74	81	75	99	76	80	67	67	60	55	41	40	31	63	48	.....	.....	.....	.....	.....	.....	.....	.....
6	85	75	86	72	88	76	86	66	74	60	61	40	37	29	60	53	.....	.....	.....	.....	.....	.....	.....	.....
7	90	74	93	75	85	75	85	72	78	58	61	42	42	28	53	48	.....	.....	.....	.....	.....	.....	.....	.....
8	88	78	91	74	83	76	84	73	73	60	59	53	57	43	48	38	.....	.....	.....	.....	.....	.....	.....	.....
9	89	77	95	76	85	75	83	73	61	48	68	56	63	42	53	39	.....	.....	.....	.....	.....	.....	.....	.....
10	92	76	93	74	82	74	77	67	66	49	63	39	45	30	54	45	.....	.....	.....	.....	.....	.....	.....	.....
11	94	76	94	77	82	74	75	67	73	50	61	35	55	42	63	54	.....	.....	.....	.....	.....	.....	.....	.....
12	86	78	93	77	85	74	72	63	68	57	63	45	62	47	68	51	.....	.....	.....	.....	.....	.....	.....	.....
13	90	78	91	76	84	65	74	67	65	48	58	50	54	40	68	49	.....	.....	.....	.....	.....	.....	.....	.....
14	96	76	91	77	80	65	73	65	63	53	60	50	65	41	60	45	.....	.....	.....	.....	.....	.....	.....	.....
15	90	77	92	77	78	69	76	67	66	53	65	50	53	43	48	44	.....	.....	.....	.....	.....	.....	.....	.....
16	87	77	90	78	78	69	82	70	68	59	54	40	64	46	(*)	(*)	.....	.....	.....	.....	.....	.....	.....	.....
17	86	78	90	77	79	70	81	67	72	62	57	44	58	48	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
18	88	76	94	76	81	68	72	56	64	59	57	37	63	52	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
19	96	76	99	77	80	69	61	46	62	53	49	38	49	36	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
20	86	71	101	80	86	70	68	56	64	50	52	44	51	28	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
21	90	72	90	76	87	71	69	65	68	50	64	52	61	39	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
22	98	77	85	74	86	73	71	65	57	44	55	40	65	42	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
23	88	79	84	75	82	72	67	51	65	42	46	32	69	48	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
24	89	79	82	75	84	73	68	52	69	45	60	35	72	47	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
25	87	78	88	69	82	75	71	57	72	53	52	40	73	49	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
26	92	74	94	73	86	74	70	61	68	60	58	42	59	50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
27	95	76	91	78	82	70	72	62	68	54	42	28	60	50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
28	92	78	96	75	72	66	72	61	55	41	40	25	73	55	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
29	91	76	91	76	78	66	68	63	59	42	48	35	79	58	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
30	92	78	91	76	77	68	79	65	61	49	54	46	62	52	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
31	95	79	93	78	.....	.....	66	46	.....	.....	49	44	61	51	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Range	27°		29°		28°		40°		37°		43°		55°		.....		.....		.....		.....		.....	
Monthly mean	81°.5		82°.5		77°.4		68°.7		58°.4		49°.6		49°.8		†50°.4		.....		.....		.....		.....	

*Station discontinued February 15, 1879.

†Monthly mean for fifteen days only.

Maximum, minimum, and mean temperatures—Continued.

STATION, UMATILLA, OREG. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	91.0	58.0	90.0	69.0	93.0	49.0	65.0	54.0	65.0	38.5	42.5	34.0	21.0	− 1.0	30.0	21.0	48.0	31.0	76.0	42.0	79.5	55.5	88.0	50.0
2	77.0	54.0	93.0	61.0	84.0	65.0	67.0	44.0	58.5	33.0	56.5	39.5	20.0	+ 1.5	32.0	23.0	54.0	37.0	77.0	43.0	59.0	47.5	82.0	58.5
3	73.0	54.0	95.0	63.0	84.0	51.0	66.0	38.0	55.5	31.5	53.0	44.5	19.0	− 1.0	38.0	22.0	51.5	28.0	71.0	51.0	65.0	39.0	82.0	57.0
4	79.0	55.0	95.0	67.0	84.0	49.0	68.0	35.0	52.5	35.5	49.0	41.5	19.0	− 2.5	36.0	17.0	52.0	37.0	73.0	43.0	71.0	42.0	82.0	46.5
5	82.0	46.0	82.0	64.0	89.0	47.0	73.0	46.0	52.5	46.0	47.0	42.5	20.0	0.0	38.0	23.0	52.0	28.0	70.0	53.0	73.0	47.0	75.0	56.0
6	89.0	59.0	84.0	47.0	88.0	53.0	72.0	45.0	52.5	44.0	46.0	42.0	33.0	14.0	45.5	29.0	62.0	37.0	72.0	41.5	69.0	47.0	71.0	51.0
7	92.0	58.0	96.0	49.0	77.0	49.0	67.0	55.0	55.2	35.5	54.0	42.0	28.5	8.0	45.0	32.0	55.0	33.0	64.0	48.5	63.5	37.0	72.5	49.0
8	98.0	57.0	92.0	64.0	78.0	41.0	69.0	42.0	53.0	34.5	45.0	34.0	37.0	21.5	54.5	36.0	56.0	31.5	56.5	37.0	67.0	42.0	75.0	50.0
9	88.0	58.0	98.0	56.0	81.0	44.0	63.0	50.0	56.0	40.0	52.0	38.0	38.0	27.0	48.0	35.0	51.0	36.5	61.5	38.0	67.0	41.5	75.0	50.0
10	82.0	69.0	99.0	57.0	85.0	41.0	61.0	45.0	51.0	30.5	51.5	37.0	40.0	15.0	47.0	33.5	57.0	38.5	54.5	43.0	69.0	44.0	79.0	55.0
11	82.0	57.0	96.0	63.0	82.0	46.0	59.0	51.0	49.0	28.0	45.5	28.0	43.5	30.0	38.5	26.0	62.5	44.0	62.0	33.0	67.0	49.0	83.0	49.0
12	91.0	53.0	95.0	61.0	83.0	48.0	61.0	49.0	47.5	27.0	40.0	20.0	42.0	18.0	32.0	21.0	65.5	41.5	62.0	34.0	72.5	53.5	87.0	51.5
13	76.0	61.0	99.0	59.0	74.0	59.0	59.0	36.0	44.5	29.0	37.0	19.0	46.0	37.0	27.0	11.0	64.0	34.0	66.0	46.0	67.0	47.0	91.0	56.0
14	92.0	56.0	100.0	57.0	70.0	41.0	51.0	38.0	56.0	34.5	35.0	17.0	37.0	22.0	33.0	18.0	64.0	34.5	62.0	45.0	64.0	51.5	84.0	57.5
15	81.0	56.0	93.0	62.0	70.0	40.0	58.0	43.2	55.5	42.0	37.0	23.0	40.0	12.5	32.0	18.0	62.5	48.0	60.0	39.0	65.0	44.0	75.0	50.0
16	78.0	63.0	86.0	66.0	72.0	38.0	57.5	35.0	73.0	49.0	34.0	18.0	37.0	15.0	32.0	19.0	61.0	35.0	59.0	38.0	69.0	42.0	76.0	47.0
17	80.0	56.0	76.0	60.0	81.0	37.0	68.0	47.0	63.0	51.0	35.0	21.0	38.0	26.0	33.0	16.0	63.0	45.5	63.0	46.0	70.0	44.5	83.0	49.0
18	88.0	59.0	83.0	57.0	80.0	40.0	71.5	46.0	52.5	40.0	37.5	23.5	39.5	24.0	43.5	21.0	60.0	39.0	56.0	40.0	68.0	51.0	84.0	54.5
19	94.0	56.0	92.0	57.0	78.0	49.0	70.7	48.5	53.3	44.5	33.0	28.5	43.0	29.0	45.0	34.0	58.0	44.0	62.0	42.5	67.0	44.0	87.0	56.5
20	92.0	62.0	88.0	66.0	79.0	47.0	58.5	45.2	63.0	48.5	33.5	26.5	41.5	28.0	47.0	30.0	57.0	40.0	64.0	46.0	70.0	44.0	84.0	56.0
21	94.0	63.0	81.0	57.0	78.0	49.0	62.8	41.0	59.5	40.3	31.0	24.0	44.0	31.0	47.5	38.0	58.0	30.5	68.0	41.0	74.0	42.5	78.0	58.5
22	96.0	65.0	90.0	49.0	72.0	51.0	61.5	48.5	55.5	43.0	30.5	24.0	36.0	23.0	48.0	29.0	56.0	41.0	73.0	36.5	75.0	51.0	70.0	51.0
23	98.0	65.0	90.0	67.0	66.0	48.0	58.8	37.0	50.5	31.5	33.0	25.0	42.0	33.0	54.0	39.0	59.0	35.5	77.0	43.0	71.5	50.0	73.0	51.0
24	94.0	67.0	91.0	61.0	68.0	47.0	55.0	28.0	45.5	24.5	32.0	15.0	45.0	31.0	57.0	41.5	71.5	44.0	72.0	42.0	69.0	50.5	77.0	51.5
25	93.0	66.0	87.0	64.0	72.0	41.0	59.8	36.0	39.0	23.5	32.0	20.0	40.0	29.0	53.5	33.0	70.0	49.5	67.0	40.0	78.0	47.5	80.0	53.5
26	92.0	67.0	92.0	55.0	73.0	51.0	51.5	25.0	47.0	28.5	31.0	24.0	38.0	29.0	61.0	39.5	63.5	49.0	71.0	43.0	72.0	55.5	84.0	53.0
27	94.0	59.0	96.0	55.0	67.0	52.0	57.0	28.0	42.0	28.5	31.0	23.0	38.0	28.0	65.5	47.0	60.0	43.5	69.0	46.0	73.0	49.0	91.0	50.0
28	93.0	61.0	99.0	69.0	66.0	49.0	62.0	32.0	47.0	29.0	29.0	19.5	34.0	26.0	52.0	38.0	68.0	46.0	77.0	45.0	71.5	52.5	83.5	61.5
29	93.0	63.0	92.0	68.0	59.0	45.0	63.6	36.0	46.0	27.0	24.0	19.0	33.0	26.0	.....	.....	73.0	48.0	76.5	44.0	70.5	48.0	76.5	52.0
30	93.0	58.0	85.0	58.0	66.0	51.0	61.0	37.0	39.0	26.5	25.0	8.0	33.0	19.0	.....	.....	77.5	49.0	81.0	46.0	75.0	48.5	83.0	46.0
31	100.0	59.0	86.0	50.0	.....	.....	63.8	35.5	.....	.....	26.0	9.0	34.0	18.0	.....	.....	74.0	54.0	.....	.....	81.5	48.5	.....	.....
Range	54°.0		53°.0		56°.0		48°.0		49°.5		48°.5		48°.5		54°.5		49°.5		48°.0		44°.5		45°.0	
Monthly mean	74°.3		76°.1		62°.3		51°.5		43°.3		32°.4		27°.6		35°.5		49°.8		54°.7		58°.2		65°.3	

Maximum, minimum, and mean temperatures—Continued.

STATION, UNALASHKA, ALASKA. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	.....	.....	.....	.....	(*)	†45	.....	38	45	36	40	28	43	34	33	24	29	22	42	31	.....	.....	.....	.....
2	.....	.....	.....	.....	.....	44	.....	38	43	30	38	28	38	29	39	30	31	20	39	32	.....	.....	.....	.....
3	.....	.....	.....	.....	.....	46	.....	30	39	26	35	19	37	30	40	26	28	21	40	30	.....	.....	.....	.....
4	.....	.....	.....	.....	.....	44	.....	30	38	27	38	27	36	29	39	27	40	20	40	31	.....	.....	.....	.....
5	.....	.....	.....	.....	.....	45	.....	29	40	25	37	33	36	32	41	32	40	31	42	31	.....	.....	.....	.....
6	.....	.....	.....	.....	.....	45	.....	33	40	30	39	33	36	32	38	34	40	32	39	29	.....	.....	.....	.....
7	.....	.....	.....	.....	.....	45	.....	38	48	32	37	29	36	34	39	34	45	32	36	27	.....	.....	.....	.....
8	.....	.....	.....	.....	.....	45	.....	40	40	32	38	28	42	30	39	35	39	32	45	30	.....	.....	.....	.....
9	.....	.....	.....	.....	.....	46	.....	39	43	30	38	33	37	30	38	33	37	31	36	29	.....	.....	.....	.....
10	.....	.....	.....	.....	.....	42	.....	40	37	27	38	27	37	30	39	32	35	32	37	27	.....	.....	.....	.....
11	.....	.....	.....	.....	.....	43	.....	40	38	32	39	34	45	34	36	33	42	28	33	27	.....	.....	.....	.....
12	.....	.....	.....	.....	.....	46	.....	39	38	26	39	32	44	36	39	34	40	18	35	22	.....	.....	.....	.....
13	.....	.....	.....	.....	.....	47	.....	42	40	26	42	34	48	33	44	34	36	30	39	21	.....	.....	.....	.....
14	.....	.....	.....	.....	.....	47	.....	38	43	27	38	32	33	26	37	32	43	26	32	26	.....	.....	.....	.....
15	.....	.....	.....	.....	.....	43	.....	37	39	27	38	32	33	28	36	24	45	15	34	21	.....	.....	.....	.....
16	.....	.....	.....	.....	.....	42	.....	30	37	27	38	32	36	27	33	26	39	29	38	23	.....	.....	.....	.....
17	.....	.....	.....	.....	.....	44	.....	28	37	33	37	28.5	30	26	32	24	37	29	35	23	.....	.....	.....	.....
18	.....	.....	.....	.....	.....	45	.....	29	38	31	35	28	33	27	33	26	40	29	49	29	.....	.....	.....	.....
19	.....	.....	.....	.....	.....	46	.....	27	32	26	33	23	36	28	34	27	41	29	40	32	.....	.....	.....	.....
20	.....	.....	.....	.....	.....	45	.....	27	34	23	31	24	43	30	34	20	40	24	34	30	.....	.....	.....	.....
21	.....	.....	.....	.....	.....	43	.....	29	26	21	29	22	42	30	24	18	40	26	36	28	.....	.....	.....	.....
22	.....	.....	.....	.....	.....	36	.....	38	32	25	28	19	34	28	24	16	49	32	45	30	.....	.....	.....	.....
23	.....	.....	.....	.....	.....	40	.....	43	32	24	25	19	33	28	18	12	39	22	46	38	.....	.....	.....	.....
24	.....	.....	.....	.....	.....	42	.....	38	35	24	33	21	40	30	16	7	38	21	45	38	.....	.....	.....	.....
25	.....	.....	.....	.....	.....	46	.....	38	38	32	40	33	48.5	40	24	12	41	21	52	36	.....	.....	.....	.....
26	.....	.....	.....	.....	.....	43	.....	40	36	29	40	34	46	28	36	16	42	26	43	35	.....	.....	.....	.....
27	.....	.....	.....	.....	.....	43	.....	32	36	33	43	36	34	28	25	20	42	26	51	34	.....	.....	.....	.....
28	.....	.....	.....	.....	.....	42	.....	33	38	22	45	38	34	24	25	14	36	26	43	30	.....	.....	.....	.....
29	.....	.....	.....	.....	.....	40	.....	33	37	33	45	37	32	24	.....	.....	41	31	(§)	.....	.....	.....	.....	.....
30	.....	.....	.....	.....	.....	38	‡43	26	39	30	42	35	39	20	.....	.....	39	32	.....	.....	.....	.....	.....	.....
31	.....	.....	.....	.....	.....	.....	45	40	.....	.....	40	32	28	21	.....	.....	39	30	.....	.....	.....	.....	.....	.....
Range	.....	.....	.....	.....	.....	.....	.....	.....	27°		26°		28°.5		37°		34°		.....	.....	.....	.....	.....	.....
Monthly mean	.....	.....	.....	.....	48°.0		40°.8		33°.5		35°.1		34°.0		29°.2		32°.2		‖33°.1		.....	.....	.....	.....

* Station opened September 1, 1878.
† Observation taken at 5.02 p. m.
‡ Observations on maximum temperatures began October 30, 1878.
§ Station closed April 28, 1879.
‖ Mean for twenty-eight days only.

Maximum, minimum, and mean temperatures—Continued.

STATION, URALDE, TEXAS. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	90	71	95	72	92	66	98	70	75	46	68	31	61	40	72	33	84	57	85	51	95	51	87	59
2	91	67	98	76	94	66	(*)	(*)	(*)	(*)	71	28	56	35	72	28	82	44	77	37	91	65	91	53
3	92	68	99	73	93	65	92	75	.....	.....	78	32	44	28	71	32	81	47	84	41	97	61	87	51
4	91	66	98	71	91	66	93	69	76	47	77	35	40	22	66	44	80	54	82	50	90	61	94	49
5	95	64	97	71	95	67	91	63	78	47	71	45	39	24	62	36	81	57	79	58	95	64	95	54
6	96	70	95	72	96	72	91	62	86	59	75	46	42	19	62	29	83	56	78	67	80	56	97	63
7	93	77	96	71	83	78	91	64	80	65	77	55	52	30	61	23	83	58	91	46	82	57	97	61
8	93	68	96	72	93	71	88	63	81	66	71	50	45	28	66	37	79	58	93	62	93	50	96	70
9	96	70	99	72	83	70	86	62	83	63	(*)	(*)	47	15	66	35	82	52	91	59	88	62	97	72
10	96	71	98	71	80	61	95	69	83	55	75	24	48	21	75	31	83	61	89	42	91	63	104	72
11	96	71	99	71	80	59	102	69	74	52	76	38	62	34	80	36	81	62	88	48	93	62	97	73
12	97	72	96	73	83	49	101	63	80	39	72	54	65	21	83	36	76	54	86	52	(*)	(*)	92	69
13	97	71	96	69	86	47	95	65	65	37	69	35	64	28	76	45	81	52	90	51	94	60	91	70
14	97	71	96	69	86	48	92	67	68	37	62	28	71	44	65	30	83	50	93	54	96	59	97	70
15	98	72	97	69	86	49	91	72	73	40	56	16	81	52	65	28	81	52	92	60	96	61	98	73
16	101	71	97	70	86	51	96	67	79	44	61	17	71	51	77	42	84	59	81	53	100	59	94	66
17	100	73	96	70	90	53	81	49	72	48	53	25	71	49	74	42	73	41	79	48	99	66	96	70
18	97	74	98	71	95	70	80	41	68	45	53	24	74	33	71	27	73	33	84	44	104	67	95	69
19	99	70	(*)	(*)	93	71	82	39	74	36	53	40	65	24	73	31	74	36	85	44	101	67	93	69
20	96	73	87	70	92	69	85	44	79	35	47	32	67	(†)	73	39	84	58	90	53	107	69	92	68
21	96	70	(*)	(*)	84	58	80	52	74	47	62	25	70	.....	79	53	91	53	92	61	113	66	95	70
22	100	72	.....	.....	90	56	79	38	74	36	59	24	76	.....	85	56	88	52	86	54	105	75	97	72
23	95	72	92	68	95	68	81	33	79	36	66	29	73	.....	85	44	85	47	79	52	100	71	96	73
24	98	71	96	69	95	72	87	32	79	36	60	27	75	.....	86	33	86	60	76	54	92	67	100	69
25	98	72	93	71	96	72	86	54	51	34	54	21	74	.....	91	42	87	65	82	53	94	68	97	68
26	92	65	85	68	96	70	85	58	56	32	48	22	73	.....	77	38	92	66	92	54	93	67	98	69
27	91	70	97	67	92	66	70	45	70	28	45	24	74	.....	72	36	92	64	94	69	93	66	99	72
28	85	70	97	69	95	69	61	39	70	31	44	32	73	.....	74	44	81	51	91	59	94	64	101	71
29	91	72	93	69	94	71	81	52	74	35	58	37	78	.....	.....	.....	87	49	91	61	96	61	100	75
30	94	72	92	66	95	69	78	50	69	41	53	41	78	.....	.....	.....	92	56	98	63	94	68	101	72
31	95	73	94	63	.....	.....	81	49	.....	.....	56	39	79	48	.....	.....	94	58	.....	.....	91	71	.....	.....
Range	37°		.....	.....	49°		.....	.....	.....	.....	.....	.....	.....	.....	68°		61°		61°		.....	.....	55°	
Monthly mean	.....		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* No observation taken. † Minimum thermometer broken.

Maximum, minimum, and mean temperatures—Continued.

STATION, VICKSBURG, MISS. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	94	73	97	76	(*)	(*)	90	66	(§)	33	53	42	47	42	53	42	71	44	77	52	69	61	84	70
2	88	74	93	76	.....	...	91	71	.....	38	57	42	43	28	50	34	65	53	67	46	73	56	73	59
3	82	71	91	73	.....	.....	85	66	.....	44	67	39	30	20	57	32	63	42	64	48	81	55	74	53
4	84	71	91	75	.....	.....	86	59	.....	45	65	49	25	16	63	44	70	40	62	39	86	68	80	59
5	93	74	93	71	....	.....	89	60	.....	48	62	37	29	15	63	47	75	51	69	42	75	66	85	63
6	95	72	98	75	.....	.....	82	63	.....	50	67	38	29	12	51	40	75	54	77	48	73	61	73	68
7	93	72	98	77	.....	.....	87	61	.....	55	68	49	43	13	51	38	77	55	81	61	77	56	81	66
8	92	72	99	76	.....	.....	87	64	.....	55	63	54	46	36	59	35	78	55	77	55	81	55	88	72
9	97	73	97	76	.....	.....	77	70	.....	44	54	39	36	25	60	39	80	60	81	66	85	60	93	72
10	94	71	100	77	.....	.....	84	66	.....	52	54	36	41	22	62	48	79	61	73	58	85	63	95	74
11	93	74	96	74	.....	.....	86	64	.....	58	69	45	52	37	66	52	79	62	72	55	84	65	95	75
12	96	75	92	73	.....	.....	79	57	.....	43	65	52	42	36	73	47	75	53	70	47	86	62	94	74
13	89	74	91	73	.....	.....	85	53	.....	41	72	50	42	33	65	38	67	56	80	55	88	67	96	72
14	95	76	92	73	.....	.....	88	60	.....	46	63	41	60	38	39	27	71	51	80	60	86	66	90	73
15	98	75	94	73	.....	.....	85	65	.....	51	47	34	66	50	49	24	72	45	78	63	80	63	92	76
16	94	80	92	74	.....	.....	86	70	.....	52	46	29	65	52	48	39	77	56	74	58	80	61	94	75
17	94	75	92	74	.....	.....	72	57	56	49	50	31	74	52	52	41	69	37	65	54	83	59	91	72
18	95	74	95	75	.....	.....	67	47	61	51	48	32	58	34	48	38	55	32	67	49	88	63	89	70
19	98	76	98	77	.....	.....	65	42	70	47	44	33	44	31	55	34	64	37	75	48	88	67	90	64
20	99	78	98	76	86	70	70	43	66	44	46	37	58	30	59	38	75	52	76	56	88	71	92	70
21	100	79	98	79	75	64	78	48	64	45	49	38	63	41	67	39	82	65	80	56	83	67	87	69
22	95	78	93	72	84	62	67	50	67	39	42	33	68	48	71	51	74	59	83	57	91	67	90	69
23	93	74	96	73	87	71	70	40	73	47	53	27	66	52	62	46	69	47	82	62	94	69	94	71
24	96	74	96	72	89	68	76	47	76	47	48	28	62	46	70	44	76	49	79	60	85	68	93	72
25	99	75	97	75	89	61	78	54	68	46	38	20	72	53	76	54	80	56	72	62	87	68	92	72
26	97	77	92	74	90	68	82	59	52	43	37	25	77	57	69	38	82	58	73	61	90	67	92	72
27	99	78	87	73	86	64	69	43	50	37	35	23	75	61	50	30	79	63	76	56	92	68	92	72
28	97	73	92	75	89	67	59	35	60	35	38	21	77	66	62	34	84	61	78	62	94	68	92	72
29	92	72	76	68	87	66	61	45	62	56	49	32	80	66	.....	.....	82	64	79	58	91	70	88	73
30	97	77	83	68	87	66	(*)	(*)	66	42	45	38	65	60	.....	.....	82	63	83	58	91	71	91	69
31	98	77	84	65	.....	.....	.....	.....	.....	.....	47	37	72	51	.....	.....	77	53	.....	.....	83	69	.....	.....
Range	29°		35°		.....		.....		.....		52°		68°		52°		52°		44°		39°		43°	
Monthly mean	83°.5		82°.3		†75°.9		‡66°.6		56°.5		44°.6		47°.4		49°.6		64°.0		65°.2		74°.9		75°.4	

* No observation taken.
† Monthly mean temperature for fifteen days only.
‡ Monthly mean temperature for twenty-nine days only.
§ Maximum thermometer not observed.

Maximum, minimum, and mean temperatures—Continued.

STATION, VIRGINIA CITY. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	82	46	90	54	82	50	49	39	51	35	42	22	9	-16	28	5	35	14	60	32	71	45	70	40
2	85	55	86	62	88	58	47	35	54	32	46	32	16	3	35	8	44	20	64	37	67	31	77	45
3	82	53	87	62	70	45	46	28	57	33	41	32	19	1	35	8	37	22	66	38	46	25	72	51
4	76	43	87	64	60	43	50	25	59	38	43	32	24	7	10	- 9	40	17	60	44	52	28	71	49
5	64	47	90	61	62	41	58	33	55	37	41	28	28	9	20	0	42	18	55	40	52	38	70	48
6	65	42	86	56	70	43	55	39	50	35	38	27	29	15	28	18	47	37	54	43	56	37	57	44
7	72	42	88	60	59	37	58	41	50	30	39	25	21	0	26	14	40	22	62	35	52	37	52	39
8	73	52	89	59	49	34	54	41	52	33	34	20	21	- 5	40	4	32	25	47	20	53	30	53	49
9	78	49	77	60	50	26	64	30	43	28	41	25	21	13	40	26	32	24	46	18	55	39	61	35
10	78	49	78	61	54	35	44	28	36	20	32	18	27	13	39	18	47	23	51	31	53	39	64	44
11	86	50	84	63	70	38	61	40	39	20	24	17	32	9	37	6	47	30	48	36	55	38	60	54
12	86	53	88	55	71	43	53	33	41	23	25	10	26	12	20	- 3	42	30	59	28	60	37	64	48
13	92	53	80	57	62	44	38	30	38	22	14	- 4	27	11	32	15	45	31	64	34	71	40	66	48
14	86	62	80	55	46	36	43	24	44	27	21	4	18	0	29	12	47	26	55	39	70	48	73	48
15	77	47	79	63	52	34	40	32	43	34	27	10	20	- 7	29	12	43	25	41	28	52	35	73	50
16	81	48	72	57	55	32	42	25	46	23	19	6	16	5	26	9	37	19	43	18	53	26	59	45
17	83	55	67	53	67	36	56	32	47	28	24	4	22	- 2	28	2	38	18	54	31	57	29	53	44
18	74	49	76	55	64	43	61	37	44	30	28	10	31	9	30	25	43	19	55	34	59	44	62	41
19	79	52	74	50	58	41	61	40	43	30	21	1	38	18	45	27	36	22	64	42	54	36	59	41
20	91	60	72	52	59	32	51	28	47	30	25	9	41	16	50	37	44	20	45	35	50	35	70	43
21	88	60	82	57	67	37	43	23	56	38	27	10	40	23	45	30	34	21	45	32	59	35	75	50
22	88	66	78	62	60	32	55	40	53	27	29	11	38	22	41	30	46	19	50	32	60	40	77	51
23	79	62	74	63	46	27	43	27	33	21	29	7	44	29	49	39	39	17	58	34	52	38	51	41
24	76	59	72	59	42	33	27	15	26	17	15	- 5	44	27	46	35	51	32	66	36	54	36	62	43
25	77	54	82	54	51	27	23	10	37	15	15	7	40	22	37	18	51	38	57	33	61	39	64	47
26	70	50	78	57	64	35	27	9	39	27	15	1	31	12	43	25	58	46	46	21	72	43	64	44
27	81	51	75	57	60	42	47	23	36	21	13	0	20	4	49	40	52	33	58	28	69	49	73	42
28	83	52	81	58	56	34	50	36	38	20	5	15	15	1	43	19	52	29	60	34	65	48	82	52
29	76	62	76	54	50	39	46	39	29	13	6	- 8	19	2	.....	.....	65	43	63	44	54	41	70	59
30	79	50	80	53	48	35	47	29	34	11	10	- 8	14	3	.....	.....	68	43	64	38	59	40	61	45
31	83	56	78	59	.....	.....	57	29	.....	.....	10	- 5	18	- 2	.....	.....	52	37	.....	.....	53	41	.....	.....
Range	50°		40°		62°		55°		48°		61°		60°		5.°		51°		48°		47°		47°	
Monthly mean	67°.2		69°.2		48°.9		38°.9		35°.1		17°.7		18°.2		26°.2		35°.9		44°.4		47°.9		55°.1	

Maximum, minimum, and mean temperatures—Continued.

STATION, VISALIA, CAL. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	102	63	97	60	95	66	75	46	72	40	63	32.5	59.3	46	59	34	68	39	66	52	82	55	101	60
2	95	65	99	59	95	64	80	48	74	42	63.5	35	59.3	33.5	62	33.5	67	47.5	69	50	73	54	107	64
3	80	54	96	60	90	59	84	51	68	41	63	35	57.5	36	65	34.5	61.7	38.5	66.5	50	75	44	109	62
4	86	54	95	62	91	56	86	52	69	41	70	39	53.5	38.3	56	35	67	41	60.5	50	82	46.5	99	70
5	88	58	94	66	94	57	86	53	64	47	73	43	51.5	38.8	56.5	33.3	73	52	67	47	77.5	51	94	60
6	93	56	96	62	93	59	88	55	58	34	63	46.5	53.5	30.5	58.5	32	62.7	50.5	71	47.4	76	49	85	55.5
7	96	58	93	60	94	57	88	54	67	41	55	36	47.5	31.5	59.5	36.5	60	42	62	46.5	69.5	45	83	54.5
8	94	59	99	58	93	58	87	54	69	43	62	34	51.3	27.5	56	39.8	61	46	66.5	40	73.5	42	85.5	56
9	94	59	99	60	93	56	81	50	65	43	70	41	49.5	33	58.5	47.5	65	44	71.5	42	71.5	46	84	49
10	90	62	102	61	96	59	77	50	66	40	54	38	50	32	65	48	67	41	67	43.5	65	49	72	56
11	91	58	103	65	95	58	80	47	70	41	52	26	54	31.5	69	51	71	42	57.5	42	74.5	45	76	52
12	96	60	106.5	69	93	54	71	55	66	48	52	26	52.5	43	66	56.5	75	46	70	50	81	51	89	63
13	99	62	104	72	92	57	69	50	64	41	53	26	50	33	63.5	47.3	80	46.5	66	47.5	88.5	56.5	96	62
14	102	61	102	77	89	63	59	39	67	41	52	24	48	36	61	49	80	48.5	69.3	53	81	59	102	64
15	99	63	100	67	85	58	64	50	62	51	52	22.5	47	28	61.5	41	79	49.5	70	45	74	49	97	63
16	92	58	95	65	74	49	68	40	62	38	55	24	46.5	25.5	60	47	75	44.5	75	43.5	78.5	47	81	54
17	87	62	92	61	72	49	74	45	64	38	55	23.5	49	28.5	66	51	75	45	80.5	48	70.5	48	87.5	46
18	90	60	94	56	74	49	78	46	64	38	55	24	52.5	27	66.5	48	69	46	83.5	56	75	54	92	51
19	94	62	95	57	77	48	77	46	64	38	55	25	53	24	70	45	64	46	73	56.5	72	52	98	53.5
20	97	62	96	58	82	49	72	47	66	41	60	26	63	31	76.5	46	69	50	62.5	47.5	72	49	104	59
21	99	63	87	58	87	55	73	43	76	41	58	26	61.5	30	66	49	69	51.5	66	41	67	52	103	64
22	98	68	79	52	87	49	82	44	69	44	57	28	63	33.5	69	42.8	72	48.5	75.5	46	68	48.5	91	62
23	99	68	85	49	88	51	78	47	64.5	42.5	58	27	62.5	47	73.4	43.5	75.5	50.5	84.5	50	76.5	48	88.5	55
24	96	63	91	50	87	52	75	45	64	38	51	27	61	52.5	74	45	78	52	89.5	53	81	48	96	52
25	96	62	91	55	85	48	73	44	66	36	51.5	30	60.5	44	72.3	47	79.3	55	88.5	56	87.5	50	100	56
26	97	62	91	52	87	53	74	41	63	35	53.5	27	55.3	36	74	47	78	52	87.5	56	78	51	101.5	57
27	100	60	90	55	77	52	75	40	62	34	51	21.5	51	41	79.5	49	72.5	50.5	87	54	82.5	56	103	60
28	103	61	89	57	73	49	73	42	57	29.5	51.5	30.5	47	37.5	69	49	79.7	45	88.5	56.5	81	53	102	62
29	100	63	92	57	72	51	75	41	58	32	51	26.5	48.5	32	.....	.....	91.5	52	84	53	79.5	54	99	61.5
30	103	65	98	58	75	59	77	41	63	32	57	30.8	54	32	.....	.....	90.5	57.5	83	56	87	48	92	57.5
31	102	64	100	65	.....	.....	76	42	.....	.....	58.5	44	56	35.5	.....	.....	75.7	55	.....	.....	97	57	.....	.....
Range	49°		57°.5		48°		49°		46°.5		51°.5		39°		47°.5		53°		49°.5		55°		63°	
Monthly mean	80°.5		79°.7		69°.4		61°.1		52°.5		43°.2		43°.7		54°.5		60°.1		62°.0		64°.6		78°.5	

Maximum, minimum, and mean temperatures—Continued.

STATION, WASHINGTON, D.C. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	84.5	69.5	93	71.5	89	74	76	52	51	34.5	47	35.5	32	25	35	21.5	43	21	60	36	65	42.5	95	72
2	89.5	69.5	89.5	72.5	88.5	72	81	59	61	34	60	44.5	36	6	31	20	42	31	51	38.5	63	43	90	69
3	91	73.5	92	69.5	91	71	80	57	53	34	52	39.5	10	— 0.5	42	26.5	40	30	50	27	68	36.5	72	66
4	94	72.5	92	69	86	68	80.5	51.5	52	32	51	40	16	4.5	51.5	31	50	24.5	39.5	27	63	53	78	61
5	91.5	71.5	90	64	82.5	66	70	52	45.5	30	41.5	34	20	5.5	40	31	53	36.5	39	29.5	79	54	87	61
6	93	72	89	67.5	80.5	64.5	65	48.5	60	31	43.5	31.5	23	13	37.5	34	53.5	31	59	31	70	55	87.5	64
7	91	72.5	86	67	78	65	61	41.5	60	41	41.5	26.5	32	12	39.5	29	54	38	52	37	69	45	68	51
8	96.5	69	88	66	71	65	68.5	49	50.5	36	38.5	29	47	25.5	39.5	23	40	30	58	32	67	48	78	51
9	93.5	77	93.5	71	77.5	64	81.5	58.5	48	27.5	57	34.5	39	25.5	44	25	60.5	34	68.5	35	69	43.5	85	57
10	96	74	91.5	68	74.5	61.5	71	55	58	37	59.5	34	28	17	38	22	75	39	61	51	69	42	89	65
11	93	73	81.5	68.5	75.5	68	61.5	51	59.5	36	49	36	36	19.5	48	34	71.5	46	54	39	78	49	87	67
12	93.5	70	83.5	67.5	79	67.5	62.5	50.5	61	46.5	44	33	32	26	48	35	55	36	53	33	81.5	56	86	66
13	85	72.5	80	68	79.5	63	71	46.5	59.5	37	41	30.5	38	26	36	28.5	66.5	38.5	64.5	36.5	83	64	81	65
14	91	70	82	69.5	75.5	55	74.5	47	49.5	33	44	27	36	30.5	31	19.5	59.5	44.5	65.5	45.5	83	59	86	58
15	90	72	78	71.5	75	54	75	50	48.5	32.5	44.5	35	35	26	27.5	11	53	34.5	71	51	79.5	64	89	70
16	85	70	80	71.5	74.5	53	79	56	54.5	34	36	27.5	44.5	23	36	17	51.5	35	61	46	81.5	64.5	86	67
17	94.5	74	87.5	71.5	77	53	78.5	62	55.5	48.5	34	22	35	21.5	32	29	59	35	48	40	75	64.5	73	58
18	98	76	87	67.5	85	59	69	44	53.5	48.5	37	24	46	28	36.5	27.5	43	28.5	48	36.5	77	63.5	72	51.5
19	96.5	74	85	70	86	61	56.5	43	57	44	33	21	35.5	20	36	27	44	28.5	53	39.5	78	64.5	73	56
20	91	73	84.5	66.5	86	64	63	41	56	47	33	19.5	23	16	33	25	51	25.5	64	37	81	65	78	53.5
21	95.5	76.5	82	66	76.5	60.5	68.5	39.5	53	47	34	27.5	34	18	30	18.5	61	38.5	67	40	86	65	82	57.5
22	84	68	78.5	65	70	51.5	63.5	41	53	42	39	27.5	57	32	37	19.5	45	37	74	40.5	70	53.5	76	64
23	84.5	63.5	77	63	67.5	50	66	52	46.5	40.5	28	17	53	33	51.5	30.5	46	34.5	81.5	46	66.5	47	87	64.5
24	87.5	65	81	59.5	71	61	64.5	47	58.5	35.5	25	16.5	40.5	27.5	42.5	30	54	28.5	67	48	74.5	47	89	65
25	88	66.5	78	64.5	76	64.5	64.5	42	66	39.5	25	14	65	32	41	31.5	51	37	78	47	80	58	77.5	67
26	92	72	81	60	83	61	68	40	54	42	31	13.5	39	26.5	58.5	31	52.5	30	85.5	56	71.5	58	91.5	67
27	82	72	81	57.5	65	49	66.5	49.5	55.5	36.5	29	21	52	25.5	31	22	56	41.5	67	50	70.5	54	94.5	71
28	89.5	69.5	78	67	64	48	50	37	49.5	42.5	29.5	18.5	66	45	30	18.5	58.5	43	68.5	52	75	61.5	95	73
29	78	69.5	80	66.5	67	52.5	54	30	50.5	37.5	30	14	50	34	.....	.....	62	43	72.5	51.5	82	53	82.5	68
30	87	71.5	81	69	70	57.5	61	43.5	49.5	32.5	39	26.5	44	27.5	.....	.....	54	39.5	74	48	87	63.5	83	64
31	91	71	77	69.5	.....	.....	53	38.5	.....	.....	37	18	46	28.5	.....	.....	50	35.5	.....	.....	94	67	.....	.....
Range	34°.5		36°.0		43°.0		51°.5		38°.5		46°.5		66°.5		47°.5		54°.0		58°.5		58°.0		44°	
Monthly mean	80°.4		74°.9		68°.8		56°.9		45°.7		33°.6		31°.1		32°.0		43°.8		52°.1		65°.4		73°.4	

Maximum, minimum, and mean temperatures—Continued.

STATION, WICKENBURG, A. T. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878.												1879.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	106	44	96	73	90	66	86	47	81	37	68	23	57	30	68	31	75	41	71	55	96	49	(*)	(*)
2	105	40	100	72	86	69	89	48	76	42	74	28	58	30	67	33	81	39	75	53	93	45	.....	.....
3	106	65	104	73	86	71	93	51	80	41	77	30	60	33	68	44	76	41	79	45	89	53	.....	62
4	105	72	105	74	89	66	93	50	79	41	76	33	58	35	57	44	73	34	82	48	86	46	.....	60
5	108	79	107	72	90	64	91	52	73	36	73	34	61	32	52	32	77	36	71	42	85	47	.....	61
6	108	68	107	76	93	60	90	49	62	46	70	33	61	32	51	28	77	36	80	40	83	47	.....	56
7	106	64	107	79	93	60	92	49	62	33	70	29	48	34	54	26	70	33	74	42	86	46	.....	58
8	107	63	106	79	94	57	92	46	64	37	63	33	48	28	58	28	63	31	70	37	87	46	88	51
9	104	72	102	71	93	57	89	44	63	37	65	28	49	20	62	40	66	31	77	37	90	47	90	50
10	107	63	98	74	91	54	86	44	81	34	60	24	50	23	62	31	70	32	82	37	86	56	90	51
11	108	(?)68	98	74	94	65	87	46	70	34	55	20	50	20	68	35	77	35	68	45	74	42	86	66
12	105	(?)73	102	72	91	51	84	45	71	36	51	15	57	20	70	38	82	37	62	40	86	41	87	50
13	107	59	103	73	92	53	84	45	70	33	49	12	57	25	74	39	84	46	69	39	91	50	92	55
14	105	63	105	74	93	51	87	46	68	35	52	14	51	24	73	44	82	41	75	44	94	50	99	57
15	106	(?)64	98	73	92	54	75	47	66	35	54	15	48	29	69	40	80	45	79	41	91	50	98	60
16	106	(?)62	(*)	(*)	91	53	74	38	71	35	56	15	51	22	69	37	75	36	80	43	90	48	95	60
17	101	49	.....	.....	89	51	83	38	71	35	58	19	50	23	69	35	75	38	86	40	87	48	92	59
18	106	(?)60	.....	.....	81	51	89	41	73	33	57	16	56	22	71	36	76	38	90	43	89	51	92	53
19	107	68	.....	.....	80	44	86	43	74	29	58	19	65	23	76	40	73	38	89	47	89	55	95	56
20	102	80	99	72	88	46	84	43	79	32	57	25	64	29	77	37	73	40	80	42	88	55	98	54
21	103	74	94	72	90	49	81	47	79	40	58	20	65	30	76	41	71	41	72	44	93	61	100	60
22	102	72	93	70	90	50	82	43	78	40	62	23	65	27	76	40	74	39	89	49	(*)	(*)	100	65
23	107	71	87	68	92	50	83	43	76	37	62	21	70	28	77	40	78	42	83	48	.....	.....	99	60
24	107	70	98	68	92	47	81	40	61	38	59	20	76	35	79	39	84	45	85	48	.....	.....	98	60
25	105	68	96	71	93	48	79	35	61	37	55	35	75	36	80	39	89	47	88	44	.....	.....	100	57
26	107	65	97	68	(?)92	52	80	40	61	23	50	22	68	38	80	43	88	48	91	46	.....	.....	103	67
27	102	62	97	66	91	49	79	35	69	23	53	21	56	25	82	43	83	50	92	50	.....	.....	103	64
28	107	67	97	63	89	45	75	32	67	26	(*)	(*)	60	36	78	41	86	54	95	51	.....	.....	101	60
29	109	70	97	66	(?)87	51	76	30	68	25	.....	.....	64	30	.....	.....	92	51	98	58	.....	.....	100	56
30	110	70	96	72	87	45	79	35	63	29	.....	.....	51	39	.....	.....	88	51	96	51	.....	.....	96	54
31	107	70	(?)94	69	.....	.....	83	39	.....	.....	31	50	59	29	.....	.....	71	58	.....	.....	.....	.....	.....	.....
Range	70°		.....	.....	50°		63°		58°		.....		56°		56°		61°		61°		.....		.....	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

* No observation taken.

Maximum, minimum, and mean temperatures—Continued.

STATION, WILMINGTON, N. C. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	88	70	93	75	89	77	77	62	53	32	66	45	48	37	48	35	56	26	57	43	68	55	85	69
2	86	70	99	77	90	75	82	64	68	36	65	47	57	38	38	23	64	34	61	45	70	51	86	67
3	86	72	90	72	88	74	82	60	68	43	60	38	38	20	50	26	51	46	71	40	76	49	83	68
4	84	71	92	74	89	74	82	62	62	41	63	42	31	15	55	34	53	39	55	32	79	59	80	66
5	87	71	84	74	94	74	80	52	61	38	53	37	35	23	58	40	67	43	53	36	81	67	85	63
6	93	72	86	72	87	71	80	61	73	44	58	34	33	19	56	50	66	38	61	37	88	65	88	68
7	90	75	95	73	86	70	79	62	76	56	53	40	43	16	52	40	77	50	74	49	68	57	78	66
8	86	72	92	72	86	70	86	64	67	46	53	32	57	33	40	35	58	45	61	47	66	54	77	58
9	89	71	92	75	84	70	83	64	52	36	70	51	73	42	54	30	74	48	65	40	66	50	80	64
10	90	74	91	79	85	68	82	65	64	36	63	40	44	28	53	35	81	58	71	57	72	55	82	70
11	90	71	91	78	86	72	72	58	71	47	58	32	54	30	61	46	82	58	74	57	76	58	83	66
12	91	74	94	70	86	68	70	53	71	53	59	41	63	39	61	50	66	48	61	45	73	62	82	71
13	94	74	86	73	85	71	69	50	67	43	59	35	49	37	66	49	68	44	69	44	77	64	86	71
14	88	75	82	70	83	63	71	47	61	44	58	43	66	37	54	35	65	58	75	60	70	66	85	68
15	89	71	86	75	79	64	78	51	66	42	70	50	53	36	46	31	62	48	79	60	82	65	86	72
16	91	70	87	76	81	59	80	60	68	49	50	40	66	38	36	27	69	47	72	63	78	67	93	77
17	89	71	89	74	82	60	80	61	70	58	44	36	52	39	49	33	73	55	68	62	78	67	83	72
18	90	73	93	72	83	62	72	51	63	53	46	31	63	46	48	40	63	38	65	47	76	64	78	66
19	92	76	94	77	85	65	60	44	55	50	45	28	54	34	47	33	54	33	63	44	81	65	73	58
20	90	79	91	73	85	65	69	41	66	49	44	29	37	21	49	33	68	43	67	45	82	65	76	54
21	91	77	87	72	88	66	70	47	69	51	68	34	55	29	44	27	77	62	71	46	85	66	81	53
22	94	77	86	69	80	65	71	59	56	42	55	37	65	44	56	31	74	60	77	46	80	61	86	61
23	88	71	88	66	80	63	69	50	59	39	43	30	70	46	61	50	68	50	82	53	74	54	92	66
24	86	68	84	62	82	66	69	43	73	45	53	35	64	48	61	40	67	47	71	57	71	48	91	70
25	86	66	90	64	85	70	74	48	75	56	46	32	75	50	68	44	66	51	73	53	86	57	82	70
26	86	70	78	72	88	69	74	49	65	54	42	27	62	41	72	55	69	49	81	62	91	66	86	66
27	97	75	87	65	76	62	78	51	71	53	37	28	65	34	62	35	79	59	77	61	82	67	86	69
28	93	79	88	72	74	55	65	52	59	41	39	21	77	56	46	28	70	50	71	65	91	68	84	73
29	93	71	89	71	77	62	66	47	57	33	43	27	70	49	.....	.....	76	51	77	62	86	68	89	72
30	89	77	84	75	80	62	77	57	60	35	42	31	55	40	.....	.....	60	44	81	58	87	70	86	70
31	84	73	88	76	.....	.....	66	40	.....	.....	48	34	53	38	.....	.....	60	41	.....	.....	85	69	.....	.....
Range	31°		37°		39°		46°		44°		49°		62°		49°		56°		50°		43°		40°	
Monthly mean	80°.0		79°.2		73°.8		68°.4		54°.0		44°.5		45°.9		44°.6		56°.0		59°.4		68°.7		74°.3	

Maximum, minimum, and mean temperatures—Continued.

STATION, WINNEMUCCA, NEV. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	93	44	91	53	94	53	63	40	66.5	23	48	12.1	43	13	41	15	48	16	71	44	73	50	81	47
2	87	56	94	48	89	63	63	32	66.5	32	61	24	46	6	40	18	49	22	63	39	63	38	89	50
3	69	49	95	57	69	53	65	36	66	24	65	27	44	7	42	17	50	21	66	47	62	20	91	48
4	72	37	93	56	73	41	70	37	64	25	57	15	44	14	32	12	55	28	56	44	68	29	82	60
5	72	53	93	66	81	41	74	30	54	37	51	18	44	7	36	7	58	39	54	42	65	43	86	50
6	80	37	94	51	86	42	75	34	50	35	57	27	38	13	43	12	53	34	64	36	66	42	66	47
7	86	48	96	51	73	49	77	34	61	32	50	30	33	9	50	24	47	27	53	33	55	25	58	37
8	86	48	94	60	67	35	73	42.5	60	24	47	12	40	0	55	30	45	30	45	32	65	31	74	31
9	88	51	96	63	69	35	74	37	58	24	55	22	34	24	50	39	53	40	58	26	62	30	73	46
10	87	59	97	61	77	33	65	31	49	19	43	18	38	9	49	37	56	32	59	35	54	28	65	53
11	87	47	100	61	84	36	73	30	54	21	36	21	42	23	58	42	61	45	59	37	65	27	57	49
12	92	49	98	56	83	39	66	45	54	15	38	15	32	8	54	45	57	30	63	35	73	37	68	49
13	97	60	99	58	81	51	57	43	53	29	33	9	26	—14	50	31	64	27	56	39	77	46	77	51
14	95	60	95	66	75	40	51	35	55	36	40	0	27	16	48	35	66	25	54	41	70	49	85	48
15	88	56	80	62	69	43	47	33	52	34	44	1	25	— 9	47	29	63	31	52	32	58	34	84	53
16	88	57	83	55	62	40	53	21	53	27	42	— 1	24	7	40	19	61	25	60	31	67	31	62	34
17	83	51	78	52	64	40.5	63	31.5	59	23	46	6	38	1	47	32	63	31	65	40	65	41	55	39
18	83	49	81	44	70	43	72	30	56	29	44	6	31	— 3	57	36	63	37	73	40	57	38	71	37
19	92	56	87	51	73.5	38	73	35	57	37	40	20	31	— 6	63	37	47	36	61	46	50	39	73	44
20	94	52	88	51	78	36	50	37	62	34	43	6	31	— 1	67	35	42	34	51	36	61	30	81	50
21	94	53	84	46	76	38	58	20	62	30	41	3	33	— 3	56	37	49	29	54	30	64	42	89	56
22	91	62	85	55	72	50	67	26	64	32	42	3	46	—22	58	23	60	37	61	27	61	33	74	54
23	90	66	83	46	78	39	56	31	49	22	40	7	50	34	62	28	59	32	69	30	63	36	66	35
24	91	54	87	46	68.5	45	46.5	13	40	12	38	19	55	40	60	42	66	44	77	37	67	36	77	42
25	93	53	90	45	69.5	30	47	10	46	9	31	— 2	43	33	57	28	67	50	73	48	73	37	80	49
26	91	51	85	65	79	29	50	14	53	10	33	— 6	36	26	61	38	69	39	66	33	66	42	86	47
27	94	54	85	60	69	43.5	61	14	54	13	33	3	33	15	69	39	55	28	74	34	72	40	88	53
28	96	54	90	58	65	37	62	18	53	14	31	6	30	8	55	30	70	29	76	37	65	43	94	55
29	91	57	89	52	53	44	63	24	42	10	31	— 6	30	8	.....	.....	82	34	71	45	61	38	90	65
30	93	49	91	56	55	40	64	31	48	9	32	0	40	7	.....	.....	76	38	76	36	70	36	81	56
31	95	57	93	52	.....	.....	68	25	.....	.....	42	8	38	11	.....	.....	75	49	.....	.....	75	42	.....	.....
Range	60°		56°		65°		67°		57°.5		71°		69°		62°		66°		51°		57°		63°	
Monthly mean	74°.4		74°.8		58°.1		46°.5		38°.9		25°.9		24°.6		39°.9		46.5		51°		52°.6		63°.6	

Maximum, minimum, and mean temperatures—Continued.

STATION, WOOD'S HOLL, MASS. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	74	65	69	58	75	62	69	53	49	40	43	32	33	24	31	18	36	16	43	30	54	45	70	56
2	71	64	74	63	73	67	70	61	57	45	56	42	42	17	28	13	35	30	43	38	49	41	71	59
3	75	65	80	66	76	66	74	62	55	39	53	44	20	9	34	23	37	32	44	28	51	41	62	53
4	83	65	80	66	68	64	72	60	49	33	48	40	26	17	33	29	42	28	29	24	50	43	65	58
5	84	65	80	66	69	64	68	54	41	27	42	32	30	23	35	27	43	25	34	22	56	46	66	59
6	78	61	72	65	73	62	61	48	38	31	38	29	25	17	37	31	40	21	39	28	59	46	66	57
7	72	60	79	63	68	56	62	46	45	35	34	22	32	12	34	22	40	22	42	37	58	46	64	49
8	74	65	78	65	67	54	63	54	45	33	33	23	42	30	31	23	35	20	48	38	59	47	69	52
9	73	66	79	65	70	55	68	59	43	31	44	26	43	34	35	25	38	28	54	39	62	44	65	55
10	71	66	75	68	72	58	62	52	47	35	55	43	37	20	32	14	44	36	49	39	56	44	67	57
11	82	66	75	60	72	64	56	45	55	37	52	41	32	25	48	31	46	35	49	34	60	42	71	55
12	71	64	80	65	77	66	54	47	57	49	41	36	35	17	48	35	41	32	43	32	56	47	65	59
13	70	63	77	64	78	68	62	45	55	42	37	33	36	26	35	26	43	30	44	36	57	49	75	58
14	72	61	74	63	71	64	62	44	45	35	35	28	36	28	26	16	47	38	49	40	60	51	67	55
15	75	57	72	63	67	57	64	54	46	31	44	33	32	12	25	12	42	33	50	41	68	49	66	60
16	70	54	77	67	69	51	64	58	48	34	37	25	32	10	32	21	39	27	55	39	64	56	65	53
17	70	60	72	67	70	54	67	59	47	42	31	23	35	16	38	28	50	33	43	40	64	54	68	52
18	81	66	73	65	73	61	71	60	50	43	36	27	36	22	35	27	40	31	42	38	68	54	64	51
19	86	69	78	62	73	62	62	47	47	37	34	28	33	24	29	20	43	26	38	32	63	57	67	53
20	84	67	79	63	73	62	58	43	45	41	34	25	27	13	34	21	41	30	53	35	69	55	67	53
21	74	63	76	64	73	66	64	53	53	38	47	26	30	8	22	15	45	34	53	42	63	56	66	55
22	78	66	69	54	70	55	64	52	52	44	47	36	42	29	33	12	44	30	55	40	60	50	69	57
23	76	61	71	54	65	48	62	54	52	44	36	26	39	29	39	27	44	34	59	44	53	44	70	61
24	77	62	67	55	65	50	62	52	50	42	26	21	38	22	40	21	43	30	55	39	61	45	74	60
25	74	64	69	60	75	62	60	51	52	39	30	21	42	32	36	16	47	36	51	43	63	49	77	61
26	74	66	70	54	72	59	62	52	52	37	32	21	32	9	49	36	44	33	48	40	66	52	71	63
27	74	69	72	60	63	50	57	50	52	30	35	21	40	7	43	16	42	36	55	40	61	49	72	62
28	80	65	72	59	61	46	57	44	53	43	30	25	42	37	22	11	41	36	57	46	65	52	72	64
29	79	63	73	57	63	47	55	38	46	36	31	20	37	21	.....	.....	44	35	59	49	72	54	72	63
30	70	60	78	62	65	52	58	44	46	37	31	20	31	14	.....	.....	43	38	61	49	65	53	77	61
31	68	59	75	63	.....	.....	55	46	.....	.....	32	24	36	24	.....	.....	41	30	.....	.....	66	56	.....	.....
Range	32°		26°		32°		36°		30°		36°		36°		38°		34°		39°		31°		28°	
Monthly mean	68°.8		68°.5		62°.1		57°.8		43°.6		34°.4		28°.5		28°.6		36°.7		43°.0		54°.7		62°.6	

Maximum, minimum, and mean temperatures—Continued.

STATION, YANKTON, D. T. (Readings made at 11 p. m., Washington mean time.)

Day of month.	1878. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1879. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
1	76	56	83	63	82	64	68	52	73	29	45	15	6	—22	39	9	17	— 3	48	20	75	40	62	38
2	76	56	83	61	86	48	72	43	47	27	55	19	—16	—25	40	17	42	10	40	19	82	46	77	45
3	78	59	91	66	89	61	67	43	60	32	50	36	—12	—26	43	23	53	26	36	7	74	52	87	45
4	81	60	89	65	92	65	66	33	62	23	46	26	—11	—30	36	13	53	24	54	12	74	44	82	60
5	85	67	91	61	81	61	67	35	72	41	42	21	— 8	—23	34	7	55	35	72	26	57	34	80	55
6	87	69	90	62	67	59	70	48	64	37	28	14	25	—17	32	8	55	22	57	42	54	29	74	57
7	85	69	92	73	77	58	73	32	43	35	33	9	25	4	36	6	70	41	62	25	51	45	88	61
8	85	63	92	73	80	52	63	40	49	20	33	24	7	— 8	27	11	59	38	64	43	66	45	87	68
9	82	63	80	61	63	46	62	29	54	33	35	14	19	—17	46	5	67	36	54	38	74	54	87	65
10	81	66	80	60	61	39	75	49	45	33	27	11	17	— 5	36	20	56	33	56	38	85	63	91	53
11	90	70	83	56	63	42	73	35	49	33	26	15	27	— 4	22	7	59	20	63	30	88	60	87	60
12	94	74	87	63	68	34	75	52	59	30	22	9	43	16	7	—10	64	38	68	47	73	57	81	64
13	94	74	81	63	70	46	81	54	46	26	20	8	25	8	3	—16	38	3	62	34	60	54	80	65
14	94	78	86	63	78	45	68	44	51	26	19	14	13	— 7	21	—14	29	— 3	61	36	71	46	78	61
15	92	77	72	56	68	51	83	42	59	27	21	13	13	1	28	— 6	26	— 1	60	30	74	42	70	58
16	94	71	73	50	68	48	52	42	55	27	21	3	29	— 8	28	1	22	10	61	28	71	55	71	50
17	87	69	87	64	77	47	51	31	59	27	4	— 6	32	10	28	6	27	3	65	37	83	57	79	52
18	92	74	84	70	83	47	62	21	59	37	11	— 4	15	— 7	41	22	26	5	77	30	82	61	81	53
19	94	76	79	70	72	48	75	44	53	29	19	0	43	—13	29	5	44	7	70	34	81	58	75	55
20	89	73	85	65	61	37	79	49	46	33	28	1	47	27	33	2	35	12	70	49	73	54	82	60
21	83	62	82	71	64	33	52	32	55	33	21	— 4	48	28	62	15	30	20	74	50	71	56	86	62
22	74	63	97	76	80	44	66	29	56	31	16	— 8	31	14	53	28	41	19	72	56	80	57	88	68
23	74	65	96	69	66	46	57	40	47	36	15	—10	46	8	49	19	54	26	73	57	93	57	92	69
24	84	66	80	60	73	41	48	30	36	26	6	—11	61	37	60	17	50	27	73	47	85	66	81	65
25	81	71	75	48	63	38	41	23	27	16	14	— 3	42	28	17	— 5	63	35	80	49	75	61	80	54
26	79	67	87	56	62	28	28	12	44	15	12	— 2	62	29	7	—17	69	39	72	50	75	56	80	59
27	80	57	85	66	68	40	43	9	42	26	13	— 8	43	26	27	3	87	38	65	38	82	53	71	57
28	75	61	80	57	77	55	52	33	45	18	16	— 1	45	25	29	7	69	46	72	48	93	70	78	57
29	84	59	85	57	86	64	55	23	39	16	17	—11	41	24	.....	.....	72	42	70	36	84	61	82	59
30	80	62	83	56	83	63	44	25	37	19	18	— 6	47	15	.....	.....	60	35	71	38	78	57	81	66
31	82	62	93	54	.....	.....	57	18	.....	.....	18	4	38	19	.....	.....	58	37	.....	.....	63	46	.....	.....
Range	38°		49°		64°		74°		58°		66°		92°		79°		90°		73°		64°		54°	
Monthly mean	75°.5		73°.6		60°.1		47°.7		38°.6		15°.3		15°.0		19°.0		36°.1		51°.0		64°.0		69°.8	

Maximum, minimum, and mean temperatures—Continued.

STATION, YUMA, ARIZ. (Reading made at 11 p. m., Washington mean time.)

Day of month.	1878. July.		August.		September.		October.		November.		December.		1879. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	110	74	96	71	96	74	90	60	83	50	70	45	66	42	70	50	82	55	80	59	102	63	106	68
2	109	73	103	79	98	77	93	62	83	54	76	45	66	42	71	49	86	54	78	59	100	60	108	75
3	109	73	107	81	103	80	96	62	83	51	80	50	68	49	61	49	81	52	84	54	94	64	110	74
4	108	77	109	80	98	79	95	64	82	48	80	47	68	41	65	46	82	50	91	56	93	67	111	71
5	108	73	110	82	100	74	99	65	73	49	76	46	68	44	62	47	85	52	76	55	92	62	106	70
6	108	70	110	83	103	72	99	65	64	51	76	46	68	44	60	41	84	52	85	50	93	61	99	75
7	110	70	110	82	104	68	99	64	66	50	76	45	57	42	62	37	75	54	75	57	89	63	92	63
8	114	75	104	84	101	71	94	60	70	57	71	53	55	39	62	41	71	52	77	51	94	58	90	59
9	112	81	105	84	101	75	98	58	74	47	69	44	60	30	70	48	72	48	85	48	95	61	96	61
10	109	77	109	81	101	80	94	57	75	49	62	41	60	37	74	46	78	46	91	53	88	69	96	61
11	107	77	111	82	105	73	98	62	75	51	62	39	62	30	76	48	82	51	82	55	89	53	85	63
12	109	79	108	83	102	74	92	64	75	50	60	37	62	35	78	51	87	50	70	48	94	55	91	60
13	103	80	109	83	103	70	87	61	76	50	59	29	62	34	82	53	93	56	78	50	97	63	100	62
14	108	79	111	85	104	69	83	57	76	51	59	43	63	36	82	57	91	61	78	58	97	64	105	67
15	106	82	107	82	100	69	82	61	76	48	60	36	57	40	80	53	89	58	87	56	96	66	108	68
16	106	82	109	85	99	69	78	63	76	50	65	34	59	32	76	57	84	55	85	59	97	63	107	67
17	105	76	106	81	90	67	85	64	77	52	62	36	59	33	77	52	84	54	94	55	92	64	98	67
18	108	76	105	83	85	64	89	56	77	49	63	35	63	34	79	52	85	52	95	53	91	68	99	67
19	111	73	109	78	89	60	90	54	78	47	65	35	66	49	85	56	79	56	91	63	90	65	102	67
20	108	73	114	79	93	62	91	56	82	51	62	46	69	51	86	55	79	55	82	60	89	65	105	69
21	108	80	105	79	97	62	84	59	83	53	64	35	71	41	82	52	79	55	77	56	87	66	110	68
22	110	80	98	78	98	62	86	66	83	55	68	40	74	41	85	55	83	52	86	54	87	58	110	69
23	111	80	99	77	97	60	90	55	82	49	67	40	75	45	85	53	87	56	91	54	91	59	109	71
24	111	77	101	73	100	65	86	56	78	48	69	33	80	47	87	51	90	57	95	58	93	65	106	68
25	110	77	102	71	101	66	85	55	66	48	62	41	80	46	87	55	96	57	100	58	100	60	111	70
26	106	80	106	69	99	70	81	61	66	42	58	42	69	52	89	53	99	65	98	64	100	63	110	79
27	108	78	102	72	98	65	78	57	70	41	56	38	67	45	89	58	92	70	101	62	96	60	109	72
28	111	78	104	72	97	68	80	55	71	42	62	38	65	40	90	56	94	68	102	61	89	62	111	68
29	118	77	105	71	84	66	83	42	71	40	60	44	65	45	.....	.....	100	62	102	64	92	63	108	72
30	117	78	106	80	86	61	82	50	68	52	60	42	60	40	.....	.....	97	65	103	65	95	65	106	67
31	115	84	104	74	.....	.....	85	51	.....	.....	67	42	64	41	.....	.....	80	67	.....	.....	101	63	.....	.....
Range	48°		45°		45°		57°		43°		51°		50°		53°		54°		55°		49°		52°	
Monthly mean	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

STATION STATISTICS.

PAPER 13.

Statement showing how many times the wind was observed blowing from the eight principal points of the compass during each month and season of the year ending June 30, 1879, compiled from the local observations taken at the several stations of observations at 7 a. m., 2 p. m., and 9 p. m. (local time).

Station.	Wind.	July, 1878.	August.	September.	October.	November.	December.	January, '79.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Albany, N. Y	N.	21	4	7	7	9	6	13	19	18	25	15	16	58	41	23	38
	N. W.	12	12	20	26	35	43	37	35	32	30	19	22	81	46	81	115
	W.	13	10	4	9	11	11	1	3	2	13	5	4	20	27	24	15
	S. W.	2	6	3	2	3	8	6	2	2	2	2	4	6	12	8	16
	S.	31	37	30	30	19	7	18	15	29	12	41	31	82	99	79	40
	S. E.	7	6	14	6	3	8	2	2	5	1	1	2	7	15	23	12
	E.	0	1	2	2	2	0	0	0	1	0	1	1	2	2	6	0
	N. E.	4	4	1	1	5	2	1	1	2	4	2	2	8	10	7	4
	Calm.	3	13	9	10	3	8	15	7	2	3	7	8	12	24	22	30
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alpena, Mich	N.	10	6	5	4	6	7	5	4	1	12	7	7	20	23	15	16
	N. W.	21	22	21	19	30	20	14	23	21	27	24	26	72	69	70	57
	W.	11	19	11	22	13	31	33	14	17	6	7	7	30	37	46	78
	S. W.	5	11	8	14	11	20	17	5	6	1	7	7	14	23	33	42
	S.	4	5	11	17	3	1	8	5	3	4	8	8	15	17	31	14
	S. E.	14	11	21	6	1	3	3	9	24	17	28	23	69	48	28	15
	E.	10	4	4	2	1	1	0	4	3	5	7	4	15	18	7	5
	N. E.	5	1	2	1	1	3	2	6	3	10	4	6	17	12	4	11
	Calm.	13	14	7	8	9	5	11	14	15	8	1	2	24	29	24	30
	Blank.	0	0	0	0	15	2	0	0	0	0	0	0	0	0	15	2
Atlanta, Ga*	N.	...	...	...	...	4	4	2	3	1	4	6	4	11	...	...	9
	N. W.	...	...	...	...	32	43	37	27	38	29	14	16	81	...	...	107
	W.	...	...	...	...	13	13	17	18	7	8	6	19	21	...	...	48
	S. W.	...	...	...	...	10	10	11	10	15	5	6	5	26	...	...	31
	S.	...	...	...	...	5	0	3	4	12	15	2	9	29	...	...	7
	S. E.	...	...	...	...	8	6	5	1	9	11	15	11	35	...	...	12
	E.	...	...	...	...	11	14	14	7	4	15	18	15	37	...	...	35
	N. E.	...	...	...	...	6	3	4	13	7	3	25	10	35	...	...	20
	Calm.	...	...	...	...	1	0	0	1	0	0	1	0	1	...	...	1
	Blank.	...	...	...	...	0	0	0	0	0	0	0	0	0	...	...	0
Atlantic City, N. J	N.	3	4	8	5	13	6	13	11	7	17	7	10	31	17	26	30
	N. W.	7	8	7	19	10	33	32	33	24	17	6	3	47	18	36	98
	W.	6	12	3	13	33	29	14	9	6	15	4	6	25	24	49	52
	S. W.	14	13	11	11	9	8	18	9	9	5	14	38	28	65	31	35
	S.	39	14	17	19	6	4	5	5	17	20	33	17	70	70	42	14
	S. E.	7	17	7	5	6	8	1	8	15	4	9	7	28	31	18	17
	E.	4	12	8	8	5	1	1	4	5	4	4	4	13	20	21	6
	N. E.	13	13	28	11	8	4	8	5	9	8	15	4	32	30	47	17
	Calm.	0	0	1	2	0	0	1	0	1	0	1	1	2	1	3	1
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Augusta Ga	N.	0	7	5	7	6	2	3	8	6	9	3	2	18	9	18	13
	N. W.	6	19	11	20	22	12	19	20	24	15	7	8	46	33	53	51
	W.	4	1	3	5	12	23	13	5	11	8	4	1	23	0	20	41
	S. W.	3	8	2	3	6	19	11	14	10	8	13	14	31	25	11	44
	S.	12	10	4	5	2	3	7	2	13	13	10	16	36	38	11	12
	S. E.	37	15	6	3	5	6	9	2	2	13	11	16	26	68	14	17
	E.	12	2	9	9	3	5	3	7	3	2	4	4	9	18	21	15
	N. E.	14	6	27	16	6	7	2	12	6	6	22	14	34	34	49	21
	Calm.	5	25	23	25	28	16	26	14	18	16	18	15	52	45	76	56
	Blank.	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
Baltimore Md	N.	10	2	9	15	13	6	10	6	21	13	14	17	48	29	37	22
	N. W.	9	10	8	21	22	27	22	15	23	23	11	12	57	40	51	64
	W.	8	7	12	10	17	35	24	25	4	17	6	9	27	24	39	84
	S. W.	13	9	5	6	5	9	14	2	3	2	3	19	8	41	16	25
	S.	14	17	12	12	5	5	7	11	6	5	19	18	30	49	29	23
	S. E.	16	22	9	15	6	5	5	8	15	12	20	7	47	45	30	18
	E.	11	11	23	5	11	4	5	10	9	10	11	1	30	23	39	19
	N. E.	10	4	6	3	10	2	5	4	10	6	9	7	25	21	19	11
	Calm.	2	2	6	6	1	0	1	3	2	2	0	0	4	4	13	4
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Station opened on November 1, 1878.

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1878.	August.	September.	October.	November.	December.	January, '79.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Barnegat, N. J.	N.	2	12	8	9	13	5	12	9	12	12	6	9	30	23	30	26
	N. W.	11	11	7	27	28	43	36	31	21	26	10	10	57	32	62	110
	W.	6	7	3	7	16	26	14	10	5	9	5	9	19	22	26	50
	S. W.	15	14	12	15	10	4	16	8	8	7	6	10	21	45	37	28
	S.	20	16	12	15	4	6	2	0	20	18	37	38	75	83	31	17
	S. E.	10	17	11	7	7	4	1	5	9	4	9	3	22	30	25	10
	E.	7	11	18	8	11	3	8	7	10	9	15	4	34	22	37	18
	N. E.	12	5	19	4	1	2	2	5	8	4	5	1	17	18	24	9
	Calm.	1	0	0	1	0	0	2	0	0	1	0	0	1	1	1	2
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bismarck, D. T.	N.	6	13	13	3	11	4	1	15	8	9	15	8	32	27	27	20
	N. W.	11	15	19	32	15	33	23	23	33	14	11	13	58	39	66	79
	W.	5	8	10	17	11	26	14	5	8	3	5	20	16	33	38	45
	S. W.	4	3	2	1	6	2	5	2	2	4	2	3	8	10	9	9
	S.	14	13	12	5	8	3	5	6	4	12	2	10	18	37	25	14
	S. E.	23	7	7	12	18	3	9	11	5	11	15	20	31	50	37	23
	E.	14	12	8	9	10	8	13	11	19	18	24	7	61	33	27	32
	N. E.	8	6	10	4	4	2	5	7	5	15	19	6	30	20	18	14
	Calm.	8	16	9	10	7	12	18	4	9	4	0	3	13	27	26	34
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Boise City, Idaho	N.	18	21	8	12	6	10	17	8	6	8	15	14	29	53	26	25
	N. W.	22	18	15	18	27	26	13	13	13	28	28	37	69	77	60	52
	W.	10	8	7	5	3	7	5	8	4	10	13	8	27	26	15	20
	S. W.	5	1	9	3	4	6	3	4	2	3	6	0	11	6	16	13
	S.	13	9	13	15	9	9	32	11	3	3	5	6	11	28	37	52
	S. E.	6	10	15	25	34	23	11	32	46	25	14	9	85	25	74	66
	E.	3	4	5	1	2	2	5	4	12	5	3	3	20	10	8	11
	N. E.	8	7	10	8	4	8	3	1	6	6	4	7	16	22	22	7
	Calm.	8	9	8	6	1	7	4	3	1	2	5	6	8	23	15	14
	Blank.	0	6	0	0	0	0	0	0	0	0	0	0	0	6	0	0
Boston, Mass.	N.	5	4	4	6	4	3	8	11	17	10	7	9	34	18	14	22
	N. W.	11	5	10	16	26	32	26	26	18	20	9	10	47	26	52	84
	W.	27	25	9	17	29	34	32	25	18	29	10	18	57	70	55	91
	S. W.	22	18	18	27	12	9	14	6	10	6	30	24	46	64	57	29
	S.	3	13	11	6	3	2	7	7	9	3	13	5	25	21	20	16
	S. E.	9	8	9	8	3	9	3	1	6	1	9	9	16	26	20	13
	E.	11	15	13	9	6	3	1	3	10	14	9	5	33	31	28	7
	N. E.	4	2	14	2	6	0	1	3	1	6	2	6	9	12	22	4
	Calm.	1	3	2	2	1	1	1	2	4	1	4	4	9	8	5	4
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Breckenridge, Minn.	N.	15	26	15	11	13	24	16	20	5	25	19	10	49	51	39	60
	N. W.	8	17	14	29	12	21	22	21	21	8	6	8	35	33	55	64
	W.	6	6	16	17	11	26	23	11	28	4	6	16	38	28	44	60
	S. W.	2	5	2	5	1	5	2	2	3	3	1	6	7	13	8	9
	S.	21	16	10	10	20	6	9	3	5	5	8	22	18	59	40	18
	S. E.	25	18	28	15	17	6	17	19	18	25	27	23	70	66	60	42
	E.	5	4	3	4	6	2	1	4	5	9	18	5	32	14	13	7
	N. E.	8	0	1	1	2	3	1	4	5	9	8	0	22	8	4	8
	Calm	3	1	1	1	8	0	2	0	3	2	0	0	5	4	10	2
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Buffalo, N. Y.	N.	6	11	6	2	11	4	3	5	5	5	4	6	14	23	19	12
	N. W.	9	4	4	9	5	3	4	5	8	8	5	12	21	25	18	12
	W.	12	11	9	26	25	38	15	16	6	10	7	13	23	36	54	69
	S. W.	36	36	27	21	23	26	52	33	43	45	45	40	133	112	71	111
	S.	8	17	20	26	6	6	7	9	9	6	8	6	23	31	52	22
	S. E.	1	1	6	4	2	3	1	1	1	0	3	1	4	8	12	5
	E.	5	1	3	4	3	1	1	3	3	0	13	4	16	10	10	5
	N. E.	15	11	14	6	15	11	10	12	18	15	8	3	41	29	35	33
	Calm.	1	1	1	1	0	1	0	0	0	1	0	5	1	7	2	1
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington, Vt.	N.	23	9	17	21	17	14	24	20	19	39	21	27	79	59	55	67
	N. W.	4	4	7	3	19	14	5	11	5	12	5	7	22	15	29	30
	W.	6	4	6	3	9	16	9	7	6	11	9	8	26	18	18	32
	S. W.	8	2	2	1	2	3	0	2	4	2	9	9	15	10	5	5
	S.	29	49	37	48	28	28	44	28	53	19	44	33	116	111	113	100
	S. E.	1	4	8	1	5	6	3	3	1	0	0	1	1	6	14	12
	E.	2	2	2	5	5	5	5	2	2	3	0	0	5	4	12	12
	N. E.	4	0	0	2	1	6	3	1	1	1	1	2	3	6	3	10
	Calm.	16	19	11	0	4	1	0	1	2	3	4	3	9	38	24	2
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1878.	August.	September.	October.	November.	December.	January, '79.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Cairo, Ill	N.	14	11	16	11	17	12	18	17	13	19	20	7	52	32	44	47
	N. W.	6	11	7	19	14	31	21	20	17	18	3	12	38	29	40	72
	W.	3	10	3	3	5	10	1	3	6	3	9	4	18	17	11	14
	S. W.	13	20	4	4	9	8	7	3	4	3	5	6	12	39	17	18
	S.	14	20	35	33	17	7	19	16	21	20	25	26	66	60	85	42
	S. E.	4	2	7	7	4	3	6	12	7	9	7	12	23	18	18	21
	E.	4	7	9	6	6	7	5	5	10	5	2	8	17	19	21	17
	N. E.	12	6	8	5	9	9	3	2	7	1	12	8	20	26	22	14
	Calm.	23	6	1	5	9	6	13	6	8	12	10	7	30	36	15	25
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cape Hatteras, N. C	N.	2	2	0	12	3	13	11	6	3	2	1	1	6	5	18	30
	N. W.	0	3	0	6	12	18	16	9	2	8	0	1	10	4	18	43
	W.	2	8	1	4	23	19	13	5	6	8	4	2	18	12	28	37
	S. W.	27	29	9	8	11	8	18	9	11	24	16	38	51	94	28	35
	S.	14	7	11	3	1	0	2	6	10	10	4	8	24	29	15	8
	S. E.	18	8	8	6	2	8	5	4	6	9	15	6	30	32	16	17
	E.	5	6	3	3	4	1	0	1	4	3	7	3	14	14	10	2
	N. E.	23	23	48	43	27	21	25	42	48	20	44	26	112	72	118	88
	Calm.	2	7	10	8	4	5	3	2	3	6	2	5	11	14	22	10
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cape Henry, Va	N.	1	0	8	4	2	9	6	17	8	7	9	10	24	11	14	32
	N. W.	5	13	7	26	30	17	24	16	16	19	5	2	40	20	63	57
	W.	6	4	2	5	1	9	8	6	8	8	3	0	19	10	8	23
	S. W.	17	26	8	10	28	30	31	8	8	22	12	26	42	69	46	69
	S.	18	4	8	8	2	3	4	5	11	16	9	11	36	33	18	12
	S. E.	26	23	6	11	9	12	4	8	19	13	29	28	61	77	26	34
	E.	12	8	5	8	0	4	3	1	6	3	0	3	18	23	13	8
	N. E.	7	14	41	19	17	9	9	12	16	2	17	9	35	30	77	30
	Calm.	1	0	5	2	1	0	4	11	1	0	0	1	1	2	8	15
	Blank.	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Cape Lookout, N. C	N.	1	4	2	15	10	4	11	11	6	6	1	2	13	7	27	26
	N. W.	1	6	3	11	18	24	17	12	4	11	0	1	15	8	32	53
	W.	3	7	6	3	17	17	12	8	3	6	2	1	11	11	26	37
	S. W	38	36	15	10	14	10	24	17	27	31	27	46	85	120	30	51
	S.	8	9	4	5	2	4	4	4	8	15	12	3	35	20	11	12
	S. E.	12	6	9	8	1	4	3	1	6	7	9	5	22	23	18	8
	E.	18	5	9	7	1	1	2	0	6	2	9	5	17	28	17	3
	N. E.	12	20	42	34	26	29	18	31	33	11	32	27	76	59	102	78
	Calm.	0	0	0	0	1	0	2	0	0	1	1	0	2	0	1	2
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cape May, N. J	N.	3	7	12	15	17	6	11	8	8	7	9	13	24	23	44	27
	N. W.	7	12	6	22	20	37	37	30	28	22	9	5	50	24	48	104
	W.	7	4	4	5	16	23	9	15	1	17	4	6	22	17	25	47
	S. W.	4	6	7	8	11	7	13	1	1	8	2	4	11	14	26	21
	S.	33	23	14	21	8	4	13	8	22	14	26	45	62	101	43	25
	S. E.	24	25	10	8	5	9	2	9	14	9	21	11	44	60	23	20
	E.	7	10	17	5	8	2	3	8	4	6	14	5	24	22	30	18
	N. E.	6	6	20	5	5	4	5	5	15	7	8	0	30	12	30	14
	Calm.	2	0	0	4	0	1	0	0	0	0	0	1	0	3	4	1
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Charleston, S. C	N.	2	4	5	21	9	5	11	15	10	8	4	2	22	8	35	31
	N. W.	0	0	1	5	6	11	12	8	9	8	1	3	18	3	12	31
	W.	2	15	5	6	18	26	19	13	8	8	3	6	19	23	29	58
	S. W.	23	39	7	3	15	12	20	18	34	31	30	28	95	90	25	50
	S.	11	15	9	3	7	2	6	0	5	6	13	15	24	41	19	8
	S. E.	18	6	14	21	8	8	3	3	7	14	9	16	30	40	48	14
	E.	24	10	19	13	10	12	15	8	9	9	14	13	32	47	42	35
	N. E.	13	4	29	19	15	15	6	10	8	5	17	7	30	24	63	40
	Calm.	0	0	1	2	2	2	1	0	3	1	2	0	6	0	5	8
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*Charlotte, N. C	N.	....	....	....	....	9	8	5	12	8	11	9	7	28	....	....	25
	N. W.	....	....	....	....	9	12	15	12	13	17	10	2	40	....	....	39
	W.	....	....	....	....	9	14	12	6	4	7	4	7	15	....	....	32
	S. W.	....	....	....	....	20	12	20	13	26	22	12	22	60	....	....	45
	S.	....	....	....	....	11	12	11	9	12	21	12	21	45	....	....	32
	S. E.	....	....	....	....	2	5	3	1	6	3	8	4	17	....	....	9
	E.	....	....	....	....	9	13	15	11	10	5	15	11	30	....	....	39
	N. E.	....	....	....	....	18	16	10	19	14	3	22	16	39	....	....	45
	Calm.	....	....	....	....	3	1	2	1	0	1	1	0	2	....	....	4
	Blank.	....	....	....	....	0	0	0	0	0	0	0	0	0	....	....	0

*Station opened October 6, 1878.

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1878.	August.	September.	October.	November.	December.	January, '79.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Chattanooga, Tenn*	N.	....	....	....	....	....	....	....	10	6	11	12	12	29	....	....	....
	N. W.	....	....	....	....	....	....	....	20	16	17	12	9	45	....	....	....
	W.	....	....	....	....	....	....	....	9	13	4	6	7	23	....	....	....
	S. W.	....	....	....	....	....	....	....	7	10	12	6	11	28	....	....	....
	S.	....	....	....	....	....	....	....	7	9	12	15	19	36	....	....	....
	S. E.	....	....	....	....	....	....	....	9	10	7	7	7	24	....	....	....
	E.	....	....	....	....	....	....	....	1	9	7	6	2	22	....	....	....
	N. E.	....	....	....	....	....	....	....	13	12	11	16	5	39	....	....	....
	Calm.	....	....	....	....	....	....	....	8	8	9	13	18	30	....	....	....
	Blank.	....	....	....	....	....	....	....	0	0	0	0	0	0	....	....	....
Cheyenne, Wyo	N.	6	8	12	6	14	16	14	7	5	18	17	17	40	31	32	37
	N. W.	15	18	26	29	31	42	29	27	24	18	15	12	57	45	86	98
	W.	9	5	12	25	13	3	23	28	19	18	11	20	48	34	50	54
	S. W.	15	7	9	6	8	7	8	13	13	4	9	10	26	32	23	28
	S.	22	12	15	7	9	1	6	2	11	9	20	14	40	48	31	9
	S. E.	11	15	2	2	3	2	3	0	4	9	9	6	22	33	7	5
	E.	3	5	1	1	1	0	2	1	2	3	7	3	12	11	3	3
	N. E.	7	8	3	3	1	5	1	3	8	7	4	5	19	20	7	9
	Calm.	5	15	10	14	10	17	6	3	7	4	1	3	12	23	34	26
	Blank.	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Chicago, Ill	N.	0	4	3	9	13	6	4	6	8	26	22	24	56	28	25	16
	N. W.	3	5	16	13	13	20	13	15	13	8	0	0	21	8	42	48
	W.	3	5	4	10	11	19	32	18	14	3	4	3	21	11	25	69
	S. W.	13	29	33	34	18	33	29	16	14	8	7	15	29	57	85	78
	S.	2	7	10	18	9	5	1	12	17	13	14	14	44	23	37	18
	S. E.	20	10	12	2	5	4	6	6	5	9	15	8	29	38	19	16
	E.	15	12	2	2	8	3	3	4	9	10	15	7	34	34	12	10
	N. E.	36	20	10	5	11	2	3	6	9	12	14	14	35	70	26	11
	Calm.	1	1	0	0	2	1	2	1	4	1	2	5	7	7	2	4
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cincinnati, Ohio	N.	15	14	14	13	9	5	10	8	11	15	9	9	35	38	36	23
	N. W.	10	16	9	15	16	19	20	21	23	16	8	5	47	31	40	60
	W.	7	20	6	10	13	19	15	12	12	5	7	6	24	33	29	46
	S. W.	15	5	5	7	10	19	14	10	11	13	7	20	31	40	22	43
	S.	13	3	13	16	9	6	11	7	8	4	6	6	18	22	38	24
	S. E.	10	16	21	20	16	13	13	13	12	13	23	18	48	44	57	39
	E.	9	3	12	5	8	7	5	7	8	6	4	8	18	20	25	19
	N. E.	14	15	5	6	7	5	5	6	7	11	26	16	44	45	18	16
	Calm.	0	1	5	1	2	0	0	0	1	7	3	2	11	3	8	0
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleveland, Ohio	N.	35	21	10	7	11	2	6	8	5	18	31	33	64	80	28	16
	N. W.	13	20	6	10	19	4	3	10	8	15	7	8	30	41	35	17
	W.	6	7	9	10	11	24	24	7	13	15	5	6	33	19	30	55
	S. W.	3	10	9	13	14	30	24	23	18	8	3	8	29	21	36	86
	S.	14	11	24	31	14	16	20	6	11	6	10	11	27	36	69	42
	S. E.	10	11	23	17	9	7	10	24	19	15	25	14	50	35	49	41
	E.	4	9	6	3	4	0	4	2	5	5	5	8	15	21	13	6
	N. E.	6	3	2	2	8	1	2	4	4	7	6	2	17	11	12	7
	Calm.	2	1	1	0	0	0	0	0	0	1	1	0	2	3	1	0
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Columbus, Ohio	N.	10	19	15	9	8	3	10	6	12	17	13	14	42	43	32	19
	N. W.	13	7	8	14	14	10	10	11	21	17	8	5	46	25	36	31
	W.	9	13	8	16	19	24	18	25	14	6	11	9	31	31	43	67
	S. W.	7	12	9	9	16	30	20	10	15	10	6	16	31	35	34	60
	S.	9	16	22	24	9	9	21	14	14	13	16	18	43	43	55	44
	S. E.	0	7	13	11	10	6	6	8	8	8	13	6	29	13	34	20
	E.	3	5	8	5	8	9	6	7	6	5	9	10	20	18	21	22
	N. E.	2	12	5	4	5	2	2	3	2	10	17	12	29	26	14	7
	Calm.	40	2	2	1	1	0	0	0	1	4	0	0	5	42	4	0
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Concho, Texas†	N.	....	14	7	5	7	2	4	5	7	8	9	....	24	....	19	11
	N. W.	....	6	4	10	21	18	11	9	12	20	4	....	36	....	35	38
	W.	....	3	3	5	6	7	4	7	6	11	9	....	26	....	14	18
	S. W.	....	6	1	13	8	13	17	22	15	17	15	....	47	....	22	52
	S.	....	12	38	26	9	2	12	10	24	9	22	....	55	....	73	24
	S. E.	....	12	8	11	10	6	4	0	5	8	14	....	27	....	29	10
	E.	....	23	12	3	6	2	2	1	2	2	6	....	10	....	21	5
	N. E.	....	7	11	20	4	25	13	19	18	10	8	....	36	....	35	57
	Calm.	....	10	6	0	19	18	26	11	4	5	6	....	15	....	25	55
	Blank.	....	0	0	0	0	0	0	0	0	0	0	....	0	....	0	0

* Station opened January 8, 1879. † Local series of observations discontinued May 31, 1879.

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1878.	August.	September.	October.	November.	December.	January, '79.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Corsicana, Texas	N.	9	5	17	25	10	19	13	14	14	10	6	7	30	21	52	46
	N. W.	0	3	0	1	20	30	20	14	10	15	4	2	29	5	21	64
	W.	4	1	0	0	7	7	4	4	3	4	3	0	10	5	7	15
	S. W.	4	3	1	2	4	0	1	7	2	6	1	5	9	12	7	8
	S.	38	24	32	36	29	12	23	18	28	17	39	32	84	94	97	53
	S. E	15	22	29	11	12	9	18	14	28	20	21	29	69	66	52	41
	E.	11	18	4	8	2	7	4	9	3	8	12	11	23	40	14	20
	N. E.	7	14	5	10	3	8	8	4	4	4	1	4	9	25	18	29
	Calm.	5	3	2	0	3	1	2	0	1	6	6	0	13	8	5	3
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Davenport, Iowa	N.	4	6	4	9	13	5	6	8	6	8	5	7	19	17	26	20
	N. W.	11	8	17	17	21	31	17	18	24	18	6	11	48	30	55	59
	W.	2	5	3	17	5	27	24	16	19	8	6	9	33	16	25	59
	SW.	14	16	12	14	13	14	20	9	13	8	5	14	26	44	39	42
	S.	10	1	21	21	5	4	9	10	8	12	13	11	33	22	47	27
	S. E.	7	6	6	3	6	3	4	7	7	11	16	7	34	20	15	18
	E.	23	7	6	1	8	3	4	10	8	9	26	20	43	50	15	22
	N. E.	17	7	2	5	9	5	8	5	7	16	16	9	39	33	16	20
	Calm.	5	37	19	6	10	1	1	1	1	0	0	2	1	44	35	3
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deadwood, D. T.*	N.	....	....	....	....	25	17	6	15	13	8	7	4	28	....	....	38
	N. W.	....	....	....	....	3	10	8	6	4	1	6	3	11	....	....	24
	W.	....	....	....	....	1	19	24	11	8	7	5	13	20	....	....	54
	S. W.	....	....	....	....	17	13	29	22	27	10	15	14	52	....	....	64
	S.	....	....	....	....	34	20	5	12	22	11	7	14	40	....	....	37
	S. E.	....	....	....	....	2	1	0	0	3	7	8	8	18	....	....	1
	E.	....	....	....	....	0	0	0	1	2	13	1	3	16	....	....	1
	N. E.	....	....	....	....	0	5	1	6	9	13	19	9	41	....	....	12
	Calm.	....	....	....	....	8	8	20	11	5	20	25	22	50	....	....	39
	Blank.	....	....	....	....	0	0	0	0	0	0	0	0	0	....	....	0
Denison, Texas	N.	12	14	15	11	8	19	18	21	15	14	5	8	34	34	34	58
	N. W.	2	5	4	12	24	26	16	12	8	7	6	1	21	8	40	54
	W.	1	3	0	1	3	1	2	3	1	3	0	0	4	4	4	6
	S. W.	6	8	6	6	12	10	9	4	7	10	3	7	20	21	24	23
	S.	23	13	19	21	19	7	22	16	28	10	21	22	59	58	59	45
	S. E.	27	27	35	19	13	2	11	14	16	31	37	41	84	95	67	27
	E.	16	12	7	11	3	7	3	7	4	2	11	9	17	37	21	17
	N. E.	4	9	3	12	8	20	9	6	14	12	10	2	36	15	23	35
	Calm.	2	2	1	0	0	1	3	1	0	1	0	0	1	4	1	5
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Denver, Colo	N.	13	20	22	13	16	10	14	12	11	19	10	21	40	54	51	36
	N. W.	8	21	14	16	8	15	18	16	13	19	18	4	50	33	38	49
	W.	5	7	3	5	2	6	4	4	10	5	4	5	19	17	10	14
	S. W.	3	1	6	5	4	4	6	5	5	1	7	6	13	10	15	15
	S.	18	14	19	26	31	30	32	25	23	23	24	25	70	57	76	87
	S. E.	30	16	16	11	18	10	12	12	10	6	13	13	29	59	45	34
	E.	4	3	6	7	5	4	3	6	7	12	12	5	31	12	18	13
	N. E.	5	5	1	10	6	14	4	4	13	4	5	11	22	21	17	22
	Calm.	7	5	3	0	0	0	0	0	1	1	0	0	2	12	3	0
	Blank.	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Des Moines, Iowa†	N.	....	3	9	8	11	12	8	11	13	10	6	8	29	...	28	31
	N. W.	....	21	11	20	20	40	29	20	22	13	2	7	37	...	51	89
	W.	....	12	9	11	8	8	3	9	10	4	5	9	19	....	28	20
	S. W.	....	16	18	27	15	11	17	10	12	7	16	11	35	....	60	38
	S.	....	5	6	4	3	3	4	5	5	7	11	17	23	....	13	12
	S. E.	....	2	15	4	11	2	7	10	10	15	20	18	45	....	30	19
	E.	...	3	2	3	5	0	3	2	3	8	5	6	16	....	10	5
	N. E.	....	3	3	7	11	6	8	6	6	10	14	5	30	....	21	20
	Calm.	....	28	17	9	6	10	14	11	12	16	14	9	42	...	32	35
	Blank.	....	0	0	0	0	1	0	0	0	0	0	0	0	....	0	1
Detroit, Mich	N.	9	7	7	6	12	3	5	7	11	12	8	11	31	27	25	15
	N. W.	10	8	9	16	19	14	8	11	12	16	10	7	38	25	44	33
	W.	4	13	10	20	19	32	25	26	24	5	6	4	35	21	49	83
	S. W.	19	23	21	31	15	29	39	12	13	18	21	35	52	77	67	80
	S.	4	2	8	16	4	1	5	10	9	7	12	7	28	13	28	16
	S. E.	2	0	11	1	0	2	3	7	4	3	4	2	11	4	12	12
	E.	15	3	4	2	9	9	3	4	11	11	13	6	35	24	15	16
	N. E.	18	11	5	1	11	3	5	7	9	17	19	17	45	46	17	15
	Calm.	12	26	15	0	1	0	0	0	0	1	0	1	1	39	16	0
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Station reopened November 1, 1878. † Station opened August 1, 1878.

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1878.	August.	September.	October.	November.	December.	January, '79.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Dodge City, Kansas	N.	3	5	11	15	26	21	28	20	18	18	12	11	48	19	52	69
	N. W.	2	0	3	9	7	22	11	6	3	10	5	2	18	4	19	39
	W.	2	0	4	5	6	13	11	5	8	4	1	3	13	5	15	29
	S. W.	13	17	9	8	10	2	5	11	9	4	6	5	19	35	27	18
	S.	44	35	38	24	10	3	13	25	18	31	34	37	83	116	72	41
	S. E.	19	17	13	11	9	8	12	3	13	10	24	20	47	56	33	23
	E.	4	6	3	2	5	4	4	1	3	7	2	3	12	13	10	9
	N. E.	6	9	6	17	10	14	6	9	20	6	6	6	32	21	33	29
	Calm.	0	4	3	2	7	6	3	4	1	0	3	3	4	7	12	13
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dubuque, Iowa	N.	6	15	10	15	17	19	13	12	9	13	14	10	36	31	42	44
	N. W.	10	9	12	22	17	35	24	24	27	13	2	12	42	31	51	83
	W.	3	13	7	14	5	17	5	5	10	6	4	5	20	21	26	27
	S. W.	9	9	10	12	9	7	11	2	9	10	7	11	26	29	31	20
	S.	10	9	23	20	12	4	10	10	13	14	11	14	38	33	55	24
	S. E.	22	12	14	3	10	2	0	13	3	10	34	16	47	50	27	15
	E.	9	4	0	2	1	0	3	3	3	8	11	10	22	23	3	6
	N. E.	14	7	6	1	7	4	6	4	9	16	7	12	32	33	14	14
	Calm.	10	15	8	4	12	5	21	11	10	0	3	0	13	25	24	37
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Duluth, Minn	N.	8	2	2	0	3	3	4	0	1	6	2	1	9	11	5	7
	N. W.	14	27	22	18	16	35	19	30	17	8	10	12	35	53	56	84
	W.	8	12	8	22	10	6	15	9	11	5	2	7	18	27	40	30
	S. W.	15	8	11	19	20	38	39	14	29	4	7	11	40	34	50	91
	S.	0	0	2	1	0	0	1	0	1	0	0	0	1	0	3	1
	S. E.	3	1	2	1	2	0	0	2	3	0	0	2	3	6	5	2
	E.	0	0	1	1	2	0	0	0	0	0	1	0	1	0	4	0
	N. E.	29	21	31	19	17	2	3	17	21	58	66	50	145	100	67	22
	Calm.	16	22	11	12	20	9	12	12	10	9	5	7	24	45	43	33
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eastport, Me	N.	6	5	8	11	12	3	9	9	12	14	7	11	33	22	31	21
	N. W.	13	11	11	14	22	40	42	28	16	14	7	14	37	38	47	110
	W.	8	7	7	6	19	18	12	14	12	9	3	4	24	19	32	44
	S. W.	7	13	10	11	14	11	10	14	9	16	15	10	40	30	35	35
	S.	45	38	32	26	11	2	6	8	14	21	47	20	82	112	69	16
	S. E.	2	1	1	4	2	9	2	0	7	3	0	5	10	8	7	11
	E.	2	4	5	9	3	4	2	1	11	2	2	4	15	10	17	7
	N. E.	3	3	10	9	6	3	5	10	9	7	8	11	24	17	25	18
	Calm.	7	11	6	3	1	3	5	0	3	4	4	2	11	20	10	8
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erie, Pa	N.	14	15	7	7	12	5	3	2	8	6	5	6	19	35	26	10
	N. W.	11	3	8	17	17	11	5	10	10	11	5	13	26	27	42	26
	W.	17	20	9	9	15	13	22	23	16	26	14	19	56	65	33	58
	S. W.	11	6	8	12	13	37	30	11	14	9	14	14	37	31	33	78
	S.	12	27	36	39	17	10	15	12	17	12	22	16	51	55	92	37
	S. E.	6	2	7	4	6	11	1	5	2	4	4	3	10	11	17	17
	E.	4	2	4	1	3	2	0	0	2	3	3	4	8	10	8	2
	N. E.	11	2	8	2	4	1	10	12	9	12	17	9	38	22	14	23
	Calm.	7	7	3	2	3	3	7	9	15	7	9	6	31	20	8	19
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Escanaba, Mich	N.	30	23	15	12	10	17	19	24	21	33	28	19	82	72	46	60
	N. W.	7	10	15	26	24	30	23	26	15	9	5	4	29	21	65	79
	W.	8	13	9	12	7	28	16	5	9	1	6	2	16	18	28	49
	S. W.	9	15	6	18	16	10	21	5	6	2	1	10	9	34	40	36
	S.	25	25	30	17	11	1	10	13	19	15	30	38	64	88	58	24
	S. E.	4	4	9	4	2	0	1	4	9	7	11	5	27	13	15	5
	E.	2	0	0	1	3	2	1	2	6	3	4	1	13	3	4	5
	N. E.	6	3	4	2	7	4	2	3	6	16	6	6	28	15	18	9
	Calm.	7	0	2	1	1	1	0	2	2	4	2	5	8	12	4	3
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fort Gibson, I. T	N.	9	7	12	16	20	35	33	27	24	20	6	7	50	23	48	95
	N. W.	3	2	2	11	8	5	9	4	6	7	4	2	17	7	21	18
	W.	2	4	0	3	8	6	3	0	3	8	4	2	15	8	11	9
	S. W.	4	6	3	2	6	5	4	6	2	9	1	6	12	16	11	15
	S.	26	24	27	28	16	9	26	21	26	11	27	21	64	71	71	56
	S. E.	24	19	23	19	14	7	9	7	12	17	20	30	49	73	56	28
	E.	12	12	15	9	11	12	5	10	11	11	20	14	42	38	35	27
	N. E.	9	5	2	3	2	11	2	6	4	3	8	1	15	15	7	19
	Calm.	4	14	6	2	5	3	2	3	5	4	3	7	12	25	13	8
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1878.	August.	September.	October.	November.	December.	January, 79.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Galveston, Texas	N.	7	4	18	25	8	14	17	21	10	9	3	7	22	18	51	52
	N. W.	4	6	2	2	13	22	9	6	1	9	2	2	12	12	17	37
	W.	6	6	0	1	9	7	2	4	1	4	5	1	10	13	10	13
	S. W.	8	8	0	0	2	5	2	1	1	4	3	4	8	20	2	8
	S.	12	15	12	26	12	6	16	16	24	23	34	25	81	52	50	38
	S. E.	36	26	28	21	10	12	25	15	33	26	29	36	88	98	59	52
	E.	11	15	18	9	30	20	15	14	17	10	9	9	36	35	57	49
	N. E.	8	5	9	8	6	7	6	7	4	4	6	6	14	19	23	20
	Calm.	1	8	3	1	0	0	1	0	2	1	2	0	5	9	4	1
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Haven, Mich.	N.	5	11	13	13	12	8	9	11	12	16	7	10	35	26	38	28
	N. W.	16	16	12	17	11	25	18	19	17	15	18	15	50	47	40	02
	W.	12	13	3	10	12	19	14	9	17	8	8	13	33	38	25	42
	S. W.	11	15	8	11	10	4	19	3	8	12	13	19	33	45	29	26
	S.	12	10	26	23	6	2	7	4	7	5	12	13	24	35	55	13
	S. E.	6	4	11	4	4	5	7	9	8	6	7	2	21	12	19	21
	E.	13	7	3	4	25	17	10	19	14	10	12	5	36	25	32	46
	N. E.	13	8	6	7	10	11	6	8	6	15	10	8	31	29	23	25
	Calm.	5	9	8	4	0	2	3	2	4	3	6	5	13	19	12	7
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indianapolis, Ind.	N.	19	8	11	5	2	3	8	2	4	11	13	7	28	34	18	13
	N. W.	13	17	13	24	25	17	16	20	28	20	7	12	55	42	62	53
	W.	4	11	3	5	6	20	21	10	10	6	5	5	21	20	14	57
	S. W.	16	23	11	7	13	23	16	8	17	9	6	5	32	44	31	47
	S.	11	7	12	10	9	6	15	3	3	6	9	21	18	39	31	24
	S. E.	8	4	20	27	11	5	9	13	14	10	20	10	44	22	58	27
	E.	4	4	9	0	4	4	2	4	6	6	7	6	19	14	13	10
	N. E.	16	15	3	3	10	8	3	4	4	6	14	5	24	36	16	15
	Calm.	2	4	8	12	10	7	3	14	7	16	12	19	35	25	30	24
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indianola, Texas	N.	1	3	10	13	14	24	23	20	10	9	2	7	21	11	37	67
	N. W.	4	3	0	1	13	13	1	3	1	4	1	0	6	7	14	17
	W.	3	2	0	2	2	3	1	6	0	1	1	0	2	5	4	10
	S. W.	5	5	0	0	4	4	6	4	12	2	0	0	14	10	4	14
	S.	25	22	19	32	14	13	21	17	31	35	42	26	108	73	65	51
	S. E.	18	19	24	20	10	8	14	5	20	26	29	36	75	73	54	27
	E.	22	27	26	12	22	11	16	17	13	8	13	15	34	64	60	44
	N. E.	13	9	10	12	11	16	11	12	6	5	5	4	16	26	33	39
	Calm.	2	3	1	1	0	1	0	0	0	0	0	2	0	7	2	1
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jacksonville, Fla.	N.	0	0	0	13	8	10	8	9	5	1	5	0	11	0	30	27
	N. W.	2	1	0	15	8	6	15	14	7	14	4	1	25	4	23	35
	W.	4	7	4	0	15	20	12	5	5	11	3	2	19	13	19	37
	S. W.	12	20	2	5	8	8	17	12	15	9	20	8	44	40	15	37
	S.	18	23	1	0	7	10	4	8	15	15	4	8	34	49	8	22
	S. E.	12	5	2	3	6	7	6	3	6	10	13	23	20	40	11	16
	E.	15	10	30	21	5	5	2	2	3	10	21	25	34	50	56	9
	N. E.	19	10	34	30	22	12	10	10	20	16	23	23	59	52	86	41
	Calm.	11	17	8	6	11	15	19	12	17	4	0	0	21	28	25	46
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Keokuk, Iowa	N.	6	16	13	13	19	6	9	13	22	8	10	11	40	33	45	28
	N. W.	5	4	9	20	16	34	21	22	20	16	9	8	45	17	45	77
	W.	10	12	8	9	5	26	21	8	6	10	2	10	18	32	22	55
	S. W.	10	18	11	6	9	9	11	7	6	4	8	11	18	30	26	27
	S.	20	5	23	28	12	5	11	13	15	8	23	14	46	30	63	29
	S. E.	11	8	18	6	10	6	3	9	7	20	17	15	44	34	34	18
	E.	14	11	2	2	8	2	6	5	8	8	14	10	30	35	12	13
	N. E.	17	16	4	8	11	5	9	7	9	16	10	9	35	42	23	21
	Calm.	0	3	2	1	0	0	2	0	0	0	0	2	0	5	3	2
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Key West, Fla.	N.	4	1	5	13	10	19	17	23	14	17	13	2	44	7	28	59
	N. W.	6	3	2	6	12	5	7	5	8	6	14	0	28	9	20	17
	W.	4	9	8	1	2	2	1	3	5	3	5	0	13	13	11	6
	S. W.	5	10	7	2	1	1	1	3	1	6	5	1	12	16	10	5
	S.	9	10	0	1	3	4	3	4	3	9	3	16	15	35	4	11
	S. E.	28	27	10	3	10	8	3	13	17	15	9	27	41	82	23	24
	E.	19	20	30	26	16	15	21	12	25	24	27	30	76	69	72	48
	N. E.	9	5	28	40	36	39	36	18	20	9	12	14	41	28	104	93
	Calm.	9	8	0	1	0	0	4	3	0	1	5	0	6	17	1	7
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1878.	August.	September.	October.	November.	December.	January, '79.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Kitty Hawk, N. C.	N.	3	2	0	11	9	10	13	8	2	0	0	1	2	6	20	31
	N. W.	0	0	1	14	15	20	15	12	3	12	1	1	16	1	30	47
	W.	13	12	6	6	14	22	19	9	9	9	5	9	23	34	26	50
	S. W.	30	29	15	13	18	10	17	13	17	29	15	38	61	97	46	40
	S.	3	3	3	6	1	6	2	4	8	5	11	1	24	7	10	12
	S. E.	14	13	6	3	1	0	1	3	4	4	4	9	12	36	10	4
	E.	8	9	12	10	9	6	2	0	8	10	19	8	37	25	31	8
	N. E.	21	24	45	20	20	19	24	35	39	18	38	22	95	67	94	78
	Calm.	1	1	2	1	3	0	0	0	3	3	0	1	6	3	6	0
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knoxville, Tenn.	N.	4	1	6	3	9	4	13	18	10	13	12	8	35	13	18	35
	N. W.	4	2	1	6	4	9	8	7	10	12	6	7	28	13	11	24
	W.	7	11	3	12	9	20	21	12	17	14	8	15	39	33	24	53
	S. W.	12	11	4	5	10	14	18	19	26	14	18	26	58	49	19	51
	S.	3	0	0	0	0	0	0	0	1	1	2	2	4	5	0	0
	S. E.	0	5	0	0	1	2	2	0	3	2	4	0	9	5	1	4
	E.	3	2	8	4	2	7	4	8	4	10	13	6	27	11	14	19
	N. E.	13	5	14	6	17	18	17	18	16	13	26	21	55	39	37	53
	Calm.	47	56	54	57	38	19	10	2	6	11	4	5	21	108	149	31
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
La Crosse, Wis.	N.	21	22	8	15	26	25	16	19	20	20	23	16	63	59	49	60
	N. W.	7	13	17	14	8	15	13	19	21	10	4	6	35	26	39	47
	W.	1	11	10	18	5	17	17	10	21	2	2	15	25	27	33	44
	S. W.	11	10	4	5	9	16	14	1	7	6	9	3	22	24	18	31
	S.	26	22	37	36	30	14	26	20	16	23	28	37	67	85	103	60
	S. E.	15	6	10	4	3	0	0	4	5	5	16	9	26	30	17	4
	E.	2	3	1	0	3	2	0	2	0	4	5	2	9	7	4	4
	N. E.	10	5	3	1	6	4	3	9	3	10	3	1	16	16	10	16
	Calm.	0	1	0	0	0	0	4	0	0	10	3	1	13	2	0	4
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laredo, Texas	N.	1	2	5	9	6	12	8	6	6	(*)	....	....	....	....	20	26
	N. W.	0	1	3	2	18	21	7	6	5	....	....	....	....	....	23	34
	W.	0	0	3	0	2	0	0	2	1	....	....	....	....	....	5	2
	S. W.	1	0	0	0	0	1	2	0	0	....	....	....	....	....	0	3
	S.	12	6	6	9	6	6	11	9	6	....	....	....	....	....	21	26
	S. E.	46	42	46	47	27	18	28	18	46	....	....	....	....	....	120	64
	E.	20	25	7	13	11	2	5	7	15	....	....	....	....	....	31	14
	N. E.	10	10	8	9	4	16	17	16	8	....	....	....	....	....	21	49
	Calm.	3	3	4	4	16	17	15	20	6	....	....	....	....	....	24	52
	Blank.	0	4	8	0	0	0	0	0	0	....	....	....	....	....	8	0
Leavenworth, Kansas	N.	8	13	18	21	25	30	19	22	23	20	12	12	55	33	64	71
	N. W.	2	1	0	8	11	22	24	20	18	11	4	9	33	12	19	66
	W.	2	5	1	1	4	1	1	1	1	2	3	3	6	10	6	3
	S. W.	8	16	5	7	11	3	1	5	4	1	3	2	8	26	23	9
	S.	29	16	46	34	15	16	29	25	22	15	38	27	75	72	95	70
	S. E.	7	5	2	3	2	7	6	7	6	19	21	25	46	37	7	20
	E.	8	5	1	1	5	3	4	0	7	6	6	8	10	21	7	7
	N. E.	2	11	3	10	10	10	3	2	5	12	4	2	21	15	23	15
	Calm.	27	21	14	8	7	1	6	2	7	4	2	2	13	50	29	9
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Los Angeles, Cal.	N.	3	0	6	18	25	14	8	5	12	8	4	1	24	10	49	27
	N. W.	0	1	3	3	4	0	9	5	2	5	3	3	10	4	10	14
	W.	41	43	27	27	19	10	6	13	14	13	15	37	42	121	73	29
	S. W.	14	13	15	9	11	13	10	14	21	21	24	20	66	47	35	37
	S.	2	2	2	2	3	2	1	6	1	3	3	2	7	6	7	9
	S. E.	0	3	2	0	1	4	5	4	4	1	4	9	9	12	3	13
	E.	7	4	16	7	5	10	8	8	15	5	16	3	30	14	28	26
	N. E.	6	2	8	10	18	38	39	24	14	21	15	7	50	15	36	101
	Calm.	20	19	11	17	4	2	7	5	10	13	9	8	32	47	32	14
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Louisville, Ky.	N.	25	23	25	13	14	5	12	5	13	16	18	7	47	55	52	22
	N. W.	8	14	7	11	11	14	11	14	18	12	5	10	35	32	29	39
	W.	4	9	2	12	16	18	16	19	13	5	3	8	21	21	30	53
	S. W.	20	24	10	12	12	30	20	15	17	13	11	21	41	74	34	65
	S.	6	6	24	21	15	8	17	9	11	14	20	13	45	25	60	20
	S. E.	3	2	10	8	6	11	10	10	11	8	12	10	31	15	24	31
	E.	3	1	5	5	3	2	6	8	2	10	4	7	16	11	13	16
	N. E.	15	14	7	11	13	9	1	4	8	12	20	14	40	48	31	14
	Calm.	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Local series of observations discontinued April 5, 1879.

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1878.	August.	September.	October.	November.	December.	January, '79.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Lynchburgh, Va	N.	2	3	4	3	1	0	3	0	1	1	2	1	4	6	8	3
	N. W.	7	3	2	7	8	9	9	15	17	14	8	12	39	22	17	33
	W.	11	13	5	14	17	25	21	18	13	12	8	4	33	28	36	64
	S. W.	8	12	6	7	11	13	16	7	6	17	7	20	30	40	24	36
	S.	15	7	7	16	7	10	8	13	14	12	16	22	42	44	30	31
	S. E.	0	4	1	2	3	6	1	3	1	8	7	4	16	17	6	10
	E.	12	6	12	3	8	1	6	4	4	2	9	8	15	26	23	11
	N. E.	4	9	21	7	5	5	3	2	9	7	15	9	31	22	33	10
	Calm.	25	36	32	34	30	24	26	21	28	17	21	10	66	71	96	71
	Blank.	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Madison, Wis.*	N.	...	...	...	3	6	10	8	10	5	16	5	9	26	...	..	28
	N. W.	...	...	...	25	27	25	25	17	25	14	11	7	50	...	..	67
	W.	...	...	...	19	10	25	22	16	21	5	5	5	31	...	..	63
	S. W.	...	...	...	15	11	15	12	6	10	6	10	13	26	.	...	33
	S.	...	...	...	21	14	7	17	15	15	17	17	15	49	.	..	39
	S. E.	...	...	...	6	7	2	1	6	11	15	20	23	46	..	...	9
	E.	...	...	...	1	5	1	4	5	2	5	14	9	21	...	..	10
	N. E.	...	...	...	3	10	8	3	9	4	12	11	9	27	...	..	20
	Calm.	...	...	...	0	0	0	1	0	0	0	0	0	0	...	...	1
	Blank.	...	...	...	0	0	0	0	0	0	0	0	0	0	...	..	0
Marquette, Mich	N.	7	9	3	4	3	4	2	6	4	7	8	5	19	21	10	12
	N. W.	26	27	19	7	12	17	29	34	26	29	33	24	88	77	38	80
	W.	12	18	15	30	8	13	20	20	15	3	2	9	20	39	53	53
	S. W.	9	7	12	20	10	10	22	5	13	5	10	12	28	28	42	37
	S.	7	7	10	11	15	7	3	1	3	4	7	9	14	23	36	11
	S. E.	3	4	17	15	18	17	4	6	24	12	6	10	42	17	50	27
	E.	12	4	3	1	11	14	0	3	0	7	9	10	16	26	15	17
	N. E.	8	9	8	4	9	8	2	4	4	10	2	5	16	22	21	14
	Calm.	9	8	3	1	4	3	11	5	4	13	16	6	33	23	8	19
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Memphis, Tenn	N.	11	17	13	16	11	17	9	18	8	11	5	3	24	31	40	44
	N. W.	12	19	11	20	12	23	22	16	13	13	13	7	39	38	43	61
	W.	7	6	5	4	11	11	4	1	5	5	10	7	20	20	20	16
	S. W.	18	20	13	10	20	13	15	14	14	14	8	15	36	53	43	42
	S.	13	10	12	18	10	3	17	7	17	13	11	9	41	32	40	27
	S. E.	5	2	12	8	9	3	5	12	11	16	22	20	49	27	29	20
	E.	7	1	2	7	3	5	4	4	8	5	4	11	17	19	12	13
	N. E.	20	16	21	9	14	18	17	11	17	10	20	18	47	54	44	46
	Calm.	0	2	1	1	10	0	0	1	0	3	0	0	3	2	2	1
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Milwaukee, Wis	N.	20	7	7	1	15	2	2	5	8	10	18	18	45	45	23	9
	N. W.	6	13	18	19	16	33	20	28	19	8	5	5	32	24	53	81
	W.	7	16	8	19	19	32	37	17	20	8	6	5	34	28	46	86
	S. W.	13	15	17	23	16	17	17	8	11	8	9	9	28	37	56	42
	S.	3	4	14	17	5	1	8	7	7	6	9	11	22	18	36	16
	S. E.	17	17	17	9	3	1	2	7	12	14	22	16	48	50	29	10
	E.	6	13	4	0	4	3	4	4	8	7	9	16	24	35	8	11
	N. E.	9	6	5	5	12	3	2	6	8	20	15	10	43	25	22	11
	Calm.	12	2	0	0	0	1	1	2	0	0	0	0	0	14	0	4
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mobile, Ala	N.	12	3	32	33	40	39	33	47	19	25	24	22	68	37	105	119
	N. W.	4	2	2	6	7	13	5	2	6	7	2	0	15	6	15	20
	W.	3	9	2	0	6	6	2	0	5	3	5	5	13	17	8	8
	S. W.	11	16	4	5	3	4	6	4	8	7	9	3	24	30	12	14
	S.	34	43	18	26	19	19	41	19	36	28	31	36	95	113	63	79
	S. E.	10	9	8	14	6	8	0	7	4	16	13	12	33	31	28	15
	E.	12	7	7	0	3	1	1	0	4	0	2	6	6	25	10	2
	N. E.	7	3	15	0	2	2	3	3	3	4	7	6	14	16	26	8
	Calm.	0	1	2	0	4	1	2	2	8	0	0	0	8	1	6	5
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Montgomery, Ala	N.	6	4	15	13	18	8	8	22	17	12	8	16	37	20	46	38
	N. W.	6	2	15	17	16	20	25	16	13	17	8	7	38	15	48	61
	W.	2	3	2	2	10	18	13	7	10	10	4	5	24	10	14	38
	S. W.	6	10	1	4	6	7	6	9	15	9	8	9	32	25	11	22
	S.	6	2	1	9	8	6	15	8	8	11	13	10	32	18	18	29
	S. E.	6	7	10	14	9	10	9	6	12	17	21	14	50	27	33	25
	E.	14	5	18	20	7	5	4	8	9	5	18	15	32	34	45	17
	N. E.	5	5	19	10	6	8	2	3	3	4	9	13	16	23	35	13
	Calm.	42	55	9	4	10	11	11	5	6	5	4	1	15	98	23	27
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Station opened September 29, 1878.

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1878.	August.	September.	October.	November.	December.	January, '79.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Morgantown, W. Va.	N.	11	9	12	13	18	3	11	3	4	14	10	9	28	29	43	17
	N. W.	8	5	1	3	9	6	4	8	13	12	5	2	30	15	13	18
	W.	6	5	6	16	13	14	13	20	15	8	2	7	25	18	35	47
	S. W.	16	21	23	29	19	50	31	20	20	14	13	30	47	67	71	101
	S.	5	15	10	21	13	8	13	7	9	5	5	0	19	20	44	28
	S. E.	2	8	10	2	3	5	3	2	4	1	3	1	8	11	15	10
	E.	3	5	6	0	6	2	1	3	4	2	3	0	9	8	12	6
	N. E.	6	4	5	1	2	0	4	4	0	1	9	6	10	16	8	8
	Calm.	36	21	17	8	7	5	13	17	24	33	43	35	100	92	32	35
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mt. Washington, N. H.	N.	4	1	3	1	0	0	0	0	0	4	4	7	8	12	4	0
	N. W.	62	61	43	54	65	72	73	61	55	56	46	40	157	163	162	206
	W.	12	9	14	17	7	5	8	10	14	11	15	21	40	42	38	23
	S. W.	0	5	5	7	3	3	5	3	7	0	11	12	18	17	15	11
	S.	1	8	9	2	1	0	0	0	1	0	10	7	11	16	12	0
	S. E.	3	1	6	7	4	12	3	6	9	2	1	2	12	6	17	21
	E.	1	0	3	0	5	0	2	0	1	4	1	0	6	1	8	2
	N. E.	0	4	5	3	4	1	2	4	5	13	4	1	22	5	12	7
	Calm.	10	4	2	2	1	0	0	0	1	0	1	0	2	14	5	0
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nashville, Tenn.	N.	15	11	8	5	5	4	12	5	7	9	13	10	20	36	18	21
	N. W.	7	12	10	11	9	19	20	20	16	18	3	10	37	29	30	59
	W.	17	30	4	11	16	25	15	9	8	9	6	8	23	55	31	49
	S. W.	6	5	5	7	6	5	7	4	7	3	3	10	13	21	18	16
	S.	7	0	1	6	4	4	5	8	13	11	12	11	36	18	11	17
	S. E.	8	4	14	22	8	6	10	6	6	9	12	10	20	22	44	22
	E.	11	6	5	9	8	9	6	7	7	7	6	7	37	24	22	22
	N. E.	9	7	11	5	3	12	6	3	1	2	12	7	15	23	19	21
	Calm.	13	18	32	17	31	9	12	22	28	22	26	17	76	48	80	43
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New Haven, Conn.	N.	9	2	9	18	14	17	18	8	21	9	13	9	43	20	41	43
	N. W.	10	10	4	12	17	13	26	26	19	34	14	14	67	34	33	65
	W.	3	6	5	12	28	37	14	12	6	10	3	2	19	11	45	63
	S. W.	26	12	17	18	7	10	16	13	8	6	16	25	30	63	42	39
	S.	19	31	16	19	4	2	5	6	14	2	29	22	45	72	39	13
	S. E.	2	2	10	3	1	3	0	0	6	8	5	5	19	9	14	3
	E.	0	1	4	3	2	3	2	2	4	3	3	4	10	5	9	7
	N. E.	11	6	21	6	15	6	10	15	14	14	7	6	35	23	42	31
	Calm.	13	23	4	2	2	2	2	2	1	4	3	3	8	39	8	6
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New London, Conn.	N.	19	4	10	14	14	8	20	18	14	17	7	8	38	22	38	46
	N. W.	5	10	5	10	23	31	28	23	24	31	10	14	65	29	47	82
	W.	4	6	6	7	11	29	16	14	5	10	9	3	24	13	24	59
	S. W.	27	20	15	16	15	3	17	13	11	8	25	34	44	81	46	33
	S.	7	7	9	16	2	2	2	4	8	2	17	5	27	19	27	8
	S. E.	9	14	14	4	2	4	1	1	10	5	10	10	25	33	20	6
	E.	4	0	8	3	8	3	0	2	7	6	3	4	16	8	19	5
	N. E.	4	6	7	2	4	3	5	6	7	7	3	4	17	14	13	14
	Calm.	23	26	16	12	11	10	4	3	7	4	9	8	20	57	39	17
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New Orleans, La.	N.	12	6	20	20	17	17	17	25	16	10	3	15	29	33	57	59
	N. W.	9	3	6	19	17	24	8	2	6	10	12	2	28	14	42	34
	W.	4	7	1	2	8	2	6	5	5	7	3	2	15	13	11	13
	S. W.	8	11	0	1	7	3	6	7	3	9	13	8	25	27	8	16
	S.	10	15	3	2	7	7	9	9	21	12	9	7	42	32	12	25
	S. E.	12	20	9	12	7	12	19	6	23	22	6	20	51	52	28	37
	E.	5	11	18	13	12	20	13	10	15	12	21	27	48	43	43	43
	N. E.	20	11	28	21	11	5	6	18	4	7	24	8	35	30	60	29
	Calm.	13	9	5	3	4	3	9	2	0	1	2	1	3	23	12	14
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Newport, R. I.	N.	8	5	10	10	9	4	7	9	15	6	3	5	24	18	29	20
	N. W.	7	8	10	18	21	17	26	13	19	18	11	9	48	24	49	56
	W.	2	6	3	6	25	48	30	91	9	19	8	10	36	18	34	109
	S. W.	50	36	21	28	17	7	19	15	15	21	34	37	70	123	66	41
	S.	8	11	5	6	1	0	2	5	7	3	22	12	32	31	12	7
	S. E.	3	12	16	12	6	9	2	1	10	4	8	8	22	23	34	12
	E.	3	3	6	1	3	0	2	3	10	8	4	4	22	10	10	5
	N. E.	6	3	12	7	8	6	3	4	1	0	1	4	11	13	27	13
	Calm.	6	9	7	5	0	2	2	3	7	2	2	1	11	16	12	7
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1878.	August.	September.	October.	November.	December.	January, '79.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
New York, N. Y.	N.	4	3	2	9	11	2	6	3	11	7	4	4	22	11	22	11
	N. W.	14	17	11	24	29	39	32	38	30	34	19	16	83	47	64	109
	W.	9	12	7	11	18	29	25	13	11	11	7	21	29	42	36	67
	S. W.	29	19	18	23	8	5	16	5	7	12	12	20	31	68	49	26
	S.	11	5	5	10	4	4	2	3	6	5	20	13	31	29	19	9
	S. E.	11	17	11	8	3	5	0	4	12	7	21	4	40	32	22	9
	E.	2	5	8	2	1	4	3	5	8	7	7	2	22	9	11	12
	N. E.	13	13	27	6	14	5	9	12	7	7	2	8	16	34	48	26
	Calm.	0	2	0	0	2	0	0	1	1	0	1	2	2	4	2	1
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Norfolk, Va	N.	5	10	6	15	10	13	11	11	9	11	7	4	27	19	31	35
	N. W.	4	4	1	9	11	10	18	14	8	14	2	4	24	12	21	42
	W.	3	4	1	5	15	19	8	5	1	6	2	3	9	10	21	32
	S. W.	25	17	11	11	15	11	22	9	13	21	11	35	45	77	37	42
	S.	31	27	16	17	10	13	12	10	19	18	22	14	59	71	43	35
	S. E.	14	9	6	3	3	5	4	7	11	6	18	11	35	34	12	16
	E.	6	12	18	6	6	5	5	5	9	2	12	3	23	21	30	15
	N. E.	5	9	27	18	13	6	11	19	22	10	18	14	50	28	58	36
	Calm.	0	1	4	9	7	11	2	4	1	2	1	2	4	3	20	17
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North Platte, Neb.	N.	6	3	11	6	11	7	10	10	11	7	10	4	28	13	28	27
	N. W.	5	6	16	45	40	56	31	25	22	14	14	15	50	26	101	112
	W.	1	4	4	7	7	10	21	19	9	6	4	3	19	8	18	50
	S. W.	1	3	4	4	4	2	3	4	7	3	0	1	10	5	12	9
	S.	17	15	12	9	7	7	6	4	14	12	18	23	44	55	28	17
	S. E.	41	24	17	4	6	2	2	3	9	17	17	26	43	91	27	7
	E.	9	18	9	2	8	1	10	8	2	7	15	7	24	34	19	19
	N. E.	10	16	14	13	7	8	10	8	17	22	15	9	54	35	34	26
	Calm.	3	4	3	3	0	0	0	3	2	2	0	2	4	9	6	3
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olympia, Wash.	N.	20	37	20	17	10	7	7	7	9	13	20	18	42	75	47	21
	N. W.	9	10	3	2	2	1	8	1	8	6	5	5	10	24	7	10
	W.	13	7	3	3	2	1	2	3	4	6	8	18	18	38	8	6
	S. W.	17	12	13	24	14	5	12	10	12	21	22	31	55	60	51	27
	S.	7	8	24	34	48	41	51	53	46	29	28	8	103	23	106	145
	S. E.	1	0	3	0	2	13	6	1	2	3	0	1	5	2	5	20
	E.	2	1	3	4	6	6	3	1	2	3	0	4	5	7	13	10
	N. E.	0	5	8	4	4	14	3	6	7	6	3	2	16	16	16	23
	Calm.	15	13	13	5	2	5	1	2	3	3	7	3	13	31	20	8
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Omaha, Neb.	N.	16	20	10	17	14	12	9	11	16	19	13	5	48	41	41	32
	N. W.	8	10	15	18	19	33	30	24	26	10	.	10	42	28	52	87
	W.	5	4	5	15	12	17	12	9	9	3	4	6	16	15	32	38
	S. W.	3	5	3	6	9	4	6	7	4	8	5	5	17	13	18	17
	S.	33	26	28	27	11	5	18	14	14	5	10	2	29	61	66	37
	S. E.	19	9	16	4	8	6	7	7	11	23	30	27	64	55	28	20
	E.	1	5	3	3	9	2	5	4	6	7	15	17	28	23	15	11
	N. E.	3	5	1	0	4	6	3	6	5	10	7	2	22	10	5	15
	Calm.	5	9	9	3	4	8	3	2	2	5	3	16	10	30	16	13
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oswego, N. Y.	N.	16	16	11	11	13	8	6	5	7	9	13	12	29	44	35	19
	N. W.	27	19	10	19	32	25	13	16	7	21	12	16	40	62	61	54
	W.	10	17	9	15	11	10	23	16	25	22	19	21	66	48	35	49
	S. W.	6	4	7	8	4	25	8	12	14	13	6	10	33	20	19	45
	S.	19	27	42	34	19	12	10	1	11	4	27	14	42	60	95	23
	S. E.	4	2	4	2	5	7	22	23	16	6	5	8	27	14	1[illegible]	62
	E.	2	0	2	0	4	4	5	6	5	2	1	0	8	2	6	15
	N. E.	4	2	2	3	2	1	3	5	8	10	4	3	22	9	7	9
	Calm.	5	6	3	1	0	1	3	0	0	3	6	6	9	17	4	4
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pembina, Dak.	N.	7	7	11	6	5	12	3	7	4	16	21	6	41	20	22	22
	N. W.	15	31	27	30	22	43	45	44	42	22	14	12	78	58	79	182
	W.	16	16	7	22	11	10	3	5	9	1	2	12	12	44	40	18
	S. W.	2	1	3	1	0	4	0	0	1	1	0	2	2	5	4	4
	S.	29	13	23	14	31	21	31	13	23	19	23	16	65	58	68	65
	S. E.	17	18	14	4	11	2	7	8	6	6	13	18	25	53	29	17
	E.	4	2	3	11	3	0	1	4	4	11	11	9	26	15	17	5
	N. E.	2	0	0	2	4	0	0	0	0	3	6	6	9	8	6	0
	Calm.	1	5	2	3	3	1	3	3	4	11	3	9	18	15	8	7
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1878.	August.	September.	October.	November.	December.	January, '79.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Philadelphia, Pa.	N.	8	1	10	13	15	4	9	5	11	8	9	13	28	22	38	18
	N. W.	7	16	6	22	16	26	24	33	31	25	12	10	68	33	44	83
	W.	11	9	7	8	21	38	19	14	7	16	8	14	31	34	36	71
	S. W.	29	21	17	28	11	11	20	7	10	11	21	30	42	80	56	38
	S.	16	16	5	9	7	1	3	7	7	9	18	12	34	44	21	11
	S. E.	4	10	5	0	1	4	1	2	5	1	4	1	10	15	6	7
	E.	9	11	19	6	3	3	1	3	8	7	5	5	20	25	28	7
	N. E.	9	9	19	7	15	6	14	13	13	12	15	5	40	33	41	33
	Calm.	0	0	2	0	1	0	2	0	1	1	1	0	3	0	3	2
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pike's Peak, Colo.	N.	8	5	3	11	3	12	8	13	5	13	3	3	21	16	17	33
	N. W.	6	16	16	16	21	25	19	39	18	17	3	3	38	25	53	83
	W.	6	8	2	34	9	12	22	22	23	11	9	10	43	24	45	56
	S. W.	48	18	57	30	23	19	35	9	44	26	64	57	134	123	110	63
	S.	6	9	1	0	3	2	4	0	1	0	0	9	7	24	4	6
	S. E.	7	12	1	0	3	4	0	0	0	1	2	0	3	19	4	4
	E.	4	1	0	0	0	3	0	0	1	3	0	0	4	5	0	3
	N. E.	8	17	10	2	26	13	5	0	1	10	11	5	22	30	38	18
	Calm.	0	7	0	0	2	3	0	1	0	3	1	3	4	10	2	4
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reche, Nev.	N.	4	3	9	16	31	30	14	17	8	17	17	14	42	21	56	61
	N. W.	3	3	13	29	15	26	18	19	14	6	6	17	26	23	57	63
	W.	2	3	4	3	3	3	10	6	5	2	1	2	8	7	10	19
	S. W.	13	4	5	11	8	8	10	6	16	13	2	3	31	20	24	24
	S.	53	62	45	28	29	25	41	34	48	47	61	51	156	166	102	100
	S. E.	15	17	8	5	1	1	0	0	1	1	1	1	3	33	14	1
	E.	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	N. E.	1	0	2	0	1	0	0	1	0	0	0	0	0	1	3	1
	Calm.	2	0	4	1	2	0	0	1	1	4	5	2	10	4	7	1
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pittsburg, Pa.	N.	12	8	7	11	8	1	4	2	4	15	13	16	32	36	26	7
	N. W.	24	25	18	19	26	18	26	30	34	34	16	19	84	68	63	74
	W.	8	11	9	14	19	44	26	17	18	10	7	15	35	34	42	87
	S. W.	10	8	9	18	8	10	18	9	9	6	8	24	23	42	35	37
	S.	10	11	9	9	1	4	8	9	7	3	15	9	25	30	19	21
	S. E.	7	4	14	3	8	8	3	4	1	3	7	3	11	14	25	15
	E.	8	2	8	7	14	6	4	11	16	7	11	2	34	12	29	21
	N. E.	8	5	6	2	5	1	3	1	2	4	11	2	17	15	13	5
	Calm.	6	19	10	10	1	1	1	1	2	8	5	0	15	25	21	3
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Port Huron, Mich.	N.	19	8	5	7	5	2	3	11	12	23	29	23	64	50	17	16
	N. W.	3	10	13	13	20	10	14	15	13	14	1	3	28	16	46	39
	W.	4	11	11	13	16	27	19	14	15	5	4	6	24	21	40	60
	S. W.	10	18	4	16	17	30	21	12	14	7	8	7	29	35	37	63
	S.	18	12	23	31	7	7	22	13	14	15	24	24	53	54	61	42
	S. E.	0	5	15	6	7	5	3	8	8	4	7	4	19	9	28	16
	E.	1	4	4	2	5	8	3	5	3	4	1	1	8	6	11	16
	N. E.	26	15	11	5	11	4	8	6	14	15	16	19	45	60	27	18
	Calm.	12	10	4	0	2	0	0	0	0	3	3	3	6	25	6	0
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portland, Me.	N.	6	5	10	12	11	9	18	11	12	17	8	8	37	19	33	38
	N. W.	10	11	7	12	17	19	22	21	20	20	8	12	48	33	36	62
	W.	9	5	6	9	23	30	30	24	14	13	11	9	38	23	38	84
	S. W.	15	15	7	7	8	12	7	9	5	12	17	13	34	43	22	28
	S.	21	21	20	21	5	1	2	6	15	5	26	14	46	56	46	9
	S. E.	13	13	10	13	1	7	2	0	8	9	8	4	25	30	24	9
	E.	3	6	15	9	5	4	1	2	5	7	2	16	14	25	29	7
	N. E.	5	4	5	3	4	0	1	3	5	2	0	6	7	15	12	4
	Calm.	11	13	10	7	16	11	10	8	9	5	13	8	27	32	33	29
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portland, Oreg.	N.	3	4	6	10	12	20	9	8	5	12	15	28	32	35	28	37
	N. W.	64	71	27	24	7	19	19	5	15	28	15	32	58	107	58	43
	W.	3	2	3	4	7	2	1	3	3	2	2	4	7	9	14	6
	S. W.	5	1	8	5	6	5	6	10	12	7	8	4	27	10	19	21
	S.	8	4	18	26	43	16	38	35	33	21	35	9	89	21	87	89
	S. E.	8	2	8	12	7	4	6	12	8	12	13	9	33	19	27	22
	E.	1	3	0	1	2	12	7	4	9	3	2	1	14	5	3	23
	N. E.	0	0	4	6	2	14	4	3	6	1	2	2	9	2	12	21
	Calm.	1	6	16	5	4	1	8	4	2	4	1	1	7	8	25	8
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1878.	August.	September.	October.	November.	December.	January, '79.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Punta Rassa, Fla...	N.	5	5	2	12	6	15	13	18	9	7	6	2	22	12	20	46
	N. W.	6	5	4	8	11	12	16	9	9	16	11	3	36	14	23	37
	W.	12	13	10	2	9	2	7	4	12	8	12	3	32	28	21	13
	S. W.	11	17	6	4	6	4	8	7	8	12	19	13	39	41	16	19
	S.	7	6	4	2	4	9	7	13	11	15	3	12	29	25	10	29
	S. E.	13	9	3	5	12	9	9	11	12	9	5	10	26	32	20	29
	E.	21	22	23	16	17	13	9	6	8	16	19	26	43	69	56	28
	N. E.	11	13	37	44	25	29	22	16	24	6	18	21	48	45	106	67
	Calm.	7	3	1	0	0	0	2	0	0	1	0	0	1	10	1	2
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red Bluff, Cal.....	N.	13	10	19	40	45	58	43	36	17	22	18	33	57	56	104	137
	N. W.	15	7	15	26	19	16	18	7	9	11	15	24	35	46	60	41
	W.	5	2	1	3	0	1	1	1	2	3	7	4	12	11	4	3
	S. W.	2	3	4	3	4	0	1	2	1	1	6	4	8	9	11	3
	S.	43	41	28	11	11	6	10	9	25	23	17	11	65	95	50	25
	S. E.	12	23	18	7	5	4	14	24	38	28	24	13	90	48	30	42
	E.	1	2	2	1	0	0	1	0	0	1	4	0	5	3	3	1
	N. E.	0	2	1	1	0	1	2	2	1	0	2	1	3	3	2	5
	Calm.	2	3	2	1	6	7	3	3	0	1	0	0	1	5	9	13
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rochester, N. Y	N.	4	7	5	4	1	3	0	3	1	3	6	7	10	18	10	6
	N. W.	9	11	6	7	21	7	19	10	20	27	11	20	58	40	34	36
	W.	30	33	25	36	35	59	45	38	31	34	24	34	89	97	96	142
	S. W.	15	22	25	29	8	5	16	7	13	4	27	13	44	50	62	28
	S.	4	5	14	10	3	3	5	8	5	1	5	2	11	11	27	16
	S. E.	7	5	7	6	12	11	3	11	15	6	6	6	27	18	25	25
	E.	9	5	4	0	4	4	4	3	6	7	5	3	18	17	8	11
	N. E.	14	4	4	0	4	0	1	3	2	8	9	5	19	23	8	4
	Calm.	1	1	0	1	2	1	0	1	0	0	0	0	0	2	3	2
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Roseburg, Oreg.....	N.	47	39	20	5	14	12	0	3	1	10	12	41	23	127	39	15
	N. W.	17	12	15	15	8	13	8	7	6	21	24	24	51	53	38	28
	W.	4	4	0	8	4	12	6	8	12	6	10	5	28	13	12	26
	S. W.	1	2	8	5	5	8	11	17	23	11	15	2	49	5	18	36
	S.	1	0	4	11	13	3	12	7	14	8	6	1	28	2	28	22
	S. E.	1	0	1	1	0	3	3	2	5	2	2	0	9	1	2	8
	E.	1	1	1	3	4	6	13	7	3	1	1	0	5	2	8	26
	N. E.	1	3	1	3	6	3	3	2	3	1	4	4	8	8	10	8
	Calm.	20	32	40	42	36	33	37	31	26	30	19	13	75	65	118	101
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sacramento, Cal	N.	4	4	14	34	40	49	38	24	14	13	13	17	40	25	88	111
	N. W.	5	2	12	10	7	3	4	2	4	8	6	18	18	25	35	9
	W.	2	5	2	5	5	1	2	0	1	7	6	2	14	9	12	3
	S. W.	17	16	15	6	11	3	6	9	18	14	37	25	69	58	32	18
	S.	59	60	40	18	9	6	17	21	39	35	18	24	92	143	67	44
	S. E.	4	3	1	2	6	10	16	18	14	7	11	2	32	9	9	44
	E.	0	0	1	0	3	1	0	1	2	1	0	0	3	0	4	2
	N. E.	1	1	0	4	1	3	1	0	0	1	0	0	1	2	5	4
	Calm.	1	2	5	8	8	17	9	9	1	4	2	2	7	5	21	35
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salt Lake City, Utah.	N.	20	13	9	10	9	9	1	4	6	2	6	18	14	51	28	14
	N. W.	15	18	22	20	24	15	16	11	19	24	29	24	72	57	66	42
	W.	4	6	6	11	6	18	14	9	5	6	7	1	18	11	23	41
	S. W.	5	2	1	3	1	5	8	0	9	0	2	3	11	10	5	13
	S.	13	12	9	8	7	9	12	7	2	2	0	1	4	26	24	28
	S. E.	22	15	11	19	17	15	14	25	22	23	24	19	69	56	47	54
	E.	5	9	8	7	13	10	11	6	3	6	4	5	13	19	28	27
	N. E.	6	10	12	9	5	6	4	3	4	4	10	3	18	19	26	13
	Calm.	3	8	12	6	8	6	13	19	23	23	11	16	57	27	26	38
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Diego, Cal.....	N.	5	7	7	16	12	2	12	12	11	4	4	2	19	14	35	26
	N. W.	25	21	28	25	16	11	10	16	18	22	19	18	59	64	69	37
	W.	37	31	20	19	21	10	14	16	23	29	34	25	86	93	60	40
	S. W.	11	11	7	4	0	4	9	5	13	7	6	28	26	50	11	18
	S.	5	3	1	3	1	6	1	9	3	3	7	7	13	15	5	16
	S. E.	2	1	2	2	3	6	4	4	3	2	4	3	9	6	7	14
	E.	0	1	7	4	7	11	8	3	5	4	5	0	14	1	18	22
	N. E.	1	2	1	7	24	35	21	11	0	7	3	3	19	6	32	67
	Calm.	7	16	17	13	6	8	14	8	8	12	11	4	31	27	36	30
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1878.	August.	September.	October.	November.	December.	January, 79.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Sandusky, Ohio	N.	25	14	6	6	11	2	2	7	8	15	12	18	35	57	23	11
	N. W.	7	6	13	14	19	11	13	13	18	15	7	3	40	16	46	37
	W.	4	10	7	15	17	29	19	21	9	6	6	8	21	22	39	69
	S. W.	14	25	24	30	16	35	41	21	26	12	15	22	53	61	70	97
	S.	9	13	19	20	7	5	5	10	4	7	13	10	24	32	46	20
	S. E.	6	10	9	2	5	5	3	3	6	4	2	3	12	19	16	11
	E.	14	5	4	3	9	5	7	5	15	15	14	13	44	32	16	17
	N. E.	13	10	7	3	6	0	3	3	7	11	19	13	17	36	16	6
	Calm.	1	0	1	0	0	1	0	1	0	5	5	0	10	1	1	2
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sandy Hook, N. J	N.	2	2	5	13	10	5	10	8	18	10	7	7	35	11	28	23
	N. W.	12	15	8	11	20	20	20	34	17	24	13	13	54	40	39	74
	W.	18	16	11	19	23	48	32	10	8	14	10	15	32	49	53	90
	S. W.	19	17	9	15	10	7	13	10	12	16	16	30	44	66	34	30
	S.	18	10	12	16	3	5	2	5	9	4	12	6	25	34	31	12
	S. E.	10	11	13	3	5	2	2	1	18	9	26	12	53	33	21	5
	E.	3	11	19	10	13	4	4	5	4	5	2	5	11	19	42	13
	N. E.	10	9	13	4	4	0	10	9	6	6	5	2	17	21	21	19
	Calm.	1	2	0	2	2	2	0	2	1	2	2	0	5	3	4	4
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Francisco, Cal.	N.	0	0	2	14	16	24	27	6	0	3	3	0	15	0	32	57
	N. W.	2	1	1	14	14	23	8	3	10	12	14	3	36	6	29	34
	W.	28	17	12	26	20	10	5	22	25	44	58	62	127	107	58	37
	S. W.	55	73	68	22	14	3	7	15	22	23	9	17	54	145	104	25
	S.	6	1	5	2	4	3	8	5	7	2	4	3	13	10	11	16
	S. E.	0	1	0	2	10	4	14	14	8	1	5	1	14	2	12	32
	E.	0	0	0	3	2	6	8	2	0	0	0	3	0	3	5	16
	N. E.	0	0	0	2	5	15	15	4	2	0	0	0	2	0	7	34
	Calm.	2	0	2	8	5	5	1	13	10	5	0	1	15	3	15	19
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Santa Fé, N. Mex.	N.	6	15	9	17	20	18	25	18	9	8	2	6	19	27	46	61
	N. W.	8	11	6	15	14	16	12	20	9	14	7	4	30	23	35	48
	W.	9	2	5	7	5	5	3	11	14	8	6	3	28	14	17	19
	S. W.	6	2	5	9	3	3	7	6	13	9	13	15	35	23	17	16
	S.	9	6	13	9	3	6	11	3	10	8	16	13	34	28	25	20
	S. E.	15	9	11	4	11	5	5	4	3	8	11	11	22	35	26	14
	E.	24	30	25	16	11	12	13	7	21	16	17	16	54	70	52	32
	N. E.	8	8	5	3	10	3	7	6	11	11	12	15	34	31	18	16
	Calm.	8	10	11	13	13	25	10	9	3	7	9	7	19	25	37	44
	Blank.	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0
Savannah, Ga.	N.	1	2	4	16	9	3	5	18	10	6	10	5	26	8	29	26
	N. W.	3	3	4	15	19	23	19	13	13	13	3	6	29	12	38	55
	W.	4	15	3	3	14	21	17	10	13	13	8	4	34	23	20	48
	S. W.	19	34	1	1	11	8	19	10	18	15	12	16	45	60	13	37
	S.	13	15	5	10	7	5	7	8	14	20	27	24	61	52	22	20
	S. E.	15	3	12	6	4	5	3	0	9	9	7	14	25	32	22	8
	E.	24	11	21	15	4	4	8	6	8	9	9	14	26	49	40	18
	N. E.	9	6	25	10	15	14	4	11	6	5	16	7	27	22	59	29
	Calm.	5	4	15	8	7	10	11	8	2	0	1	0	3	9	30	20
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shreveport, La.	N.	8	14	15	18	11	13	9	11	7	10	3	7	20	29	44	33
	N. W.	3	3	2	7	8	13	13	6	3	10	4	10	17	16	17	32
	W.	3	5	0	2	7	10	4	5	3	12	3	6	18	14	9	19
	S. W.	11	7	1	3	3	3	5	2	6	6	4	6	16	24	7	10
	S.	19	9	12	18	11	9	12	20	35	19	32	22	86	50	41	41
	S. E.	15	15	24	14	8	5	10	6	10	14	17	19	41	49	46	21
	E.	13	9	11	6	7	10	6	7	9	8	14	11	31	33	24	23
	N. E.	6	6	6	14	1	10	7	9	7	4	9	4	20	16	21	26
	Calm.	15	25	19	11	34	20	27	18	13	7	7	5	27	45	64	65
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Smithville, N. C.	N.	6	9	18	31	12	16	14	16	10	13	6	6	29	21	61	46
	N. W.	1	3	5	6	18	21	15	10	5	6	2	1	13	5	29	46
	W.	2	10	2	3	23	19	20	11	10	8	4	3	22	15	28	50
	S. W.	23	29	13	2	7	6	16	14	22	19	19	28	60	80	22	36
	S.	22	23	15	12	2	3	3	4	7	23	26	23	56	68	20	10
	S. E.	12	4	6	21	6	5	7	2	20	8	4	4	32	20	33	14
	E.	21	6	16	6	8	11	8	6	5	8	10	13	23	40	30	25
	N. E.	6	5	14	12	12	12	10	21	14	4	21	10	39	21	38	43
	Calm.	0	4	1	0	2	0	0	0	0	1	1	2	2	6	3	0
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1878.	August.	September.	October.	November.	December.	January, 79.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Springfield, Mass	N.	10	6	9	16	16	17	18	18	28	20	16	12	64	28	41	53
	N. W.	4	7	6	9	18	17	24	26	20	22	14	12	56	23	33	67
	W.	7	7	5	11	20	29	10	12	7	14	8	12	29	26	36	51
	S. W.	11	7	5	7	7	12	5	7	4	3	6	10	13	28	19	24
	S.	33	33	25	24	14	7	24	10	20	15	42	32	77	98	63	41
	S. E.	0	4	5	5	0	3	1	1	2	0	3	1	5	5	10	5
	E.	3	2	3	4	0	1	0	0	2	4	1	2	7	7	7	1
	N. E.	5	4	15	0	5	3	1	5	6	10	0	9	16	18	20	9
	Calm.	20	23	17	17	10	4	10	5	4	2	3	0	9	43	44	19
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Saint Louis, Mo.	N.	14	15	15	16	11	7	14	14	16	22	12	10	50	39	42	35
	N. W.	5	12	8	14	17	24	14	21	16	14	4	8	34	25	39	59
	W.	5	3	0	7	12	27	19	7	8	5	3	12	16	20	19	53
	S. W.	8	13	5	3	3	5	9	4	3	3	3	11	9	32	11	18
	S.	30	23	32	37	19	7	20	19	26	18	34	24	78	77	88	46
	S. E.	6	5	15	5	11	11	6	14	8	16	14	15	38	36	31	81
	E.	11	9	10	2	7	7	2	5	6	4	10	6	20	26	19	14
	N. E.	12	11	5	6	9	5	8	0	8	8	13	4	29	27	20	13
	Calm.	2	2	0	3	1	0	1	0	2	0	0	0	2	4	4	1
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Saint Marks, Fla.	N.	6	5	29	17	16	16	16	25	18	10	7	4	35	15	62	57
	N. W.	4	5	6	9	14	23	10	6	11	20	6	5	37	14	29	39
	W.	3	10	2	2	5	2	4	2	5	4	3	6	12	10	9	8
	S. W.	8	12	0	2	2	8	12	17	12	14	22	17	48	37	4	37
	S.	22	25	10	11	14	7	21	8	22	19	17	18	58	65	35	36
	S. E.	15	6	3	9	10	15	5	4	2	13	8	21	23	42	22	24
	E.	8	4	14	10	2	1	2	2	2	0	5	4	7	16	26	5
	N. E.	11	4	21	28	17	10	10	16	9	4	20	9	33	24	66	36
	Calm.	16	22	5	5	10	11	13	4	12	6	5	6	23	44	20	28
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Saint Paul, Minn.	N.	11	8	6	5	8	10	3	8	5	21	18	11	44	30	19	21
	N. W.	9	25	13	23	21	29	30	24	21	17	13	11	51	45	57	83
	W.	3	13	14	14	10	15	17	9	21	7	4	6	32	22	38	41
	S. W.	5	12	8	17	6	21	14	10	13	4	4	12	21	29	31	45
	S.	8	5	18	9	7	6	8	0	6	10	8	12	24	25	34	14
	S. E.	37	18	20	19	22	8	17	18	14	16	28	27	58	82	61	43
	E.	9	4	3	5	7	0	1	7	7	8	10	9	25	22	15	8
	N. E.	7	1	2	0	4	2	1	3	3	6	6	2	15	10	0	6
	Calm.	4	7	6	1	5	2	2	5	3	1	2	0	6	11	12	9
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thatcher's Island, Mass.	N.	9	5	9	6	4	0	2	4	15	8	8	13	31	27	19	6
	N. W.	10	16	8	22	30	51	48	43	20	34	6	5	60	31	69	142
	W.	2	6	9	8	16	22	16	8	8	11	6	13	25	21	33	46
	S. W.	36	23	13	17	8	4	16	10	16	7	23	24	46	83	38	30
	S.	20	27	29	18	6	2	1	3	10	7	36	17	53	64	43	6
	S. E.	6	6	4	9	5	11	5	3	13	4	4	1	21	13	18	19
	E.	2	4	11	3	2	1	1	0	1	4	5	6	10	12	16	2
	N. E.	8	6	13	10	9	2	4	13	10	15	4	11	29	25	32	19
	Calm.	0	0	4	0	1	0	0	0	0	0	1	0	1	0	5	0
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Toledo, Ohio	N.	3	22	4	2	3	1	7	2	2	11	13	10	26	35	9	10
	N. W.	2	1	2	5	6	2	4	9	20	17	5	6	42	9	13	15
	W.	14	17	12	17	18	9	16	20	16	13	14	21	43	52	47	45
	S. W.	2	7	6	22	21	30	30	22	20	11	10	14	41	23	49	82
	S.	12	25	28	8	8	27	20	10	8	6	13	13	27	50	44	57
	S. E.	2	0	13	32	9	12	4	7	6	3	2	1	11	3	54	23
	E.	5	0	8	4	2	2	6	7	10	14	26	15	50	20	14	15
	N. E.	30	9	12	2	18	8	5	7	11	10	7	6	28	45	32	20
	Calm.	23	11	5	1	5	2	1	0	0	5	3	4	8	38	11	3
	Blank.	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Tybee Island, Ga*	N.	3	4	5	13	7	6	4	...	...	...	...	...	...	...	25	...
	N. W.	1	4	5	8	17	33	25	...	...	...	...	...	...	...	30	...
	W.	3	7	0	5	7	9	14	...	...	...	...	...	...	...	12	...
	S. W.	7	17	2	1	6	6	7	...	...	...	...	...	...	...	9	...
	S.	26	37	11	8	16	10	17	...	...	...	...	...	...	...	35	...
	S. E.	19	6	15	10	7	4	2	...	...	...	...	...	...	...	62	...
	E.	28	10	25	30	12	11	16	...	...	...	...	...	...	...	67	...
	N. E.	3	4	24	15	13	13	6	...	...	...	...	...	...	...	52	...
	Calm.	3	4	3	3	5	1	2	...	...	...	...	...	...	...	11	...
	Blank.	0	0	0	0	0	0	0	...	...	...	...	...	...	...	0	...

* Discontinued on February 15, 1879, as a reporting station.

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1878.	August.	September.	October.	November.	December.	January, '79.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Umatilla, Oreg	N.	1	2	5	3	3	4	3	10	2	5	4	1	11	4	11	17
	N. W.	6	5	8	7	3	9	1	1	2	3	3	0	8	11	18	11
	W.	44	25	21	20	19	12	7	16	24	29	30	28	83	97	60	35
	S. W.	14	15	5	16	8	7	5	12	16	16	31	43	63	72	29	24
	S.	0	1	4	10	2	7	4	6	4	2	1	1	7	2	16	17
	S. E.	1	10	19	17	23	18	29	16	12	5	7	1	24	12	59	63
	E.	4	5	4	7	14	13	22	10	14	18	5	4	37	13	25	45
	N. E.	4	3	4	2	5	10	7	7	15	3	7	8	25	15	11	24
	Calm.	19	27	20	11	13	13	15	6	4	9	5	4	18	50	44	34
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vicksburg, Miss	N.	11	16	10	13	14	17	17	17	8	14	4	6	26	33	37	51
	N. W.	7	4	1	5	17	14	7	7	4	5	6	1	15	12	23	28
	W.	8	11	1	2	5	5	2	5	9	7	7	9	23	28	8	12
	S. W.	8	10	2	6	9	8	20	8	20	13	9	10	42	28	17	36
	S.	9	14	6	14	9	13	17	11	20	23	15	17	58	40	29	41
	S. E.	13	9	11	22	19	8	9	8	14	12	17	15	43	37	52	25
	E.	11	6	4	4	5	12	4	8	3	4	11	9	18	26	13	24
	N. E.	7	7	7	17	9	13	13	18	13	6	16	12	35	26	33	44
	Calm.	19	16	6	5	3	3	4	2	2	6	8	11	16	46	14	9
	Blank.	0	0	42	5	0	0	0	0	0	0	0	0	0	0	47	0
Virginia City, Mont	N.	0	3	0	0	0	0	3	1	0	0	1	0	1	3	0	4
	N. W.	5	9	5	20	4	7	3	8	7	9	7	19	23	33	29	18
	W.	11	8	13	22	13	7	9	25	18	10	13	16	41	35	48	41
	S. W.	4	1	6	7	5	3	10	16	21	7	7	7	35	12	18	29
	S.	8	2	1	4	3	3	2	1	2	7	6	2	15	12	8	6
	S. E.	15	22	15	4	15	17	16	6	9	13	26	18	48	55	34	39
	E.	5	9	4	3	0	6	3	2	1	4	8	3	13	17	7	11
	N. E.	8	11	9	2	1	3	5	3	3	4	4	3	11	22	12	11
	Calm.	37	28	37	31	49	47	42	22	32	36	21	22	89	87	117	111
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Visalia, Cal	N.	12	8	11	15	10	6	10	11	12	15	12	3	39	23	36	27
	N. W.	42	22	33	24	17	31	15	18	26	23	40	42	89	106	74	64
	W.	10	21	3	9	6	5	4	13	7	4	11	12	22	43	18	22
	S. W.	5	5	4	4	6	4	13	6	12	10	9	3	31	13	14	23
	S.	6	8	4	6	9	10	9	8	9	4	7	3	20	17	19	27
	S. E.	6	4	10	15	9	9	21	17	15	11	3	13	29	23	34	47
	E.	0	1	2	6	16	10	8	1	3	5	1	3	9	4	24	19
	N. E.	7	1	2	2	4	3	3	1	2	5	2	6	9	14	8	7
	Calm.	5	23	21	12	13	15	10	9	7	13	8	5	28	33	46	34
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Washington, D. C	N.	11	10	13	15	7	10	13	9	20	11	15	14	46	35	35	32
	N. W.	13	18	9	24	31	30	30	30	20	27	11	14	58	45	64	90
	W.	7	9	8	7	6	17	8	6	4	11	4	6	19	22	21	31
	S. W.	11	6	6	5	9	8	4	7	2	3	5	25	10	42	20	19
	S.	31	16	13	22	10	11	20	12	16	14	28	17	58	64	45	43
	S. E.	6	5	2	2	2	3	1	1	5	4	11	5	20	16	6	5
	E.	7	12	15	4	6	6	5	7	7	6	9	3	32	22	25	18
	N. E.	5	11	15	5	14	5	8	8	10	10	7	4	27	20	34	21
	Calm.	2	6	9	9	5	3	4	4	9	4	3	2	16	10	23	11
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wilmington, N. C	N.	2	4	7	16	10	10	7	17	12	4	9	8	25	14	33	34
	N. W.	1	4	0	10	9	11	18	9	9	12	3	2	24	7	19	38
	W.	3	9	2	4	18	26	10	9	6	8	7	2	21	14	24	45
	S. W.	16	28	6	4	13	9	25	12	17	19	13	22	49	66	23	46
	S.	26	12	12	5	8	2	9	8	14	17	16	23	47	61	25	19
	S. E.	7	10	4	8	2	5	4	5	14	11	8	9	33	26	14	14
	E.	21	5	12	10	7	11	8	3	10	8	13	13	31	39	29	22
	N. E.	8	7	29	17	14	12	7	17	6	5	14	6	25	21	60	36
	Calm.	9	14	18	19	9	7	5	4	5	6	10	5	21	28	46	16
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Winnemucca, Nev	N.	8	9	9	11	13	15	4	4	4	6	4	8	14	25	33	23
	N. W.	2	3	5	3	2	1	4	1	0	2	6	8	8	13	10	6
	W.	13	10	9	12	5	8	7	12	10	14	26	17	50	40	26	27
	S. W.	42	34	35	25	29	18	31	47	46	35	29	23	110	99	89	96
	S.	7	12	7	2	4	4	8	5	9	10	1	7	20	26	13	17
	S. E.	0	1	0	0	0	2	0	1	0	1	0	1	1	2	0	3
	E.	3	4	6	11	11	6	7	4	8	7	13	8	28	15	28	17
	N. E.	17	16	14	23	22	35	31	9	14	11	13	14	38	47	59	75
	Calm.	1	4	5	6	4	4	1	1	2	4	1	4	7	9	15	6
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1878.	August.	September.	October.	November.	December.	January, '79.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Wood's Holl, Mass	N.	3	5	6	13	4	9	15	10	15	9	4	4	28	12	23	34
	N. W.	13	11	13	25	44	46	27	32	16	25	11	14	52	38	82	105
	W.	5	12	5	7	10	18	27	13	16	17	10	7	43	24	22	58
	S. W.	34	28	14	17	9	4	12	14	8	14	40	44	62	100	40	30
	S.	17	17	19	12	2	2	1	5	6	3	11	8	20	42	33	8
	S. E.	8	11	9	12	4	12	3	0	17	9	13	6	39	25	25	15
	E.	6	4	15	2	14	0	3	7	7	9	2	4	18	14	31	10
	N. E.	7	4	9	5	3	2	5	3	8	4	2	3	14	14	17	10
	Calm.	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yankton, Dak	N.	11	11	6	10	4	6	6	9	15	9	13	4	37	26	20	21
	N. W.	11	10	27	32	31	47	34	27	29	20	15	13	64	34	90	108
	W.	1	6	2	10	7	11	9	7	10	1	3	8	14	15	19	27
	S. W.	6	11	8	14	9	12	14	7	11	7	1	5	19	22	31	33
	S.	19	17	14	10	10	3	8	8	11	13	13	15	37	51	34	19
	S. E.	26	11	23	9	12	10	6	12	11	10	24	29	54	66	44	28
	E.	16	11	5	3	7	4	5	3	2	9	7	5	18	32	15	12
	N. E.	2	12	2	3	4	0	6	10	0	7	16	6	23	20	9	16
	Calm.	1	4	3	2	6	0	5	1	4	5	1	5	10	10	11	6
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prescott, Ariz*	N.	....	....	....	....	....	....	17	21	11	9	3	0	23	....	....	....
	N. W.	....	....	....	....	....	....	2	3	2	10	2	6	14	....	....	....
	W.	....	....	....	....	....	....	3	12	35	18	37	37	90	....	....	....
	S. W.	....	....	....	....	....	....	1	4	12	20	41	31	82	....	....	....
	S.	....	....	....	....	....	....	30	10	10	4	0	3	14	....	....	....
	S. E.	....	....	....	....	....	....	2	1	4	2	1	1	7	....	....	....
	E.	....	....	....	....	....	....	2	5	8	2	1	2	11	....	....	....
	N. E.	....	....	....	....	....	....	2	7	3	8	4	7	15	....	....	....
	Calm.	....	....	....	....	....	....	16	5	8	8	4	3	20	....	....	....
	Blank.	....	....	....	....	....	....	18	16	0	0	0	0	0	....	....	....
Lead City, Dak†	N.	23	14	18	7	....	....	....	....	....	....	....	....	....	....	....	....
	N. W.	2	7	16	32	....	....	....	....	....	....	....	....	....	....	....	....
	W.	2	7	11	12	....	....	....	....	....	....	....	....	....	....	....	....
	S. W.	0	12	11	25	....	....	....	....	....	....	....	....	....	....	....	....
	S.	55	44	20	10	....	....	....	....	....	....	....	....	....	....	....	....
	S. E.	5	1	2	1	....	....	....	....	....	....	....	....	....	....	....	....
	E.	3	6	6	4	....	....	....	....	....	....	....	....	....	....	....	....
	N. E	1	2	1	1	....	....	....	....	....	....	....	....	....	....	....	....
	Calm.	2	0	5	1	....	....	....	....	....	....	....	....	....	....	....	....
	Blank.	0	0	0	0	....	....	....	....	....	....	....	....	....	....	....	....
Mason, Tex.‡	N.	....	....	....	....	....	....	....	....	....	5	2	2	....	....	....	....
	N. W.	....	....	....	....	....	....	....	....	....	11	6	1	....	....	....	....
	W.	....	....	....	....	....	....	....	....	....	7	4	0	....	....	....	....
	S. W.	....	....	....	....	....	....	....	....	....	11	9	5	....	....	....	....
	S.	....	....	....	....	....	....	....	....	....	3	15	25	....	....	....	....
	S. E.	....	....	....	....	....	....	....	....	....	24	34	42	....	....	....	....
	E.	....	....	....	....	....	....	....	....	....	7	16	6	....	....	....	....
	N. E.	....	....	....	....	....	....	....	....	....	5	6	8	....	....	....	....
	Calm.	....	....	....	....	....	....	....	....	....	13	1	1	....	....	....	....
	Blank.	....	....	....	....	....	....	....	....	....	4	0	0	....	....	....	....
Fort Saint Michaels, Alaska§	N.	11	19	12	19	16	22	7	27	10	14	13	....	....	47	56	37
	N. W.	6	1	4	3	1	0	0	0	0	6	1	....	....	8	0	7
	W.	7	2	2	7	2	0	6	2	0	3	11	....	....	11	8	14
	S. W.	24	26	9	6	8	2	0	4	9	17	15	....	....	23	12	41
	S.	27	17	14	16	7	10	28	20	6	14	16	....	....	37	58	36
	S. E.	2	3	15	8	2	7	12	10	1	0	10	....	....	25	29	11
	E.	6	15	18	25	17	27	17	6	7	9	13	....	....	60	50	29
	N. E.	10	9	14	8	30	9	15	7	34	19	9	....	....	52	31	62
	Calm.	0	1	2	1	7	16	2	8	26	8	5	....	....	10	26	39
	Blank.	0	0	0	0	0	0	0	0	0	0	0	....	....	0	0	0

*Local series of observations began January 1, 1879.
‡Local series of observations began at 2 p. m. of April 2, 1879.
†Station closed October 31, 1878.
§Records for June, 1879, not received in time for publication.

PAPER 14.

Mean normal barometer (corrected for temperature and instrumental error only), from observations taken at 7.35 a. m., 4.35 p. m., and 11 p. m. (Washington mean time), from January 1, 1873, to December 31, 1878. For stations opened subsequent to January 1, 1873, the means have been computed from the beginning of the year next succeeding the date of opening of the station.

Station.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Means.
Albany, N. Y	29.878	29.817	29.747	29.708	29.710	29.716	29.718	29.741	29.813	29.769	29.803	29.789	29.767
Alpena, Mich	29.369	29.354	29.310	29.296	29.313	29.270	29.315	29.334	29.351	29.303	29.322	29.318	29.321
Atlantic City, N. J	30.146	30.082	30.015	29.955	29.990	29.989	29.990	29.996	30.051	30.035	30.057	30.067	30.031
Augusta, Ga	30.015	29.939	29.904	29.822	29.842	29.860	29.877	29.858	29.877	29.926	29.926	29.989	29.903
Baltimore, Md	30.132	30.054	29.999	29.930	29.957	29.954	29.957	29.972	30.037	30.028	30.040	30.085	30.012
Barnegat, N. J	30.117	30.054	29.992	29.940	29.961	29.962	29.955	29.968	30.031	30.008	30.031	30.040	30.005
Bismarck, Dak	28.217	28.219	28.171	28.108	28.077	28.099	28.134	28.142	28.177	28.142	28.184	28.175	28.154
Boise City, Idaho	27.205	27.057	27.119	27.038	27.094	27.095	27.053	27.049	27.147	27.249	27.275	27.349	27.144
Boston, Mass	29.925	29.843	29.798	29.772	29.806	29.813	29.816	29.843	29.906	29.854	29.864	29.863	29.842
Breckenridge, Minn	29.032	29.003	28.991	28.923	28.882	28.851	28.918	28.928	28.948	28.939	28.987	29.008	28.951
Buffalo, N. Y	29.335	29.303	29.250	29.233	29.259	29.248	29.271	29.294	29.331	29.281	29.287	29.295	29.282
Burlington, Vt	29.813	29.755	29.693	29.685	29.692	29.676	29.687	29.736	29.788	29.746	29.763	29.754	29.732
Cairo, Ill	29.776	29.712	29.658	29.566	29.592	29.596	29.636	29.626	29.667	29.698	29.701	29.767	29.666
Cape Hatteras, N. C	30.140	30.069	30.024	29.932	30.007	30.015	30.003	29.979	30.002	30.010	30.004	30.041	30.019
Cape Henry, Va	30.151	30.081	30.013	29.945	29.988	29.989	29.988	29.986	30.016	30.029	30.041	30.087	30.026
Cape Lookout, N. C	30.131	30.043	30.028	29.900	30.017	30.011	30.013	29.969	30.020	30.052	30.034	30.116	30.028
Cape May, N. J	30.120	30.054	30.003	29.941	29.979	29.981	29.977	29.990	30.015	30.036	30.039	30.091	30.019
Charleston, S. C	30.133	30.061	30.033	29.948	29.973	30.000	30.010	29.986	30.019	30.033	30.039	30.106	30.028
Cheyenne, Wyo	23.935	23.907	23.912	23.950	23.959	24.064	24.138	24.143	24.114	24.071	24.003	23.981	24.015
Chicago, Ill	29.366	29.340	29.294	29.240	29.259	29.244	29.294	29.290	29.325	29.300	29.314	29.336	29.300
Cincinnati, Ohio	29.472	29.415	29.366	29.295	29.333	29.315	29.337	29.337	29.390	29.407	29.402	29.447	29.376
Cleveland, Ohio	29.346	29.305	29.258	29.220	29.253	29.245	29.270	29.279	29.319	29.284	29.289	29.309	29.281
Corsicana, Tex	29.697	29.615	29.522	29.457	29.478	29.503	29.527	29.510	29.550	29.570	29.600	29.650	29.557
Davenport, Iowa	29.463	29.422	29.367	29.295	29.313	29.294	29.355	29.360	29.394	29.384	29.411	29.440	29.375
Denver, Col	24.732	24.701	24.689	24.724	24.718	24.803	24.869	24.859	24.859	24.834	24.784	24.775	24.779
Denison, Tex	29.329	29.269	29.169	29.081	29.149	29.161	29.204	29.195	29.224	29.225	29.283	29.355	29.220
Detroit, Mich	29.370	29.337	29.294	29.259	29.295	29.269	29.307	29.318	29.354	29.317	29.326	29.339	29.315
Dodge City, Kans	27.447	27.398	27.315	27.290	27.294	27.351	27.402	27.400	27.416	27.395	27.421	27.438	27.381
Dubuque, Iowa	29.397	29.358	29.289	29.235	29.266	29.217	29.279	29.290	29.318	29.298	29.320	29.341	29.301
Duluth, Minn	29.361	29.326	29.306	29.271	29.266	29.209	29.255	29.272	29.286	29.262	29.310	29.314	29.286
Eastport, Me	29.933	29.850	29.829	29.831	29.841	29.869	29.869	29.918	29.967	29.888	29.863	29.856	29.876
Erie, Pa	29.352	29.321	29.256	29.234	29.262	29.244	29.273	29.286	29.322	29.280	29.297	29.286	29.284
Escanaba, Mich	29.350	29.347	29.325	29.312	29.296	29.253	29.313	29.319	29.341	29.296	29.340	29.320	29.318
Fort Gibson, Ind. T	29.596	29.515	29.422	29.362	29.373	29.388	29.432	29.425	29.460	29.492	29.502	29.560	29.461
Fort Sill, Ind. T	28.886	28.837	28.733	28.651	28.684	28.709	28.769	28.766	28.788	28.770	28.846	28.913	28.779
Galveston, Tex	30.134	30.053	30.000	29.940	29.937	29.963	29.992	29.964	29.959	30.036	30.048	30.104	30.011
Grand Haven, Mich	29.377	29.364	29.324	29.282	29.306	29.278	29.331	29.339	29.369	29.326	29.349	29.361	29.334
Indianapolis, Ind	29.309	29.259	29.209	29.152	29.190	29.188	29.224	29.223	29.267	29.259	29.251	29.290	29.235

Mean normal barometer, corrected for temperature and instrumental error only, &c.—Continued.

Station.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Means.
Indianola, Tex	30.126	30.084	30.011	29.959	29.949	29.974	30.006	29.986	29.980	30.061	30.079	30.130	30.029
Jacksonville, Fla	30.171	30.098	30.083	30.005	30.002	30.038	30.049	30.018	29.994	30.050	30.072	30.156	30.061
Keokuk, Iowa	29.462	29.418	29.360	29.282	29.294	29.344	29.331	29.338	29.375	29.383	29.405	29.444	29.370
Key West, Fla	30.112	30.073	30.055	30.007	29.976	30.023	30.030	30.003	29.945	29.964	30.022	30.100	30.026
Kitty Hawk, N. C	30.149	30.092	30.037	29.943	30.022	30.022	30.009	29.988	30.038	30.038	30.041	30.081	30.038
Knoxville, Tenn	29.132	29.081	29.019	28.959	29.003	29.028	29.056	29.033	29.074	29.097	29.071	29.129	29.057
La Crosse, Wis	29.346	29.310	29.259	29.191	29.206	29.175	29.236	29.244	29.270	29.248	29.289	29.306	29.257
Leavenworth, Kans	29.271	29.188	29.135	29.054	29.042	29.061	29.112	29.115	29.174	29.164	29.190	29.240	29.145
Los Angeles, Cal	29.715	29.657	29.659	29.573	29.579	29.572	29.537	29.532	29.576	29.601	29.679	29.718	29.616
Louisville, Ky	29.556	29.499	29.465	29.385	29.417	29.411	29.443	29.439	29.491	29.507	29.499	29.554	29.472
Lynchburg, Va	29.418	29.351	29.307	29.262	29.306	29.316	29.325	29.329	29.406	29.402	29.393	29.440	29.355
Marquette, Mich	29.279	29.275	29.249	29.250	29.254	29.199	29.248	29.268	29.290	29.231	29.263	29.248	29.254
Memphis, Tenn	29.867	29.794	29.737	29.662	29.680	29.683	29.719	29.704	29.749	29.792	29.784	29.853	29.752
Milwaukee, Wis	29.308	29.265	29.236	29.200	29.234	29.204	29.272	29.281	29.303	29.267	29.286	29.299	29.263
Mobile, Ala	30.168	30.090	30.054	29.987	29.985	30.003	30.021	29.986	29.984	30.058	30.073	30.142	30.046
Montgomery, Ala	29.972	29.906	29.865	29.782	29.792	29.811	29.831	29.798	29.818	29.886	29.887	29.961	29.859
Morgantown, W. Va	29.049	28.959	28.886	28.878	28.906	28.940	28.958	28.963	29.000	28.992	28.958	29.008	28.958
Mount Washington, N. H	23.393	23.367	23.399	23.542	23.702	23.831	23.894	23.921	23.867	23.691	23.503	23.404	23.626
Nashville, Tenn	29.636	29.550	29.510	29.431	29.463	29.476	29.500	29.486	29.533	29.566	29.551	29.613	29.526
New Haven, Conn	29.991	29.937	29.875	29.836	29.869	29.873	29.875	29.900	29.961	29.919	29.925	29.949	29.909
New London, Conn	30.068	29.997	29.949	29.909	29.951	29.954	29.955	29.983	30.038	29.994	29.998	30.019	29.985
New Orleans, La	30.123	30.045	30.007	29.938	29.946	29.969	29.984	29.955	29.950	30.026	30.038	30.099	30.007
Newport, R. I	30.024	29.955	29.921	29.870	29.921	29.934	29.916	29.933	30.027	29.957	29.952	29.961	29.948
New York, N. Y	29.956	29.884	29.832	29.790	29.826	29.825	29.837	29.860	29.914	29.878	29.883	29.909	29.866
Norfolk, Va	30.121	30.046	30.002	29.929	29.975	29.977	29.984	29.974	30.024	30.034	30.030	30.085	30.015
North Platte, Nebr	27.095	27.069	26.998	26.977	26.974	27.032	27.079	27.085	27.102	27.081	27.097	27.096	27.057
Olympia, Wash	29.782	29.991	29.849	29.930	29.973	30.008	29.947	29.960	29.948	30.045	30.007	30.175	29.968
Omaha, Nebr	28.949	28.903	28.842	28.792	28.819	28.787	28.848	28.856	28.914	28.915	28.926	28.963	28.876
Oswego, N. Y	29.751	29.721	29.663	29.641	29.674	29.647	29.656	29.686	29.725	29.688	29.862	29.710	29.702
Pembina, Dak	29.238	29.223	29.199	29.128	29.082	29.029	29.077	29.096	29.120	29.126	29.178	29.180	29.130
Philadelphia, Pa	30.126	30.047	29.987	29.927	29.970	29.957	29.954	29.979	30.031	30.020	30.032	30.065	30.008
Pike's Peak, Colo	17.512	17.518	17.506	17.612	17.765	17.942	18.078	18.059	17.952	17.820	17.653	17.587	17.750
Pioche, Nev	24.046	23.927	23.986	23.905	23.972	24.055	24.069	24.125	24.082	24.116	24.113	24.076	24.039
Pittsburg, Pa	29.274	29.215	29.164	29.124	29.167	29.165	29.186	29.197	29.240	29.224	29.212	29.240	29.201
Port Huron, Mich	29.387	29.346	29.297	29.248	29.302	29.267	29.304	29.297	29.355	29.302	29.324	29.301	29.311
Portland, Me	30.006	29.929	29.887	29.874	29.897	29.901	29.900	29.949	30.003	29.947	29.945	29.942	29.932
Portland, Oreg	29.994	29.943	29.935	30.024	29.987	29.970	29.974	29.959	29.971	30.018	29.994	30.059	29.986
Punta Rassa, Fla	30.157	30.104	30.104	30.041	30.013	30.056	30.064	30.039	29.986	30.014	30.063	30.149	30.066
Red Bluff, Cal	29.659	29.563	29.653	29.544	29.559	29.477	29.468	29.466	29.564	29.641	29.737	29.786	29.593
Rochester, N. Y	29.415	29.394	29.338	29.321	29.347	29.333	29.353	29.378	29.417	29.373	29.381	29.375	29.369
Roseburg, Oreg	29.353	29.268	29.419	29.467	29.512	29.502	29.463	29.462	29.483	29.592	29.578	29.667	29.480
Sacramento, Cal	29.970	29.885	29.949	29.824	29.835	29.763	29.761	29.755	29.837	29.900	30.005	30.042	29.877

Salt Lake City, Utah	*25.683*	*25.679*	*25.587*	*25.579*	*25.552*	*25.611*	*25.613*	*25.628*	*25.643*	*25.681*	*25.709*	*25.739*	*25.642*
San Diego, Cal	*30.040*	*30.019*	*30.001*	*29.973*	*29.903*	*29.899*	*29.882*	*29.881*	*29.867*	*29.932*	*29.993*	*30.012*	*29.950*
Sandy Hook, N. J	*30.112*	*30.049*	*29.982*	*29.928*	*29.949*	*29.952*	*29.953*	*29.967*	*30.037*	*30.016*	*30.036*	*30.038*	*30.002*
Sandusky, Ohio	*29.364*	*29.282*	*29.284*	*29.139*	*29.278*	*29.287*	*29.324*	*29.256*	*29.415*	*29.358*	*29.338*	*29.347*	*29.306*
San Francisco, Cal	30.027	30.014	30.014	29.995	29.917	29.899	29.878	29.890	29.882	29.954	30.019	30.044	29.961
Santa Fé, N. Mex	23.221	23.178	23.169	23.173	23.214	23.305	23.384	23.390	23.338	23.307	23.269	23.237	23.265
Savannah, Ga	30.116	30.041	30.010	29.929	29.944	29.969	29.985	29.958	29.958	30.011	30.021	30.099	30.003
Shreveport, La	29.974	29.883	29.828	29.766	29.777	29.798	29.811	29.793	29.807	29.872	29.878	29.946	29.844
Smithville, N. C	30.172	30.078	30.036	29.950	30.034	30.024	30.029	29.993	30.013	30.051	30.005	30.120	30.042
Springfield, Mass	29.958	29.886	29.863	29.791	29.826	29.836	29.816	29.836	29.913	29.855	29.874	29.865	29.860
Saint Louis, Mo	29.562	29.498	29.445	29.369	29.389	29.389	29.438	29.442	29.488	29.505	29.506	29.553	29.465
Saint Mark's, Fla	30.188	30.118	30.073	29.992	30.008	30.031	30.036	30.020	29.996	30.049	30.069	30.145	30.069
Saint Paul, Minn	29.184	29.141	29.117	29.055	29.051	29.021	29.090	29.099	29.118	29.149	29.131	29.205	29.113
Thatcher's Island, Mass	29.997	29.930	29.901	29.866	29.898	29.911	29.892	29.916	30.018	29.943	29.940	29.926	29.928
Toledo, Ohio	29.390	29.350	29.292	29.262	29.294	29.273	29.313	29.309	29.354	29.325	29.337	29.357	29.321
Tybee Island, Ga	30.172	30.102	30.053	29.963	30.009	30.018	30.016	29.983	29.999	30.050	30.069	30.134	30.047
Umatilla, Oreg	29.694	29.484	29.616	29.604	29.632	29.618	29.537	29.534	29.626	29.739	29.767	29.912	29.647
Vicksburg, Miss	29.948	29.866	29.816	29.741	29.760	29.766	29.804	29.782	29.806	29.868	29.876	29.930	29.830
Virginia City, Mont	24.183	24.151	24.123	24.196	24.185	24.276	24.327	24.325	24.318	24.303	24.229	24.243	24.238
Visalia, Cal	29.738	29.668	29.693	29.558	29.554	29.484	29.487	29.481	29.580	29.652	29.748	29.773	29.618
Washington, D. C	30.054	29.981	29.927	29.869	29.906	29.897	29.906	29.912	29.972	29.968	29.980	30.017	29.949
Wilmington, N. C	30.118	30.034	30.003	29.921	29.961	29.976	29.992	29.958	29.977	30.016	30.014	30.092	30.005
Winnemucca, Nev	25.639	25.515	25.599	25.519	25.580	25.616	25.583	25.593	25.636	25.696	25.743	25.738	25.621
Wood's Holl, Mass	30.068	29.992	29.944	29.907	29.932	29.944	29.969	30.002	30.034	30.006	29.988	29.999	29.982
Yankton, D k	28.805	28.779	28.715	28.657	28.628	28.626	28.686	28.693	28.753	28.740	28.752	28.778	28.718

PAPER 15.

Monthly and annual mean actual barometer (corrected for temperature and instrumental error only), observations taken at 7.35 a. m., 4.35 p. m., and 11 p.m., Washington mean time, from July, 1878, to June, 1879, inclusive.

Stations.	1878.						1879.						Annual means.
	July.	August.	September.	October.	November.	December.	January.	February	March.	April.	May.	June.	
Albany, N. Y	29.683	29.646	29.894	29.762	29.696	29.693	29.746	29.788	29.683	29.677	29.812	29.721	29.733
Alpena, Mich	29.307	29.222	29.372	29.272	[1]29.306	[2]29.261	29.314	29.370	29.361	29.352	29.379	29.318	29.319
Atlanta, Ga	.....	.....	.....	[3]28.934	28.848	[4]28.938	28.988	28.939	28.952	28.834	28.902	28.878	.....
Atlantic City, N. J	29.944	29.901	30.110	30.023	29.963	30.007	30.036	30.086	30.104	29.928	30.084	29.983	30.014
Augusta, Ga	29.815	29.790	29.904	29.923	29.898	29.982	30.010	29.965	29.952	29.842	29.867	29.859	29.901
Baltimore, Md	29.903	29.865	30.081	30.003	29.967	30.011	30.104	30.074	30.081	29.912	30.044	29.959	30.000
Barnegat, N. J	29.942	29.902	30.016	30.016	29.952	29.986	30.017	[4]30.047	30.072	29.893	30.055	29.957	29.988
Bismarck, Dak	28.096	28.131	28.136	28.087	28.146	28.222	28.150	28.197	28.142	28.105	28.140	28.046	28.133
Boerne, Tex	.....	[5]28.472	[6]28.561	28.578	[7]28.588	[6]28.662	28.638	[4]28.660	28.664	[8]28.472	28.485	28.497	.....
Boise City, Idaho	27.037	27.067	27.145	27.250	27.277	27.351	27.255	27.187	27.143	27.099	27.110	27.070	27.166
Boston, Mass	29.773	29.756	30.009	29.850	29.763	29.768	29.768	29.838	29.927	29.707	29.897	29.790	29.820
Brackettville, Tex	28.781	28.770	28.846	28.865	28.899	28.993	28.979	28.962	28.873	28.763	28.764	28.765	28.855
Breckenridge, Minn	28.914	28.884	28.911	28.854	28.966	29.055	29.025	29.067	28.989	28.954	28.925	28.847	28.949
Brownsville, Tex	29.868	29.854	29.931	29.965	29.988	30.083	30.095	30.026	29.992	29.834	29.848	29.845	29.944
Buffalo, N. Y	29.248	29.186	29.374	29.279	29.239	29.205	29.284	29.301	29.331	29.238	29.333	29.264	29.273
Burlington, Vt	29.654	29.611	29.879	29.741	29.675	29.653	29.654	29.722	29.764	29.585	29.717	29.612	29.689
Cairo, Ill	29.598	29.552	29.642	29.654	29.676	29.779	29.844	29.793	29.750	29.641	29.641	29.644	29.684
Camp Grant, Ariz	25.198	25.185	25.214	25.189	25.211	25.197	25.214	25.204	25.210	25.156	25.213	25.195	25.199
Campo, Cal	27.397	27.345	27.381	27.405	27.444	27.452	27.472	27.455	27.465	27.411	29.321	27.339	27.407
Camp Verde, Ariz	26.650	26.695	26.728	26.755	26.802	(9)	.....	.....	.....	.....	[10]26.689	.....	.....
Cape Hatteras, N. C	30.016	29.947	30.095	30.055	30.034	30.094	30.131	30.110	30.116	30.000	30.069	30.054	30.060
Cape Henry, Va	29.952	29.919	30.079	30.028	29.979	30.022	30.047	30.071	30.088	29.955	30.061	30.006	30.017
Cape Lookout, N. C	30.001	29.938	30.076	30.045	30.031	30.084	30.132	30.090	30.103	29.990	30.032	30.041	30.047
Cape May, N. J	29.950	29.908	30.111	30.026	29.962	30.019	30.045	30.060	30.069	29.882	30.017	29.939	29.998
Castroville, Tex	29.132	29.132	29.232	29.239	29.256	29.353	29.329	29.305	29.264	29.145	[7]29.129	29.140	29.221
Charleston, S. C	29.978	29.936	30.034	30.051	30.038	30.097	30.154	30.066	30.074	29.960	29.984	29.987	30.030
Charlotte, N. C	.....	.....	.....	[11]29.247	29.178	29.226	29.272	29.244	29.240	29.134	29.210	29.193	.....
Chattanooga, Tenn	.....	.....	.....	.....	.....	.....	[12]29.424	29.414	29.371	29.199	29.236	29.239	.....
Cheyenne, Wyo	24.104	24.149	24.204	24.028	24.052	24.002	23.950	23.929	24.009	23.980	24.004	24.023	24.036
Chicago, Ill	29.267	29.202	29.333	29.280	29.302	29.321	29.378	29.354	29.344	29.321	29.321	29.289	29.309
Cincinnati, Ohio	29.290	29.252	29.432	29.435	29.398	29.440	29.507	29.467	29.453	29.352	29.397	29.374	29.400
Cleveland, Ohio	29.245	29.192	29.369	29.308	29.278	29.276	29.351	29.336	29.335	29.253	[7]29.330	29.274	29.296
Coleman City, Tex	28.450	[13]28.170	28.223	28.231	28.242	28.324	28.317	28.267	28.292	[14]28.140	28.125	28.120	28.242
Columbus, Ohio	[15]29.143	29.072	29.245	29.206	29.163	29.183	29.249	29.224	29.224	29.130	29.200	29.160	29.183
Concho, Tex	[16]27.943	28.024	28.100	28.118	28.133	28.198	28.189	28.143	28.102	[17]27.973	[2]28.007	28.037	28.081
Corsicana, Tex	29.479	29.469	29.563	29.580	29.592	29.695	29.704	29.645	29.592	29.480	29.541	29.487	29.569
Davenport, Iowa	29.337	29.291	29.404	29.363	29.398	29.456	29.485	29.441	29.428	29.346	29.338	29.325	29.384
Deadwood, Dak	.....	.....	.....	.....	[18]25.377	25.368	25.277	25.259	25.318	25.333	25.333	25.323	.....

Decatur, Tex		[19]28.802	28.947	28.076	[7]28.886	28.975	[30]28.967	[31]28.937	[22]28.889	[19]28.762	[8]28.754	28.787	.....
Denison, Tex	29.155	29.156	29.238	29.245	29.254	29.362	29.361	29.301	29.249	29.148	29.137	29.153	29.230
Denver, Colo	24.827	24.866	24.821	24.794	24.819	24.797	24.730	24.708	24.754	24.714	24.717	24.735	24.773
Des Moines, Iowa	.....	[21]29.038	29.114	29.081	29.135	29.226	29.229	29.177	29.157	29.082	29.050	29.050	.....
Detroit, Mich	29.288	29.221	29.388	29.315	29.308	29.289	29.362	29.353	29.363	29.292	29.363	29.303	29.320
Dodge City, Kans	27.380	27.392	27.395	27.391	27.434	27.519	27.470	27.434	27.436	27.332	27.315	27.325	27.402
Dubuque, Iowa	29.266	29.209	29.308	29.265	29.321	29.365	29.396	29.374	29.345	29.285	29.281	29.255	29.306
Duluth, Minn	29.272	29.195	29.279	29.186	29.316	29.336	29.321	29.389	29.302	29.339	29.328	29.240	29.292
Eagle Pass, Tex	29.125	29.106	29.233	29.240	29.250	29.347	29.339	29.298	29.226	29.121	29.104	29.115	29.209
Eastport, Me	29.812	29.796	30.078	29.903	29.768	29.774	29.741	29.822	29.974	29.713	29.938	29.825	29.845
El Paso, Tex	.....	.....	.....	.....	.....	.....	.....	[24]26.255	26.239	26.163	26.163	26.154	.....
Erie, Pa	29.240	29.181	29.371	29.284	29.249	29.225	29.307	29.311	29.327	29.247	29.332	29.267	29.278
Escanaba, Mich	29.323	29.229	29.353	29.253	29.423	29.306	29.331	29.393	29.350	29.359	29.379	29.314	29.334
Florence, Ariz	([25])	([25])	28.367	28.412	28.498	28.531	28.547	28.499	28.477	28.415	28.388	28.331	.....
Fort Buford, Dak	.....	.....	.....	.....	.....	.....	.....	[26]28.062	[4]27.961	[17]27.908	[7]27.911	27.811	.....
Fort Craig, N. Mex	([25])	([25])	25.537	25.547	[26]25.592	[7]25.533	25.562	25.514	25.309	25.450	[7]25.456	[29]25.459	.....
Fort Davis, Tex	25.214	25.230	25.253	25.252	25.227	25.213	25.224	25.207	25.218	25.154	25.176	25.188	25.213
Fort Gibson, Ind. Ter	29.401	29.395	29.489	29.489	29.495	29.612	29.629	29.564	29.509	29.398	29.393	29.405	29.531
Fort Griffin, Tex	28.672	28.677	28.739	28.748	28.773	28.884	28.859	[30]28.782	[4]28.734	28.648	28.630	28.652	28.733
Fort Keogh, Mont	.....	.....	.....	.....	.....	.....	.....	27.443	27.430	27.360	27.351	27.290	.....
Fort McKavett, Tex	.....	[31]27.749	27.795	27.990	27.807	[3]27.848	27.856	[20]27.811	[30]27.774	[21]27.667	27.674	27.692	27.787
Fort Sill, Ind. Ter	28.736	28.746	28.780	28.799	28.827	28.938	28.923	28.864	28.811	28.709	28.690	28.704	28.794
Fort Stevenson, Dak	.....	.....	.....	.....	.....	.....	[31]28.180	28.210	28.124	[27]28.112	28.114	28.015	.....
Fredericksburg, Tex	([25])	[34]28.221	[35]28.294	28.294	28.291	28.357	28.361	28.316	28.294	[30]28.178	[8]28.170	28.192	.....
Galveston, Tex	29.914	29.902	29.981	30.015	30.027	30.116	30.151	30.089	30.067	29.935	29.933	29.928	30.088
Graham, Tex	([25])	([25])	([25])	[2]28.932	28.951	[7]29.050	[21]29.051	29.002	[32]28.973	[2]28.831	[16]28.818	28.840	.....
Grand Haven, Mich	29.323	29.244	29.387	29.318	29.349	29.319	29.382	29.398	29.387	29.326	29.365	29.325	29.344
Indianapolis, Ind	29.182	29.141	29.294	29.255	29.224	29.265	29.329	29.294	29.280	29.192	29.198	29.210	29.297
Indianola, Tex	29.920	29.908	29.987	30.027	30.045	30.131	30.177	30.102	30.067	29.955	29.943	29.939	30.017
Jacksboro', Tex	28.812	28.813	28.872	28.878	[33]28.884	28.978	28.974	28.911	28.890	28.776	28.762	28.751	28.858
Jacksonville, Fla	29.963	29.961	29.982	30.044	30.052	30.134	30.189	30.118	30.126	30.014	30.007	30.021	30.051
Keokuk, Iowa	29.303	29.273	29.387	29.357	29.383	29.473	29.496	29.443	29.418	29.330	29.311	29.304	29.373
Key West, Fla	29.941	29.958	29.869	29.940	30.004	30.091	30.150	30.073	30.102	30.012	29.955	29.980	30.006
Kittyhawk, N. C	29.984	29.912	30.081	30.030	29.993	30.053	30.094	30.081	30.095	29.945	30.038	30.015	30.027
Knoxville, Tenn	29.021	28.980	29.119	29.119	29.059	29.110	29.173	29.130	29.116	29.011	29.067	29.028	29.078
La Crosse, Wis	29.218	29.155	29.251	29.183	29.272	29.304	29.321	29.314	29.270	29.240	29.232	29.198	29.246
La Mesilla, N. Mex	26.026	26.042	26.068	26.092	26.120	26.118	26.137	26.084	26.088	26.025	26.005	25.989	26.066
Laredo, Tex	29.479	29.460	[20]29.536	29.563	29.599	29.699	29.690	29.657	29.570	[27]29.443	29.452	29.467	29.551
Lead City, Dak	24.869	24.910	24.839	[37]24.766	.....	.....	.....	.....	.....	.....	.....	.....	.....
Leavenworth, Kans	29.089	29.068	29.144	29.132	29.166	29.293	29.285	29.226	29.195	29.092	29.058	29.074	29.152
Los Angeles, Cal	29.524	29.532	29.576	29.601	29.679	29.718	29.752	29.720	29.727	29.667	29.667	29.575	29.645
Louisville, Ky	29.390	29.364	29.526	29.508	29.479	29.541	29.598	29.561	29.537	29.421	29.455	29.445	29.486
Lynchburg, Va	29.291	29.275	29.456	29.405	29.332	29.370	29.426	29.410	29.399	29.276	29.389	29.348	29.365
Madison, Wis	.....	.....	[38]28.798	28.959	29.017	29.018	29.055	29.042	29.022	28.982	29.000	28.972	.....
Marquette, Mich	29.258	29.161	29.273	29.162	29.267	29.224	29.239	29.321	29.264	29.302	29.304	29.232	29.251
Mason, Tex	28.305	[8]28.311	[39]28.377	28.391	[4]28.407	28.482	28.481	28.431	[9]28.381	28.306	28.297	28.334	28.375
Memphis, Tenn	29.661	29.642	29.764	29.773	29.748	29.861	29.902	29.847	29.811	29.691	29.685	29.676	29.755
Milwaukee, Wis	29.245	29.174	29.301	29.221	29.267	29.267	29.315	29.310	29.290	29.251	29.275	29.240	29.263
Mobile, Ala	29.935	29.933	30.003	30.047	30.044	30.137	30.196	30.120	30.117	29.984	29.968	29.961	30.037
Montgomery, Ala	29.756	29.721	29.835	29.871	29.849	29.934	29.991	29.931	29.906	29.787	29.801	29.799	29.848
Morgantown, W. Va	28.931	28.882	29.061	28.998	28.939	28.955	29.021	28.988	29.001	28.891	29.016	29.023	28.975
Mount Washington, N. H	23.865	23.815	23.974	23.732	23.433	23.272	23.243	23.288	23.505	23.416	23.819	23.773	23.595

Monthly and annual mean actual barometer, &c., from July, 1878, to June, 1879, inclusive—Continued.

Stations.	1878.						1879.						Annual means.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Nashville, Tenn	29.448	29.420	29.572	29.571	29.527	29.606	29.663	29.623	29.594	29.478	29.493	29.497	29.541
New Haven, Conn	29.837	29.804	30.041	29.907	29.839	29.846	29.873	29.913	29.976	29.774	29.965	29.842	29.801
New London, Conn	29.917	29.880	30.123	29.984	29.903	29.921	29.926	29.980	30.052	29.841	30.032	29.916	29.956
New Orleans, La	29.900	29.895	29.963	30.009	30.002	30.991	30.152	30.080	30.072	29.943	29.936	29.923	29.997
Newport, R. I	29.896	29.865	30.110	29.962	29.881	29.898	29.901	29.967	30.033	29.820	30.029	29.912	29.939
New York, N. Y	29.798	29.763	29.985	29.868	29.821	29.816	29.852	29.896	29.929	29.744	29.913	29.801	29.849
Norfolk, Va	29.942	29.884	30.071	30.024	29.974	30.021	30.061	30.051	30.053	29.916	30.023	29.972	29.999
North Platte, Nebr	27.070	27.089	27.094	27.074	27.131	27.179	27.120	27.088	27.102	27.017	26.999	27.001	27.080
Olympia, Wash	29.934	29.947	29.948	30.044	30.007	30.175	30.007	29.922	29.829	29.989	29.953	30.017	29.981
Omaha, Nebr	28.817	28.809	28.868	28.835	28.876	28.983	28.962	28.914	28.895	28.807	28.756	28.768	28.857
Oswego, N. Y	29.627	29.569	29.788	29.680	29.632	29.604	29.682	29.720	29.756	29.618	29.733	29.643.	29.671
Pembina, Dak	29.086	29.065	29.091	29.003	29.106	29.222	29.160	29.288	29.148	29.167	29.153	28.970	29.122
Philadelphia, Pa	29.913	29.881	30.102	30.002	29.946	29.977	30.021	30.036	30.054	29.880	30.030	29.932	29.979
Phœnix, Ariz	28.614	28.653	28.719	28.754	[2]28.836	28.894	28.913	28.845	28.809	28.746	28.696	28.599	28.756
Pike's Peak, Colo	18.067	18.102	17.907	17.777	17.729	17.504	17.535	17.556	17.711	17.687	17.818	17.921	17.776
Pilot Point, Tex	.....	[40]29.174	29.253	[14]29.282	[30]29.250	29.315	[41]29.159	[42]29.196	[43]29.188	[27]29.112	[20]29.126	[43]29.169	.....
Pioche, Nev	24.056	24.105	24.082	24.116	24.113	24.076	24.028	24.066	24.055	23.991	[10]23.954	.....	.....
Pittsburgh, Pa	29.145	29.096	29.285	29.230	29.178	29.194	29.262	29.240	29.254	29.143	29.244	29.191	29.205
Port Huron, Mich	29.286	29.216	29.383	29.306	29.294	29.257	29.334	29.341	29.359	29.296	29.365	29.303	29.312
Portland, Me	29.844	29.830	30.104	29.928	29.833	29.827	29.830	29.913	30.015	29.778	29.962	29.868	29.894
Portland, Oreg	29.939	29.940	29.965	30.074	30.051	30.188	30.064	29.989	29.875	30.005	29.990	30.031	30.009
Prescott, Ariz	24.793	24.814	24.816	24.815	24.737	24.701	[21]24.724	[2]24.756	24.755	24.691	24.701	24.707	24.751
Punta Rassa, Fla	29.978	29.994	29.891	30.004	30.054	30.145	30.199	30.113	30.147	30.048	29.982	30.000	30.046
Red Bluff, Cal	29.455	29.453	29.564	29.641	29.737	29.786	29.785	29.736	29.675	29.641	29.661	29.488	29.635
Rio Grande City, Tex	.....	.....	29.798	29.845	29.869	29.979	29.954	29.912	29.832	[45]29.690	29.699	29.702	.....
Rochester, N. Y	29.324	29.267	29.470	29.369	29.318	29.291	29.363	29.391	29.431	29.318	29.426	29.345	29.359
Roseburg, Oreg	29.450	29.449	29.483	29.592	29.578	29.667	29.598	29.542	29.418	29.488	29.519	29.539	29.527
Sacramento, Cal	29.748	29.742	29.837	29.900	30.005	30.042	30.061	30.018	29.997	29.937	29.964	29.761	29.918
Salt Lake City, Utah	25.572	25.626	25.642	25.723	25.747	25.759	25.685	25.677	25.641	25.573	25.549	25.565	25.647
San Antonio, Tex	29.241	29.232	29.316	29.341	29.409	29.582	29.455	29.402	29.360	29.250	29.237	29.248	29.339
San Diego, Cal	29.824	29.836	29.875	29.899	29.980	30.007	30.053	30.016	30.031	29.969	29.967	29.870	29.944
Sandusky, Ohio	29.311	29.256	29.415	29.357	29.338	29.347	29.418	29.395	29.392	29.317	29.384	29.327	29.355
Sandy Hook, N. J	29.931	29.894	30.116	30.002	29.936	29.961	29.996	30.031	30.058	29.876	30.042	29.933	29.981
San Francisco, Cal	29.832	29.832	29.902	29.937	30.029	30.050	30.083	30.054	30.030	29.987	30.024	29.842	29.967
Santa Fé, N. Mex	23.371	23.392	23.351	23.229	23.272	23.216	23.236	23.225	23.264	23.220	23.291	23.307	23.281
Savannah, Ga	29.916	29.885	29.968	30.001	29.991	30.057	30.112	30.054	30.051	29.937	29.957	29.964	29.991
Shreveport, La	29.744	29.721	29.830	29.853	29.847	29.952	29.939	29.909	29.867	29.748	29.782	29.768	29.830
Silver City, N. Mex	24.323	24.323	[17]	24.333	24.309	24.252	24.291	24.298	24.318	[17]	24.294	24.300	.....
Smithville, N. C	30.015	29.946	30.074	30.066	30.053	30.101	30.149	30.115	30.112	30.004	30.047	30.044	30.060
Springfield, Mass	29.748	29.726	30.020	29.881	29.811	29.810	29.837	29.898	29.953	29.760	29.931	29.818	29.849
Saint Louis, Mo	29.398	29.372	29.503	29.475	29.467	29.562	29.605	29.558	29.524	29.422	29.419	29.411	29.476
Saint Marks, Fla	29.960	29.964	29.992	30.055	30.063	30.147	30.208	30.120	30.138	30.021	30.008	30.018	30.059

Saint Michaels, Alaska	*29.756*	*29.649*	*29.684*	*29.628*	*29.245*	*29.721*	*29.599*	*30.144*	*29.722*	*29.652*	*29.903*	.....	[44]*29.700*
Stockton, Texas	*26.905*	*26.927*	*26.974*	*27.002*	*27.000*	*27.039*	*27.020*	*26.996*	*26.967*	*26.888*	*26.896*	*26.908*	*26.960*
Saint Paul, Minn	*29.091*	*29.033*	*29.100*	*29.025*	*29.131*	*29.179*	*29.184*	*29.189*	*29.133*	*29.107*	*29.093*	*29.056*	*29.110*
Thatcher's Island, Mass	*29.868*	*29.851*	*30.112*	*29.953*	*29.861*	*29.863*	*29.899*	*29.946*	30.028	29.806	30.003	29.896	29.924
Toledo, Ohio	29.275	29.217	29.382	29.320	29.318	29.308	29.369	29.349	29.356	29.279	29.347	29.304	29.319
Tucson, Ariz	27.357	27.249	[46]27.245	27.494	.....	.....	.....	[47]27.582	27.542	27.483	27.465	27.422	.....
Tybee Island, Ga	29.962	29.929	30.006	30.037	30.034	30.115	30.184	[48]30.103	.....	.....	.....	.....	.....
Umatilla, Oreg	29.524	29.534	29.622	29.727	29.780	30.000	29.808	29.706	29.602	29.648	29.627	29.590	29.681
Uvalde, Tex	.....	[49]29.014	[4]29.099	[6]29.114	[8]29.121	[30]29.243	29.224	[4]29.180	[2]29.123	29.038	29.008	28.987	.....
Vicksburg, Miss	29.742	29.728	[33]29.804	[21]29.856	29.857	29.945	29.986	29.927	29.897	29.777	29.773	29.774	29.839
Virginia City, Mont	24.266	24.329	24.290	24.248	24.294	24.300	24.160	24.125	24.165	24.189	24.187	24.212	24.230
Visalia, Cal	29.474	29.481	29.580	29.652	29.748	29.773	29.772	29.732	29.707	29.631	29.647	29.449	29.637
Washington, D. C	29.854	29.825	30.032	29.957	29.904	29.941	29.994	29.998	30.001	29.839	30.080	29.887	29.944
Wilmington, N. C	29.952	29.871	30.012	29.997	29.978	30.031	30.074	30.044	30.031	29.928	29.978	29.970	29.989
Winnemucca, Nev	25.570	25.593	25.644	25.728	25.746	25.768	25.687	25.675	25.631	25.597	25.602	25.591	25.653
Wood's Holl, Mass	29.882	29.880	30.007	29.954	29.866	29.894	29.891	29.956	30.038	29.826	30.075	29.922	29.933
Yankton, Dak	28.665	28.659	28.705	28.668	28.751	28.862	28.821	28.791	28.772	28.692	28.636	28.620	28.720
Yuma, Ariz	29.563	29.584	29.673	29.720	29.838	29.913	29.938	29.837	29.805	29.748	29.702	29.607	29.744

[1] Twenty-four days only.
[2] Two observations missed.
[3] Observations commenced October 3, 1878.
[4] One observation missed.
[5] Twenty-three days only.
[6] Three observations missed.
[7] Seven observations missed.
[8] Ten observations missed.
[9] No observations taken after November 30, 1878, owing to breaking of barometer.
[10] Nineteen days only.
[11] Observations commenced October 6, 1878.
[12] Observations commenced January 8, 1879.
[13] Twenty observations missed.
[14] Seventeen observations missed.
[15] Observations commenced July 1, 1878.
[16] Twelve observations missed.
[17] Data incomplete.
[18] Station opened November 1, 1878.
[19] Sixteen observations missed.
[20] Eight observations missed.
[21] Four observations missed.
[22] Fourteen observations missed.
[23] Station opened August 1, 1878.
[24] Barometer observations commenced February 1, 1879.
[25] Only one observation taken daily.
[26] Twenty-four observations missed.
[27] Fifteen observations missed.
[28] Twenty-five days only.
[29] Observations discontinued June 26, 1879.
[30] Fifteen days only.
[31] Twenty-three observations missed.
[32] Eleven observations missed.
[33] Five days only.
[34] Twenty-nine observations missed.
[35] Nineteen observations missed.
[36] Six observations missed.
[37] Station discontinued October 31, 1878.
[38] Station opened September 29, 1878.
[39] Thirteen observations missed.
[40] Twenty-seven observations missed.
[41] Twenty-eight observations missed.
[42] No midnight observations taken.
[43] Twenty-one observations missed.
[44] Twenty-six days only.
[45] Mean for eleven months only, the reports for June, 1879, not having been received.
[46] Seventeen days only.
[47] Twenty days only.
[48] Station discontinued February 15, 1879.
[49] Eighteen days only.

PAPER 16.

Monthly and annual mean relative humidity (observations taken at 7 a. m., 2 p. m., and 9 p. m. local time) from July, 1878, to June, 1879, inclusive.

[NOTE.—Unalashka Island, Alaska—Reports for May and June, 1879, not yet received.]

Stations.	1878.						1879.						Annual means.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Albany, N. Y	69.6	73.3	74.3	70.4	74.1	74.4	78.6	71.6	74.5	61.2	56.6	71.7	70.9
Alpena, Mich	74.0	70.0	78.3	73.0	*a*76.4	*b*82.9	71.1	71.1	68.0	64.3	58.8	67.9	71.3
Atlanta, Ga	.....	.....	.....	*c*68.3	64.6	*b*69.1	67.4	57.2	52.5	53.6	55.5	55.7	60.4
Atlantic City, N. J	84.0	82.8	82.6	76.8	74.9	78.2	78.9	77.2	76.8	75.0	77.3	78.8	78.6
Augusta, Ga	66.7	72.6	75.9	72.2	74.3	70.5	69.2	57.3	56.9	62.5	58.7	56.3	66.1
Baltimore, Md	65.5	70.0	72.1	65.3	66.6	66.5	70.7	68.2	64.7	55.8	59.8	62.4	66.7
Barnegat, N. J	82.8	81.4	79.7	75.3	75.7	77.7	76.4	78.9	76.8	76.1	77.5	77.1	78.8
Bismarck, Dak	60.2	57.0	61.1	66.1	75.9	84.8	88.3	90.6	82.5	59.3	68.3	67.9	71.8
Boise City, Idaho	34.4	*d*39.6	48.7	54.1	62.1	69.6	73.5	67.4	60.2	52.0	50.2	50.1	55.2
Boston, Mass	66.4	73.7	75.3	68.1	68.9	69.6	62.6	66.1	73.7	61.1	61.8	70.1	68.9
Breckenridge, Minn	74.7	75.3	74.4	69.0	79.1	83.8	84.8	84.2	74.8	59.0	69.4	67.7	77.5
Buffalo, N. Y	71.5	69.1	74.1	72.6	78.2	83.8	81.8	81.2	75.7	68.0	59.8	71.8	74.0
Burlington, Vt	61.6	73.4	70.1	65.5	71.4	72.8	73.1	72.1	69.0	57.9	52.9	68.0	67.3
Cairo, Ill	72.3	70.3	70.4	67.3	66.3	74.1	73.7	63.4	63.7	57.8	60.1	69.2	67.4
Cape Hatteras, N. C	77.8	83.3	78.6	76.3	73.0	68.4	81.0	78.5	84.5	73.9	81.8	72.8	77.5
Cape Henry, Va	72.9	*b*78.1	76.9	71.5	65.4	67.4	65.2	69.5	71.7	66.5	71.8	65.1	78.5
Cape Lookout, N. C	75.0	80.2	78.8	76.3	73.7	68.9	81.5	74.9	82.2	72.5	79.9	71.4	76.3
Cape May, N. J	78.3	77.9	76.8	72.4	70.4	70.6	78.8	75.0	73.8	73.4	70.6	72.9	74.2
Charleston, S. C	75.0	77.3	77.7	73.7	72.1	66.8	65.4	62.7	68.5	64.2	69.9	66.2	70.0
Charlotte, N. C	.....	.....	.....	*e*72.7	63.7	68.4	67.3	61.5	56.2	55.0	64.1	60.2	71.1
Chattanooga, Tenn	.....	.....	.....	.....	.....	.....	*l*77.5	64.1	59.1	55.7	59.5	59.1	62.5
Cheyenne, Wyo	52.1	59.2	51.4	*b*46.6	55.3	65.9	*b*61.3	52.5	44.2	52.1	41.6	33.4	51.3
Chicago, Ill	71.1	69.9	67.0	68.7	73.6	77.8	72.2	76.0	74.4	61.6	65.5	66.4	70.3
Cincinnati, Ohio	65.0	63.9	68.5	63.5	64.3	69.1	62.9	63.8	62.7	54.2	52.8	58.9	62.5
Cleveland, Ohio	73.1	67.3	70.5	64.5	71.6	79.2	74.0	73.6	73.7	64.8	59.1	66.4	69.8
Columbus, Ohio	*f*69.4	69.8	73.3	68.6	69.1	74.2	65.7	65.4	64.8	52.7	55.0	60.1	65.7
Concho, Tex	*o*59.2	52.4	60.4	53.2	58.7	57.8	65.1	49.8	51.7	55.3	49.8	(*q*)	55.8
Corsicana, Tex	73.0	68.0	64.0	65.0	61.0	61.0	73.0	56.2	60.4	62.7	69.8	61.9	64.4
Davenport, Iowa	67.4	70.7	67.4	63.8	69.4	74.7	69.3	68.8	68.8	56.1	57.2	68.3	66.8
Deadwood, Dak	.....	.....	.....	.....	*k*63.7	72.5	65.8	68.8	62.0	53.0	63.2	57.4	63.3
Denison, Tex	72.5	70.1	67.2	63.6	64.6	65.8	76.2	61.8	58.7	61.9	70.9	65.8	66.6
Denver, Colo	46.2	*b*49.7	44.1	28.0	42.0	51.5	52.1	56.8	45.5	51.2	38.9	38.5	45.4
Des Moines, Iowa	.....	*g*66.6	63.6	64.6	66.2	*b*74.6	70.0	69.3	67.4	57.0	62.9	70.6	66.6
Detroit, Mich	70.8	66.6	71.8	64.7	73.6	79.9	76.4	71.0	73.2	61.1	58.9	68.4	69.7
Dodge City, Kans	60.5	61.8	58.3	55.3	69.0	76.6	82.1	77.6	59.9	53.8	58.0	51.5	63.7
Dubuque, Iowa	68.8	67.4	65.7	62.7	69.2	70.2	66.2	66.8	65.6	52.8	53.8	66.2	64.6

Duluth, Minn	*69.8*	*64.1*	*73.8*	*70.8*	*72.5*	*75.0*	*73.4*	*77.5*	*73.9*	*69.3*	*75.2*	*68.8*	*72.0*
Eastport, Me	*75.7*	*82.2*	*79.0*	*80.4*	*77.1*	*73.8*	*74.9*	*75.7*	*76.5*	*68.6*	*76.2*	*77.3*	*76.4*
Erie, Pa	*73.7*	*70.4*	*73.8*	*70.2*	*72.8*	*79.9*	*81.1*	*82.1*	*77.9*	*71.1*	*61.4*	*71.8*	*73.8*
Escanaba, Mich	*65.9*	*70.8*	*76.0*	*72.6*	*73.2*	*72.9*	*72.3*	*72.2*	*65.5*	*58.8*	*64.3*	*66.5*	*69.2*
Fort Gibson, Ind. T	*75.0*	*72.7*	*65.5*	*69.9*	*52.2*	*67.4*	*72.3*	*61.9*	*54.7*	*54.6*	*61.5*	*61.0*	*64.1*
Galveston, Tex	*74.3*	*76.1*	*75.8*	*68.4*	*76.6*	*74.8*	*84.4*	*75.8*	*84.4*	*73.8*	*72.4*	*71.6*	*75.7*
Grand Haven, Mich	*71.9*	*72.6*	*71.9*	*70.0*	*72.0*	*78.5*	*73.9*	*74.2*	*72.0*	*63.4*	*62.3*	*66.2*	*70.7*
Indianapolis, Ind	65.9	66.4	67.0	62.8	65.9	68.9	66.0	65.6	64.4	52.1	55.4	66.2	63.9
Indianola, Tex	74.1	77.5	76.1	69.6	76.7	80.8	84.0	76.8	80.0	70.9	72.1	71.2	75.8
Jacksonville, Fla	72.6	70.9	78.2	71.8	70.0	66.3	65.0	65.0	66.0	62.0	67.5	65.6	68.4
Keokuk, Iowa	65.6	65.5	64.0	60.1	68.8	75.9	76.6	69.5	67.8	55.5	57.5	65.9	66.1
Key West, Fla	72.0	70.7	78.2	75.7	73.5	79.4	80.3	75.6	72.4	68.4	70.3	74.8	74.3
Kittyhawk, N. C	78.4	82.4	80.2	79.3	72.7	72.4	75.7	74.9	77.3	73.2	81.7	74.0	79.3
Knoxville, Tenn	67.0	72.0	69.0	71.0	68.0	76.0	74.0	68.0	59.5	56.0	57.6	59.9	66.5
La Crosse, Wis	75.5	68.4	73.5	68.5	75.0	71.8	70.7	73.6	61.7	51.1	59.7	68.0	68.1
Laredo, Tex	68.5	67.7	*n*65.4	59.1	64.2	68.4	71.6	63.7	62.9	*m*51.4	.....	.....	64.3
Lead City, Dak	63.2	62.8	63.2	*h*60.5	.....	.....	.....	.....	.....	.....	.....	.....	62.4
Leavenworth, Kans	70.5	67.2	63.5	55.3	60.5	73.7	75.8	64.0	55.5	51.1	58.6	66.3	63.5
Los Angeles, Cal	70.2	68.9	62.7	60.0	58.6	44.1	63.8	75.9	70.8	66.5	60.0	64.7	63.8
Louisville, Ky	62.9	59.5	63.1	58.8	62.1	66.4	66.3	59.3	54.8	50.0	50.5	55.3	59.1
Lynchburg, Va	61.6	68.2	68.0	63.1	60.3	62.0	62.6	*n*58.2	51.6	50.1	58.5	62.4	60.5
Madison, Wis	.....	.....	.....	*i*67.8	70.2	66.2	63.5	70.0	66.3	59.3	60.4	69.6	65.9
Marquette, Mich	65.9	65.6	71.7	70.7	70.2	75.4	71.3	71.9	65.6	62.1	66.4	63.2	68.3
Mason, Tex	.....	.....	.....	.....	.....	.....	.....	.....	.....	*p*54.3	55.1	48.6	52.7
Memphis, Tenn	69.2	68.3	66.7	66.6	60.6	65.4	75.7	63.4	58.2	56.2	61.3	64.3	64.7
Milwaukee, Wis	77.2	72.2	72.2	67.3	72.1	76.9	74.1	73.0	68.8	64.5	64.0	68.6	70.9
Mobile, Ala	72.5	76.3	71.5	73.2	75.2	75.8	80.4	69.6	74.1	66.7	71.2	71.4	73.2
Montgomery, Ala	64.7	68.4	65.6	67.3	68.5	72.8	73.1	59.1	66.1	54.4	59.9	60.5	65.0
Morgantown, W. Va	65.5	69.2	72.8	71.5	74.4	75.6	70.9	61.9	63.5	57.3	60.5	64.8	67.3
Mount Washington, N. H	79.6	91.0	83.2	87.8	92.7	87.9	84.9	85.3	89.8	86.0	80.8	88.1	86.4
Nashville, Tenn	68.4	68.9	68.3	67.1	69.6	74.7	75.4	69.9	59.3	53.8	55.7	58.1	65.8
New Haven, Conn	72.5	75.1	77.5	72.1	69.5	71.0	72.8	74.7	71.9	61.6	66.2	69.9	71.2
New London, Conn	76.7	80.4	80.9	74.5	69.8	67.4	76.0	74.0	74.0	63.0	74.0	74.7	73.9
New Orleans, La	71.5	71.7	71.0	68.8	68.8	70.5	75.6	62.5	72.7	65.1	67.2	67.4	69.4
Newport, R. I	77.3	80.5	77.5	73.5	69.9	65.1	69.6	76.1	74.0	65.9	70.5	75.9	72.9
New York, N. Y	69.7	73.1	74.3	65.5	69.4	70.8	75.2	74.9	68.8	63.2	64.3	70.9	70.0
Norfolk, Va	67.6	75.4	79.4	76.2	73.8	72.2	71.5	62.7	71.2	64.1	67.3	60.3	70.1
North Platte, Nebr	69.4	65.0	61.3	52.5	63.0	61.4	61.6	74.0	52.9	52.4	63.1	59.5	61.3
Olympia, Wash	69.7	69.7	77.9	83.9	88.7	87.5	83.4	88.3	85.8	75.9	78.6	69.9	79.9
Omaha, Nebr	71.4	69.4	67.8	58.7	58.5	70.5	69.0	69.4	59.0	52.4	58.3	66.5	64.2
Oswego, N. Y	70.4	73.4	72.8	69.9	71.4	76.8	75.0	75.4	71.1	67.0	64.4	75.8	71.9
Pembina, Dak	74.5	72.6	78.6	77.7	83.5	93.6	86.4	92.2	88.7	75.0	71.3	73.0	80.6
Philadelphia, Pa	66.7	70.2	71.6	62.1	66.5	69.9	72.3	71.3	69.6	63.3	64.5	68.5	68.9
Pike's Peak, Colo	56.8	55.5	61.5	40.0	56.0	63.0	40.0	51.0	37.0	60.0	37.3	47.7	50.5
Pioche, Nev	13.2	30.0	22.7	24.0	42.8	45.7	59.7	48.1	28.1	35.2	13.5	18.6	31.8
Pittsburgh, Pa	66.5	66.8	72.2	69.8	73.1	76.3	71.9	72.8	67.4	62.4	55.9	63.8	68.2
Port Huron, Mich	74.4	67.6	72.1	67.4	77.6	82.5	77.0	78.2	74.9	66.6	59.7	70.7	72.4

a Twenty-four days only.
b Thirty days only.
c Observations commenced October 3, 1878.
d Twenty-nine days only.
e Observations commenced October 6, 1878.
f Station opened July 1, 1878.
g Station opened August 1, 1878.
h Station discontinued October 31, 1878.
i Station opened September 29, 1878.
k Station reopened November 1, 1878.
l Station opened January 8, 1879.
m Five days only.
n Twenty-seven days only.
o Twenty-five days only.
p Local observations commenced April 3, 1879.
q No local observations taken.

Monthly and annual mean relative humidity, &c., from July, 1878, *to June,* 1879, *inclusive*—Continued.

Stations.	1878.						1879.						Annual means.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Portland, Me	68.8	77.9	76.5	72.2	68.0	51.3	75.0	72.6	73.4	63.0	66.4	73.8	68.2
Portland, Oreg	62.5	62.5	70.5	78.0	82.8	75.7	76.1	79.3	78.8	65.8	73.5	66.5	72.5
Punta Rassa, Fla	77.2	74.9	74.7	67.4	68.1	67.7	71.6	69.3	68.6	65.2	68.9	71.3	70.4
Red Bluff, Cal	32.5	37.3	41.3	41.2	61.9	53.3	64.8	68.8	70.2	59.4	50.8	29.9	50.9
Rochester, N. Y	68.0	69.4	70.0	70.5	80.2	82.9	80.7	82.2	78.8	63.9	53.6	64.1	72.0
Roseburg, Oreg	68.2	63.7	64.9	78.7	87.5	90.4	85.3	81.6	79.7	73.1	76.6	64.3	76.2
Sacramento, Cal	50.7	52.0	51.0	54.0	66.0	55.0	72.0	73.0	57.2	65.4	59.0	50.4	38.8
Salt Lake City, Utah	26.2	33.7	37.0	44.5	54.6	59.1	63.6	49.0	34.9	38.3	26.4	31.9	41.6
San Diego, Cal	78.0	77.2	70.8	73.3	72.3	55.7	72.6	87.0	78.4	75.3	70.7	71.8	73.6
Sandusky, Ohio	74.3	68.9	73.3	68.8	71.6	71.2	73.1	74.9	72.6	65.4	60.9	67.9	70.2
Sandy Hook, N. J	73.8	78.2	78.6	70.4	73.5	71.5	74.9	73.1	70.6	71.0	71.0	71.5	73.2
San Francisco, Cal	76.9	79.4	76.1	66.0	74.6	59.4	67.5	79.2	74.5	70.3	70.7	70.4	72.1
Santa Fé, N. Mex	40.4	48.5	37.2	23.2	52.6	49.4	55.4	49.6	34.7	35.3	24.3	20.5	39.3
Savannah, Ga	79.8	76.5	81.2	76.3	73.3	65.5	68.3	63.9	67.0	61.6	67.7	67.5	70.7
Shreveport, La	75.0	73.8	72.5	70.7	68.4	73.5	78.9	64.5	61.1	70.1	72.7	61.0	70.2
Smithville, N. C	75.6	81.7	79.8	76.8	75.4	71.4	79.0	76.6	80.8	74.7	78.9	73.5	77.0
Springfield, Mass	67.0	75.2	72.1	67.0	65.5	67.0	59.0	59.5	67.7	66.2	59.6	69.8	66.3
Saint Louis, Mo	62.9	64.2	59.9	60.6	61.7	74.0	70.4	66.1	63.2	52.3	53.7	62.1	62.6
Saint Mark's, Fla	80.9	83.0	77.8	69.8	79.5	75.2	75.3	71.6	73.7	72.3	75.4	76.4	75.9
Saint Michael's, Alaska	77.2	83.3	89.4	87.4	89.9	90.0	89.3	91.1	88.7	87.0	85.4	....	87.2
Saint Paul, Minn	72.9	68.3	67.4	62.3	66.2	74.3	79.2	71.0	62.5	47.2	63.3	64.0	66.5
Thatcher's Island, Mass	81.2	84.7	84.8	80.4	71.5	72.2	73.1	65.6	70.6	70.0	83.7	84.4	76.8
Toledo, Ohio	71.1	a66.8	71.7	63.2	68.5	79.4	78.3	76.0	71.5	58.8	56.6	64.5	68.9
Tybee Island, Ga	82.7	77.8	80.6	74.6	76.7	73.5	75.8	b76.1	....	....	....	....	77.2
Umatilla, Oreg	39.6	37.0	43.9	61.2	79.6	83.4	82.3	78.4	62.1	57.5	58.4	47.7	60.8
Unalaska Island, Alaska	....	....	c86.0	92.0	80.0	85.0	84.5	84.0	80.9	82.3	....	....	....
Vicksburg, Miss	73.1	77.0	j74.7	d68.8	67.9	70.5	78.3	61.5	60.2	62.4	65.6	65.8	68.8
Virginia City, Mont	36.9	45.4	54.5	59.7	54.0	72.0	63.4	62.8	55.3	44.0	44.4	48.2	53.4
Visalia, Cal	42.9	44.3	50.6	59.6	69.0	58.6	73.0	69.3	59.2	56.6	45.1	33.3	55.1
Washington, D. C	69.5	77.3	77.0	71.6	72.4	71.4	72.3	67.0	58.6	57.7	61.7	64.4	68.4
Wilmington, N. C	73.3	79.4	78.8	71.8	69.8	65.4	66.8	62.4	73.9	62.0	71.4	68.9	70.3
Winnemucca, Nev	19.1	25.3	31.4	39.7	53.7	55.7	68.0	55.1	43.3	46.7	34.6	36.1	42.4
Wood's Holl, Mass	82.8	82.8	78.5	75.7	70.9	73.5	75.9	78.3	76.5	75.6	77.5	78.0	77.2
Yankton, Dak	74.6	71.1	66.9	52.7	62.9	69.2	62.5	68.1	60.3	52.1	63.7	65.2	64.1

a Thirty days only. b Fifteen days only. c Observations commenced September 1, 1878. d Twenty-nine days only.

PAPER 17,

Showing stations inspected, by whom and when inspected, during the fiscal year ending June 30, 1879.

Stations.	Name of inspector.	Date.
Albany, N. Y	First Lieut. John McClellan, acting signal-officer	July 18–20, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	February 6–10, 1879.
Albuquerque, N. Mex	Second Lieut. James Allen, acting signal-officer	October 3–4, 1878.
	do	May 11, 1879.
Alpena, Mich	First Lieut. J. A Buchanan, acting signal-officer	July 20, 21, 1878.
	First Lieut. C. E. Kilbourne, acting signal-officer	September 22, 1878.
	First Lieut. John McClellan, acting signal-officer	April 19, 20, 1879.
Apache Pass, Ariz	First Lieut. C. A. Booth, acting signal-officer	September 25, 1878.
Apache, Ariz	do	October 5, 1878.
Ashtabula, Ohio	First Lieut. S. C. Vedder, acting signal-officer	August 29, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	June 4, 1879.
Atlanta, Ga	First Lieut. J. A. Buchanan, acting signal-officer	October 7, 8, 1878.
Atlantic City, N. J	First Lieut. John McClellan, acting signal-officer	January 7–9, 1879.
	do	February 19, 20, 1879.
Augusta, Ga	First Lieut. J. A. Buchanan, acting signal-officer	June 24, 25, 1879.
Baltimore, Md	Second Lieut. C. A. Tingle, acting signal-officer	Sept. 12–14, 1878.
	First Lieut. John McClellan, acting signal-officer	October 10–12, 1878.
	do	February 10–12, 1879.
Bangor, Me	do	March 28, 1879.
Barnegat, N. J	do	February 23, 24, 1879.
Bay City, Mich	First Lieut. J. A. Buchanan, acting signal-officer	June 27–29, 1879.
	First Lieut. C. E. Kilbourne, acting signal-officer	September 21, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	June 13, 1879.
Belfast, Me	First Lieut. S. C. Vedder, acting signal-officer	September 11, 1878.
	First Lieut. John McClellan, acting signal-officer	April 8, 9, 1879.
	First Lieut. B. H. Gilman, acting signal-officer	May 10, 1879.
Bismarck, Dak	First Lieut. J. A. Buchanan, acting signal-officer	August 16, 17, 1878.
	First Lieut. John McClellan, acting signal-officer	May 21–24, 1879.
Boston, Mass	do	July 31–August 1–3, 5, 1878.
	do	March 10–13, 1879.
Booth Bay, Me	First Lieut. S. C. Vedder, acting signal-officer	September 14, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	May 13, 1879.
Boise City, Idaho	First Lieut. Robert Craig, acting signal-officer	October 3–7, 1878.
Breckenridge, Minn	First Lieut. John McClellan, acting signal-officer	May 17, 18, 1879.
Buffalo, N. Y	First Lieut. J. A. Buchanan, acting signal-officer	July 13–17, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	February 18–20, 1879.
Burlington, Vt	First Lieut. John McClellan, acting signal-officer	August 24–26, 1878.
	do	April 4, 5, 1879.
Burkes, Ariz	First Lieut. C. A. Booth, acting signal-officer	September 13, 1878.
Cairo, Ill	First Lieut. John McClellan, acting signal-officer	December 29, 30, 1878.
	First Lieut. J. A. Buchanan, acting signal-officer	May 10–12, 1879.
Campo, Cal	First Lieut. C. A. Booth, acting signal-officer	August 20, 21, 1878.
Cambridge, Tex	First Lieut. George S. Grimes, acting signal-officer	October 1, 2, 1878.
Camp Grant, Ariz	First Lieut. C. A. Booth, acting signal-officer	September 28, 1878.
Camp Goodwin, Ariz	do	September 30, 1878.
Camp Lowell, Ariz	do	September 20, 1878.
Cape Hatterras, N. C	First Lieut. J. A. Buchanan, acting signal-officer	Nov. 13–15, 1878.
Cape Henry, Va	Second Lieut. C. A. Tingle, acting signal-officer	September 2–5, 1878.
Cape Lookout, N. C	First Lieut. J. A. Buchanan, acting signal-officer	Nov. 18, 19, 1878.
Cape May, N. J	First Lieut. John McClellan, acting signal-officer	February 17, 18, 1879.
	First Lieut. J. A. Buchanan, acting signal-officer	June 21–23, 1879.
Cape Vincent, N. Y	First Lieut. B. H. Gilman, acting signal-officer	May 30, 1879.
Charlotte, N. C	First Lieut. J. A. Buchanan, acting signal-officer	October 9–11, 1878.
	do	January 18–21, 1879.
Charlotte, N. Y	First Lieut. S. C. Vedder, acting signal-officer	September 4, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	May 31, 1879.
Charleston, S. C	Second Lieut. C. A. Tingle, acting signal-officer	September 8–11, 1878.
	First Lieut. J. A. Buchanan, acting signal-officer	January 12–16, 1879.
Chatham, Mass	First Lieut. S. C. Vedder, acting signal-officer	September 19, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	May 6, 1879.
Cheyenne, Wyo	First Lieut. John McClellan, acting signal-officer	December 4, 5, 1878.
Chicago, Ill	First Lieut. J. A. Buchanan, acting signal-officer	Sept. 18–21, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	March 17–22, 1879.
Cincinnati, Ohio	First Lieut. J. A. Buchanan, acting signal-officer	May 22–25, 1879.
	First Lieut. John McClellan, acting signal-officer	Sept. 24–28, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	April 13–16, 1879.
City Island, N. Y	First Lieut. J. A. Buchanan, acting signal-officer	May 29–June 1, 1879.
Cleveland, Ohio	First Lieut. John McClellan, acting signal-officer	March 1, 1879.
	do	Sept. 10–12, 1878.
Colorado Springs, Colo	First Lieut. B. H. Gilman, acting signal-officer	February 25–27, 1879.
Columbus, Ohio	First Lieut. John McClellan, acting signal-officer	December 12, 13, 1878.
	do	September 30–October 4, 1878.
Corsicana, Tex	First Lieut. B. H. Gilman, acting signal-officer	April 17–19, 1879.
Davenport, Iowa	First Lieut J. A. Buchanan, acting signal-officer	April 8–10, 1879.
	do	September 5, 6, 1878.
Decatur, Tex	First Lieut. B. H. Gilman, acting signal-officer	April 2–4, 1879.
	Second Lieut. C. A. Tingle, acting signal-officer	June 24, 25, 1879.

PAPER 17.—*Showing stations inspected, by whom and when inspected, &c.*—Continued.

Stations.	Name of inspector.	Date.
Deer Isle, Me	First Lieut. B. H. Gilman, acting signal-officer	May 15, 1879.
Denver, Colo	First Lieut. John McClellan, acting signal-officer	December 10, 11, 1878.
Des Moines, Iowa	First Lieut. J. A. Buchanan, acting signal-officer	August 30, 31, 1878.
Detroit, Mich	do	September 26–28, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	March 5–9, 1879.
Dodge City, Kans	First Lieut. John McClellan, acting signal-officer	December 14, 1878.
Dubuque Iowa	First Lieut. J. A. Buchanan, acting signal-officer	September 7–9, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	March 29, 30, 1879.
Duluth, Minn	First Lieut. J. A. Buchanan, acting signal-officer	August 4–6, 1878.
	First Lieut. John McClellan, acting signal-officer	May 7, 8, 1879.
Dunkirk, N. Y	First Lieut. S. C. Vedder, acting signal-officer	September 2, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	June 3, 1879.
Eastport, Me	First Lieut. John McClellan, acting signal-officer	August 15, 16, 1878.
	do	March 30, 31, 1879.
East Tawas, Mich	First Lieut. C. E. Kilbourne, acting signal-officer	September 20, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	June 12, 1879.
El Paso, Tex	Second Lieut. James Allen, acting signal-officer	November 12, 1878.
	do	April 21, 22, 1879.
Erie, Pa	First Lieut. John McClellan, acting signal-officer	September 8–10, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	February 22–24, 1879.
Escanaba, Mich	First Lieut. J. A. Buchanan, acting signal-officer	July 26–29, 1878.
	First Lieut. John McClellan, acting signal officer	April 27, 28, 1879.
Fairport, Ohio	First Lieut. S. C. Vedder, acting signal-officer	August 31, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	June 5, 1879.
Fall River, Mass	First Lieut. S. C. Vedder, acting signal-officer	September 21, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	May 1, 1879.
Florence, Ariz	First Lieut. C. A. Booth, acting signal-officer	September 15–16, 1878.
Forrester, Mich	First Lieut. C. E. Kilbourne, acting signal-officer	September 16–17, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	June 10, 1879.
Fort Bayard, N. Mex	Second Lieut. James Allen, acting signal-officer	December 30, 31, 1878.
	do	May 1, 1879.
Fort Craig, N. Mex	do	October 9, 10, 1878.
	do	May 9, 10, 1879.
Fort Gibson, Ind T	First Lieut. John McClellan, acting signal-officer	December 17, 18, 1878.
	First Lieut. J. A. Buchanan, acting signal officer	May 6, 7, 1879.
Fort Macon, N. C	do	November 21, 1878.
Fort Sill, Ind T	First Lieut. George S. Grimes, acting signal officer	September 29, 1878.
Frankfort, Mich	First Lieut. C. E. Kilbourne, acting signal-officer	September 30, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	June 23, 1879.
Galveston, Tex	First Lieut. J. A. Buchanan, acting signal officer	April 10–13, 1879.
Gloucester, Mass	First Lieut. B. H. Gilman, acting signal-officer	May 9, 1879.
Grand Haven, Mich	First Lieut. J. A. Buchanan, acting signal-officer	September 22, 23, 1878.
	First Lieut. B. H. Gilman, acting signal officer	March 14–16, 1879.
Henrietta, Tex	First Lieut. George S. Grimes, acting signal-officer	October 1, 2, 1878.
	Second Lieut. C. A. Tingle, acting signal-officer	June 30, 1879.
Highland Light, Mass	First Lieut. S. C. Vedder, acting signal-officer	September 18, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	May 7, 1879.
Hyannis, Mass	do	May 6, 1879.
Indianapolis, Ind	First Lieut. S. C. Vedder, acting signal-officer	September 20, 1878.
	First Lieut. J. A. Buchanan, acting signal-officer	October 1–3, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	April 8–12, 1879.
	First Lieut. J. A. Buchanan, acting signal-officer	May 26–28, 1879.
Indianola, Tex	do	April 14–17, 1879.
Jacksonville, Fla	do	January 29 – February 4, 1879.
Jacksboro', Tex	Second Lieut. C A. Tingle, acting signal-officer	June 27, 1879.
Kenosha, Wis	First Lieut. C. E. Kilbourne, acting signal-officer	October 10, 1878.
Keokuk, Iowa	First Lieut. J. A. Buchanan, acting signal-officer	September 2–4, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	April 5–7, 1879.
Key West, Fla	First Lieut. J. A. Buchanan, acting signal-officer	February 17–20, 1879.
Kittyhawk, N. C	do	November 8–10, 1878.
Knoxville, Tenn	Second Lieut. C. A. Tingle, acting signal-officer	Sept. 14–18, 1878.
La Crosse, Wis	First Lieut. J. A. Buchanan, acting signal-officer	Sept. 10, 11, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	March 27, 28, 1879.
Las Cruces, N. Mex	Second Lieut. James Allen, acting signal-officer	October 15, 1878.
	do	May 5, 1879.
La Mesilla, N. Mex	do	October 15–17, 1878.
	do	April 18, 19, 1879.
Leavenworth, Kans	First Lieut. John McClellan, acting signal-officer	June 4–6, 1879.
Los Angeles, Cal	First Lieut. Robert Craig, acting signal-officer	Nov. 20, 21, 1878.
Los Lunas, N. Mex	Second Lieut. James Allen, acting signal-officer	October 5, 6, 1878.
	do	April 13, 14, 1879.
Louisville, Ky	First Lieut. John McClellan, acting signal-officer	January 3–5, 1879.
Ludington, Mich	First Lieut. C. E. Kilbourne, acting signal-officer	October 3, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	June 19, 1879.
Lynchburg, Va	Second Lieut. C. A. Tingle, acting signal-officer	August 24–27, 1878.
Mackinac, Mich	First Lieut. C. E. Kilbourne, acting signal-officer	September 27, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	June 16, 1879.
Madison, Wis	First Lieut. John McClellan, acting signal-officer	Nov. 28, 29, 1878.
Manitowoc, Wis	First Lieut. C. E. Kilbourne, acting signal-officer	October 10, 1878.
Marblehead, Mass	First Lieut. S. C. Vedder, acting signal-officer	September 17, 1878.

PAPER 17.—*Showing stations inspected, by whom and when inspected, &c.*—Continued.

Stations.	Name of inspector.	Date.
Marblehead, Mass	First Lieut. B. H. Gilman, acting signal-officer	May 8, 1879.
Marquette, Mich	First Lieut. J. A. Buchanan, acting signal-officer	July 29–31, 1878.
	First Lieut. John McClellan, acting signal-officer	April 29–May 1, 1879.
Melvin Station, Ariz	First Lieut. C. A. Booth, acting signal-officer	October 28, 1878.
Memphis, Tenn	First Lieut. John McClellan, acting signal-officer	December 22–24, 1878.
	First Lieut. J. A. Buchanan, acting signal-officer	April 27–30, 1879.
Milwaukee, Wis	do	Sept. 15–17, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	March 23–26, 1879.
Monroe, Mich	First Lieut. C. E. Kilbourne, acting signal officer	September 13, 1878.
	First Lieut. B. H. Gilman, acting signal officer	June 7, 1879.
Mobile, Ala	First Lieut. J. A. Buchanan, acting signal-officer	March 18–20, 1879.
Montgomery, Ala	do	March 14–16, 1879.
Morgantown, W. Va	First Lieut. John McClellan, acting signal-officer	February 4–6, 1879.
Mt. Washington, N. H	do	August 19, 20, 1878.
Muskegon, Mich	First Lieut. B. H. Gilman, acting signal-officer	June 25, 1879.
Nashville, Tenn	First Lieut. J. A. Buchanan, acting signal-officer	October 4, 5, 1878.
Newburyport, Mass	First Lieut. S. C. Vedder, acting signal-officer	September 16, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	May 9, 1879.
New Bedford, Mass	do	May 2, 1879.
	First Lieut. S. C. Vedder, acting signal-officer	September 21, 1878.
New Buffalo, Mich	First Lieut. C. E. Kilbourne, acting signal-officer	October 7, 1878.
New Haven, Conn	First Lieut. John McClellan, acting signal-officer	July 22–25, 1878.
	do	March 3, 4, 1879.
New London, Conn	do	July 25–27, 1878.
	do	March 4–6, 1879.
New Orleans, La	First Lieut. J. A. Buchanan, acting signal-officer	March 23–29, 1879.
Newport, R. I	First Lieut. John McClellan, acting signal-officer	September 2–4, 1878.
New River Inlet, N. C	First Lieut. J. A. Buchanan, acting signal-officer	Nov. 28, 29, 1878.
New York, N. Y	First Lieut. John McClellan, acting signal-officer	July 1–11, 1878.
	do	February 25–28, 1879.
Norfolk, Va	Second Lieut. C. A. Tingle, acting signal-officer	August 29–September 2, 1878.
Northport, Mich	First Lieut. C. E. Kilbourne, acting signal-officer	September 29, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	June 21, 1879.
North Platte, Neb	First Lieut. John McClellan, acting signal-officer	December 3, 4, 1878.
Olympia, Wash	First Lieut. Robert Craig, acting signal-officer	October 26–28, 1878.
Omaha, Nebr	First Lieut. J. A. Buchanan, acting signal-officer	August 27–29, 1878.
Oswego, N. Y	First Lieut. B. H. Gilman, acting signal-officer	February 11–13, 1879.
Pembina, Dak	First Lieut. J. A. Buchanan, acting signal-officer	August 10–12, 1878.
	First Lieut. John McClellan, acting signal-officer	May 14, 15, 1879.
Pentwater, Mich	First Lieut. C. E. Kilbourne, acting signal-officer	October 4, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	June 19, 1879.
Pensacola, Fla	First Lieut. J. A. Buchanan, acting signal-officer	March 17, 1879.
Philadelphia, Pa	First Lieut. John McClellan, acting signal-officer	October 7–9, 1878.
	do	February 14–16, 1879.
Phœnix, Ariz	First Lieut. C. A. Booth, acting signal-officer	October 23, 24, 1878.
Pioche, Nev	First Lieut. Robert Craig, acting signal-officer	September 9, 10, 1878.
Pittsburgh, Pa	First Lieut. John McClellan, acting signal-officer	October 4, 5, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	April 20–22, 1879.
Pilot Point, Tex	First Lieut. J. A. Buchanan, acting signal-officer	June 3–5, 1879.
Port Austin, Mich	Second Lieut. C. A. Tingle, acting signal-officer	May 4, 1879.
	First Lieut. C. E. Kilbourne, acting signal-officer	September 19, 1878.
Port Eads, La	First Lieut. B. H. Gilman, acting signal-officer	June 11, 1879.
Port Huron, Mich	First Lieut. J. A. Buchanan, acting signal-officer	March 23, 1879.
	do	Sept. 24, 25, 1878.
Portland, Me	First Lieut. B. H. Gilman, acting signal-officer	March 10–12, 1879.
	First Lieut. John McClellan, acting signal-officer	August 12–14, 1878.
Portland, Oreg	do	March 24–27, 1879.
Portsmouth, N. C	First Lieut. Robert Craig, acting signal-officer	October 17–22, 1878.
Portsmouth, N. H	First Lieut. J. A. Buchanan, acting signal-officer	Nov. 16, 17, 1878.
	First Lieut. S. C. Vedder, acting signal-officer	September 14, 1878.
Prescott, Ariz	First Lieut. B. H. Gilman, acting signal-officer	May 10, 1879.
Punta Rassa, Fla	First Lieut. C. A. Booth, acting signal-officer	October 30, 1878.
Racine, Wis	First Lieut. J. A. Buchanan, acting signal-officer	February 23–25, 1879.
Rochester, N. Y	First Lieut. C. E. Kilbourne, acting signal-officer	October 9, 1878.
	First Lieut. J. A. Buchanan, acting signal-officer	July 10–12, 1878.
Rockland, Me	First Lieut. B. H. Gilman, acting signal-officer	February 15–17, 1879.
Rogers City, Mich	do	May 14, 1879.
	First Lieut. C. E. Kilbourne, acting signal-officer	September 25, 1878.
Roseburg, Oreg	First Lieut. B. H. Gilman, acting signal-officer	June 15, 1879.
Sacramento, Cal	First Lieut. Robert Craig, acting signal-officer	October 22–24, 1878.
	do	Nov. 25, 26, 1878, Mar. 12–14, 1879.
Salt Lake City, Utah	do	September 4, 1878.
Sandy Hook, N. J	First Lieut. John McClellan, acting signal-officer	July 15–17, 1878.
Sandusky, Ohio	do	Sept. 16, 17, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	February 28–March 2, 1879.
San Diego, Cal	First Lieut. C. A. Booth, acting signal-officer	August 12–17, 1878.
San Francisco, Cal	First Lieut. Robert Craig, acting signal-officer	Nov. 14–19, 1878.
	do	November 4–11, 1878.
Savannah, Ga	First Lieut. J. A. Buchanan, acting signal-officer	January 25–28, 1879.

PAPER 17.—*Showing stations inspected, by whom and when inspected, &c.*—Continued.

Stations.	Name of inspector.	Date.
Sheboygan, Wis	First Lieut. C. E. Kilbourne, acting signal-officer	October 9, 1878.
Shreveport, La	First Lieut. J. A. Buchanan, acting signal-officer	April 4–6, 1879.
Silver City, N. Mex	Second Lieut. James Allen, acting signal-officer	December 27–29, 1878.
	do	April 27–30, 1879.
Sloop Point, N. C	First Lieut. J. A. Buchanan, acting signal-officer	December 1, 2, 1878.
Smithville, N. C	do	December 6, 7, 1878.
South Haven, Mich	First Lieut. C. E. Kilbourne, acting signal-officer	October 5, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	June 26, 1879.
Springfield, Mass	First Lieut. John McClellan, acting signal-officer	August 28–30, 1878.
	do	March 14, 15, 1879.
Saint Joseph, Mich	First Lieut. C. E. Kilbourne, acting signal-officer	October 6, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	June 26, 1879.
Saint Louis, Mo	Second Lieut. C. A. Tingle, acting signal officer	September 24–October 3, 1878.
	First Lieut. John McClellan, acting signal-officer	December 31, 1878–January 2, 1879.
	First Lieut. J. A. Buchanan, acting signal-officer	May 13–20, 1879.
Saint Mark's, Fla	do	March 8–11, 1879.
Saint Paul, Minn	do	Sept. 12–14, 1878.
	First Lieut. John McClellan, acting signal-officer	May 9–12, 1879.
Stonington, Conn	First Lieut. B. H. Gilman, acting signal-officer	April 30, 1879.
Thatcher's Island, Mass	First Lieut. John McClellan, acting signal-officer	August 6–8, 1878.
	do	March 19, 20, 1879.
Toledo, Ohio	First Lieut. J. A. Buchanan, acting signal-officer	Sept. 29, 30, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	March 3, 4, 1879.
Traverse City, Mich	First Lieut. C. E. Kilbourne, acting signal-officer	September 28, 1878.
	First Lieut. B. H. Gilman, acting signal-officer	June 20, 1879.
Trés Alamos, Ariz	First Lieut. C. A. Booth, acting signal-officer	September 23, 1878.
Tucson, Ariz	do	Sept. 17–21, 1878.
Tybee Island, Ga	First Lieut. J. A. Buchanan, acting signal-officer	December 13, 14, 1878.
Umatilla, Oreg	First Lieut. Robert Craig, acting signal-officer	October 14–16, 1878.
Vicksburg, Miss	First Lieut. John McClellan, acting signal-officer	December 25–27, 1878.
	First Lieut. J. A. Buchanan, acting signal-officer	April 25–27, 1879.
Visalia, Cal	First Lieut. Robert Craig, acting signal-officer	Nov. 23, 24, 1878.
Watch Hill, R. I	First Lieut. B. H. Gilman, acting signal-officer	April 30, 1879.
Wickenburg, Ariz	First Lieut. C. A. Booth, acting signal-officer	October 25, 1878.
Wilmington, N. C	First Lieut. J. A. Buchanan, acting signal-officer	December 3–5, 1878.
Winnemucca, Nev	First Lieut. Robert Craig, acting signal-officer	September 28, 1878.
Wood's Holl, Mass	First Lieut. John McClellan, acting signal-officer	July 29, 30, 1878.
	do	March 7, 8, 1879.
Yankton, Dak	First Lieut. J. A. Buchanan, acting signal-officer	August 23–25, 1878.
	First Lieut. John McClellan, acting signal-officer	May 31–June 2, 1879.
Yuma, Ariz	First Lieut. C. A. Booth, acting signal-officer	September 6–12, 1878.

PAPER 18.

(On the cover of the Book of Forms and Rules.)

(Form 14.)

WAR DEPARTMENT, OFFICE OF THE CHIEF SIGNAL-OFFICER,

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

Inspection report of ——, made on station at ——, on ——.

Comparative readings of barometer and thermometers at ——. Corrected for an elevation of —— feet

Date.	Inspector's barometer No. ——. Instrumental error, ——.			Station barometer No. ——. Instrumental error, ——.			Extra barometer No. ——. Instrumental error, ——.			Aneroid barometer No. ——.	Aneroid barometer No. ——. Corrected.	Station thermometer No. ——.	Extra thermometer.	Dry bulb.
	Attached thermometer.	Observed reading.	Corrected reading.	Attached thermometer.	Observed reading.	Corrected reading.	Attached thermometer.	Observed reading.	Corrected reading.					

Station barometer No. —— reads —— than inspector's barometer No. ——.
Extra barometer No. —— reads —— than inspector's barometer No. ——.

——, *Inspector.*

RULES FOR THE GUIDANCE OF INSPECTING OFFICERS OF THE SIGNAL SERVICE, UNITED STATES ARMY.

1. The outfit of an inspecting officer will consist of the following-named instruments, in addition to the necessary blanks, stationery, &c.:

One standard mercurial barometer.
One standard aneroid barometer.
One standard thermometer.
One standard compass.

2. Upon arriving at a station he will carefully compare all station instruments with his standards, making not less than thirty readings of each instrument, and keeping an accurate record of the observations of both his own and the station instruments, and forwarding the same to the Chief Signal-Officer with his inspection report.

3. He will determine by the aid of his compass the accuracy with which the station wind-vane is placed in position upon the true meridian, and, if an error is found, will have it corrected before he leaves the station.

4. He will ascertain by actual measurement whether any change has been made in the elevation of the barometer, thermometer, or rain-gauge since the station was last inspected, and if such change has been made, will report the amount and date of the same.

5. In the event of any change having been made in the location of the office since the date of the last report, he will ascertain the exact elevation of the new office and of the several instruments above the bench-mark of the station, as given in circular No. 2, issued from the office of the Chief Signal-Officer under date of January 11, 1873, and is authorized to employ for this purpose, whenever necessary, the city engineer, or, in his absence, any other responsible person.

6. He will note carefully the condition of the office room or rooms, and when they are found improperly kept or arranged will see that the proper changes are made before he leaves the station.

7. He will examine in detail the office books from the date of the last previous inspection, and if errors are found, will point them out and instruct the observer in charge how to correct them. In case of omission on the part of the observer in charge to keep all or part of any record, he will report the fact to the Chief Signal-Officer, with such recommendations as he thinks proper, accompanying the report with a written statement from the observer of the cause of said omission.

8. The condition of the several instruments will be thoroughly examined, and when any fault of location or want of cleanliness is discovered, will attend in person to its correction. The observer will be examined as to his knowledge of the instruments and their management in detail, and when found ignorant of any part will be properly instructed.

9. All map and bulletin frames will be personally inspected and their condition noted from actual observation, and not from the observer's statement. The date of the several maps and bulletins posted in the frames at the time of inspection will be observed, and if the latest issue is not found therein the observer will be called to account for neglect of duty.

10. A full list will be forwarded with each report of all maps and bulletins issued at the station inspected, showing the names and local address of each person, firm, or institution receiving them.

11. The chairman of the meteorological committee, or committees where more than one exist at a station, will be visited, and inquiry made as to the conduct of the observer and other men on duty at the station, and the manner in which they perform their special duties. Suggestions will be invited that tend to increase the usefulness of the service by a wider diffusion of the reports.

12. The amount and condition of the property for which the observer is responsible will be noted in the report, and suitable disposition of unserviceable property recommended.

13. The observer in charge will be examined as to his knowledge of the various circulars from the central office, and when he does not appear to understand any one or part of one, proper instructions will be given him.

14. The inspector will explain to each observer the proper manner of furnishing items of special interest in the reports to the local newspapers, impressing upon them at all times, however, the fact that these items will not be furnished when the papers can be induced to print full reports.

15. The inspection report of each station must be made out and mailed before the inspecting officer leaves the station.

16. The inspector will be present in person at all the observations made at the station he is inspecting during some one day of his inspection, and will correct on the spot any errors into which the observer may have fallen.

17. He will examine the assistants on duty at the station as to their knowledge of their practical duties, and also as to the progress made by them in the theoretical

knowledge of meteorology, and will report the result of such examination to the Chief Signal-Officer.

18. When any instrument or other item of public property is found unserviceable at a station, the inspector will state whether or not it is necessary that it should be replaced.

19. When the removal of an office is recommended by an inspector, the location and rental of the proposed office will be given, and also a careful estimate of the cost of removal.

20. The official numbers of all instruments will be given in each inspection report.

21. If the inspector finds it necessary to change instruments on any station, the fact, as well as the numbers of the instruments exchanged, will be reported.

WAR DEPARTMENT,

OFFICE OF THE CHIEF SIGNAL OFFICER,

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

INSPECTION REPORT.

Diagram of office, giving dimensions, number and location of doors and windows. Positions of instruments to be marked.	Name and number of street on which office is situated.	Price paid for rent of office. (Per month.)	Name and address of person or persons from whom office is rented.	Name.	Miscellaneous instruments, &c.														Kind of shelter, size and location, with position of instruments.
					Anemometers.	Anemometer rods, telescopic.	Anemoscopes.	Barometers, mercurial.	Barometers, aneroid.	Compass.	Eye-glasses, colored, and case, pairs.	Grensers for instruments.	Hygrometers (complete).	Hygrometer tubes.	Keys, telegraph.	Lightning arrestors.	Measuring stick.	Marine glasses, cases and straps.	
		Elevation of surface of mercury in cistern of barometer above mean tide level.	Authority.	Number															
				Elevation above the ground ...															
				Condition															

REMARKS UPON THE LOCATION OF OFFICE, ETC.

INSPECTION REPORT—Continued.

Name.	Miscellaneous instruments, &c.																					Office furniture and supplies.											
	Mercury, pounds.	Rain-gauges.	Relays.	Relays, pocket.	Repeaters.	Self-registers for anemometers.	Self-registers for anemometers and anemoscopes combined.	Sounders.	Sounders, box.	Switch-board, wires.	Switches, cut-out.	Styli.	Telescopes, telegraph.	Telescopes and straps.	Telescope holders.	Thermometers, standard.	Thermometers, maximum.	Thermometers, minimum.	Thermometers, water, and case.	Thermometers, tester, tin.	Tool-box (complete).	Wind-vanes, large.	Arrows and discs, combined, for weather maps.	Arrows for weather maps.	Baskets, waste paper.	Boxes, coal and wood.	Boxes, cash.	Boxes, stamp.	Brooms.	Brushes, dust.	Brushes, scrubbing.	Brushes, hygrometer.	Bulletin-boards.	Buckets, water.	Calendars.
Number ..... Elevation above the ground ..... Condition																																	

REMARKS. *Note.*—State how fuel and lights are obtained and paid for.

Name.	Office furniture and supplies.																																
	Candles, pounds.	Carpet, yards.	Cases, office.	Chairs.	Clocks, regulator.	Coal, tons of.	Coal-hods.	Cord for W. thermometer, feet of.	Counters and partitions, feet of.	Cupboards and closets.	Cushions.	Desks.	Dippers.	Discs for weather maps.	Dusters, feather.	Dust-pans.	Flags, United States recruiting.	Flags, international code signal, sets of.	Flags, 6-foot, white.	Flags, 8-foot, white.	Flags, 6-foot, red.	Flags, 8-foot, red.	Flags, 15-foot, red.	Frames, bulletin.	Frames, map.	Frames, monthly moon.	Gas-fixtures.	Indicator, cautionary signal.	Ladders.	Lamps.	Lamp-chimneys.	Lamp-wick.	Lanterns.	Lanterns, dark.	Lanterns, signal, white.
Number ..... Condition																																	

REMARKS.

INSPECTION REPORT—Continued.

Number Condition	Name.		Remarks.
	Lanterns, signal, red.	Office furniture and supplies.	
	Letter presses.		
	Letter scales.		
	Lounges, bed.		
	Mallets.		
	Matches, boxes of.		
	Maps.		
	Maps, large weather.		
	Mats, foot.		
	Matting, yards.		
	Oil, clock, bottles of.		
	Oil, kerosene, gallons of.		
	Oil, lard, gallons of.		
	Oil, sperm, gallons of.		
	Oil-cans.		
	Oil-cloth, yards.		
	Pitchers.		
	Pokers, fire.		
	Railing, wooden, feet of.		
	Screws, clamp, for W. map.		
	Shears, pairs.		
	Shades, for gas or lamps.		
	Shelving, feet.		
	Shovels, coal.		
	Shovels, fire.		
	Signs, office.		
	Sprinklers.		
	Spittoons.		
	Staffs, flag.		
	Stamps or dies, boxes of.		
	Stoves.		
	Stove-pipe, joints.		
	Tables.		
	Tables, operating.		
	Tin, sheets, for manifold forms.		

Number Condition	Name.		Remarks.
	Towels.	Office furniture and supplies.	
	Towel racks.		
	Tumblers.		
	Twine, balls of.		
	Wash-basin.		
	Wash-stand.		
	Water-cooler.		
	Wicking for hygrometer.		
	Window curtains.		
	Wood, cords of.		
	Annual Reports of C. S. O., copies.	Text and record books.	
	Bibles.		
	Buchan's Meteorology, copies.		
	Cipher Hand-books, copies.		
	Daily Bulletins, &c., &c., bound copies.		
	Daily Journals.		
	Daily Records of Observation.		
	Dictionaries.		
	Expense books.		
	Flags of Maritime Nations' books.		
	Guyôt's Meteorological Tables, copies.		
	Instructions to Observer Sergeants.		
	Index-books.		
	International Code Signal books.		
	Loomis' Meteorology, copies.		
	Manual of Signals, copies.		
	Manual of Military Telegraphy, copies.		
	Marine Register (American Lloyds').		
	Messengers' receipt books.		
	Original Records of Observation.		
	Piddington's Horn Book, copies.		
	Pope's Telegraphy, copies.		
	Postage Memo. Books.		
	Records of American and foreign shipping.		
	Records of Bulletins.		

Number ..... Condition	Name.	
	Record of letters sent.	Text and record books.
	Record of letters received.	
	Record of signals.	
	Register books.	
	River record books.	
	Rule books.	
	Smithsonian directions, met. for obs.	
	Suggestions, copies.	
	Tariff books, W. U.	
	Binders, Conant.	Forms, stationery, &c.
	Cards, barometer.	
	Cards, cipher, sets.	
	Cards, error.	
	Cards, notifying.	
	Circuit blanks.	
	Envelopes, official.	
	Envelopes, message.	
	Envelopes, small.	
	Envelopes, printed "C. S. O."	
	Envelopes, printed "Supt. U. S. Tel."	
	Erasers.	
	Files, Shipman's.	
	Form No. 1, tel.	
	Form No. 2, tel.	
	Form No. 3, tel.	
	Form No. 4, tel.	
	Form No. 5, tel.	
	Form No. 6, tel.	
	Form No. 7, tel.	
	Form No. 8, tel.	
	Form No. 9, tel.	
	Form No. 10, tel.	
	Form No. 11, tel.	
	Form No. 12, tel.	
	Form No. 1, met'l.	

Number ..... Condition	Name.	
	Form No. 2, met'l.	Forms, stationery, &c.
	Form No. 3, met'l.	
	Form No. 4, met'l.	
	Form No. 5, met'l.	
	Form No. 6, met'l.	
	Form No. 7, met'l.	
	Form No. 8, met'l.	
	Form No. 15, met'l.	
	Form No. 16, met'l.	
	Form No. 19, met'l.	
	Form No. 20, met'l.	
	Form No. 21, met'l.	
	Form No. 22, met'l.	
	Form No. 23, met'l.	
	Form No. 24, met'l.	
	Form No. 25, met'l.	
	Form No. 26, met'l.	
	Form No. 27, met'l.	
	Form No. 28, met'l.	
	Form No. 29, met'l.	
	Form No. 30, met'l.	
	Form No. 31, met'l.	
	Form No. 32, met'l.	
	Form No. 33, met'l.	
	Form No. 34, met'l.	
	Form A, met'l.	
	Form B, met'l.	
	Form, acknowledgment of orders, &c.	
	Form, estimate of stationery, forms, &c.	
	Form, report of signal-service property.	
	Form, stamp return.	
	Form, record sheets.	
	Form, purchases or expenditures.	
	Form, medical vouchers.	
	Form, pay vouchers, commissary, sets.	

INSPECTION REPORT—Continued.

Number ..... Condition	Name.	
	Sponge-cups.	Forms, stationery, &c.
	Sponge, pieces.	
	Sealing-wax.	
	Tape, spools.	
	Axes.	Telegraph materials, tools, implements, &c.
	Brackets, insulator, screw.	
	Block and tackle, sets.	
	Battery brushes.	
	Battery cups, Daniell.	
	Battery cups, Eagle's, round.	
	Battery cups, Eagle's, square.	
	Battery pitchers.	
	Battery porous cups.	
	Battery syringes.	
	Battery zincs.	
	Binding screws.	
	Connectors, double.	
	Climbers and straps.	
	Crowbars.	
	Digging bars.	
	Files.	
	Hammers.	
	Hatchets.	
	Insulators, screw.	
	Nails, pounds.	
	Planes.	
	Pliers, cutting.	
	Poles, new, feet.	
	Poles, new, feet.	
	Poles, old, feet.	
	Shovels, long-handle.	
	Saws.	
	Solder, pounds or bars.	
	Soldering irons.	
	Soldering fluid, pounds.	

Number ..... Condition	Name.	
	Form, pay vouchers, quartermaster, sets.	Forms, stationery, &c.
	Form, pay vouchers, paymaster, sets.	
	Ink, copying, quarts.	
	Ink, copying, pints.	
	Ink (writing fluid), quarts.	
	Ink (writing fluid), pints.	
	Ink, red, bottles.	
	Inkstands.	
	Letter clips.	
	Mucilage, bottles of.	
	Memorandum books.	
	Paper, blotting, sheets.	
	Paper, carbon, sheets.	
	Paper, cap, quires of.	
	Paper, clip, packages of.	
	Paper, envelope, quires of.	
	Paper, legal cap, quires of.	
	Paper, letter, quires of.	
	Paper, note, quires of.	
	Paper, printing, quires of.	
	Paper, manifold, books of.	
	Paper, flat letter, reams of.	
	Paper fasteners.	
	Paper folders, ivory.	
	Paper cutters, tin.	
	Paper weights.	
	Pencils, lead.	
	Pencil leads, boxes of.	
	Pen-holders.	
	Pen-racks.	
	Pens.	
	Rubber bands, gross.	
	Rubber erasers.	
	Rulers.	
	Ruling pens.	

Name.		Number ..... Condition .....
Soldering pots, with pans.	Telegraph materials, tools, implements, &c.	
Staples, pounds.		
Sulphate of copper, pounds.		
Sulphate of zinc, pounds.		
Vises, hand.		
Vises, strapped.		
Wire, compound, pounds.		
Wire, galvanized, No. —, pounds.		
Wire, galvanized, No. 9, coils.		
Wire, insulated, feet.		
Wire, office, feet.		
Wrenches, splicing.		
Benzine, gallons of.	Printing material.	
Blankets, press.		
Bodkins.		
Boxes, miter.		
Brushes, lye.		
Cans, benzine.		
Cases, job.		
Cases, type, single.		
Cases, type, pairs.		
Chases.		
Cotton waste, pounds.		
Electrotypes, autograph of A. J. Myer.		
Electrotypes, "Farmers' Bulletin."		
Electrotypes, letter heads.		
Electrotypes, "Indications."		
Electrotypes, "Published by co-operation."		
Electrotypes, "Synopsis."		
Furniture, feet.		
Furniture, pounds.		
Galleys.		
Ink, black, pounds.		
Ink, lake, pounds.		
Leads, pounds.		

Name.		Number ..... Condition .....
Lye, boxes.	Printing material.	
Lye-pots.		
Mallets.		
Oiling cans.		
Planers.		
Presses, printing.		
Quoins.		
Quadrats.		
Rollers, ink.		
Rules, brass, feet of.		
Rules, composing.		
Saws.		
Spatula.		
Springs, type.		
Stands, type.		
Sticks, composing.		
Sticks, side.		
Sticks, shooting.		
Stones, imposing.		
Symbols, type.		
Turpentine.		
Tweezers, pairs.		
Type, fonts of.		
Type, pounds of.		
Type, figures, pounds of.		
Wrenches.		
Bedsteads, camp, and slats.	Miscellaneous.	
Canteens and straps.		
Canvas cases and straps.		
Cans, copper, 5-gallon.		
Carbines.		
Carbine slings.		
Carbine swivels.		
Cartridge boxes.		
Cartridges, cal.		

INSPECTION REPORT—Continued.

Name.	Miscellaneous.																																	
	Cartridges, cal.	Extinguishers, foot.	Extinguishers, flying.	Flags, 4-foot, white.	Flags, 4-foot, red.	Flame shades, foot.	Flame shades, flying.	Funnels.	Haversacks.	Matches, wind, boxes of.	Pliers, pairs.	Revolvers.	Revolver holsters.	Screw-driver for revolver.	Scissors, pairs.	Staffs, jointed, sets.	Straps, small.	Torches, foot.	Torches, flying.	Turpentine, gallons.	Waist-belts.	Waist-belt plates.	Wicking, balls of.	Wormers.										
Number																																		
Condition																																		

BULLETINS.

No. issued of a. m. reports.	Where posted.	No. issued of p. m. reports.	Where posted.	No. issued of night reports.	Where posted.

REMARKS. *Note.*—The style, size, and general appropriateness of the bulletin boards should be stated.

PRESS REPORTS.

No. of papers supplied with 7.00 a. m. reports.	Names of papers.	No. supplied with 3.00 p. m. reports.	Names of papers.	No. supplied with 11.00 p. m. reports.	Names of papers.

REMARKS.

MANIFOLD MAPS.

Number issued.	Where posted.	Condition.

REMARKS.

TELEGRAPH AND WAND PRACTICE.

Name.	Rank.	Telegraph practice (Morse code).		Wand practice.	
		Number of words sent per minute.	Number of words received per minute.	Number of words sent per minute.	Number of words received per minute.

REMARKS.

GENERAL REMARKS AND SUGGESTIONS:

A. S. O. and Inspector.

Date, ——.
Station, ——.

PAPER 20.

Extracts from the instructions to observer sergeants.

* * * * * * *

6. The regular observations from ——— will commence with the morning observation of ———, and on and after that date eight observations will be made daily, three of which will form the *telegraphic*, three the *local*, and one the *midday*, and one the *sunset* series. These observations will be recorded in the "Original Record of Observations" and the "Daily Record of Observations," a separate sheet being used in the Daily Record of Observations for each series.

7. The observations forming the telegraphic series will be taken daily at — a. m., — p. m., and — p. m., local time (corresponding with 7 a. m., 3 p. m., and 11 p. m. Washington mean time), and, after the proper corrections have been made, will be written on Form 5, if the station is a telegraphic one, and also in the Record of Bulletins (where this is authorized). The midday series of observations will be taken at — m., local time (corresponding with 11 a. m. Washington mean time), and those of the local series at 7 a. m., 2 p. m., and 9 p. m., respectively. The midday series will be entered in the Daily Record as a separate series. When this rep telegraph from the central Office a full report will be sent, consisti and actual barometric readings, temperature, humidity, direction o weather; velocity of wind, in miles, per hour; maximum velocit per hour since last telegraphic observation; upper clouds; lower clouds; and the reading of the maximum thermometer at the time of observation; the whole being sent in the order in which they are here named, and in the regular cipher words, the word to express the maximum velocity since last telegraphic report being taken from the column of words beginning with the letter I. Rain-fall will not be sent at this report. In sending the maximum temperature at time of observation, the cipher words on page 32 of the cipher book will be used. At stations that do not report by telegraph, Form 5 will not be used. A reading of the barometer, *i. e.*, corrected for temperature and instrumental error only (actual barometer), will be taken and recorded daily at each station at the hour of sunset. Spaces will be ruled on the last leaf of the Original Record of Observations, and an additional column in the weekly Meteorological Record book, and on Form 4, local sheet, in the blank space headed "Remarks for recording these observations."

8. The instruments will be read in the following order:

1. Barometer.	3. Hygrometer.	5. Anemoscope.
2. Thermometer.	4. Anemometer.	6. Rain-gauge.

The minimum thermometer at the a. m. telegraphic observation and the maximum and minimum thermometers at the midnight telegraphic observation will be read after the exposed thermometer. After the instruments have been read the character of the clouds and state of weather will be noted.

9. The readings of the different instruments and character of clouds and state of weather must be entered in the Original Record of Observations as soon as made, and *not* copied in afterward from a slip of paper. Observers will habitually carry this book when making observations and enter the readings in *pencil*, as noted at the time. They will also enter the proper corrections, as indicated by the marginal references. Pen and ink must *not* be used for entering any observation or correction. In filling up that portion of the Original Record of Observations which comes under the head of "Weather," *local* time will be used.

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27. At all stations ordered to make river reports, the depth of water will be observed at 1 o'clock (local time) each afternoon, and embodied in the next succeeding regular telegraphic report.

28. Whenever any sudden or unusual change occurs in the condition of the river, a special series of observations will be made, which will be reported in the usual manner at the next succeeding telegraphic reports. These special reports will be continued tri-daily (one at each telegraphic report) until the river resumes its normal condition, when they will be discontinued.

* * * * * * *

30. The observations for the morning and midnight special river reports will be made, if practicable, within an hour of the time of report.

Observers must exercise the utmost care in making and recording the river observations, in order that they may be relied upon as accurate by interested parties.

31. The amount of precipitation (rain and melted snow) will be measured and reported at each of the three telegraphic reports only. Should more than four (4) inches of rain-fall be recorded, two (2) cipher words will be used in reporting it.

The observer at each station will note, each day, at the exact time of sunset, and

for a time not to exceed thirty minutes after sunset, the character of the western sky and of the sunset, and will state this character at the time, in writing, as "Fair Weather Sunset," "Doubtful Sunset," or "Foul Weather Sunset." The term "Fair Weather Sunset" will express such condition of the sky, particularly the western, and such characrer of the sunset as is considered to indicate a clear day for the day ensuing. The term "Doubtful Sunset" will indicate that the conditions are such as to leave the mind of the observer in doubt as to what the sunset presages for the following day. The term "Foul Weather Sunset" indicates that the sun is wholly obscured by clouds, and the appearances indicate a rainy or stormy day for the day following. It will be frequently noticed at the time of sunset that the western sky, while exhibiting generally the characteristics of a fair-weather sunset, is tinged more or less and in different places with the colors yellow or green. It is important that these colors should be carefully noted. In some instances the sunset will be found a decidedly yellow sunset, that being the predominant color of the western sky. The color green is rarely the predominant color, but portions of the western sky will sometimes markedly exhibit it. For purposes of observation and report, the sunsets so differently described are known as yellow sunsets or green sunsets. Care must be taken in reference to reporting yellow, and particularly in reporting green, sunsets. The observer is to be quite sure that he clearly sees "green," and enough of it to be worthy of report. Whenever green is reported, the retained copy of such report will have written upon it the extent of western sky-surface seen apparently so colored, as $\frac{1}{8}$, $\frac{1}{4}$, and so on. Yellow and green sunsets will be considered as fair-weather sunsets.

The observer will endeavor to note either "Fair Weather," or "Foul Weather," noting as few "Doubtful" as possible. It is considered that practice will be found to make this comparatively easy. The note made for each evening will, at sunset of *next* day, be noted in writing as "verified" or "not verified."

The sunset prediction will be the last entry in the Journal and Abstract for the day, and its verification, as determined by the weather from the hour of prediction up to sunset of the ensuing day, be entered on the same line with it. In making sunset predictions, only local observations will be used.

An additional word will be added to the "midnight" telegraphic report from the station when the character of the sunset is "Doubtful" or indicates "Foul Weather." If, however, after the cipher word for thermometer, and before humidity, no word is added, it will be understood at this Office that the station reports a "Fair Weather Sunset." If the station reports a "Doubtful Sunset," it will do so by adding after the cipher word for thermometer, and before that for humidity, the word "Doubt." If the report is "Foul Weather Sunset," it will add, in the same space, the word "Foul." If a yellow sunset, the word "Yellow" will be added in the same space. If a green sunset, the word "Vert" will be added in the same space.

1. A sunset prediction of one day is verified, or not verified, as the case may be, by the weather until sunset of the ensuing day.

2. The prediction "FOUL" or "FAIR" refers especially to rain, and does not refer, in any way, to amount or kind of clouds or fog.

3. The prediction "FOUL" means that the appearance of the sky indicates *rain*. If *any* rain equaling or exceeding one one-hundredth of any inch falls before sunset on the ensuing day, the prediction is verified; and if not, it is *not* verified.

4. FAIR means that the appearance of the sky does not indicate rain, and if no rain equaling or exceeding one one-hundredth of an inch falls, the prediction is verified; if *any rain* in excess of this amount does fall, the prediction is *not verified*.

5. DOUBTFUL sunsets cannot be verified.

In using the following table for determining the proper times for taking the sunset observation, the times opposite the dates will be used as follows, viz: The time opposite the first of each month will be used on all dates from the first until the tenth; the time opposite the eleventh will be used on all dates from the eleventh until the twentieth; the time opposite the twenty-first will be used on all dates from the twenty-first until the last of the month.

* * * * * * *

BAROMETER.

34. The barometers used on signal-stations of observation will in all cases be carefully compared with the standard at this office before issue, and the correction to be applied for instrumental error sent with each when issued.

The two barometers at each station will be carefully compared on the last two days of each month, by the observer in charge making a series of comparative readings of not less than twenty in number, ten being made each day at hourly intervals, the result of which will be recorded, as soon as made, in the daily journal. These comparative readings must not be corrected for elevation, but for temperature and instrumental error only.

In this connection it must be borne in mind that the *correction* for instrumental error is the reverse of the instrumental error; that is, if the error of a barometer is plus (+), the instrument reads too high and an amount equal to the error must be subtracted in order to correct for the error; and vice versa when the error is minus (−).

No change of instrumental error will be made without direct authority from this office.

35. The barometer will be suspended so that the top of the mercurial column will be about the height of the eye, near a window, in such a manner as to be lighted perfectly, without exposure either to the direct rays of the sun or to the currents of air which are always found at the window-casings and doors. To protect the instrument from external injuries from dust, and from the direct radiation of warm bodies or currents of air from the window, observers will fasten the wooden case in which it is carried firmly against the wall in a vertical position. An opening large enough to admit the tube of the barometer will be cut in the upper end of the box, and directly above this, at the distance of one inch, a strong hook will be driven into the wall. This hook must be small enough to allow the barometer to swing freely upon it and to hang in a perfectly vertical position, and should extend two or three inches beyond the box, and upon it the instrument will be suspended. When not in use, the cover will be closed; but when an observation is to be taken, it will be opened, and the instrument drawn out on the hook, clear of the box, and in the full light of the window. After the observation is made the barometer will be slipped back into the box.

36. A reading of the barometer taken for telegraphic transmission will be corrected by the observer making the observation for *temperature*, for *instrumental* error, and for *elevation*, before they are sent from his station. In correcting for temperature, the reading of the *attached* thermometer will be used, while, in correcting for elevation, the temperature used will be that of the *exposed* or open-air thermometer.

In addition to the barometrical reading, reduced to sea-level, as above specified, the actual barometer reading (corrected for temperature and instrumental error only) will be reported from all stations equipped with mercurial barometers, and will be enciphered in the third space on Form 5.

In correcting for elevation, the height of the surface of the mercury in the cistern of the barometer above the ground must be added, in all cases, to the height of the station above sea-level, as in the following example, viz: Suppose height of station above sea-level to be 670 feet; height of mercury (surface) in cistern to be 27 feet above the ground; then the elevation to be corrected for would be 697 feet.

In correcting for temperature, Table I will be used; and for elevation, Table II, when special tables are not prepared under the direction of this Office.

37. The elevation to be corrected for at station No. —— is —— feet, as follows:

Height of —— above mean tide-level, —— feet. Height of ground (which should be a mark upon a door-sill, coping-stone, or other permanent object and noted in records) at office above or below datum-point, —— feet. Height of mercury in cistern of barometer above ground, —— feet. Total height to be corrected for, —— feet.

38. Observers will obtain from reliable sources the proper figures to fill up the blank spaces in the preceding paragraph, and will report them promptly to this Office on the form "Report of Instruments and their Positions," provided for this purpose.

In reporting the datum-point or bench-marks observers must be particular to give its *exact* location and the authority therefor; they will also, in every instance, give the authority for all measurements above or below such datum-points to the surface of the mercury in the cistern of the barometer, be assured that the measurements made by themselves are accurate, and must state it in such clear and concise manner as to leave no room for doubt in reference thereto at this Office. The data, step by step, from which the elevation of the datum-point above mean sea-level has been determined will be kept on file at the station. They will also briefly and clearly state on the form any other information in relation to the position of the instruments not provided for by the printed headings.

39. In moving a barometer even across a room, it should be screwed up and carried with the cistern uppermost. For traveling, it is provided with a wooden case. On steamboats or railroads, it should be hung up in a state-room or car, and the lower end firmly strapped to the side of the room or car, to prevent jarring. In wheeled vehicles, it should be carried by hand, supported by a strap over the shoulder, or held upright between the legs; but it must *not* be allowed to rest on the floor of the carriage, as a sudden jolt might break the tube. If carried on horseback, it should be strapped over the shoulders of the rider, where it is not likely to be injured, unless the animal is subject to a sudden change of gait. When required for use, it should be taken from its case, gently inverted, hung up, and unscrewed. While it has the cistern uppermost the tube is full—is one solid mass of metal and glass—and not easily injured; but when hung up, a sudden jolt might send a bubble of air into the vacuum at the upper end of the tube, and the instrument become useless until repaired. Observers must never *swing* the barometer or endeavor to force the mercury against the top of the tube without first screwing up the large adjusting screw at the base of the cistern.

40. If the cistern should become dirty, it can be cleaned with safety and without changing the zero of the instrument. Everything used in the operation must be clean and dry. Blowing upon any of the parts must be avoided, as the moisture from the breath is injurious.

The instrument being placed vertically, the cistern uppermost, unscrew and take off the brass casing which incloses the wooden and leathern part of the cistern. This wooden part (which has the grain crosswise, and therefore is not air-tight) is made in two pieces, fastened together by four screws and four brass pieces. It will be necessary to take out two of these screws and loosen the other two, when the brass pieces can be taken off. The upper wooden piece, to which the bag is attached, can then be lifted off, and the mercury will be exposed. By then inclining the instrument a little, a portion of the mercury in the cistern may be poured out into a clean vessel at hand to receive it, when the end of the tube will be uncovered. This is to be closed by the *gloved hand;* when the instrument can be inverted, the cistern emptied, and the tube brought again to its vertical position. Care must be taken to prevent any mercury from passing out of the tube. The long screws which fasten the glass portion of the cistern to the other parts can then be taken off, the various parts wiped with a clean cloth or handkerchief, and restored to their former positions. The mercury which has been taken out of the cistern must now be cleaned, or replaced by other that is clean and pure. If the old mercury is merely dusty, or dimmed by a film of oxide, the cleaning may be effected by straining it through chamois leather, or through a funnel with a capillary hole at the end, of a size to admit of the passage of but a small thread of the metal. Such a funnel is conveniently made of letter-paper. The dust will adhere to the skin or paper, and the filtered mercury will present a clean and bright appearance. At stations where muriatic acid can be procured, the mercury may be easily and quickly cleaned by mixing with it about two ounces of the acid in a small vessel or cup, and then pouring into the vessel clear water until it overflows and carries off all the impurities. When sufficiently pure, the water will be poured off, and the mercury heated over a gas or lamp light until all remaining moisture is expelled. If chemically impure, it should be rejected, and fresh, clean mercury used. With such clean mercury, the cistern should be filled as nearly full as possible, the wooden portions put together and securely fastened by the screws and clamps, the casing screwed on, and the screws at its end screwed up. The instrument can then be hung up and readjusted. If a little mercury has been lost during the operation, and there is none at hand to replace it, no serious harm has been done; but if much is lost, a little fresh mercury must be added to prevent the open end of the tube from becoming exposed while inverting the instrument. Should any air have entered the tube during the process of cleaning, efforts will be made to expel it by screwing the mercury into the tube, then inverting the instrument, loosening the screw and tapping the top against the shoe. If this fails to expel the air the fact that the barometer is unserviceable will be promptly reported to this office.

41. Station barometers will not be cleaned or repaired unless ordered from this Office, or by an inspecting officer, or when such action appears to be absolutely necessary. In any case the fact will be promptly reported to this Office, stating the number of the instrument cleaned or repaired, with date and result of the operation, and the record of a full series of comparative readings taken immediately before and after cleaning be forwarded.

42. To take a reading of the barometer: 1st. Read the attached thermometer to the nearest half degree. 2d. Adjust the surface of the mercury in the cistern carefully to the ivory point, or zero of the scale. When the mercury is perfectly pure, the proper adjustment can be easily made by causing the actual point of the zero-pin to coincide exactly with its reflected image in the mercury below; but when the mercury is covered with a slight film of oxide, it is necessary to determine the contact by immersing the point in the mercury first and then slowly lowering the screw until the depression caused by this immersion disappears. 3d. Tap the barrel of the barometer firmly, to free the mercury from the sides of the tube. 4th. Bring the lower edges of the vernier to the column of mercury, so that they exactly coincide with the top of the meniscus or curvature of the column, without cutting off any of the light at the angles. At night the light from the lamp must be thrown upon the paper. The barometer must never be viewed toward a distant white wall, nor a window, nor an artificial light, but always toward a piece of white paper in adjusting the vernier. 5th. A piece of white paper will be placed in the barometer box behind the tube to reflect the light and aid in setting the vernier accurately. 6th. The inches and tenths will then be read from the scale, and the hundredths and thousandths from the vernier.

43. Each observer, upon establishing a new station, will, as soon as he obtains the correct elevation of his barometer above sea-level, prepare a special table for reducing to sea-level the barometric observations made at his station.

44. This table will be made to cover the range of barometer (as reduced to sea-level) from 26.00 to 31.00 inches, and will give the reduction to sea-level to three decimal

places, or to the nearest thousandths of an inch for every one-hundredth of an inch of the barometric pressure, and for every five degrees of observed temperature of the air. For stations north of latitude 40° the table will cover a range of temperature from — 40° to + 100°; south of latitude 40, the range will be from — 10° to + 110°, except in specially cold localities. Printed blank forms for the proper arrangement of this table will be furnished from this Office. The correction given in this special table will be obtained by simple interpolation from the general table No. II, page ——, of these instructions, and a full copy of such special table must be forwarded to this Office for revision and approval.

45. Until the special table for the station is approved, the individual readings of the barometer will be corrected from the general table.

46. Stations having an elevation over 2,000 feet will be furnished with a constant correction from this Office or with special instructions.

47. All extra barometers when not in use must be kept screwed up sufficiently to keep the cisterns filled to prevent oxidation of the mercury.

THERMOMETER.

48. The thermometer should be hung in the instrument-shelter in such a position that it will always be at least one foot from the window-panes or the wall of the building to which the shelter is attached. The instrument must be hung vertically, with the middle of the scale at a height that will bring it on a level with the eye of the observer. The readings should be made at all times, but especially in the winter, *through the panes* of glass, without raising the sash, when the shelter is built out from a window. When the shelter is built upon the roof, great care must be exercised in making the readings, in order to prevent the instrument from being affected by the heat of the body or the lantern at night. The observation must be made as rapidly as is consistent with accuracy.

49. The accuracy of all thermometers at each station will be tested on March 31, June 30, September 30, and December 31, of each year, in the following manner:

Place the thermometers to be tested in the vessel provided for this purpose, keep them in a vertical position, pack finely-pounded ice around them to a height a little above the freezing point, and let them remain for one hour, at the expiration of which time read off the height of the mercury, without removing the thermometers from the ice, and note the result of the test of each thermometer in the daily journal, and report it to this Office in the journal abstract. If corrections have been authorized for any thermometer, the fact, with amount of such correction, will be stated. In testing the maximum thermometer it will be necessary to tap the bottom of it on the bottom of the vessel in which it is tested, to bring the mercury down to the temperature of melting ice, care being taken not to break the instrument during the operation.

Corrections will not be made for instrumental errors without authority from this Office.

MAXIMUM THERMOMETER.

50. The board which accompanies the maximum and minimum thermometers will be securely fastened with screws, in a horizontal position, upon the transverse bars which support the hygrometer and standard thermometer in the instrument-shelter.

51. For the support of the maximum thermometer, the long brass pin with a nut will be screwed into the board, in the hole to the extreme right. The nut will be taken off, and the pin slipped through the hole in the upper end of the instrument, which will be securely fastened by replacing the nut and screwing it tightly. The plain brass pin is then inserted in the hole at the left of the board, and the thermometer placed upon it so as to incline slightly in that direction.

The end of the pin to which the maximum is attached must be occasionally oiled to prevent friction.

The maximum temperature is obtained by noting the number of degrees upon the scale at the top of the column of mercury.

After making an observation the observer will remove the pin at the left, and, taking hold of the thermometer about three inches from the top, will spin it around several times, or until the top of the column is brought down to the temperature of the air at the time of observation. Care must be taken not to touch the bulb, and also that the nut is screwed up sufficiently tight to prevent the instrument from striking against the side of the board to which it is fastened. After adjustment, gradually raise the instrument to a horizontal position, and insert the pin as before.

Care should be taken in elevating the thermometer not to raise the bulb too high, as the column of mercury would then run to the upper end of the tube.

This instrument will be read daily at the time of making the 11 p. m. (Washington mean time) or last observation, and will then be set for the next day's observation, but, should a reading thereof be taken at any other time, care must be taken not to change the reading of the instrument.

MINIMUM THERMOMETER.

52. The brass support for the minimum thermometer will be screwed into the upper part of the board, and the holes so arranged as to slightly incline the left end of the support.

The top of the thermometer will be fastened by the small brass screw upon the support, while the lower end will be dropped into the notch to the left.

Upon receipt of a minimum thermometer at any station, it will be carefully compared with the standard, and if any portion of the spirit is detached from the column, the bulb will be immersed in warm water until the column reunites, *care being taken not to break the bulb by heating it too suddenly.*

After fastening the top of the instrument upon the support, the lower end will be raised until the top of the small index touches the top of the column of spirit.

The instrument is read by observing the number of degrees upon the scale where the top of the index rests. After taking a reading, the bulb or lower end of the thermometer should be elevated until the index touches the top of column, when the instrument will be dropped into the notch at the left of the support, as before.

The minimum thermometer will be read at the 7 a. m. and 11 p. m. (Washington mean time) observations. At the 7 a. m. observation care must be taken not to disturb the index, which will be set at the time of taking the night observation only. The minimum temperature at the time of making the 7 a. m. observation will form a part of the regular telegraphic report from all stations.

WATER-THERMOMETER.

53. The apparatus for noting the temperature of the water consists of a small thermometer, inclosed in a cylindrical metallic case. A portion of the case is hinged so as to be swung open when it is desired to read the thermometer. A valve at the bottom of the case admits the water as it sinks to the bottom of the river or lake, and, falling into place when the case is drawn up, prevents the water from escaping.

54. At stations provided with this thermometer one observation will be made at 3 o'clock, p. m. (local time) daily, of the temperature of the water at the surface and bottom of the lake, bay, or river upon which the station is located.

The observer will select some convenient point on the shore (a wharf or pier, when practicable) where a sufficient depth of water exists to give a positive difference between the surface and bottom temperatures, and will provide himself with enough strong cord to reach the bottom at the place selected. One end of this cord will be securely fastened to the wire handle at the upper end of the cylinder inclosing the thermometer.

In making the observations, the observer will first note the temperature of the air at the surface of the water, then that of the surface-water by immersing the thermometer in the upper stratum of water, allowing it to remain long enough therein for the mercury to acquire the temperature of the water; and then, lowering the cylinder slowly to the bottom, will allow it to rest there long enough to fill; after which it will be drawn quickly to the surface, and the temperature shown by the thermometer carefully noted. The water will be poured out of the cylinder after each observation, and the thermometer thoroughly dried.

These observations will be recorded on Form 32.

HYGROMETER.

55. The hygrometer will be placed in the same shelter as the standard thermometer, and at a distance of one foot from it. The cistern will be kept supplied with pure rain-water at all times when the temperature of the air is above the freezing-point, and the cover of the wet bulb will be changed every month and the bulb carefully cleaned. The cover may be washed as often as necessary, without removal, by means of a jet of clean water from a small syringe.

When the temperature of the air is below the freezing-point, the water will be emptied from the cistern, and in making an observation the wet bulb will be moistened with cold water, and the instant the mercury has reached its minimum its height will be noted. *Alcohol must not be used.*

The relative humidity of the air will be obtained from Table —, the manner of using which can best be given by an example.

Given dry-bulb thermometer (t) 97°, wet-bulb thermometer (t′) 76°, required corresponding relative humidity, vapor tension, dew point, and actual humidity. The difference of temperature is 21°. Place a ruler horizontally under the temperature of the wet bulb (t′) 76°. Where this meets the vertical column 21, take from the column marked at top R. H. the relative humidity 35, and from the column marked V. T. the vapor tension 0.61, and then from the table in lower right-hand corner, opposite

the vapor tension 0.61, the corresponding dew point, D. P., and actual humidity, A. H. can be taken by inspection.

Thus, for $t=97°$, $t'=76°$, R. H. $=35$. V. T. $=0.61$, D. P. $=64°.5$, A. H. $=6.68$.
$t=68°$, $t'=56°$, R. H. $=42$. V. T. $=0.29$, D. P. $=44°$. , A. H. $=3.31$.

The values of the dew point and actual humidity are obtained by interpolation. Th second sheet is to be pasted to the right of upper part of first sheet, and is for tem peratures of the wet bulb from 50° to 104°, and for differences from 27° to 45°.

Especial care must be taken to keep the tubes of the hygrometer clean and the we bulb properly moistened, and to make the observations and deductions accurately, s the humidity of the air forms an important element in all calculations of atmospheri changes.

To prevent the dry bulb of the hygrometer from showing a higher temperature tha the exposed thermometer under similar exposure, the observer will cut a circula opening, about three inches in diameter, in the board to which the dry and wet bulb are attached, and directly behind the bulbs.

ANEMOMETER.

56. The anemometer will be fixed in a vertical position upon the telescopic rod, th upper joint of which must be run up to its full extent or, when this has not bee furnished, upon a post of sufficient height to expose it to the full force of the win When possible, this post should be framed into the roof to steady it and prevent th instrument from vibrating; but when this cannot be done, it should be framed at th bottom into two pieces of scantling, not less than three feet in length, crossing eac other at right angles, which can be nailed fast to the roof or platform upon which th instrument is placed. Short braces must be added, when necessary, to insure stead ness. The outer dial of the instrument is graduated in miles and tenths of miles, th figures 1, 2, 3, &c., indicating miles, and the subdivisions tenths. One complete re olution of this dial is equivalent to ten miles of wind. This anemometer registers u to nine hundred and ninety miles.

Observers will assure themselves by making a daily comparative reading that th record of the dials and that of the self-register agree at the time of changing the re ord sheets on the self-registering attachment at midday. When a discrepancy is foun to exist between the two records, the anemometer will be carefully examined as to th condition of the dial-pegs or contact-pins (which should always be perfectly straigh and the contact-springs. The latter are liable to become corroded by the action the electric spark or moisture, and must be kept clean and dry. When found, th defect should be remedied, and the cause of such discrepancy briefly explained by marginal note on the sheet for the date, or dates, on which the discrepancy occurre Should an anemometer be found to admit moisture, melted bees-wax will be applied the joints.

Anemometers must be kept carefully and thoroughly oiled, to prevent friction an injury to the several bearings. Suitable oil for this purpose will be supplied from th Office upon application, and none other must be used after its receipt.

In making requisition for broken or defective portions of the anemometer, they wi be designated by their appropriate letters, as shown in Plate No. ——, and the of cial number of the anemometer for which they are intended must always be given.

The screw-posts must be kept bright, where they form connection with the conduc ing wires, to prevent resistance to the passage of the current.

Especial attention will be given to the large dial-screw, and when found loosen it will at once be tightened, but care must be taken not to screw it up tight enou to interfere with the free motion of dials.

57. The outer dial has one hundred and the inner dial ninety-nine divisions. the dials are moved by the same wheel, they will move forward one hundred divisio in the same time. The outer dial having one hundred divisions, the inner dial w complete one revolution and its zero be one division beyond or to the left of the ze of the outer dial when the outer dial has completed one revolution, the zeros of t scales coinciding at the time the instrument was set in motion. Thus the revolutio made by the outer dial are recorded on the inner one, the number of revolutions bei shown by the number of divisions of the scale on the inner dial between the zero that scale and the zero of the outer one. In taking the reading of the anemometer any time the hundreds and tens of miles are read from the inner scale, and the mil and tenths of miles are read from the outer one. Take from the inner scale the hu dreds and tens of miles contained between the zero of that scale and the zero of t outer one, and the miles and tenths of miles on the outer scale contained between t zero of that scale and the index of the instrument, and the sum of these readings w be the reading of the instrument at the time of making the observation.

When the anemometer is not furnished with an index-point, the centre of the sm wheel which gives motion to the dials will be taken as the reference point.

58. To obtain the velocity of the wind for the regular observations when the self-registering attachment is out of order, two readings of the outer dial must be taken with an interval of five minutes between them, and the *difference* between these readings will be the distance in tenths of miles traveled by the wind in that interval. This multiplied by twelve will give the proximate velocity in miles per hour. Example: Suppose the index of the anemometer to be at 3 on the outer dial when the first reading is taken, and at 3.6 five minutes after, the difference, .6, is the distance traveled in that time; and this multiplied by twelve gives a velocity of seven and two-tenths miles per hour. Whole numbers only will be used in expressing the velocity. When the decimal is *greater* than five-tenths, the unit's figure will be increased by one; when *five or less*, it will be thrown out.

The maximum hourly velocity of the wind when the self-registering attachment is used will be determined by multiplying the number of miles recorded in the fifteen minutes in which the maximum occurred by four, and, when the dial-readings are used, by multiplying the highest velocity in a period of five minutes by twelve.

The total movement by the wind in the preceding twenty-four hours, as shown by the anemometer, will be noted by the observer daily at 12 noon, local time (the time of changing the anemometer sheets), and recorded in the original record, on Forms 4, and on the anemometer sheets. The last will also give the velocity shown by the self-register, and will be recorded thereon in the following manner:

Total number of miles, self-register, 243.
Total number of miles, anemometer dials, 243.

In reckoning the number of miles recorded by the self-registering attachment, observers will count and record the number of spaces between the marks, and not the marks themselves.

The total movement for the twenty-four hours will be obtained in the following manner: Subtract the reading of the anemometer at 12 noon of the preceding day from the reading taken at 12 noon of the current day, and the difference will be the total movement of the wind. When the reading of the anemometer is less than the reading of the preceding day, nine hundred and ninety miles will be added to it, and the remainder, after subtracting the reading of the preceding day, will be the total movement.

Example: The dial reading of to-day is 91, and that of yesterday was 950; hence, we have $91 + 990 = 1081$; $1081 - 950 = 131$, the total movement of the wind in miles during the past twenty-four hours.

In case of the loss of record from the anemometer sheets for one or more days, blank sheets for the period during which the record is missing will be filled up with the name of station, proper dates, and on each a remark explanatory of the cause of the loss of the record, and be forwarded with the regular weekly package to this Office.

All entries on the record sheets, except the record marks made by the self-register, will be made in ink instead of lead pencil.

Whenever a station is not supplied with an anemometer, or the anemometer becomes unserviceable, and fails to record the movement of the wind, the force of the wind will be estimated and reported as light, gentle, fresh, &c., designation being taken from the column in the telegraph cipher headed "designation of wind force."

The instrument must not be taken apart unnecessarily, and those having the new style of contacts will be handled with especial care.

Observers must familiarize themselves with the construction of the several parts of the anemometer, in order that they may be able to locate faults whenever the instrument is out of order.

WIND-VANE.

66. Two wind-vanes will be furnished to each station; a small one to be sent with the observer for immediate use upon his arrival, and a larger one, or standard, to be sent as soon after the station is opened as practicable. When the latter has been received and placed in position, the small one will be removed, and carefully stored by the observer for use in cases of emergency.

67. The vane used for determining the direction of the wind must be set where the wind may act freely upon it, and must never be sheltered by surrounding buildings or other objects. Where the vane-rod does not pass through the roof to the office, the observer will mark upon a wooden dial, at the base of the upright which supports the vane, the true meridian and cardinal points of the compass.

68. At stations where the rod connected with the standard wind-vane passes through the roof and indicates the direction of the wind by an arrow in the office-room, the arrow will be adjusted to correspond exactly in direction with the vane itself, and, when such an adjustment has been made, the arrow will be securely fastened by means of the set-screw forwarded from this Office for that purpose.

A competent mechanic will be employed to perform such part of this work as cannot be done by the observer, and his bill forwarded for settlement in the usual manner.

69. When the large vane is received at any station, it will be immediately erected upon the building in which the office is located, provided the consent of the owner can be obtained, and the roof is strong enough to support its weight.

The general appearance of the vane and the location of the several parts are shown in Fig. 13. The iron straps which unite the two parts of the foot-block will be taken off and the block separated before raising the vane, in order to put the iron socket holding it in proper position. After the vane is up, the pieces will be fastened firmly together again by these straps. The central rod can be lengthened whenever necessary by adding a piece of the same diameter, and cutting a screw-thread on both ends.

When the office is on the upper floor, the central rod will be brought into the room and allowed to project about two inches below the ceiling. The gilded arrow will then be screwed on, and two circles drawn around it on the ceiling a little greater in diameter than the length of the arrow. On this circle will be painted the eight points of the compass used in the weather reports, care being taken to get the true meridian as a starting-point.

70. To fix the north and south line of the vane-circle in the "true meridian," place a table directly under the end of the vane-rod. Suspend a plummet from the center of the end of the rod. Place the compass upon the table with its center directly under the end of the plummet. If the variation of the magnet needle is given as *east* a certain number of degrees, turn the compass until the north end of the needle reads that many degrees *east* of the N point on the face of the compass. If the variation is *west*, turn the compass until the needle reads the given number of degrees *west* of the N point. Then lay a straight-edge across the face of the compass so that it will pass through the N and S points of the face, which are in the "true meridian," mark two points upon the table under the straight-edge; draw a straight line through these points; hold the plummet-string against the vane-circle and move it along until the plummet-point crosses the straight line on the table upon both the north and south sides; mark these crossings upon the circle, which are the "true" N and S points.

These instructions are based upon the supposition that the compass used is marked so that when placed upon a table and the observer sights from S to N the E point is on his right hand and the W to his left. Should the E point, as marked on the compass, be to the left and the W point to the right when the variation is given as *east*, turn the compass until the north end of needle reads the given number of degrees toward the west point; if *west*, turn it until the needle reads the proper number of degrees toward the east point.

71. At all stations supplied with the standard wind-vane, with the indicator extending through the roof to the office-ceiling, the words "*adjusted to the true meridian*" will be painted inside the vane-circle, upon the ceiling.

72. When permission cannot be obtained to put up the vane, the fact will be reported at once to this Office.

73. The observation of the vane requires more care than is usually given. In winds of considerable strength the vane is never at rest or fixed in the same direction; it oscillates incessantly, and its oscillations increase in extent with certain winds and with the violence of the wind. In such cases observers must *note the mean direction* between the extremes. When the wind is too light to move the vane, and when it is calm, no direction will be recorded. The attention of observers is called to this matter in order to prevent them from recording a direction of the wind when it is calm. The direction of the wind will be designated by the eight principal points of the compass, N., N. E., E., S. E., S., S. W., W., N. W.

In reporting changes in the *direction* of the wind, the terms *veering* and *backing* will be used. The term *veering* indicates the changing of the wind from N. to E. to S., and so on, or in the direction corresponding with the movements of the hands of a watch; while *backing*, being the reverse term, indicates that it changes from N. to W. to S., and so on.

The bearings of the vane must be kept well and carefully oiled to prevent friction.

RAIN-GAUGE.

75. The rain-gauge will be placed, whenever practicable, with the top of the funnel-shaped collector twelve inches above the surface of the ground, firmly fixed in a vertical position, and protected from the interference of unauthorized persons. It will be examined at the time of making each of the three telegraphic observations, the amount of water it contains carefully measured by means of the graduated rod sent with each gauge, and then emptied and returned to its proper position. When a position at the level of the ground cannot be found with a sufficiently clear exposure, the gauge will be placed on the top of the instrument-room, or roof of the building occupied by the observer, who will measure the height above the ground, and report it to

this Office. The measuring-rod is graduated in inches and tenths of inches, and the proportion between the cylinder and funnel is as ten to one, so that ten inches upon the rod correspond with one inch of actual rain-fall, one inch on the rod to one-tenth of rain, and one-tenth on the rod to one-hundredth of rain. Snow will be melted, and then measured and reported in the same manner as rain, *but the fact of its being melted snow must be noted under the head of remarks in the weekly reports*, and in the Original Record and the Daily Record of Observations. Whenever from any cause the snow cannot be melted, the depth will be measured and ten inches of snow reported as one inch of rain-fall.

76. Stations in localities subject to heavy rain-fall will be supplied with an attachment to the gauge of sufficient capacity to guard against overflow, but at stations where such rains are exceptional care must be taken by the observer to prevent overflow, by constant watchfulness, during heavy rain.

* * * * * * *

79. Immediately after placing his instruments in position, each observer will make out and forward to the Chief Signal-Officer, at Washington, a full report in writing, stating the kind, size, and position of room selected; the street and number of the building in which the room is situated; the position of each instrument, and its height above the ground, and also above the bench-mark furnished by this Office. In giving the height of the barometer, the measurement will be made to the surface of the mercury in the cistern. Whenever the position of any instrument is changed (which must not be done without good and sufficient cause) a record will be made of such change, with date and amount of difference in elevation; and the facts reported at once to this Office.

In addition to this information, such other facts will be stated as will enable the Chief Signal-Officer to judge of the manner in which this part of the observer's duty has been performed.

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FORMS.

117. The following-named meteorological forms are furnished by this Office for station use:

Form 1—Telegraphic river-report.
Form 2—Receiving-sheet.
Form 3—Daily manifold bulletin.
Form 4—Weekly report.
Form 5—Telegraphic report.
Form 8—Weather-map.
Form 15—Synopsis and indications.
Form 16—Monthly chart.
Form 22—Monthly mean.
Form 23—Cautionary-signal blank.
Form 24—Record of bulletins.
Form 25—Telegraphic-message form.
Form 26—River bulletin.
Form 27—Special river-report.
Form 28—Regular weekly river-report.
Form 30—Monthly instruction-report.
Form 32—Monthly report—temperature of water.
Form 33—Comparative barometric readings.
Form 34—Annual mean or meteorological summary.
Form A—Record of telegrams refused by telegraph company.
Form B—Record of telegrams sent and received.
Form X—Weekly meteorological report from sunset stations.
Form Y—Monthly sunset report.

118. Form 1 is used by the special river-observers for their reports, and should be made in duplicate; one copy for file in the telegraph-office at the schedule-times, and the other to be forwarded to this Office at the end of each week.

119. Form 2 is for the use of the telegraph-operators in receiving the reports from other stations, and will be furnished by the observers in such quantities as may be required, care being taken to guard against wasteful and unnecessary use of them. The spaces will be filled up in regular order, commencing at the upper left-hand space, and filling each space to the right in succession on the first line and then commencing at the left-hand space on the second line, and so on. Observers will require the receiving operators to sign and date each sheet, and also to note the time the reports upon it were received, before taking it from the telegraph-office. The time of receipt from the operator will be noted by the observer or assistant. When the reports are received in duplicate by the operator, observers will retain the original sheets furnished them by this Office.

After the reports have been translated and entered in the Bulletin, the receiving-sheets for each full report will be placed together, and folded neatly in three folds, parallel with the writing.

Each morning the three reports of the preceding day will be secured together, so as to form a single package. At the end of each week the seven daily packages for the week will be put in one neat package, and forwarded by mail to this Office, with the name of station plainly written upon the outer fold of the outside sheet.

120. Form 3 is the daily manifold bulletin issued for public information. The several columns will be filled up from the receiving-sheet, the words and figures being written plainly and distinctly.

Before making any entries upon the manifold form, the sheets will be carefully smoothed down, so that the registered lines of the several stations will fall directly over each other. If more than 15 bulletins are to be written, it is better to make out the number in two equal parts than to try and write them all at once, in order that all the copies may be legible.

The headings of the different columns indicate with sufficient clearness the matter to be filled in.

When any part of a report is not received, or, if received, is evidently incorrect, the word "Blank" will be written in the spaces to be filled by such part.

Absence of wind, clouds, rain-fall, or change in barometer, thermometer, and river, will be indicated by the figure zero.

New stations, whose names are not in the printed list, will be written in the blank lines at the bottom of the form, or over the names of stations from which reports are not received.

Each copy of Form 3 posted must show the name of place where posted, date, and time of posting, and be signed by the observer or assistant making it out.

A file copy of Form 3 for each report will be preserved for office-reference, and suitable covers, for protecting these retained copies from defacement and other injury, will be furnished from this Office on application. One copy of the morning issue of the Saturday bulletin, on which the name of station from which sent must be plainly written, will be inclosed in Form 24 and mailed to this Office from each station.

121. Form 4 is the weekly meteorological report, three copies of which will be forwarded to this Office at the end of each week; one copy containing the full record of the telegraphic series of observations, one the record of the local series, and the third that of the midday observations.

In filling up this form, the *daily* means of the *local* (7, 2, and 9 o'clock), and the *weekly* means of the *telegraphic*, barometric and thermometric observations will be entered in their proper columns, and the words "Daily" and "Weekly," respectively, added to the heading.

In the telegraphic series will be given, first, the mean of the morning; second, that of the afternoon; third, that of the midnight observation.

* * * * * * * * *

125. Form 5 will be used for all of the telegraphic reports, and will be made out each time in duplicate, one copy for file in the telegraph office, for transmission by telegraph, and the other for transmission by mail to this Office.

In making the duplicates of this form, carbon paper and a lead pencil will be used, and *both* copies written at the same time.

The time of filing in the telegraph-office and the transmission of the reports must be filled in by the telegraph-operator who receives and transmits them, and verified by his signature.

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133. Form 15 is for the Synopses and Indications, a copy of which, properly filled up, will be posted with each bulletin at all stations where they are received, and at which the Farmers' Bulletins are not printed. The midnight Indications will be used with the morning bulletin, and morning Indications with the afternoon bulletin, whenever practicable. At stations where the afternoon, and not the midnight, Indications are received, they will be used with the bulletin of the next morning.

In all cases the time and date of issue from Washington must be plainly written upon the form.

134. Observers will call the especial attention of the publishers of such papers as print the reports without proper official heading, time, and date, to the omission, and have it corrected when possible, as a matter of justice to this Office and to their readers.

135. Form 16 is the meteorological chart, to be made out monthly at each station, and forwarded by mail to this Office not later than the 10th of the month succeeding that for which it forms the record. In filling up this form the following instructions will be observed:

The time of beginning and ending of all auroral displays will be recorded in the spaces between the two upper lines, and under the proper dates, neatly written in

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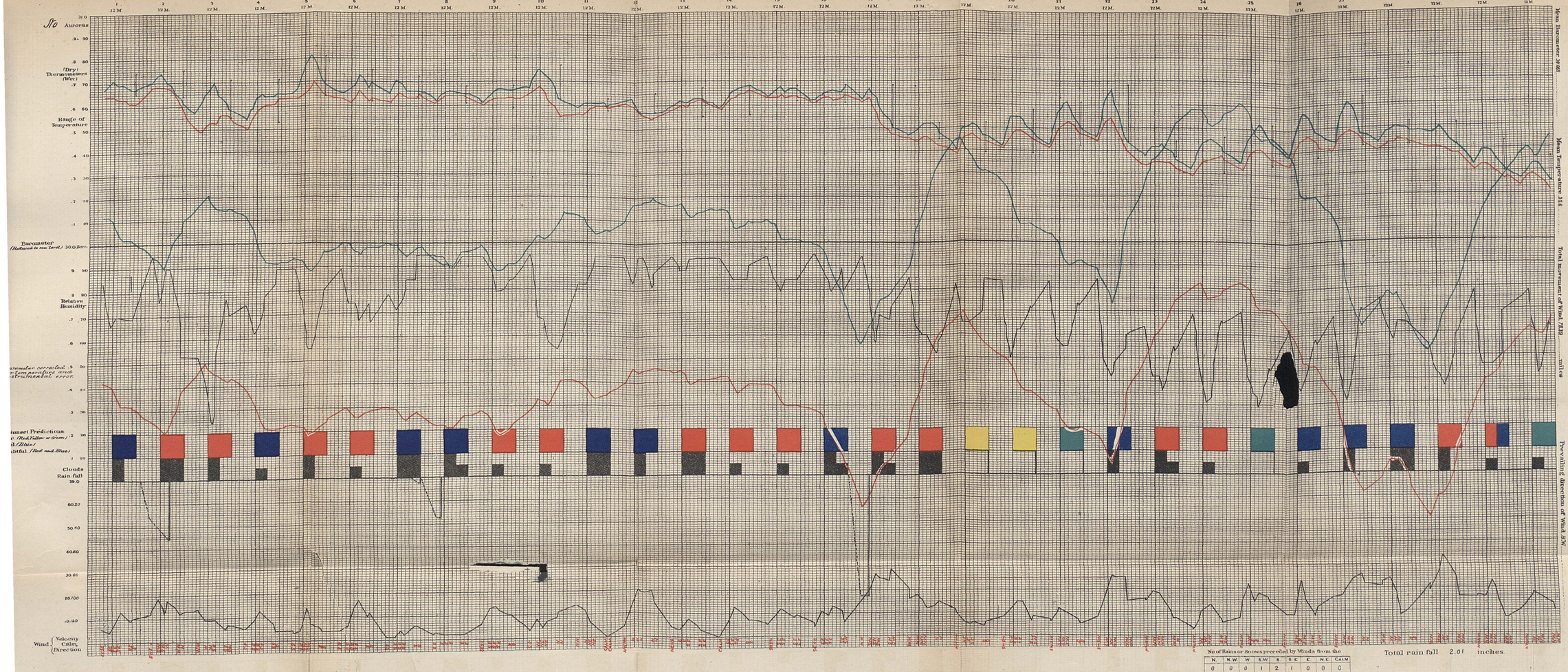
MILWAUKEE, WISCONSIN.
OCTOBER. 1879.

(Form 16)

Mean Relative humidity 71.8 per cent



Total rain fall 2.01 inches.

No. of Rains or Snows preceded by Winds from the.

N.	N.W.	W.	S.W.	S.	S.E.	E.	N.E.	CALM
0	0	0	1	2	1	0	0	0

black ink; when no auroras have been observed, the words "No Auroras observed" will be written opposite to the heading for these data.

For the thermometer, take the daily observations, and, with a sharp pencil, make a dot on the chart at the height at which the dry-bulb thermometer stood at the first observation of the first day of the month at its proper relative distance from the 12 m. (midday) line, as shown in Plate ——. Dot in a similar manner each of the seven observations. Join these dots with the pencil, and afterwards trace them with ink.

Continue the same process with the wet-bulb thermometer, reduced barometer, actual barometer, velocity of the wind, and the relative humidity, marking the direction of the wind in small letters at the point corresponding to the exact local time at which each observation was taken.

The average amount of clouds for each day will be given in the space immediately above the 29.00 inch line on the chart, dividing the squares into 1, 2, 3, and 4-4ths respectively.

The character of the sunset prediction, made each day at sunset, will be noted in the squares immediately above those used for the record of the clouds, and in the following manner: When the prediction is *fair*, by a red, yellow, or a green square, as the case may be; when *foul*, by a blue square, and when *doubtful*, by a half-red and half-blue square; the colored squares being of the same size as those used to indicate the amount of cloudiness.

The line representing the actual barometer (the barometer corrected for temperature and instrumental error only) will be drawn with *red* ink, and the line for the reduced barometer with *black* ink, so that the two may be easily distinguished from each other; and, on the left margin, opposite to the line representing the actual barometer readings, the words "Barometer Actual" will be written.

In case the scale on the chart does not extend low enough to comprehend the actual barometer readings, opposite to the reference line for 30.00 inches will be entered with *red ink* the number of the inch nearest to the normal barometer (corrected for temperature and instrumental error) and the scale graduated above and below it of sufficient compass for the range of the actual barometer; and on the left-hand margin the following note will be written:

"For (give name of station) the reference line marked 30.00 inches on the chart for reduced (sea level) readings is to be read —— inches for actual barometer, which figures see in red ink opposite said line."

This note and the scale must invariably be written with red ink.

The rain and dry winds for the month will be entered on the bottom margin immediately to the left of the "Total Rain-fall," thus:

Number of rain and snow storms preceded by winds from the

N.	NW.	W.	SW.	S.	SE.	E.	NE.	Calm.
0	0	1	2	3	2	1	2	0

In deciding whether a day is clear, fair, or cloudy, its character will be determined by taking the sum of the entire number of fourths of clouds observed at 7 a. m., 2 p. m., and 9 p. m. A clear day will be one in which the sum of the observed fourths is three or less than three; a fair day, one in which the sum is from four to eight, inclusive; and a cloudy day, one for which the sum is from nine to twelve, inclusive.

In filling up Form 16, the average cloudiness (in fourths) for the day will be entered. Average cloudiness will be found by dividing by three the sums above taken, and will be indicated as follows:

0 when the sum of the three observations is 0 or 1
1 when the sum of the three observations is 2, 3, or 4
2 when the sum of the three observations is 5, 6, or 7
3 when the sum of the three observations is 8, 9, or 10
4 when the sum of the three observations is 11 or 12

The commencement of rain or snow will be indicated by a fine line one-sixteenth of an inch or less in length; the rate of fall by a broken curved line indicating the greater or less rapidity of the same; and the amount of water by a heavy straight line, conformably to any adopted scale, and with its right edge resting at the point representing the time it ceased. Should rain or snow continue falling after midnight

of any day, the heavy straight line showing the amount which has fallen up to that time will be drawn, while a second broken curved line will be started to show the continuance of the same. When the time of commencement and ending of rain is known the lines will be drawn in black; but when the time is not known (this ought only to happen at night) the lines to express the data, whether the commencement or ending, or both, as the case may be, will be drawn on the chart at the place representing the time at which the commencement or ending is believed to have occurred, and in red ink.

As no fixed scale can be given for recording the amount of precipitation, it will be necessary for observers to adopt one, which should be made to comprehend the greatest amount of rain-fall to be recorded in any one storm on any one date, but in all cases the scale used must be divided into *equal fractional parts of inches.*

When separate storms occur on the same day, separate records of amount should be made.

Different colored inks must be used for the several lines, when the readings of the different instruments run close together or cross each other frequently.

In forwarding the charts by mail, they must never be folded, but be rolled neatly and compactly around the paper tubes furnished for that purpose. As they are intended for future reference, care must be taken to make the data given upon them an accurate summary of the station observations for each month, as compiled from the official records.

The mean relative humidity, mean barometer, actual and reduced, mean temperature, prevailing wind, total movement of the wind, and total rain-fall for the month, must be entered in their proper places on the margin of the chart.

The name of the station and month for which prepared must always be plainly written on the right margin of the form. The range of temperature will be shown for each day by a vertical line crossing the temperature curve, as shown in Plate —. Care must be taken not to use too much ink in recording the rain-fall, average cloudiness, and sunset predictions, as it penetrates the paper and injures the chart.

136. Form 22 is used for the record of the daily and monthly averages of the barometer and thermometer, the prevailing direction of the wind, amount of rain-fall, and other data for the month designated by the headings of the form.

In filling up this form, the daily averages of the thermometer readings for the local series of observations will be obtained by dividing the sum of the 7 a. m., 2 p. m., and *double* the 9 p. m. observations by four.

The average daily humidity will be obtained by dividing the sum of the 7 a. m., 2 p. m., and 9 p. m. observations by three. The *monthly* averages will be obtained by dividing the sum of the daily averages by the number of days in the month.

The monthly average of each series of the *telegraphic* (actual and reduced) observations will be obtained by dividing the sum of the observations recorded in each column by the number of days.

The total movement of wind during the month will be the number of miles counted from midnight of the last day of one month to midnight of the last day of the succeeding month, and will be the actual number recorded in the month. The maximum velocity of wind for each day will be calculated from the record sheet from midnight to midnight, as explained for computing other velocities.

In filling up that portion of the form prepared for rain-wind data, the following rules will be observed: In the

First column, record day of month and year.

Second column, record whether rain, snow, hail, or sleet.

Third column, record actual time of commencement (hour of day), and, in case it commences before the ending of the preceding month, the date also.

Fourth column, record actual time of ending (hour of day).

Fifth column, record direction from which wind was blowing at each observation during continuance of precipitation.

Sixth column, record direction from which wind was blowing at each of the three observations immediately *preceding* the commencement of precipitation.

Seventh column, record direction from which wind was blowing at each of the three observations immediately *following* the ending of precipitation.

The wind directions recorded in columns 5, 6, and 7 must follow each other in the order in which the observations are taken.

When precipitation begins and ends between observations, the words "No observation" will be written in the column headed "Direction of wind during rain or snow."

When an interval of —— hours occurs between the ending of precipitation and its recommencement, separate storms should be recorded.

Storms in which the amount of precipitation is too small to measure should not be considered.

The following is an example of the proper method of recording these data:

Date.	Rain, snow, hail or sleet.	Time of commencement.	Time of ending.	Direction of wind during rain, snow, hail or sleet at each observation.	Direction of wind at three (3) observations preceding rain, snow, hail or sleet.	Direction of wind at three (3) observations following rain, snow, hail or sleet.
1874.						
Dec. 1...	Rain.....	8 a. m.....	9.25 a. m....	No observation	0., 0., N	S., S., S.
Dec. 3...	....do.....	4.50 p. m....	.....	NW. and S....	SW., S., S.....	
Dec. 4...	....do.....	.....	1.30 a. m....	.....	.....	N., N., N.
Dec. 6...	....do.....	6 a. m.....	11 a. m.....	W. W.....	W., S., S	N., N., NW.
Dec. 13...	....do.....	8.40 p. m....	11.30 p. m...	S. and W.....	S., S., S.....	S., S., NW.
Dec. 16...	....do.....	9.40 p. m....	11.45 p. m...	S	S., S., S.....	SW., SW., NW.
Dec. 20...	....do.....	6.40 a. m....	8 p. m.....	NE., NE., NE.	NE., NE., NE.	NW., NW., N.
Dec. 22...	....do.....	2.06 p. m....	4 p. m.....	No observation	S., S., S.....	S., S., SW.
Dec. 26...	....do.....	11.50 a. m...	11.10 p. m...	S., S., S., SW..	S., S., NE	N., N., W.
Dec. 28...	....do.....	7.30 p. m....	.....	W., SW., S. 0..	S., SW., S	
Dec. 29...	....do.....	.....	9. 30 a. m...	.....	.....	NW., NW., NW.

Special attention will be given to Form 22, and the several columns will be added up *twice*, both by the observer and the assistant, in order to secure accurate results. Copies of this form, properly filled up, will, at the end of each month, be furnished by observers to as many of the newspapers and other periodicals published at their stations as may desire to make use of it. One copy will also be forwarded to this Office on the *first* day of the month succeeding that of which it forms the record. Manifold books of this form will be furnished to those stations at which a large monthly issue is found necessary.

137. Form 23 is for use at stations designated for the display of cautionary signals, and will be filled up and forwarded weekly to this Office.

Care must be taken by the observer to accurately record the time of commencing, time when at its height, and time of ending of each gale, with prevailing direction and highest velocity of wind during the storm, and the direction of the wind at the time of the highest velocity of every storm which passes over his station, whether cautionary signals were ordered for it or not.

A display of signals will not be reported as justified unless the wind attains a velocity of twenty-five miles per hour.

A signal must never be reported *partly* justified, but, should the wind in the vicinity of a station be sufficiently great to justify a display of the signal, while at the station it should not reach the storm velocity, the signal should be reported as not justified, and the facts in the case be noted in the column for remarks, giving the character of sea, nature and extent of disasters, and any other data which would enable this Office to arrive at a proper conclusion in the case.

The off-shore signal will be reported justified as to velocity when the velocity of wind during the display of that signal reaches twenty-five miles, but not justified as to direction when the direction of wind is not off-shore, and fully justified when the velocity reaches twenty-five miles per hour, and the direction of wind is off-shore.

If an order to hoist signal is received after a gale has already set in, it will be noted as justified, but a note must be made in connection therewith to the effect that the order was received late, and the cause of its late receipt given, where it is known to the observer. If, however, a storm should end before an order to hoist a signal has been received, it will be recorded as a storm for which no signal was ordered, and the display of signals as not justified.

In the column of "Remarks" will be noted such special cases of benefits to commercial or other interests as may come to the observer's knowledge. It will also be stated whether any storm passed over the station during the week for which cautionary signals were not ordered.

All casualties resulting from storms at any cautionary station will be reported so far as they come within the knowledge of the observer. In giving this information, newspaper clippings may be used and forwarded with Form 23, fastened upon a separate sheet of paper in such manner that they can be easily detached for pasting in the office scrap-books.

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140. Form 26 is the River Bulletin, and will be filled up as indicated by the several headings, and posted in such places as are found necessary to give suitable publicity to the reports and meet the wants of business men interested in them. The name and location of each place of display must be reported to this Office. A copy must be supplied regularly to each daily newspaper published at the station, and one copy will be forwarded to this Office on Saturday of each week.

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142. Form 28 is for use at *all* river-stations, whether *regular* or *special*, and will be forwarded weekly to this Office, properly filled up, as indicated by the several headings. Under the head of "Remarks" on this form will be noted all unusual occurrences connected with the stage of water in the river at and near the station, such as the presence of floating ice, timber, &c.; formation and breaking of ice-gorges and other obstructions; damages to levees; time of opening and closing of navigation; accidents to gauge, or change in location of same, &c.

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144. Form 32 is the monthly report of observations of the temperature of water, of which *two* copies will be forwarded to this Office on the first day of the month succeeding that of which it forms the record. The precise nature of the spot where the water-temperatures are taken must be noted under the head of "Remarks."

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146. Form 34 is for the annual mean, or meteorological summary, which must be posted up in a conspicuous place in the observer's office. On this form will be entered, on the first day of each month, the data for the preceding month, as indicated at the top of the several columns. A carefully-compared copy of this form must be forwarded to this Office within fifteen days after the close of the year of which it forms the record, the original being kept for station-reference. Frames for the display of this form will be supplied on requisition.

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153. In the Daily Journal will be entered all matters of interest not provided for in the various forms, such as meteoric and auroral displays, earthquakes, and unusual atmospheric appearances and disturbances, giving in each case, when possible, the time of beginning and duration of each. Whenever a meteor is seen by any observer, the "cloud" left by the meteor will be carefully noticed, both as to its appearance and the direction in which it *floats*, and a record and full description of the meteor and cloud will be entered. Especially will the observer enter a detailed account of the characteristic phenomena of every serious storm that passes over his station.

154. Observers will be particular to note in the Journal every display of aurora, seeking by inquiry of others, if necessary, to make their record complete.

If the heavens are obscured by clouds so that the aurora, if present, cannot be observed, the word "obscured" will be entered in that part of the record devoted to auroral displays. If the sky is sufficiently clear for observation, the words "aurora" or "no aurora" will be entered according as one is visible or not. When observed, a full account of the phenomenon will be entered in the journal, showing the exact minute of beginning and ending of the aurora, and the principal phases of changes that it experiences. The following particulars should be especially noted: the azimuth and altitude of each extremity and of the crown of any arch of light, and the same data for any corona or glory that may be formed.

When the observer is familiar with the names of the principal fixed stars, he may locate the arch or crown by reference to them, but it is preferable that he should observe directly the altitude and azimuth.

155. Altitudes are expressed by degrees from the horizon to the zenith. If any circle be divided into three hundred and sixty parts, and the radial lines connect these parts with the center, each pair of lines subtend an angle of one degree; the fourth part of the circle will subtend an angle of ninety degrees or one right angle, and the corresponding radii are perpendicular to each other; thus the zenith (that point in the heavens immediately above the observer) is ninety degrees from the horizon, or, in other words, its altitude is 90°. A point half-way up from the horizon to the zenith has an altitude of 45°

Azimuths are also expressed in degrees, but are measured on the horizontal plane, and will be recorded as is done in astronomy, from the south point to the westward, passing successively the west, north, and east points of the compass until 360° have been passed over, and the south point is again reached.

156. Observers must be particular as to the date of the aurora; and when it begins in the evening of one day and continues into the early morning of the next day, it will be entered as occurring on the *first* day, but its details will be given in the record as occurring between the hours of its actual beginning and ending. Thus, an aurora that began on the evening of the 12th of January and continued until the early morning of the 13th would be entered as the aurora of the 12th, but its details would be recorded as occurring, for instance, between the hours of 10 p. m. of January 12 and 2 a. m. of January 13.

157. All entries in the journal of occurrences and observations of any one day will be made under or opposite to that day, and not for a subsequent date. For example: an auroral display occurring May 23 should be entered opposite that date, and not referred to, on the 24th, as having occurred "last evening."

158. At stations west of the Mississippi River observers will note the date of appearance of Rocky Mountain locusts; the direction from which they come; the direction

and velocity of wind and character of weather at time of appearance; the length of time they remain in the neighborhood of the station, and amount of damage done by them; the direction and velocity of flight; direction of flight when they leave; whether they fly with or against the wind; whether or not they laid eggs in great quantities in the surrounding country; what means were taken to destroy the eggs or the locusts, and any other information that can be obtained on this subject. In addition to this a summary in regard to their appearance, numbers, damage done, &c., will be made as the concluding part of the abstract. Immediately after the 30th of June of each year a report on the Rocky Mountain locust, giving the following data covering the period from the first of July preceding, will be made:

(1.) Date and time of day of the arrival of swarms; 1*a*, direction and force of wind at the time; 1*b*, temperature and character of the weather at the time (clear or cloudy); 1*c*, direction of the flight, density, and extent of swarms.

(2.) Date and time of day of the departure of swarms; 2*a*, direction and force of the wind at the time; 2*b*, temperature and character of the weather at the time; 2*c*, direction of the flight, density, and extent of the swarms.

(3.) Date when the first eggs, if any, were deposited during the year.

(4.) Date when the eggs were most numerously hatching during the year.

(5.) Nature of the soil and situations in which the eggs were most largely deposited.

(6.) Nature of the soil and situations in which the young were most numerously hatched.

(7.) Date at which the first insect acquired full wings.

(8.) Date when the winged insects began to migrate.

(9.) Estimate the injury done in your county and State.

(10.) Crops which suffered most.

(11.) Crops most easily protected.

(12.) Crops which suffered least.

(13.) The prevailing direction in which the young insects traveled, and any other facts in relation to the marching of the young.

(14.) The means employed in your section for the destruction of the unfledged insects, or to protect crops from their ravages, and how far these have proved satisfactory.

(15.) The means employed in your section for the destruction of the winged insects, or to protect crops from their ravages, and how far these have proved satisfactory.

(16.) Descriptions and, if possible, figures of such mechanical contrivances as have proved useful in your locality for the destruction of either the young or the winged insects.

(17.) To what extent have birds, domestic fowls, and other animals, domestic or wild, been useful in destroying these insects?

159. Observers must pay particular attention to accuracy in the use of the terms "*morning*" and "*evening*," and will be governed by the following instructions in reference to them:

Midnight is the moment, 12*h*. 00*m*. 00*s*., and is the beginning or first moment of the new day, and should receive the date of that day. Thus, whatever happened in the afternoon of June 10, at 11*h*. 59*m*. 59*s*., happened at 11*h*. 59*m*. 59*s*. p. m. June 10; whatever happened one second later was at midnight of June 10 and 11, and at one second later at 12*h*. 00*m*. 00*s*. a. m. of June 11. At midday of same date whatever happened at 11*h*. 59*m*. 59*s*. happened at 11*h*. 59*m*. 59*s*. a. m., June 11; at one second later it was noon, June 11; at one second later it was 12*h*. 00*m*. 01*s*. p. m., June 11.

160. A monthly abstract of the entries in the journal will be mailed to this Office from stations east of the 100th meridian as soon as possible, and not later than the 5th day of each month. At stations west of that meridian they must be mailed as soon as possible, and not later than the second of the month. This abstract must contain all the important entries of the journal, especial care being taken to exclude all matters relating to the ordinary routine of observations that are given on the various forms. The abstract should show clearly and briefly all matters of interest not provided for in the regular forms, such as flight of birds, early vegetation, the movement of the Rocky Mountain locust (at stations west of the Mississippi River), meteoric and auroral displays, earthquakes, thunder-storms, distant lightning, high winds and gales, the occurrence of frost (particularly first frost and first killing frost), first ice, fog, polar bands, zodiacal light, and other unusual atmospheric phenomena, giving, whenever practicable, the time of beginning and duration of each. In each day's abstract the subject of auroras and the character of the sunset will be noted briefly in the authorized manner.

Whenever a tornado occurs in the vicinity of any station, the observer will make diligent effort to obtain an accurate description of all meteorological elements accompanying the tornado; the hour and date of occurrence; direction of movement; appearance of the clouds; direction of the whirl; rain-fall; accompanying noise; length of track; average width at different points; amount of destruction to life and prop-

erty, &c. So much of this information will be given as can be learned without leaving station for such time as to require special permission. The report required by these instructions will be entered in the journal, and also reported to this Office in the monthly abstract.

161. The following additional subjects will be noted: All changes in the working force of the station, with the date and nature of such change; all movements of office or instruments, with date of such movement, and authority for making the same. The condition of instruments and of other public property will form the closing part of each abstract—the instruments named separately, and the official number of each one given. When any instrument is reported unserviceable or out of order, the nature of the fault will be stated, and also whether a new one is required to replace it. When repairs can be made on station, this fact will be stated, with estimated cost.

162. At river-stations, all special phenomena affecting navigation will be noted, such as the date of high and low water during the month, with monthly range at station; closing of the river by ice, or from any other cause; formation of ice or other gorges, with effect upon navigation, &c.

163. At lake and sea-coast stations, the opening and closing of navigation, with the name of the first vessel to arrive and the last one to depart, with the nature of the cargo in each case, and the number of cautionary and off-shore signals displayed during the month will be reported, with results as far as known at each station; number of storms that passed over station for which cautionary or off-shore signals were not ordered, dates, with velocity of wind, being stated in each instance; and at all stations a summary of the sunset predictions, the number of each kind verified and the number not verified, will be made, and in case one or more predictions may have been missed, an explanation of their absence must be made in the summary.

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ORIGINAL RECORD OF OBSERVATIONS.

188. The "Original Record" is intended to furnish the Central Office with data for the correction of errors made at the several stations in reducing and copying the observations. To make it of any value for this purpose, the readings of the different instruments must be entered as made, and *not* copied in from a slip of paper. Observers will habitually carry this book when making an observation, and enter the readings in *pencil*, as noted at the time. They will also use this book for making the proper corrections, as indicated by the marginal references. Pen and ink must *not* be used for entering any observation or correction.

The velocity of the clouds will be indicated by a single letter, following the direction, as follows: C for "no perceptible movement," S for "slowly," and R for "rapidity."

The character of wind will be indicated by the letters S for "steady" and V for "variable," following *both* the direction and velocity.

The occurrence of *first* "Frost" at station will be noted in this book under its proper date and time, and reported to the Central Office by telegraph in the prescribed manner.

Precipitation which is too small to measure will be noted in the proper space by a dash (—), and the words "Too small to measure" written on the margin of the page; the person who takes the observation always being careful to connect the dash (—) and the note by an asterisk (*) or other proper reference mark.

Haze, smoke, and fog must not be recorded in fourths, but as "light," "dense," &c.

The occurrence of frost (except first frost), halos, coronæ, &c., being more properly journal entries, will not be recorded in the original record of observations.

In recording the amount of clouds, the upper should be noted as "hidden" when wholly obscured by the lower, or fog; when more than one kind of upper is observed all the kinds will be entered in the space for upper clouds, and the amount and velocity of each kind be given in the spaces prepared for these data; so also in case more than one kind of lower clouds be observed.

When precipitation begins and ends after the last observation for the day has been taken, the time of such beginning and ending should be entered under the head of the first observation of the next subsequent day.

The character of rain, snow, &c., must invariably be designated as "light" or "heavy," as the case may be.

Whenever, from any cause, an observation is not taken, or is taken late, the reason therefor must be plainly written in all records and on all forms affected thereby, in the space which such observation would have occupied had it been taken.

If an observation is taken fifteen minutes or more late, it will be recorded with the *exact* time at which it was taken, but it will not be used in the computation of any of the means of the station; which fact must be clearly set forth by a remark in connection with such observation whenever recorded.

In case an instrument becomes unserviceable the word "blank" will be written in the spaces for its readings, and an explanatory note made in connection therewith.

The name of the person taking observations must be signed in the spaces for that purpose at the bottom of the page, and to each observation.

Changes of the barometer since preceding observations will not be noted in this book.

All times of the beginning and ending of precipitation must be recorded when the interval between showers equals or exceeds fifteen (15) minutes.

Under no circumstances are observers allowed to make erasures or alterations in any observation recorded in the original record of observations, nor is it allowable to write one figure over another after it has been recorded. If an error has been made, the correct reading will be noted on the margin of the page, in connection with an explanatory note in reference thereto.

The book will be forwarded to this Office not later than the 10th of the month succeeding that of which it is the record.

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249. Observers will give close attention to the observation and record of all local premonitory signs of storms or changes of weather, and report them promptly to this Office. The following points should be particularly noted before, during, and after a storm or change of weather: Direction and force of the wind; kind, direction, motion, and appearance of the clouds; action of the barometer and thermometer, and such other purely local causes as appear to influence the results.

250. The attention of sergeants or other enlisted men in charge of stations is directed to the fact that they are required to make their reports absolutely correct, and that any shortcoming in this respect renders them liable to punishment. Aside from this, it should be kept constantly in mind that a single incorrect report may cause the loss of life and property to an unknown amount, and all reports must be made with this responsibility clearly in view. Whenever an observer is unable from any cause to get in his report, properly corrected, at the regular hours of report, he will *not* send the uncorrected portion, but will write the word "Blank" in each of the spaces that would otherwise have been occupied by this portion of the report. Observers will *never* send any report or part of report which they have reason to believe is incorrect, and will bear in mind that it is safer and more in accordance with instructions to omit a report than to make a false one.

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PAPER 21.

WAR DEPARTMENT, OFFICE OF THE CHIEF SIGNAL-OFFICER,
Washington, D. C., July 2, 1877.

The following rules in regard to sunset observations and verifications of reports based upon them are furnished for your information and guidance:

1. The observer at each station will note, each day, at the exact time of sunset (which he will obtain from circular No. 3, herewith inclosed), and for a time not to exceed thirty minutes after sunset, the character of the western sky and sunset, and will note in writing on Form Y, in the column for that date, the character at the time as "Fair weather sunset," "Foul weather sunset," or "Doubtful weather sunset."

The term "Fair weather sunset" will express such condition of the sky, particularly the western, and such character of the sunset, as is considered to indicate a fair day for the day *ensuing*.

The term "Foul weather sunset" indicates that the appearances are such as to presage a rainy day for the day ensuing.

The term "Doubtful weather sunset" will indicate that the conditions are such as to leave the mind of the observer in doubt as to what the sunset presages for the following day.

The prediction is for the period of time from the sunset of the day on which the prediction is made until sunset of the following day; and at the expiration of the time for which the prediction is made the observer will note on Form Y, opposite the prediction and in the column headed "Report correct," the word *yes* or *no*, according as the prediction is or is not verified.

A sunset prediction of one day is verified or not verified, as the case may be, by the weather of the ensuing day.

The prediction "Foul" or "Fair" refers especially to rain, and does not refer in any way to amount or kind of clouds or fog.

The prediction "Foul" means that the appearance of the sky indicates *rain:* if any rain equaling or exceeding one one-hundredth of an inch falls before sunset on the ensuing day the prediction is verified, and if not, it is not verified.

"Fair" means that the appearance of the sky does not indicate rain, and if no rain equaling or exceeding one one-hundredth of an inch falls, the prediction is verified. If any rain in excess of this amount does fall, the prediction is not verified.

"Doubtful" sunsets cannot be verified.

As soon as the observation has been taken and entered on Form Y the report will be enciphered (or written) on Form 5, in duplicate, and the form handed to the operator in the telegraph office as soon as possible after the observation is taken, for transmission to ———.

The signature of the operator must be obtained to both copies of each report, with the exact time of receipt by him. The operator will retain one copy of the report; the observer will retain the other copy until Monday of the following week, when he will forward the retained copies by mail to this Office in the same envelope as Form X.

In filling up Form 5, carbon paper and stylus will be used in the following manner: two sheets of the printed forms will be raised up and the piece of sheet tin placed beneath them; one of the sheets will be spread smoothly on the tin; on this sheet will be placed a piece of carbon paper, and the other form will be placed on this. When the cipher-words representing the readings of the instruments are written in the proper spaces of the Form 5, the report will appear in duplicate.

The observations will be written on the Forms 5 in the following manner:

The name of station ( ) will be written in the upper left-hand or first space; the cipher-word for the sunset prediction in the second space, and will be found in the table showing amount of clouds at the time, opposite the sunset prediction, and under the letters showing the direction from which the wind is blowing at time of observations.

In the third space will be written the cipher-word found opposite the observed reading of the barometer.

In the fourth space will be written the cipher-word found opposite the readings of the dry-bulb thermometer.

In the fifth space will be written the cipher-word found opposite the readings of the wet-bulb thermometer.

In the lower left-hand space will be written the cipher-word corresponding to the amount of rain-fall since the observation of preceding day.

The report will be signed with the surname only of the observer.

Examples are given of the proper manner of filling up Forms 5.

EXAMPLE.

Deadwood.	Abide.	Daunt.	Finny.	Finding.
Reduce.				

TRANSLATION.

Station	Deadwood.
Sunset	Fair.
Direction of wind	S. E.
Amount of clouds in fourths	0.
Barometer	29.85.
Dry-bulb thermometer	69°.
Wet-bulb thermometer	64°.
Amount of rain-fall since last report	1.20 inches.

EXAMPLE.

Fetterman.	Dimly.	Calver.	Fiddle.	Festive.
Rebuke.				

TRANSLATION.

Station	Fetterman.
Sunset	Doubtful.

Direction of wind	S.
Amount of clouds in fourths	¾.
Barometer	24.45.
Dry-bulb thermometer	44°.
Wet-bulb thermometer	33°.
Amount of rain-fall since last report	.85 inches.

EXAMPLE.

Hamilton.	Elope.	Apron.	Few.	Fennel.

TRANSLATION.

Station	Hamilton.
Sunset	Foul.
Direction of wind	E.
Amount of clouds in fourths	¼.
Barometer	18.75.
Dry-bulb thermometer	39°.
Wet-bulb thermometer	23°.
Amount of rain-fall since last report	None.

If no rain has been collected in the rain-gauge since the last report the cipher-word for rain-fall will be omitted from the report, and, until you have received a barometer, the word to express the reading of that instrument will also be omitted, and the words for the readings of dry-bulb and wet-bulb thermometers and amount of rain-fall be moved up one space.

The observation of the sunset, the direction of wind, and amount of clouds will be made at the times given in Circular No. 3. The observations of barometer, thermometers, and rain-fall, since observation of preceding day, will be taken at ——— each day.

In the form for the "Meteorological Record" for the week (Form X) should be entered as soon as possible after the observation is taken, and in the proper columns, the date of observation, hour of observation, reading of aneroid barometer, readings of dry and wet bulb thermometers, direction of wind, and velocity of wind in miles per hour (estimated from the Signal Service scale), amount of clouds in fourths, time (a. m. or p. m.) rain or snow began and ended, amount of rain or melted snow since last observation in inches and hundredths of an inch, state of the weather, and any remarks about the weather which, in the opinion of the observer, will be of interest, such as dates of auroras, thunder-storms, &c.

This form, properly filled up, should be forwarded by the mail on Monday, in an envelope addressed:

"THE CHIEF SIGNAL-OFFICER OF THE ARMY,
Washington, D. C."

Form Y will be forwarded to this Office on the *first* day of the month succeeding that of which it forms the record.

Instructions for reading the instruments.

ANEROID BAROMETER.

If the observer stands facing the barometer, the short arm will move to the right as the pressure of the atmosphere or weight of air increases, and to the left as the pressure diminishes. The long arm should be moved so as to coincide with or directly cover the short arm, and the reading of the barometer is obtained by reading from the lowest reading found on outer scale to the division of that scale to which the long arm points or which it covers. The inches and hundredths of inches are marked on the scale. The inches and hundredths are counted from left to right, or in the same direction as the hands of a watch move. The inches and hundredths are written in the same manner as dollars and cents, thus: One dollar and seventy-five cents would be written $1.75, or one and seventy-five hundredths, $29.35, twenty-nine dollars and thirty-five-hundredths.

The barometer reading 29 inches and thirty-five-hundredths of an inch would be written 29.35 inches, &c.

THERMOMETER.

In reading the thermometer the observer should be careful to place the eye at the same level as the top of the column of mercury, otherwise the reading will not be correct.

WET-BULB THERMOMETER.

A piece of wicking six or eight inches in length should be used with this thermometer, one end being drawn over the bulb until it is entirely covered, and the other end placed in the cistern which is on the wooden frame. The cistern should be kept filled with pure rain-water at all times when the temperature of the air is above freezing-point, and the cover should be changed once a month and the bulb carefully cleaned. The cover can be kept clean by washing it (without removal) by use of a jet of water thrown from a small syringe.

When the temperature of the air is below the freezing-point the water will be emptied from the cistern and the bulb moistened with water. By watching the mercury in the tube it will be seen to fall for a few minutes and then to rise again. The height of the mercury, or reading of thermometer, when at its lowest point, should be read.

WIND VANE.

The vane used for determining the direction of the wind must be set where the wind will act freely on it, and must never be sheltered by surrounding buildings or other objects.

The direction of wind is indicated by the point of the horizon from which it comes. Thus a north wind is one blowing from the North, an east wind is one blowing from the East, a south wind is one blowing from the South, &c. The direction of the wind will be designated by the eight principal points of the compass, N., E., S., W., N.E., S.E., S.W., N.W.

The wind vane and stand consist of the following parts:

1st. Upright staff about five feet in length, at the lower end of which should be cut a tenon about one inch in length; near upper end are two holes which cross each other at right angles, and through which are passed the iron arms (marked 3), at the ends of which are the letters N. and S. and E. and W. A hole is bored in the *upper* end of staff, in which the slender iron (marked 4) is screwed, and on which the wind vane (marked 5) is placed.

2d. Four iron braces.

3d. Two iron arms with letters N. and S. and E. and W. at the ends.

4th. Slender iron rod on which the vane is placed.

5th. Wind vane.

To place the vane and stand in position, a small platform, about two and a half feet square should be placed on roof of observer's office and carefully leveled. A hole to receive the tenon at the foot of staff should be cut in center of platform. Draw upon the platform the true meridian line passing through the center, and mark the ends of the line N. and S. respectively.

To determine the true meridian line, place the compass with its center over the center of the hole in the platform; place the eye at south end of needle, and mark on platform a point toward which the north end of needle points; place the eye at north end of needle, and mark the point towards which the south end of needle points. Draw through the points thus determined and the center of platform a line, which will be the magnetic meridian.

The variation of the needle at your station is ° east; that is, the needle points ° east of the true north.

On "Plate I" will be seen two lines which cross each other at the point "O." One of these lines is marked simply "N." and "S.;" the other line is marked "True N." and "True S." Place this plate with the point marked "O" at center of platform, and so that the line marked "N." and "S." immediately covers the line (or magnetic meridian) which has been marked on platform. Mark on the platform where the line marked "True N." and "True S." reaches edges of plate; a line drawn through these points, and the center of platform will be the true "N." and "S." line, or true meridian. Paint on the platform a circle (whose center coincides with the center of the platform) having a diameter of about two feet, and on this circle mark the four cardinal points N., E., S., and W., and the four intermediate points N. E., S. E., S. W., and N. W. Unscrew the nuts at ends of iron arms (3), take off the movable letters, pass the rods through the holes drilled near upper end of staff, put on the letters and screw on the nuts. Screw the slender iron rod (4) into the hole in end of staff. Place a screw about six inches above the lower end of staff and immediately below the end of arm on which the letter "N." is placed. Place the tenon at foot of staff in the hole in center of platform, and turn the staff until the screw under letter "N." is immediately over the meridian line; the arm with letter "N." will be immediately over

the end of meridian line (marked "N."), and therefore points to the true north. Place the staff in a vertical position, this being determined by the use of a plumb line; fasten one end of each of the iron braces (2) to the platform and the other end to the staff, so as to hold the latter firmly in position. Place the wind vane on the slender rod (4), passing the rod through the hole near the center of vane.

In determining the direction of the wind at the time of observation, the division of the circle which most nearly coincides with the direction in which the arrow-head of vane points will be taken as the direction of the wind.

In winds of considerable strength the vane is never at rest or fixed in the same direction; it oscillates incessantly, and its oscillations increase with the violence of the wind. In such cases observers must note the mean direction between the extremes. When the wind is too light to move the vane and when it is calm no direction will be recorded.

RAIN GAUGE.

The rain gauge will be placed, whenever practicable, with the top of the funnel-shaped collector twelve inches above the surface of the ground, firmly fixed in a vertical position and protected from the interference of unauthorized persons. It will be examined at time of making the daily observations, the amount of water it contains carefully measured by means of the graduated rod sent with each gauge, and then emptied and returned to its proper position. When a position at the level of the ground cannot be found with a sufficiently clear exposure, the gauge will be placed on the top of the instrument-room or roof of the building occupied by the observer, who will measure the height above the ground and report it to this office.

The measuring rod is graduated in or divided into inches and tenths of inches, and the proportion between the cylinder and funnel is as ten to one, so that ten inches upon the rod corresponds with one inch of actual rain-fall, one inch on the rod to one-tenth of rain, and one-tenth on the rod to one-hundredth of rain. Snow will be melted and then measured and reported in the same manner as rain, but the fact of its being melted snow must be noted under the head of remarks in the weekly reports.

Whenever from any cause the snow cannot be melted the depth will be measured and ten inches of snow reported as one inch of rain. The rule for determining the amount of rain-fall from the amount of water collected in the tube is as follows, viz:

Measure the amount of water in the tube with the measuring stick, which is divided into inches and tenths. Divide the amount of water found by ten, the quotient will be the amount of rain-fall.

EXAMPLES.

Amount of water in tube	1.4 inches.
Amount of rain-fall	0.14 inch.
Amount of water in tube	15.6 inches.
Amount of rain-fall	1.56 inches.
Amount of water in tube	0.1 inch.
Amount of rain-fall	0.01 inch.

When reports cannot be forwarded on the day on which they are taken, they will not be transmitted by telegraph.

C. E. KILBOURNE,
First Lieutenant Second U. S. Artillery, Acting Signal Officer and Assistant.

PAPER 22.

S. S. ——— ———.

Bulletin for the —— half of the month of ———, 18—, of simultaneous international meteorological observations, taken each day at 7.35 a. m., Washington mean time (43′ p. m., Greenwich mean time).

Day.	Station. (Harbor, or latitude and longitude at 7.35 a. m., Washington time.)	Barometer. —— feet above sea-level.	Attached thermometer.	Temperature. (Fahrenheit.)		Wind.		Clouds.		Rain-fall in 24 hours.	Sea-swell.		Weather.	Ship's course and distance sailed since last report.	Signature of observer.
				Dry bulb.	Wet bulb.	Direction from which coming.	Force.	Amount.	Direction from which coming.		Character.	Direction from which coming.			

☞ See notes on the back of sheet.

Barometer error ———.
Last comparisons at ———.

[On the back of the foregoing.]

NOTE.—A brief account of any remarkable storm may be indorsed hereon below.

S. S. ——— ———.

Bulletin of simultaneous international meteorological observations for the —— half of ———, 18—.

Respectfully forwarded to the Chief Signal Officer of the Army.

———— ————,
Commanding.

NOTES.

1. These observations must be taken and recorded each day, without fail, at the precise hour, 7.35 a. m., Washington mean time (43' p. m. Greenwich mean time).

2. The *mercurial barometer* is to be used when possible. When the *aneroid barometer* is used, as, for instance, on account of the ship's motion, a letter (*a*) is to be placed after the reading, and the aneroid is to be regulated at all times by the mercurial barometer.

3. When, from stress of weather or other causes, all the observations cannot be made, part of them must be invariably given. For instance, if it is not possible to say more than "violent gale," let that be said.

4. The *direction of the wind* is to be given by compass point (corrected for variation) as closely as possible. *Wind force* may be given by Beaufort scale of numbers 0 to 12, or in velocity of miles per hour or pressure per square foot, where there are anemometers.

5. One of these blanks, filled out for the first fifteen days of the month, to be mailed on the fifteenth day of each month, or as soon thereafter as practicable, and one, filled for the remaining days of the month, to be mailed on the first day of the month, or as soon thereafter as practicable, addressed to the Chief Signal Officer of the Army, Washington, D. C.

6. Commanding officers of vessels will cause frequent comparisons of barometer readings to be made with those of the Signal Service whenever practicable, and as frequently as may be found necessary to obtain correct results—the comparisons, of course, to be made at precise common time, as, for instance, at 7 a. m., 2 p. m., and 9 p. m., for several days together, and at whatever of the signal stations may be convenient at the time.

7. Whenever in foreign waters, like comparisons will be made if practicable with the barometers of United States naval vessels wherever the commanding officer has reason to believe additional accuracy can be obtained. On every report forwarded the barometer error (+ or —) will be noted, and *not applied to the observations.* (See space at foot of blank.)

8. The reading of the attached thermometer must be given with all readings of the mercurial barometer. The blank for height of barometer above sea-level must be filled on shipboard by finding the height, in feet, of the cistern of the barometer, as hung in the ship, above the water-line, whenever the ship is in port. Give reading of barometer as *read off*, leaving all correction and reductions to be made elsewhere.

9. Clouds, amount, must be reported as follows: Sky clear, 0; one-fourth covered, one-half covered, three-fourths covered, four-fourths covered.

10. Sea-swell may be reported as follows: Smooth, moderate, long, rough, cross, heavy, and very heavy.

11. Weather: Use words clear (when sky is less than one-fourth covered); fair (sky from one to three-fourths covered); cloudy (sky more than three-fourths covered); sprinkling, drizzling, light (or heavy); rain, sleeting, hailing, thunder-storm, foggy, misty, hazy, threatening, clearing, &c. The above to express the state of weather, as the case may be, at the *moment of observation.*

12. If any observation is not taken, write in the space the word "blank."

It is requested the above directions be strictly complied with.

ALBERT J. MYER,
Brig. Gen. (Brevet Assigned), Chief Signal Officer, U. S. A.

PAPER 23.

WAR DEPARTMENT, OFFICE OF THE CHIEF SIGNAL-OFFICER,
Washington, D. C., August 15, 1878.

Instructions for shipmasters comparing barometers with the Signal Service standard at the Maritime Association building in New York.

The upper surface of the mercury in the cistern of the large standard barometer is 11 feet and 6 inches above mean tide. The ship's barometer should be hung alongside and at the same elevation. A table for reducing the barometric readings to 32° Fahrenheit (freezing) will be found at the barometer desk. To all readings of the large standard barometer allow for the reduction to freezing to obtain the true reading. The difference between this corrected reading and the reading of the ship's barometer, similarly reduced to freezing, will be the correction to be always applied (that is, to be added to or subtracted from) to the readings of the ship's barometer, in order to make sure that these readings are correct. To illustrate by an example: the reading of the standard barometer reduced to freezing is, say, 29.985, and the reading of the ship's barometer to be compared, reduced to freezing, is, say, 29.970; in this case the standard is the higher, and the difference (.015) is to be added to all readings of the ship's barometer to obtain the standard reading. As another illustration: let the reading of the standard be, as above, 29.985, and the reduced reading of the compared ship's barometer 30.01; in this case the standard is the lower, and the difference (.025) is to be subtracted from all readings of the ship's barometer to obtain the standard reading. The comparisons are similarly made, though not so closely, and the correction determined, though the ship's barometer may not be scaled to very close readings, or of thousandths. The correction for the instrumental error of each ship's barometer, as thus determined, must be applied whenever corrected readings are desired.

For all reports made to this office, if such are made by any vessel, it will be sufficient to give, when a mercurial barometer is used, 1st, actual reading of barometer as read off; 2d, correction for instrumental error determined as stated above; 3d, reading of the attached thermometer; 4th, height (as nearly as possible) of barometer, as hung on shipboard, above the sea-level. These ought to appear on each separate form or report sent to this office.

Aneroid barometers are compared with standard mercurial barometer by first reading the mercurial barometer and correcting this reading for temperature only—that is, reducing the reading to what it would be if the temperature of the barometer was 32° Fahrenheit. Then read the aneroid and take the difference between the corrected reading of the mercurial and the actual (uncorrected) reading of the aneroid, which will be the correction to be applied to the aneroid; this correction to be added if the aneroid reads lower than the mercurial, and subtracted if it reads higher.

On all reports made for this office, when an aneroid barometer is used, the record should give, stated on the form, 1st, actual reading of the barometer as read off; 2d, correction for instrumental error, determined as above; 3d, reading of attached thermometer if there is one, or of a thermometer in the room; 4th, statement whether the barometer is "compensated" or not; 5th, height (as nearly as possible) of the barometer, as hung on shipboard, above sea-level.

A sergeant or assistant of the Signal Service will be in attendance at the Maritime Association building each day, from 12 to 1 p. m., to give any necessary information as to mode of making comparisons. The barometer case and the door of the screen will be opened at the hours named only, unless in instances of especial need, and always in the presence of the sergeant or assistant.

Shipmasters of all nations are invited to make use of the Signal Service standard for the purpose of comparing their ships' barometers. The superintendent of the room of the Maritime Association will take charge of ships' barometers to be compared at any time they may be left with him for the purpose. They will be duly delivered by him to the sergeant or assistant in charge of the standard. Ships' barometers can be most conveniently returned to owners at the hour between 12 m. and 1 p. m.

ALBERT J. MYER,
Brigadier General (Brevet Assigned), Chief Signal-Officer, U. S. A.

PAPER 24.

List of merchant and naval vessels and naval stations from which simultaneous meteorological reports have been received at the office of the Chief Signal-Officer during the year ending June 30, 1879.

MERCHANT VESSELS.

Name.	Months for which reports were received.	Line.
Steamship China	June, July, and August, 1878	Pacific Mail Steamship Company.
Steamship City of Panama	July to September, 1878, inclusive	Do.
Steamship City of Peking	April 2 to July 3; July 21 to September 19; and October 2 to December 11, 1878.	Do.
Steamship City of Tokio	May, 1878	Do
Steamship Colima	July to December, 1878, inclusive; January, February, and April, 1879.	Do.
Steamship Dakota	August to December, 1878, inclusive; April and first half of May, 1879.	Do.
Steamship Grenada	Part of January, 1879, and February and March, 1879.	Do.
Steamship Wilmington	Last half of July, and part of August, 1878	Do.
Steamship Zealandia	November 26, 1878, to February 25, 1879	Do.
Steamship Adriatic	July, August, October, and November, 1878	White Star Line.
Steamship Britannic	June, September, October, and November, 1878; and February and April, 1879.	Do.
Steamship Celtic	March, May, June, July, August, October, and December, 1878.	Do.
Steamship Germanic	June, July, and August, 1878	Do.
Steamship Belgic	April, May, June; August to December, 1878; January to April, 1879.	Occidental and Oriental Steamship Company.
Steamship Gaelic	May, June, July, August, September, November, December, 1878; January, February, April, 1879.	Do.
Steamship Oceanic	March to November, 1878; and March to May, 1879.	Do.
Steamship Berlin	August, 1878	North German Lloyd of Bremen.
Steamship Braunschweig	April to December, 1878; January to May, 1879	Do.
Steamship Leipzig	January, February, April, May, and June, 1879	Do.
Steamship Nurnberg	March and April, 1878	Do.
Steamship Indiana	June, 1878, to February, 1879, and April and May, 1879.	American Steamship Company.
Steamship Ohio	May to October, 1878, and January and February, 1879.	Do.
Steamship Pennsylvania	July and November, 1878	Do.
Steamship Switzerland	June to December, 1878	Red Star Line.
Steamship Austrian	January, 1879	Allan Line.
Steamship Hibernian	November and December, 1878, and February, 1879.	Do.
Steamship Peruvian	April, 1879	Do.
Schooner Addie Fuller	August, October, November, December, 1878, and January, March, April, May, and June, 1879.	
Schooner Florence	February to September, 1878	
Schooner Henry Whitney	May and June, 1879	
Schooner W. D. Hilton	June, 1879	
Schooner Charley Bucks	May and June, 1879	
Schooner Harry and Fred	April, May, and June, 1879	
Steamship Samaria	May, 1879	Cunard line.
Steamship Peruvian	May, 1877, to August, 1878	British vessel.
Steamship Algeria	February to August, 1878	Do.
Steamship Don	May and June, 1878	Do.
Steamship Gordon Castle	September, October, and November, 1878	Do.
Steamship Yorkshire	February, March, and April, 1878	Do.
Ship Naiad	April and May, 1878	Do.
Bark Commewyne	October and November, 1878	Do.
Bark Maroon	January, February, March, May, and June, 1878	Do.
Bark Margaret Smith	August, 1878, to January, 1879	Do.
Bark Virginia	July, 1878	Do.
Brig Catherine	April to November, 1878	Do.
Schooner Traveller	April to September, 1878	Do.

UNITED STATES NAVAL VESSELS.

Names.	Months for which reports were received.	Names.	Months for which reports were received.
Adams	May to December, 1878, and February and March, 1879.	Constellation	May, June, and July, 1879.
Alaska	June, 1878, to April, 1879.	Despatch	June, 1878, to April, 1879.
Alliance	June, 1878, to May, 1879.	Enterprise	July 1878, and May, 1879.
Ashuelot	May, 1878, to April, 1879.	Essex	September, 1878, to Febr'y, 1879.
Canonicus	June, 1878, to May, 1879.	Franklin	June, 1878, to June, 1879.
Colorado	June, 1878, to June, 1879.	Gettysburg	May, 1878, to April, 1879.
Constitution	Do.	Guard	April to July, 1878, and August to November, 1878.

List of merchant and naval vessels and naval stations, &c.—Continued.

UNITED STATES NAVAL VESSELS—Continued.

Names.	Months for which reports were received.	Names.	Months for which reports were received.
Hartford	May, 1878, to May, 1879.	Quinnebaug	October, 1878, to May, 1879.
Kearsarge	May and June, 1879.	Ranger	May, 1878, to April, 1879.
Lackawanna	November, 1878, to March, 1879.	Richmond	December, 1878, to May, 1879.
Marion	June to October, 1878.	Rio Bravo	June, 1878, to June, 1879.
Michigan	June, 1878, to June, 1879.	Santee	Do.
Monocacy	May, 1878, to April, 1879.	Saratoga	March, April, and May, 1879.
Monongahela	January to May, 1879.	Saint Louis	June, 1878, to June, 1879.
New Hampshire	June, 1878, to June, 1879.	Supply	June, 1878, to April, 1879.
Onward	May, 1878, to May, 1879.	Swatara	June to October, 1878.
Palos	April, 1878, to May, 1879.	Tennessee	May and June, 1878.
Passaic	August, 1878, to June, 1879.	Trenton	June, 1878, to May, 1879.
Pensacola	June to August, 1878; November, 1878, to May, 1879.	Tuscarora	May, 1878, to May, 1879.
Plymouth	June to December, 1878; March and April, 1879.	Vandalia	June, 1878, to January, 1879; April, May, and June, 1879.
Portsmouth	November and December, 1878; April and May, 1879.	Wabash	June, 1878, to June, 1879.
Powhatan	June, 1878; September, 1878, to March, 1879; May and June, 1879.	Wachusett	June, 1879.
		Wyoming	May to August, 1878; November, 1878, to May, 1879.

UNITED STATES NAVAL LAND STATIONS.

Mare Island, Cal.	July and December, 1878, to May, 1879.	Portsmouth, N.H.	June, 1878, to April, 1879.
Pensacola, Fla.	June, 1878, to June, 1879.	Yokohama, Japan	May, 1878, to May, 1879.

PORTUGUESE NAVAL VESSELS.

D. Fernando	August and September, 1878.	Sáda Bandeiro	March, 1878, to March, 1879.
Mindello	February to June, 1878, and August, 1878.	Tejo	April, May, June, September, and December, 1878, and January and February, 1879.
Rio Douro	March to July, 1878.	Quanza	May, 1878, to March, 1879.
Rio Lima	December, 1878, to February, 1879.		

SUMMARY.

Furnished by the Pacific Mail Steamship Company	9
Furnished by the White Star Line	4
Furnished by the Occidental and Oriental Steamship Company	3
Furnished by the North German Lloyd of Bremen	4
Furnished by the American Steamship Company	3
Furnished by the Red Star Line	1
Furnished by the Allan Line	3
Furnished by the Cunard Line	1
Furnished by Captain James Jorgensen	1
Furnished by Mr. O. F. Sherman	1
Furnished by Captain William Shepherd	1
Furnished by Captain N. B. Horner	1
Furnished by Captain N. B. Foss	1
Furnished by Captain George Gardner	1
Furnished by the co-operation of R. H. Scott, secretary of the Meteorological Council, London	12
Furnished by the United States Navy	49
Furnished by the Portuguese navy	7
Total	102

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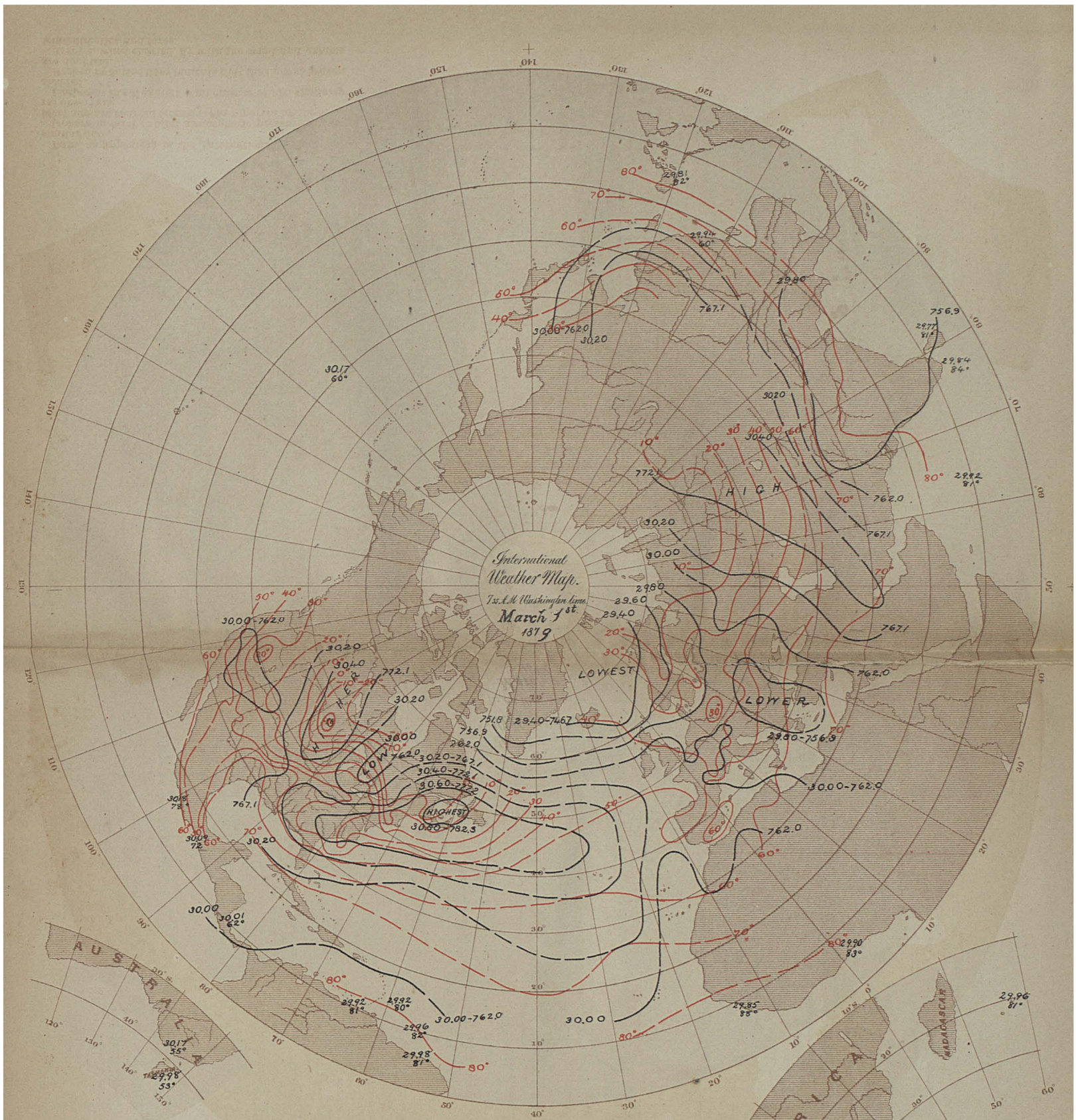

Data, as appearing in the International Bulletin of similar date.

Isobars in *black* exhibit atmospheric pressure at sea-level and are charted from data as reported by the several observers.

Isotherms in *red* exhibit temperature of air, similarly charted.

Broken or dotted lines indicate that the lines so broken are doubtful.

Arrows, when charted, fly with the wind and exhibit wind-direction and force.

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Albert J. Myer

BRIG. GEN. (BVT ASSG'D) CHIEF SIGNAL OFFICER, U. S. A.

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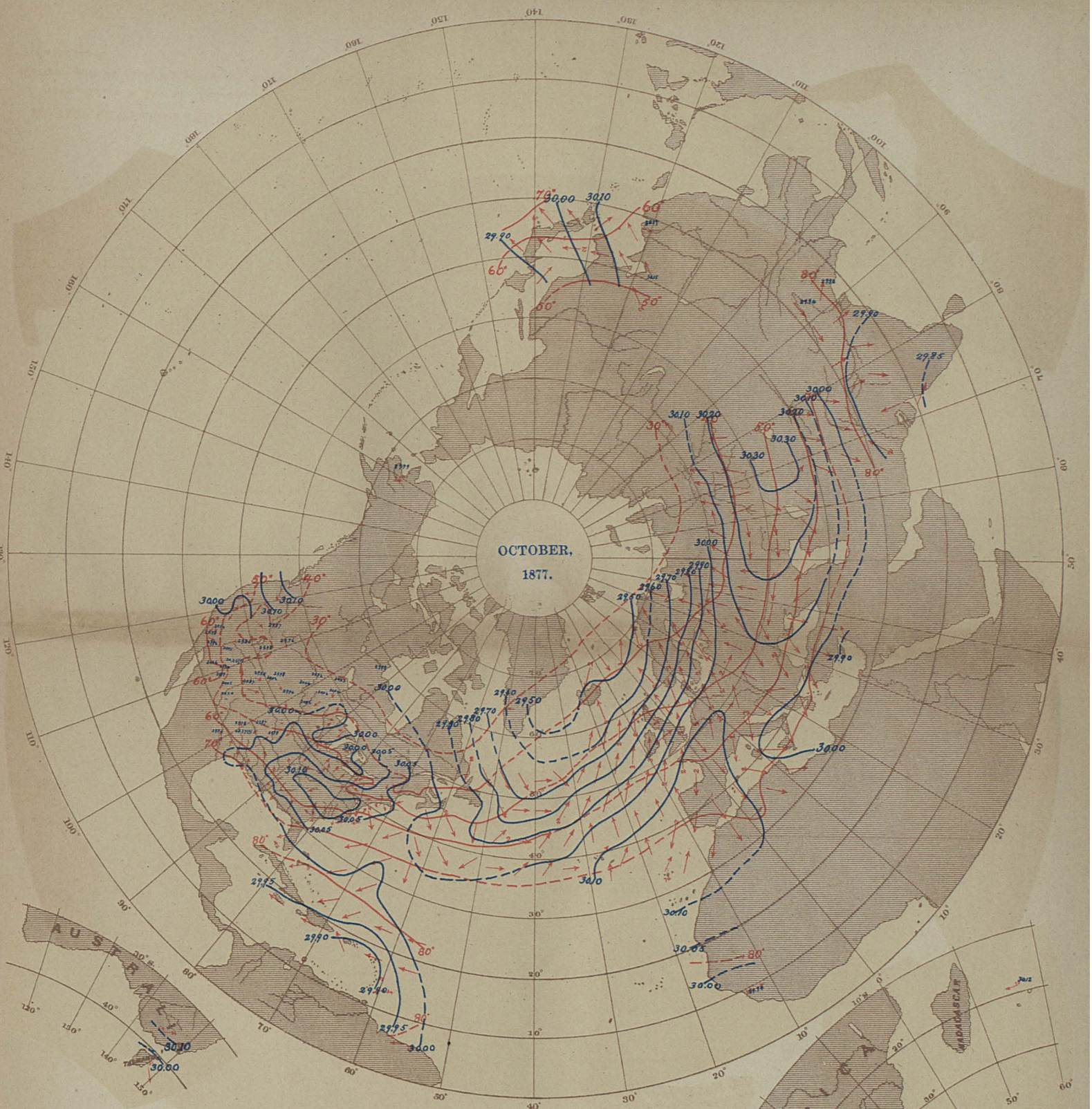
INTERNATIONAL MONTHLY CHART,

Showing mean pressure, mean temperature, mean force and prevailing direction of winds at 7:35 A. M., Washington mean time, for the month of October, 1877, based on the daily charts of the International Bulletin.



ISOBARS, ISOTHERMS AND PREVAILING WINDS.

NOTE.—Lines in *blue* are Isobars; lines in *red* are Isotherms. Arrows show the prevailing direction of, and fly with, the wind.

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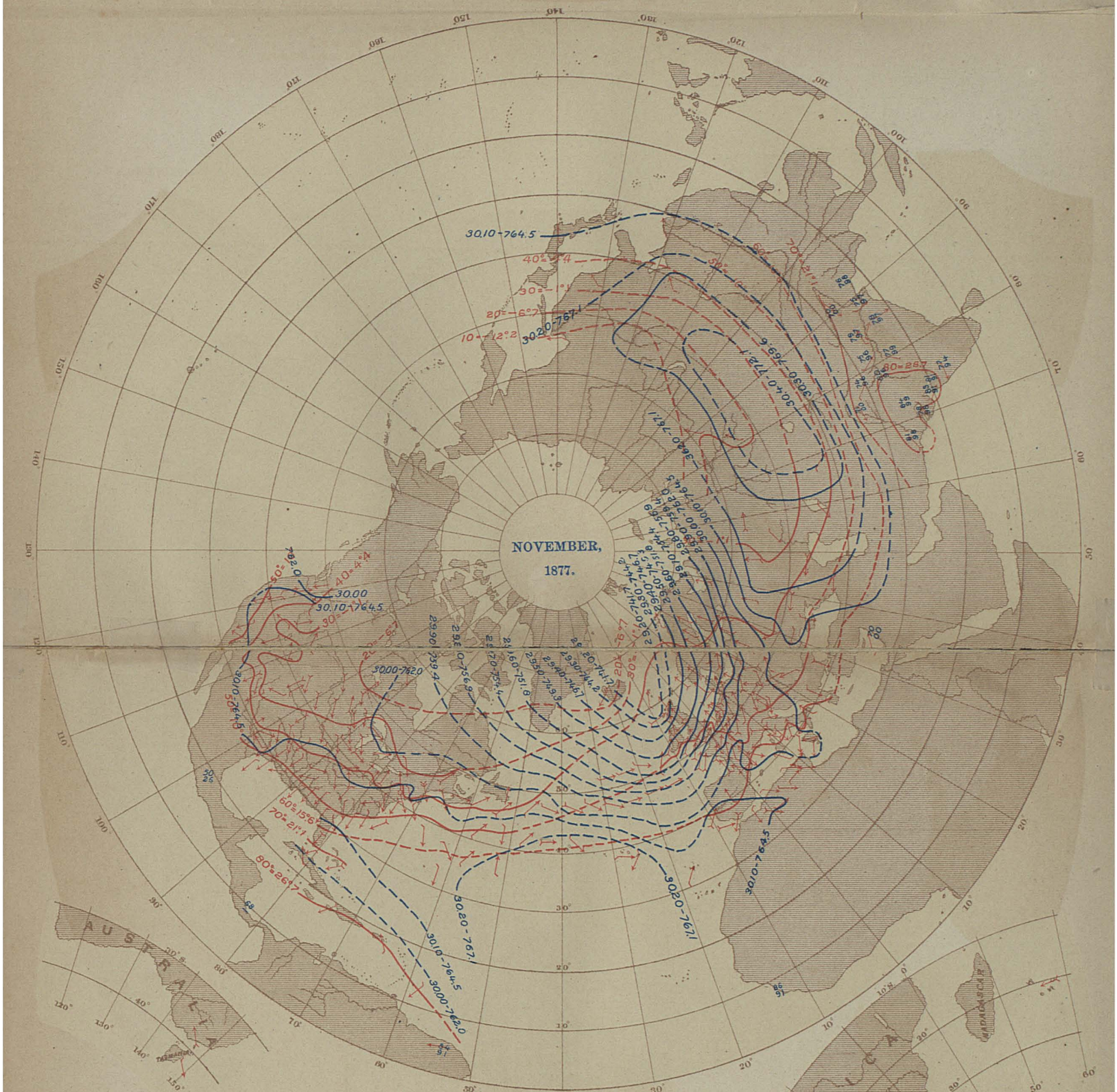

PREVAILING WINDS.

Arrows shows the direction of, and fly with, the wind. Force is shown as follows:

Symbols.	Force.	Velocity.	
		Miles per hour.	Metres per second.
	1, 2	0 to 9	0 to 4.0
	3, 4	9.1 to 22.5	4.1 to 10.1
	5, 6	22.6 to 40.5	10.1 to 18.1
	7, 8	40.6 to 67.5	18.1 to 30.2
	9, 10	67.6 up	30.2 & over.

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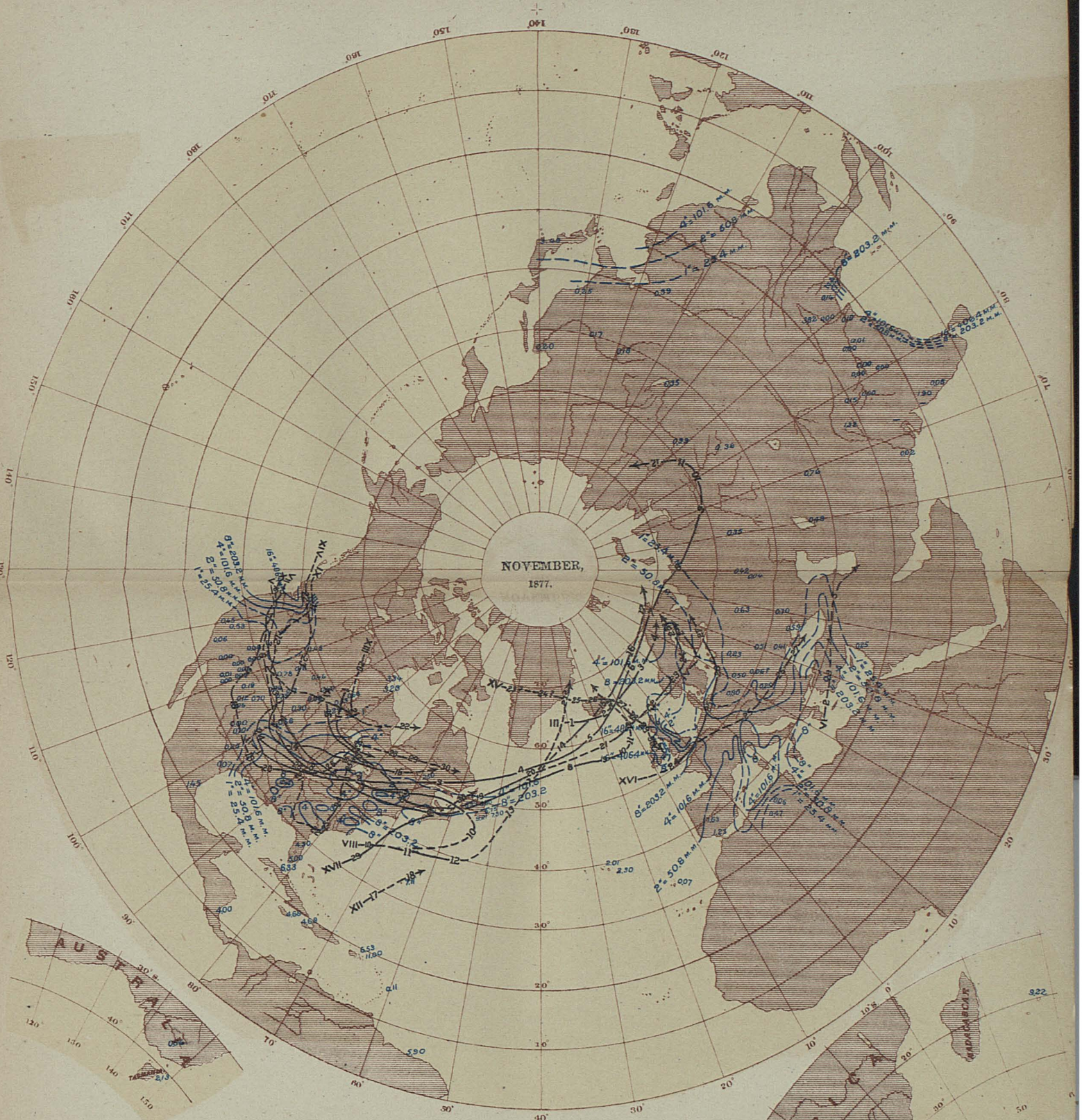
INTERNATIONAL CHART.

Showing Tracks of Centres of Low Barometer, and Precipitation Lines, for November, 1877.



Storm-tracks in *Black*. The Arabic numerals show location of the centres of Low Barometer, at 7:35 A. M., Washington mean time, of that date.

Lines of equal precipitation in *Blue*. The rain-fall is expressed in English inches at isolated stations, where the lack of reports does not admit of continuous lines.

Broken or dotted lines, are doubtful.

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CHART No. IV.

INTERNATIONAL METEOROLOGY--OCEAN STORM-TRACKS.

Broken or dotted lines indicate that the lines so broken are doubtful.

Arrows, when charted, fly with the wind and exhibit wind-direction.

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INTERNATIONAL METEOROLOGY—OCEAN STORM-TRACKS.

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BRIG. GEN. (BVT. ASSG'D) CHIEF SIGNAL OFFICER U. S. A.

Broken or dotted lines indicate that the lines so broken are doubtful.

Arrows, when charted, fly with the wind and exhibit wind-direction.

The tracks charted in black have appeared in previous *Reviews*.

The tracks charted in red have been made from data collected since preceding *Review*.

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INDEX TO STORM-TRACKS

Atlantic Ocean.

No. I, from Nov. 23rd to Nov. 25th, 1878.
II, from Dec. 26th to Jan. 2nd, 1879.
III, from Jan. 1st to Jan. 3rd, 1879.
IV, from Jan. 1st to Jan. 11th, 1879.
V, from Jan. 8th to Jan. 9th, 1879.
VI, from Jan. 6th to Jan. 15th, 1879.
VII, from Jan. 14th to Jan. 16th, 1879.

Pacific Ocean.

I, from Dec. 19th to Dec. 24th, 1878.

INTERNATIONAL METEOROLOGY—OCEAN STORM-TRACKS.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

Albert J. Myer

BRIG. GEN. (BVT ASSG'D) CHIEF SIGNAL OFFICER, U. S. A.

Broken or dotted lines indicate that the lines so broken are doubtful.

Arrows, when charted, fly with the wind and exhibit wind-direction.

The tracks charted in black have appeared in previous *Reviews*.

The tracks charted in red have been made from data collected since preceding *Review*.

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WINDS, IN MILES PER HOUR, ACCOMPANYING THE STORMS.

American Coast.	*European Coast.*
No. I, 16th, N., 35;	20th, SE., 50 to 60.
	(22nd, SW., 70 to 80, Algerian.)
II, 16th, W., 40 to 50;	18th, SE. to SW., 40 to 50.
IV, 23rd, NW., 30 to 35;	26th, SW., 40 to 50.
VII, 31st, NW., 40 to 50;	5th to 8th, S. to W., 50 to 60.
VIII, 5th, W., 30 to 40;	10th to 12th, SW. to NW., 50 to 60.

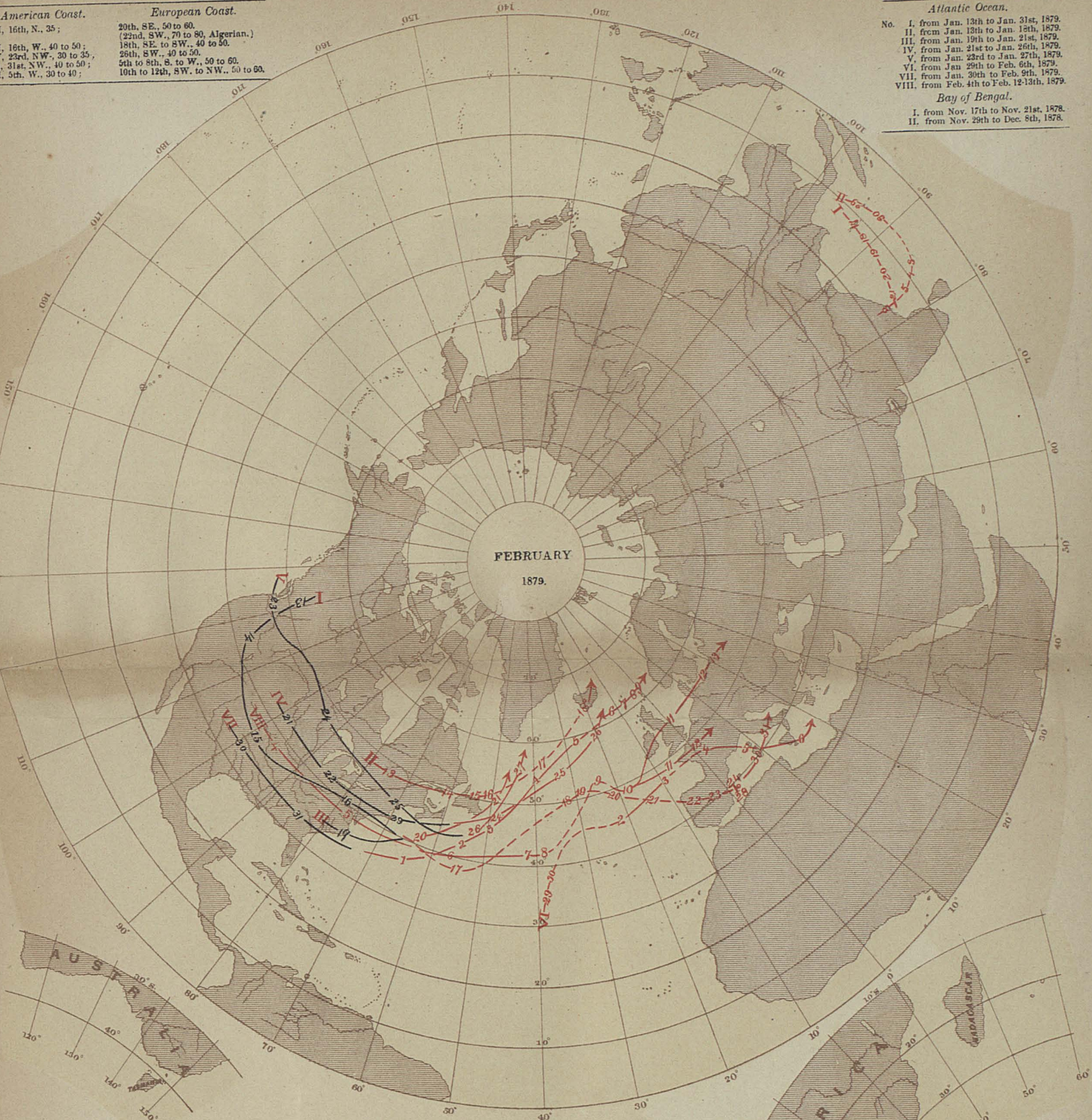
INDEX TO STORM-TRACKS

Atlantic Ocean.

No. I, from Jan. 13th to Jan. 31st, 1879.
II, from Jan. 13th to Jan. 18th, 1879.
III, from Jan. 19th to Jan. 21st, 1879.
IV, from Jan. 21st to Jan. 26th, 1879.
V, from Jan. 23rd to Jan. 27th, 1879.
VI, from Jan 29th to Feb. 6th, 1879.
VII, from Jan. 30th to Feb. 9th, 1879.
VIII, from Feb. 4th to Feb. 12-13th, 1879.

Bay of Bengal.

I, from Nov. 17th to Nov. 21st, 1878.
II, from Nov. 29th to Dec. 8th, 1878.



INTERNATIONAL METEOROLOGY—OCEAN STORM-TRACKS.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

Albert J. Myer

BRIG. GEN. (BVT. ASSG'D) CHIEF SIGNAL OFFICER, U. S. A.

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WINDS ACCOMPANYING THE STORMS.

	American Coast.				European Coast.			
	Date.	Direction.	Miles per Hour.	Meters per Second.	Date.	Direction.	Miles per Hour.	Meters per Second.
No. I.	Feb. 10th..	NW	30 to 45	13.4 to 20.1	Feb. 17–18th.	E and NW	*70 to 99	31.3 to 44.3
II.	12th..	SW	35 to 55	15.6 to 24.6	21–22nd.	E and W'ly	*70 to 99	31 3 to 44.3
III.*	21st ..	NW	40 to 56	17.9 to 25.0	March 2nd ..	SW	*45 to 75	20.1 to 33.5

* Estimated from a scale of 0 to 10.

INDEX TO STORM-TRACKS

Atlantic Ocean.

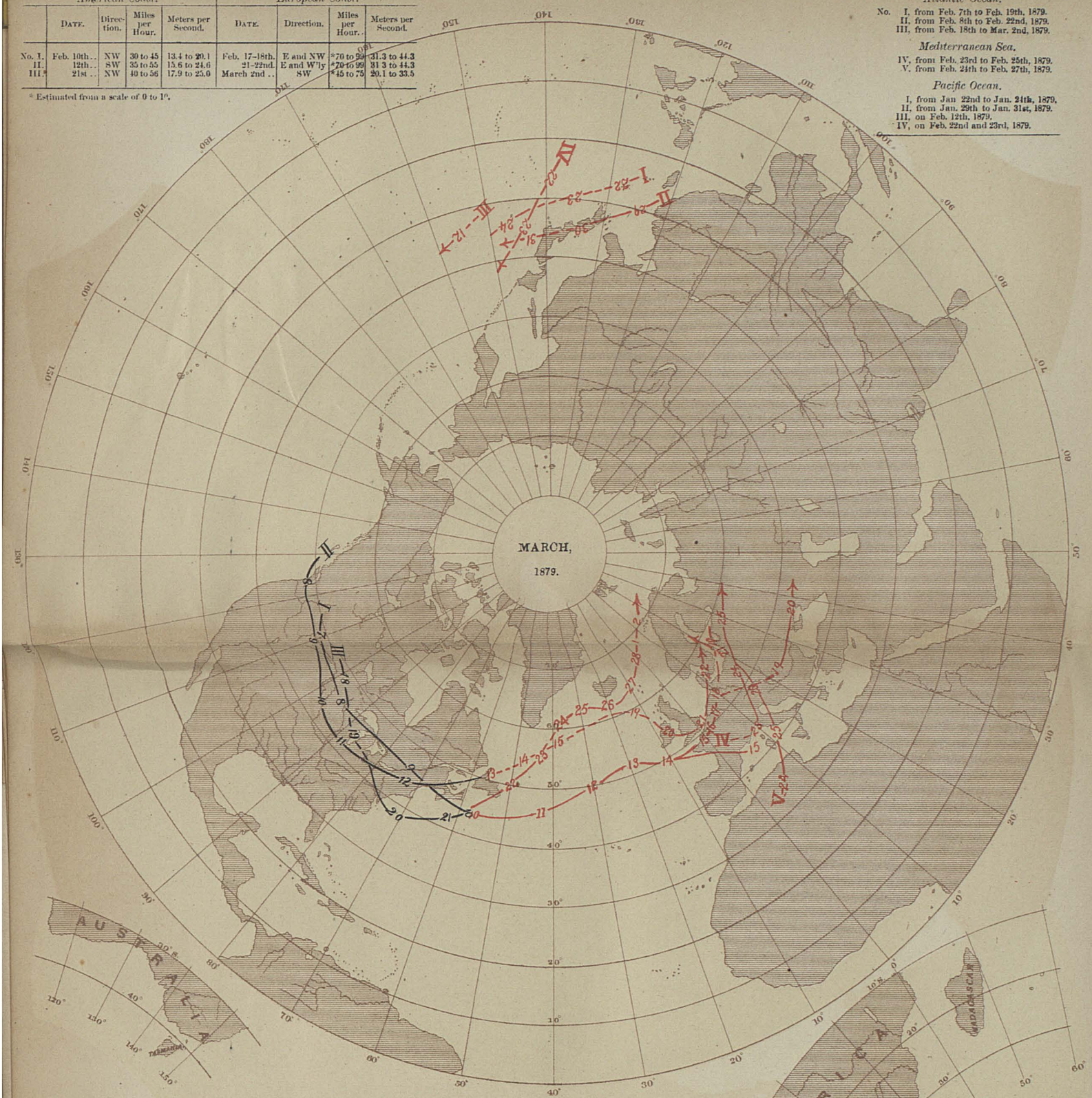
No. I, from Feb. 7th to Feb. 19th, 1879.
II, from Feb. 8th to Feb. 22nd, 1879.
III, from Feb. 18th to Mar. 2nd, 1879.

Mediterranean Sea.

IV, from Feb. 23rd to Feb. 25th, 1879.
V, from Feb. 24th to Feb. 27th, 1879.

Pacific Ocean.

I, from Jan 22nd to Jan. 24th, 1879.
II, from Jan. 29th to Jan. 31st, 1879.
III, on Feb. 12th, 1879.
IV, on Feb. 22nd and 23rd, 1879.



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WINDS ACCOMPANYING THE STORMS.

	American Coast.				European Coast.			
	Date.	Direction.	Miles per Hour.	Meters per Second.	Date.	Direction.	Miles per Hour.	Meters per Second.
No. I.	Mch. 2nd..	NE	.....	.....	Mch. 4–5th..	SSW–WSW	*50 to 90	22.4 to 40.2
III.	.....	.....	.....	.....	10–11th	SW to NW	*50 to 90	22.4 to 40.2
IV.	11–12th	W and NW	30 to 45	13.4 to 20.1	15–22nd	SW and NE	*40 to 70	17.9 to 31.2
V.	15th..	W and NW	30	13.4	18th...	SW and E	*30 to 40	13.4 to 17.9
VII	21st..	SW and SE	30	13 4	26, 27th	E'ly and SW	*50 to 75	22.4 to 33.5
VIII	25th..	SW	20	8 9	29, 30th	SW and SE	*50 to 75	22.4 to 33.5
X	31s...	N'ly	35 to 80	15.6 to 35.8	6th, 7th	SW to SE	*40 to 80	17.9 to 35.9

* Estimated from a scale of 0 to 9.

INDEX TO STORM-TRACKS

Atlantic Ocean.

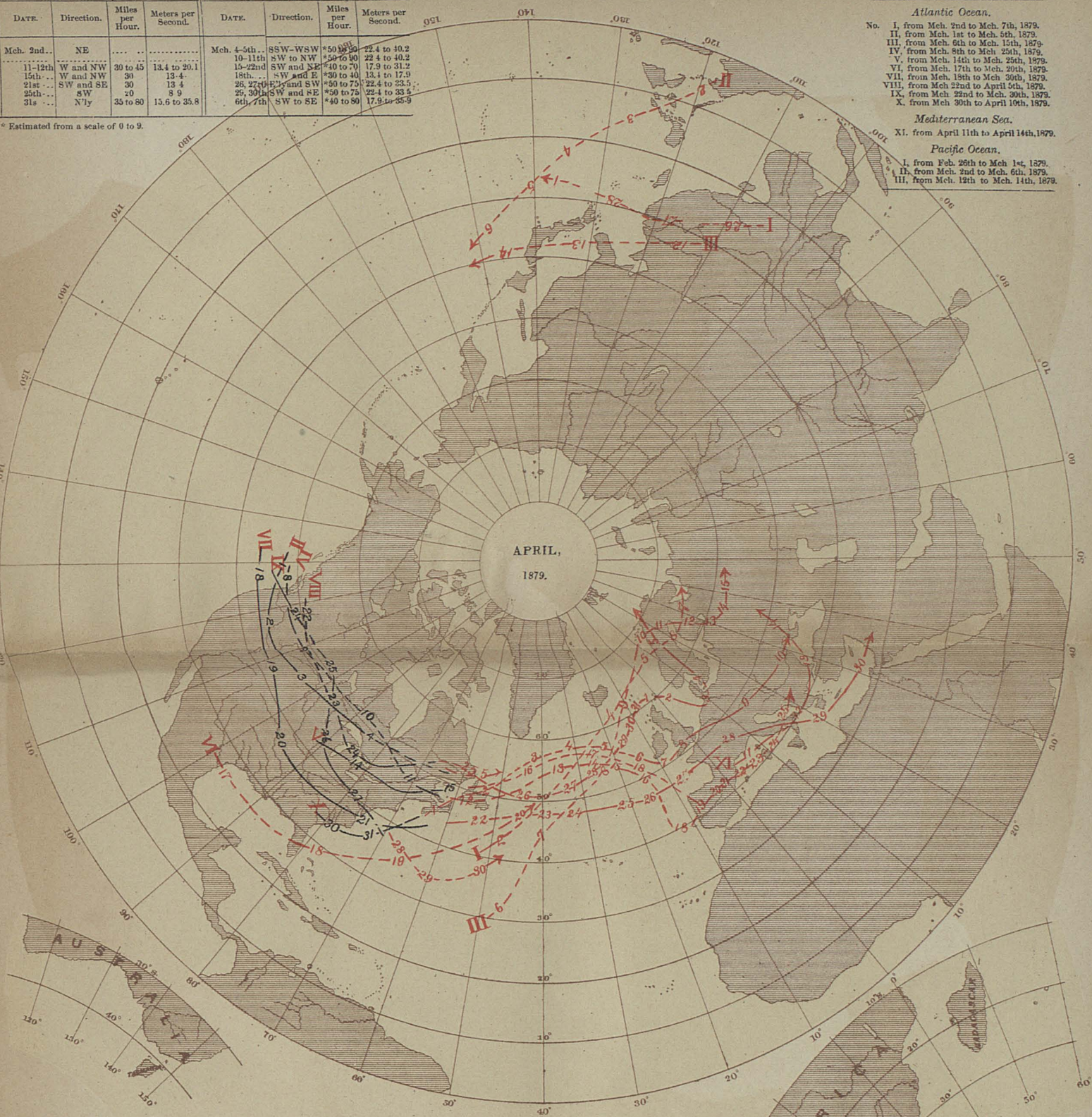
No. I, from Mch. 2nd to Mch. 7th, 1879.
II, from Mch. 1st to Mch. 5th, 1879.
III, from Mch. 6th to Mch. 15th, 1879.
IV, from Mch. 8th to Mch. 25th, 1879.
V, from Mch. 14th to Mch. 25th, 1879.
VI, from Mch. 17th to Mch. 20th, 1879.
VII, from Mch. 18th to Mch. 30th, 1879.
VIII, from Mch. 22nd to April 5th, 1879.
IX, from Mch. 22nd to Mch. 30th, 1879.
X, from Mch. 30th to April 10th, 1879.

Mediterranean Sea.

XI. from April 11th to April 14th, 1879.

Pacific Ocean.

I, from Feb. 26th to Mch. 1st, 1879.
II, from Mch. 2nd to Mch. 6th, 1879.
III, from Mch. 12th to Mch. 14th, 1879.



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WINDS ACCOMPANYING THE ATLANTIC STORMS.

American Coast.					European Coast.			
	Date.	Direction.	Miles per Hour.	Meters per Second.	Date.	Direction.	Miles per Hour.	Meters per Second.
No. I.	April 3rd..	NW	45 to 62	20.1 to 27.7	April 4th.....	SW to SE	*40 to 80	17.9 to 35.8
III.	8th..	SW	45	20.1	13 to 15th	NE and S'ly	*40to 100	17.9 to 44.8
IV.	11th..	NE and SE	28 to 56	12.5 to 25.0	19 & 20th	SE and E	*60 to 80	26.8 to 35.8
VI.	18th..	NW and NE	33 to 50	14.8 to 22.4	23rd.....	E'ly & W'ly	*10 to 40	4.5 to 17.9

* Estimated from a scale of 0 to 9.

CHART No. IV.

INDEX TO STORM-TRACKS

Atlantic Ocean.

No. I, from April 2nd to April 10th, 1879.
II, on April 7th and April 8th, 1879.
III, from April 7th to April 17th, 1879.
IV, from April 7th to April 23rd, 1879.
VI, from April 14th to April 24th, 1879.
VII, from April 23rd to April 29th, 1879.

Mediterranean Sea.

V, from April 16th to April 20th, 1879.

Pacific Ocean.

I, from February 4th to 6th, 1879.
II, on February 9th, 1879.
III, on February 25th, 1879.
IV, on March 3rd, 1879.
V, from March 15th to 22nd, 1879.
VI, March 29th and 30th, 1879.
VII, March 30th and April 1st, 1879.
VIII, April, 4th, 1879.

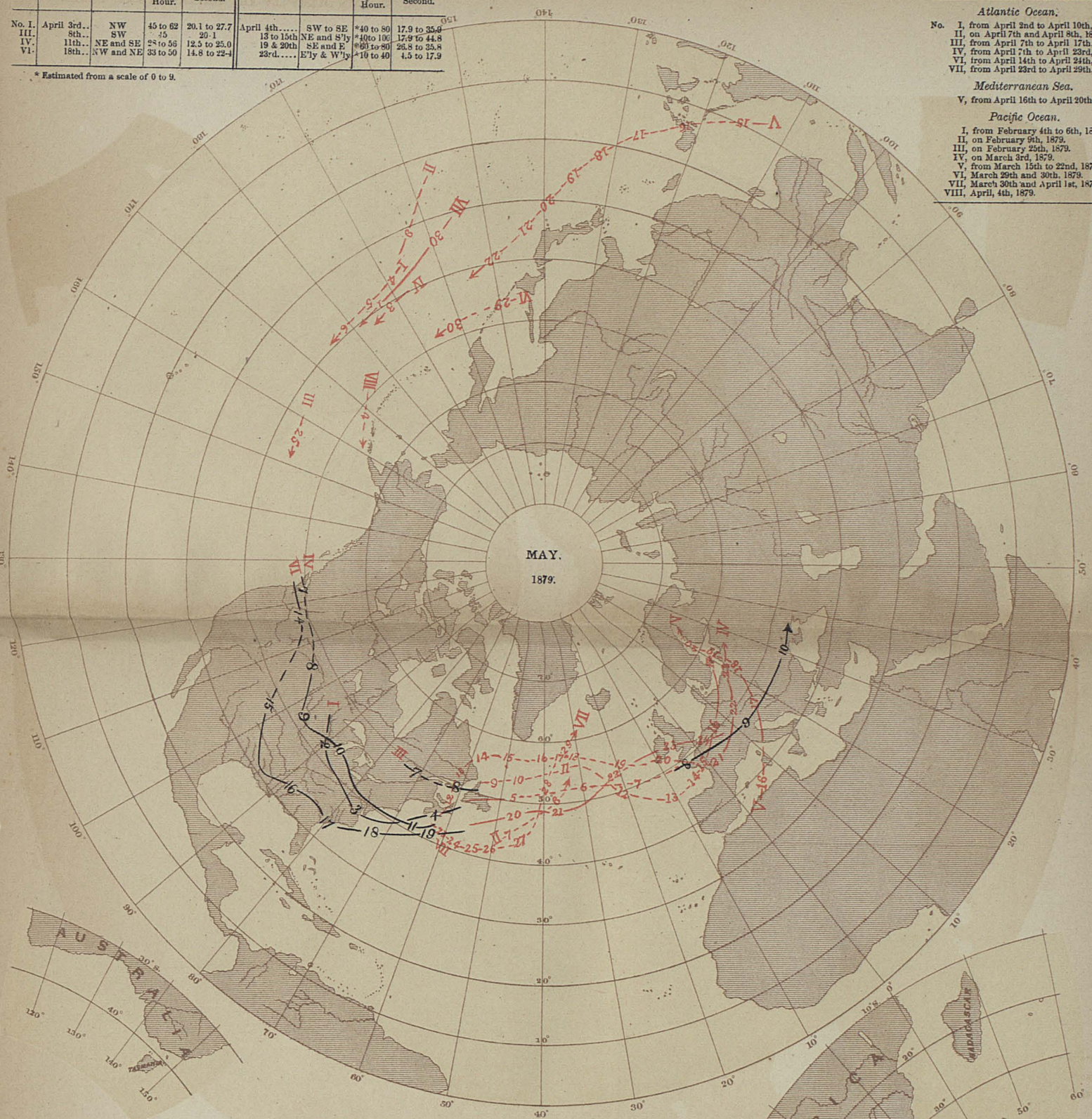

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CHART No. IV.

INDEX TO STORM-TRACKS

Atlantic Ocean & Mediterranean Sea

No. I, from April 23rd to May 1st, 1879.
II, from May 1st to May 5th, 1879.
III, from May 7th to May 12th, 1879.
IV, from M y 16th to May 20th, 1879.
V, from May 21st to May 27th, 1879.
VI, from May 22nd to May 27th, 1879.
VII, from May 24th to June 1st, 1879.

Pacific Ocean.

I, from March 28th to April 3d, 1879.
II, from April 4th to April 7th, 1879.
III, on April 9th and 10th, 1879.
IV, from April 15th to April 21st, 1879.
V, from April 17th to April 21st, 1879.

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Bulletin of international meteorological observations, taken simultaneously on March 1, 1879.

7.35 a. m., Washington mean time.
2.12 a. m., Honolulu mean time.
6.7 a. m., Mexico mean time.
7.7 a. m., San Jose mean time.
7.25 a. m., Toronto mean time.
9.2 a. m., Paramaribo mean time.
0.5 p. m., Lisbon mean time.
0.28 p. m., Madrid mean time.
0.43 p. m., Greenwich mean time.
0.53 p. m., Paris mean time.
1.1 p. m., Brussels mean time.
1.4 p. m., Utrecht mean time.
1.13 p. m., Berne mean time.
1.26 p. m., Christiania mean time.
1.2[illegible] p. m., Copenhagen mean time.
1.3[illegible] m., Rome mean time.
1.37 p. m., Berlin mean time.
1.49 p. m., Vienna mean time.
1.55 p. m., Stockholm mean time.
1.57 p. m., Cape of Good Hope mean time.
2.18 p. m., Athens mean time.
2.39 p. m., Constantinople mean time.
2.44 p. m., St. Petersburg mean time.
4.33 p. m., Mauritius mean time.
6.36 p. m., Calcutta mean time.
8.49 p. m., Zi-ka-wei mean time.
10.2 p. m., Tokei (Yeddo) mean time.
10.23 p. m., Melbourne mean time.

ALGERIAN SERIES.

[Furnished by the co-operation of General Maritz, Commandant Supérieur du Génie in Algeria.]

Stations.	Barometer. Corrected for instrumental error and temperature. Inches.	Barometer. Corrected for instrumental error and temperature. Millimeters.	Barometer. Reduced to sea-level. Inches.	Barometer. Reduced to sea-level. Millimeters.	Temperature of the air. Fahrenheit.	Temperature of the air. Centigrade.	Relative humidity. Per cent.	Wind. Direction. From—	Wind. Velocity. Miles per hour.	Wind. Velocity. Meters per second.	Clouds. Force. 0—10.	Clouds. Amount. Upper. 0—10.	Clouds. Amount. Lower. 0—10.	Clouds. Direction. Upper. From—	Clouds. Direction. Lower. From—	Rain-fall or melted snow in the past 24 hours. Inches.	Rain-fall or melted snow in the past 24 hours. Millimeters.	Weather.	Observer.
Mogador, Morocco			30.03	762.8	56.5	13.6	64	W.			1		5			0	0	Cloudy	
Nemours			30.08	763.9	57.9	14.4	60	WNW.			1		2			0	0	Fair	Kesxuche.
Algiers			30.06	763.5	57.6	14.2	65	WSW.			3		0			0	0	Clear	Tourilliere.
La Calle			30.08	763.9	55.9	13.3	82	W.			3		5			0.354	9.0	Cloudy	Foufrede.
Tunis			30.05	763.2	54.9	12.7	59	NNW.			5		10			0.232	5.9	Rainy	Jacques.
Sfax			30.11	764.7															Gau.
Saida			30.02	762.4	51.8	11.0	19	S.			4		2			0	0	Fair	Herbin.
Tebessa			30.11	764.8	44.1	6.7	49	W.			2		8			0.043	1.1	Very cloudy	Watrin.
Geriville			29.97	761.3	45.5	7.5	97	N.			3		0			0	0	Clear	Brugniaux.
Laghouat			30.06	763.5	52.2	11.2	30	E.			3		0			0	0	Clear	Bertrand.
Biskra			30.10	764.4	65.3	18.5	27	NNW.			1		2			0	0	Fair	Chanvaux.

NOTE.—In the originals the amount of cloudiness is given by the scale 0–4. Distinction between upper and lower clouds is not made. The weather is published as given. The rain-fall is measured at 7 a. m., local time. The elevation of Saida is 890? meters, or 2,919.9? feet; Tebessa, 1,088? m., or 3,569.4? feet; Geriville, 1,360? m., or 4,461.7? feet.

Bulletin of international meteorological observations, taken simultaneously on March 1, 1879—Continued.

AUSTRIAN SERIES.

[Furnished by the co-operation of Professor Dr. Julius Hann, Director of the Imperial and Royal Central Meteorological Institute at Vienna.]

Stations.	Barometer. Corrected for instrumental error and temperature. Inches.	Barometer. Corrected for instrumental error and temperature. Millimeters.	Barometer. Reduced to sea-level. Inches.	Barometer. Reduced to sea-level. Millimeters.	Temperature of the air. Fahrenheit.	Temperature of the air. Centigrade.	Relative humidity. Per cent.	Wind. Direction. From—	Wind. Velocity. Miles per hour.	Wind. Velocity. Meters per second.	Wind. Force. 0—10.	Clouds. Amount. Upper. 0—10.	Clouds. Amount. Lower. 0—10.	Clouds. Direction. Upper. From—	Clouds. Direction. Lower. From—	Rain-fall or melted snow in the past 24 hours. Inches.	Rain-fall or melted snow in the past 24 hours. Millimeters.	Weather.	Observer.
Agram	29.30	744.3	29.86	758.5	43.3	6.3	70	SW.			3		8			0	0		Prof. Ivan Stozir.
Cracow, I. R. Observatory	29.11	739.3	29.91	759.6	31.6	— 0.2	96	W.			2		10			0.020	0.5		Dr. Wierzbiski.
Eperies	28.88	733.6	29.78	756.5	38.1	3.4	73	N.			1		10s.			0	0		Julius Mikolik.
Gratz	28.63	727.3	29.91	759.7	41.0	5.0	68	S.			3		6			0	0		Andreas Rospini.
Hermanstadt	28.30	718.7	29.72	755.0	48.7	9.3	51	NW.			1		10			0.065	1.65	Raining	Prof. A. Gottschling.
Kremsmünster	28.62	726.9	30.02	762.4	34.0	1.1	68	NW.			3		10			0.055	1.4		Prof. C. Wagner.
Lemberg	28.75	730.3	29.78	756.3	32.7	0.4	90	NE.			1		10			0.303	7.7		Dr. T. Stanecki.
Pola	29.80	757.0	29.92	759.9	47.7	8.7	72	WNW.			2		6			0.260	6.6		I. R. Hydrographic Office.
Szathmar	29.31	744.5	29.78	756.5	42.8	6.0	85	SW.			3		10			0.331	8.4		Julius Csics, S. J.
Szegedin																			Karl Stancel.
Trieste	29.80	757.0	29.91	759.6	48.2	9.0	80	W.			1		4			0	0	Fair	P. Busin.
Vienna	29.19	741.5	29.89	759.3	36.9	2.7	63	W.			4		8			0	0		I. R. Central Met. Obs'y.

NOTE.—The originals occasionally give the weather by the Vienna symbols or in general terms, but it is not always certain that they refer to the amount of observation. The distinction between upper and lower clouds is not made. At Lemberg the rain-fall is measured at 7 p. m., local time; at Trieste at 7 a. m. of the following day. The elevation of Gratz is 357 meters or 1,171 feet; Hermannstadt, 411.6 m. or 1,350.4 feet; Kremsmünster, 383.6 m. or 1,258.5 feet. At Eperies the observations have been taken at 2.0 instead of 2.8 p. m.; Gratz at 2.0 instead of 1.45 p. m., local time.

BELGIAN SERIES.

[Furnished by the co-operation of J. C. Houzeau, Director of the Royal Observatory at Brussels.]

Arlon																			Prof. M. Passau.
Brussels																			Royal Observatory.
Furnes																			M. E. de Cae.
Maeseyck																			M. Pierrot.

NOTE.—The originals occasionally give the weather by the Vienna symbols. Except for Brussels, the distinction between upper and lower clouds is not made. The elevation of Arlon is 418 meters or 1,371.4 feet. At Arlon the observations have been taken at 1.0 instead of 1.6 p. m.; Furnes, 1.0 instead of 0.54 p. m. Maeseyck, 1.0 instead of 1.6 p. m., local time.

BRITISH SERIES.

[Furnished by the co-operation of Robert H. Scott, esq., F. R. S., Secretary of the Meteorological Council, London. Alexander Buchan, M. A., F. R. S. E., Secretary of the Scottish Meteorological Society, Edinburgh, and the respective observers.]

Aberdeen	29.85	758.2	29.95	760.7	38.6	3.7		SW.	10	4.5			3			0	0	Blue sky	W. Boswell.
Ardrossan	30.02	762.5	30.03	762.8															William McNeil.
Armagh, Observatory			30.11	764.8	42.9	6.1		SW.	7	3.1			3					D. clouds	S. Call.
Bidston (Liverpool Obs'y)			30.09	764.3	40.7	4.8		WNW.	9	4.0			1					Blue sky	John Hartnup.
Bolton (Sharples)			30.06	763.5	32.8	0.4		NNW.					0					Foggy	Thomas Mackereth.
Bradford (Yorkshire)	29.63	752.6	30.03	762.8	42.1	5.6		NW.			1		4			0.15	3.8	D. clouds	J. McLandsborough.
Bridgetown (Barbados)	29.90	759.4	29.92	760.0	80	26.7		NE.			2		3					D. clouds	Pvt. G. Surgener, A. H. C.
Cambridge, Observatory			30.04	763.0	46.9	8.3		N.			1		7					D. clouds	H. Todd.
Cardington			30.01	762.2	47.0	8.3		N.			1		3					D. clouds	John McLaren.
Chatham, School M. E	29.92	760.0	30.06	763.5	41.1	5.1		Calm			0		9					Overcast	Corpl. Daly, R. E.
Dartmoor	28.43	722.1	29.94	760.5	39.0	3.9		NW.			3		5					D. clouds	Alexander Watt.
Donaghadee	30.03	762.8	30.07	763.8	44	6.7		WNW.			2		0					Blue sky	J. MacGowan.
Dover	30.01	762.2	30.03	762.8	42	5.6		N.			4		7					Misty	J. Costello.
Falmouth, Observatory	29.90	759.4	30.14	765.5	45.0	7.2		NNE.			1		10					Overcast	The Staff.
Fort Napier (Natal)	27.46	697.5	29.78	756.4	80.4	26.9		E.			2		0					Blue sky	Pvt. G. Salmon, A. H. C.
Free Town (Sierra Leone)	29.62	752.3	29.85	758.2	88	31.1		E.			1		3					D. clouds	
Galway, Queen's College)			30.08	764.0	45	7.2		SSW.			1		9					Overcast	Prof. A. H. Curtis.
Gibraltar (Mediterranean)	30.00	762.0	30.05	763.3	58.2	14.6		E.			2		2					Blue sky	Sergt. Wm. Allen, A. H. C.
Glasgow, Observatory	29.80	756.9	30.00	762.0	41.1	5.1		WSW.			4							Blue sky	D. G. Maclean.
Great Yarmouth	30.04	762.2	30.02	762.5	42	5.6		N.			2		4					Misty	G. T. Watson.
Greenwich, Royal Obs'y	29.87	758.7	30.05	763.3	42.4	5.8		NE.			1		10					Overcast	The Staff, for G. B. Airy.
Guernsey	29.84	757.9	30.06	763.5	42	5.6		NNW.			1		8					D. clouds	Dr. S. E. Hoskins, F. R. S.
Helston	30.05	763.3	30.18	766.6	46	7.8		N.			2		4ck.			0.7	18	Fine	M. P. Moyle.
Holyhead	30.05	763.3	30.11	764.8	42	5.6		NNW.			2		2					Blue sky	John Tilston.
Jersey	29.79	756.7	30.09	764.3	42.2	5.7		NNW.			2		10					Misty	J. Fisher.
Kew, Observatory	30.01	762.2	30.05	763.3	44.0	6.7		N.	8	3.6			8					Misty	The Meteorological Of.
Leicester, Museum	29.80	756.9	30.06	766.5	44.9	7.2		NE.			1		1					D. clouds	Wm. J. Harrison, F. G. S.
Malta (Mediterranean)	29.86	758.4	29.94	760.5	63	17.2		NE.			2		8k.					D. clouds	Sergt. H. J. Beckett, A. H. C.
Nairn	29.77	756.1	29.86	758.4	42	5.6		WSW.			2		1					½ clouded	W. D. Penny.
Nassau (Bahamas)			30.17	766.3	69.0	20.6		NE.			5		10					Overcast	C. S. Duncombe.
Nottingham, Observatory	29.88	758.9	30.07	763.8	44.7	7.1		NNW.			2		2k.		NW.	0.048	1.22	Blue sky	E. J. Lowe, F. R. S.
Oscott, St. Mary's College	29.53	750.0	30.07	763.8	44.0	6.7		NW.			3		2					Blue sky	Rev. Stephen J. Whitty.
Oxford, Radcliffe Obs'y			30.05	763.3	47	8.3		NE.			1		2					Blue sky	H. E. Bellamy.
Plymouth	30.02	762.5	30.09	764.3	44.8	7.1		NNW.			2		10					Overcast	John Merrifield.
Roche's Point	30.10	764.5	30.15	765.8	43	6.1		NNW.			2		2					¼ clouded	W. Kennedy.
Saint Ann's Head	29.95	760.7	30.12	765.0	43	6.1		NNW.			1		2						John C. Walker.
Sandwick Manse (Orkneys)			29.78	756.4	37.1	2.8		SW.	19	8.5			10					Drizzling	Dr. Hoskins.
Scutari, Cemetery (Turkey)			29.68	753.9	63.0	17.2		ESE.			1		10					Gloomy	W. H. Lyne.
Sheffield	29.79	756.7	30.08	764.0	46.4	8.0		NW.			1		4			0	0	D. clouds	W. F. Cooper.
Silloth Rectory	30.02	762.5	30.05	763.3	47.3	8.5	81	NW.			5		0			0	0	Blue sky	Francis Redford, A. M.
Stonyhurst, Observatory	29.66	753.4	30.06	763.5	43.0	6.1		W.			2		3					Misty	Rev. S. J. Perry.
Stratfield Turgiss	29.83	757.7	30.06	763.5	44.8	7.1		N.			1		2					Blue sky	C. H. Griffith, F. M. S.
Thurso	29.75	755.6	29.82	757.4	39	3.9		SW.			3		10					Gloomy	John Trotter.
Truro, Royal Institution	30.04	763.0	30.12	765.0	49	9.4		NW.			6		6					D. clouds	W. Newcombe.
Valencia, Observatory	30.15	765.8	30.18	766.6	45.1	7.3		N.	7	3.1			4					D. clouds	The Meteorological Of.

Bulletin of international meteorological observations, taken simultaneously on March 1, 1879—Continued.

BRITISH SERIES—Continued.

Stations.	Barometer. Corrected for instrumental error and temperature.		Barometer. Reduced to sea-level.		Temperature of the air.		Relative humidity.	Wind. Direction.	Wind. Velocity.		Wind. Force.	Clouds. Amount. Upper.	Clouds. Amount. Lower.	Clouds. Direction. Upper.	Clouds. Direction. Lower.	Rain-fall or melted snow in the past 24 hours.		Weather.	Observer.
	Inches.	Millimeters.	Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second.	0—10.	0—10.	0—10.	From—	From—	Inches.	Millimeters.		
SUB-SERIES.																			
Cape of Good Hope, Obs'y	29.85	758.2	29.89	759.2	73	22.8	45	W.	29	13.0	....	10	9	.....	.....	0	0	Fine	The Staff, for D. Gill.
Hobart Town (Tasmania)	.....	.....	29.98	761.5	53.0	11.7	88	NW.	.....	.....	3	.....	7k.	.....	.....	0	0	Cloudy	Fr'ncis Abbott, F.R.A.S.
Leith, Restalrig Park	.....	.....	30.04	763.0	41.8	4.4	....	W.	.....	.....	2	.....	0	.....	.....	0	0	Fine	Andrew Gibb.
Mauritius, Observatory	29.77	756.1	29.96	761.0	81.0	27.2	62	NW.	6.0	2.7	...	.....	8	.....	ESE.	0	0	Cloudy	C. Meldrum.
Melbourne, Observatory	30.08	764.0	30.17	766.3	55.0	12.8	69	SE.	6	2.7	...	.....	4	.....	W.	0	0	Fine	R. L. J. Ellery.
Monach L. H. (Hebrides)	.....	.....	29.87	758.7	45	7.2	....	SW.	.....	.....	6	.....	10	.....	.....	0.2	5	.....	J. Youngclause.
North Unst (Shetland Il'ds)	.....	.....	29.50	749.3	34	1.1	....	SW.	.....	.....	6	.....	10	.....	.....	.....	.....	Raining	Robert Burnet.

NOTE.—Generally the originals do not give the relative humidity, rain-fall, or distinction between upper and lower clouds. They give the wind direction to 32 points; the weather by the Beaufort notation; the barometer for Cardington, Galway, Oxford, Sandwick, Leith, Monach, and North Unst, as read off; Freetown reduced to freezing, but not to sea-level. Amount of cloudiness for Holyhead by the scale 0 to 4. The wind-force is given by the scale 0 to 12 in the official series; 0 to 6 in the sub-series; except in pounds per square foot for Greenwich and Hobart Town. The rain-fall is measured at Aberdeen (following day) at 10 a. m.; Bradford, 9 a. m.; Helston, 9 a. m.; Hobart Town, 7.30 a. m.; Nottingham, 6 p. m.; Mauritius, 9 a. m., local time; Sheffield (following day), 8 a. m. The elevation of Dartmoor is 1,400 feet, or 426.7 meters; Fort Napier, 2,200 feet, or 670.6 meters.

BRITISH MARINE SERIES. *Vessels.*																Sea or swell. Height scale 0–9.	Sea or swell. Direction from—		
H. M. S. Fawn, N. 35° 54′, E. 14° 30′.	.....	.....	29.91	759.7	61	16.1	....	W.	.....	.....	2	.....	.....	.....	.....	.....	.....	D. clouds	Capt. W. J. L. Wharton.
Brig Alliance, N. 20° 34′, W. 37° 06′.	.....	.....	30.11	764.8	68.5	20.3	....	ENE.	.....	.....	6	.....	9	.....	.....	.....	.....	Showery	Capt. W. Scott.

S. S. Amanda, N. 11° 06′, E. 64° 10′.			29.92	760.0	81	27.2		NE.			4		5					D. clouds	Capt. B. Boyes.
Bark Belle Isle, N. 22° 20′, W. 85° 00′.			30.17	766.3	75	23.9		NE.			6		8			6	NE.	D. clouds	Capt. A. J. Brown.
Ship British Commodore, N. 44° 00′, W. 29° 25′.			30.61	777.5	53	11.7		NNE.			4		8			4	NE.	D. clouds	Capt. J. W. Thorne.
Bark City of Agra, S. 6° 27′, W. 26° 16′.			29.94	760.5	82	27.2		E.			4		2					Blue sky	Capt. Thomas Young.
Bark Commewyne, N. 10° 10′, W. 55° 40′.			29.96	761.0	82	27.2		ENE.			5		3					D. clouds	Capt. A. Buchan.
—— Denbighshire, S. 50° 22′, W. 13° 20′.			30.20	767.1	48	8.9		N.			3		5					Showery	Capt. H. Murdoch.
Bark Fedalina																			Capt. H. L. Fox.
Bark Mertole, N. 39° 08′, W. 14° 09′.			30.03	762.8	54.3	12.4		ENE.			7		10					Gloomy	Capt. E. W. Turner.
S. S. Nizam																			Captain Barlow.
S. S. Strathleven, N. 7° 15′, E. 83° 07′.			29.77	756.1	81	27.2		Calm			0		8					D. clouds	Capt. C. W. Pearson.
S. S. Wyberton, N. 6° 23′, E. 77° 58′.			29.84	757.9	84	28.7		W.			1		5					D. clouds	Capt. W. R. McMontry.

NOTE.—The originals give the wind direction to 32 points; the force by the Beaufort scale, 0 to 12; the distinction between upper and lower clouds is made as to direction, but not as to amount; the height of sea-disturbance by the scale 0 to 9; weather by the Beaufort notation. The barometers and thermometers used by these observers have been generally carefully compared and corrected. ; Reduced to sea-level; corrections applied at this office.

COSTA RICA SERIES.

[By authority of the Minister of Foreign Affairs. Furnished by the co-operation of Senor Federico Maison, Director of the Central Office of Statistics and Meteorology.]

Punta Arenas																			Mr. Ansart
San José	26.29	667.8	30.01	762.2	62.2	16.8	87	SE.			1	6cs				0	0		Federico Maison.

NOTE.—In the originals, the barometer is given as read off; its instrumental error is not known; it is reduced to sea-level by the use of a constant 3.72 inches. The distinction between the upper and lower clouds is not always made. The rain-fall is apparently measured at following midnight, and, in the originals, given in Spanish inches. The weather is published as given. The elevation of San José is 1,145 meters, or 3,756.4 feet.

DANISH SERIES.

[Furnished by the co-operation of Captain N. Hoffmeyer, Director of the Royal Danish Meteorological Institute at Copenhagen.]

Copenhagen	29.70	754.3	29.74	755.5	33.1	0.6	90	WSW.			2		10					Snowing
Faröe	29.81	757.1	29.83	757.6	35.6	2.0	89	W.			4		1					Foggy
Godthaab (Greenland)	29.40	746.8	29.45	747.9	11.1	—11.6	97	NNW.			4		10					Snowing
Stykkisholm (Iceland)																			
Thorshavn (Faröe)	29.29	744.0	29.33	744.9	42.4	5.8	93	SW.			6		10					Raining
Vestervig	29.58	751.3	29.75	755.6	34.9	1.6	96	E.			0		10					

NOTE.—The originals give the wind-force by the scale 0 to 6; occasionally, weather by the Vienna symbols, but it is not certain that they always refer to the moment of observation. No distinction between the amount of upper and lower clouds; they omit the cloud direction and rain-fall.

Bulletin of international meteorological observations, taken simultaneously on March 1, 1879—Continued.

FRENCH SERIES.

[Furnished by the co-operation of the Central Meteorological Bureau of France, Prof. E. Mascart, Director, and the respective observers.]

Stations.	Barometer. Corrected for instrumental error and temperature. Inches.	Barometer. Corrected for instrumental error and temperature. Millimeters.	Barometer. Reduced to sea-level. Inches.	Barometer. Reduced to sea-level. Millimeters.	Temperature of the air. Fahrenheit.	Temperature of the air. Centigrade.	Relative humidity. Per cent.	Wind. Direction. From—	Wind. Velocity. Miles per hour.	Wind. Velocity. Meters per second.	Wind. Force. 0—10.	Clouds. Amount. Upper. 0—10.	Clouds. Amount. Lower. 0—10.	Clouds. Direction. Upper. From—	Clouds. Direction. Lower. From—	Rain-fall or melted snow in the past 24 hours. Inches.	Rain-fall or melted snow in the past 24 hours. Millimeters.	Weather.	Observer.
Alençon, Normal School	29.51	749.4	30.06	763.4	45.7	7.6	94	SW.			1		10			0.063	1.6	Covered	Colignon, Director.
Amiens, Normal School	29.80	756.8	29.91	759.7	44.2	6.8	94	WSW.			1		10			0	0	Covered	Bonvallet, Director.
Avignon, Normal School	29.92	759.9	30.00	761.9	53.2	11.8	46	NNE.			2		0			0	0	Very clear	M. Girand, Director.
Bar-sur-Seine	29.50	749.4	30.08	764.0	41.9	5.5	77	S.			1		10			0	0	Covered	C. Saillard, Director.
Beauvais, Normal School	29.74	755.5	30.04	762.9	45.5	7.5	87	SW.			1		10			0	0	Covered	Frere E. Marie, Dir.
Besançon, Normal School	29.17	740.8	30.09	764.2	41.9	5.5	76	S.			2		5		S.	0	0	Cloudy	A. Carré, Director.
Bourg-en-Bresse, N. School	29.23	742.4	30.15	765.8	46.2	7.9	89	N.			1		2k	N.	N.	0	0	Slightly cl'dy	M. Marlot, Director.
Bourges, Normal School	29.48	748.8	30.08	764.0	43.3	6.3	88	SW.			4		10	SW.	SW.	0	0	ered	A. Waquet, Director.
Brest, Naval Observatory	29.81	757.2	30.06	763.4	50.0	10.0	66	N.			2		7		N.	0.108	2.75		M. de Kermaree, Dir.
Carcassonne, Normal School	29.68	753.8	30.10	764.5	52.9	11.6	55	W.			3		5	NW.	NW.	0.16	4	Cloudy	September, Director.
Caen, Normal School	29.97	761.2	30.04	763.1	43.5	6.4	88	W.			1		10			0.173	4.4	Covered	M. Lair, Director.
Chartres, Normal School	29.42	747.2	29.97	761.3	42.4	5.8	69	SSE.			1		10		W.	0.04	1	Covered	M. Vergier, Director.
Châlons-sur-Marne, N. Sch'l	29.69	754.1	30.02	762.4	43.0	6.1	85	SW.			2		8	SW.	SW.	0	0	Very cloudy	M. Jadot, Director.
Clermont-Fd., Puy de D. Obs	28.58	725.9	29.95	760.7	48.7	9.3	66	SSE.			1		10		W.			Showery	Alluard, Director.
Commercy, Normal School	29.17	741.1	30.06	763.5	39.0	3.9	87	SW.			1		10			0	0	Covered	Dr. Coulet, Director.
Commune de Gréasque*	28.84	732.6	29.98	761.6	46.9	8.3	40	NW.			2		5		NW.	0	0	½ covered	M. Kina, Director
Grenoble, Normal School	29.32	744.6	30.11	764.8	38.5	3.6	70	NNW.			1		2cs		N.	0	0	Slightly cl'dy	M. Ablard, Director.
La Roche-sur-Yon, N. Sch'l	29.90	759.4	30.12	765.0	48.6	9.2	63	WNW.			1		5		NW.	0.197	5.0	Cloudy	Mouillot, Director.
Le Mans, Normal School	29.75	755.6	30.06	763.6	46.2	7.9	80	NW.			2		10			0.030	0.75	Covered	Poirrier, Director.
Lons-Le-Saulnier, N. School	29.16	740.6	30.14	765.5	43.3	6.3	74	W.			2		10		NE.	0	0	Lightly cov'd	Baudry, Director.
Lorient, Naval Observatory	30.00	761.9	30.10	764.4	49.6	9.8	73	NNW.			3			NW.	SW.	0	0		Lt. T. Carré, Director.
Mâcon, Normal School																			M. Galzin, Director.
Mirecourt, Normal School	28.97	735.8	30.07	763.7	38.8	3.8	80	NE.			1		n		SW.	0	0		M. Barbier, Director.
Nismes, Normal School	29.78	756.3	29.98	761.5	57.2	1.4	39	NW.			3		5		NW.	0	0	Cloudy	Boyer, Director.
Privas, Normal School	28.90	734.0	29.99	761.8	45.7	7.6	83	N.			1		cn	N.	N.	0	0		M. Cantier, Director.
Puy de Dome (Summit) Obs	25.08	636.9			36.3	2.4	93	W.			2			W.		0	0	Foggy	Alluard, Director.
Rochefort, Naval Obs'y	30.07	763.8	30.10	764.6	49.1	9.5	87	NNW.			1		8	NNW.	NNW.	0	0	¾ covered	Lt. Decante, Director.
Rouen, Normal School	29.93	760.3	30.02	762.5	46.8	8.2	87	NW.			1		10			0.106	2.7	Covered	Frere Lucard, Director.

Saint Malo (Port), Obs'y	30.04	763.1	30.07	763.8	44.2	6.8	83	NNW.			2		8	NW.	NW.	0.248	7.30	Very cloudy	Lt. Hercouet, Director.
Saint Maur, (near Paris)	29.87	758.6	30.03	762.8	45.3	7.4	91	S.			1					0.024	0.6		E. Renou, Director.
Tarbes, Normal School	28.92	734.5	30.02	762.4	48.2	9	61	W.			2		0			0	0	Clear	T. Huguet, Director.
Versailles, Observatory	29.53	750.0	30.02	762.5	44.1	6.7		SW.			1		10			0.004	0.10	Foggy	Dr. A. Bérigny, Director.
Villefranche-sur-Saone, N. S	29.39	746.5	30.13	765.2	41.5	5.3	84	SE.			1		5	NW.	NW.	0	0	Cloudy	M. Nicot, Director.
SUB-SERIES.																			
Fort de France, Martinique	29.90	759.5	29.93	760.2	75.6	24.2										0.20	5.		L'Abbé Marchési.
Lyons Obs'y (Park Station)	29.44	747.8	30.07	763.7	45.0	7.2	52	NNE.			1		3s			0	0		Mr. Jays.
Marseilles, Observatory																			The Staff.
Mont-Louis	24.84	630.8	30.15	765.8	40.1	4.5	67	SW.	16.8	7.5			2		W.	0	0		M. Cave.
Nice			29.96	760.9	52.2	11.2	57	W.			2		0			0	0	Clear	Dr. A. Niepce, jr.
Paris, Montsouris Obs'y	29.74	755.5			45.9	7.7	90	S.			2		10			0.004	0.1		Marié Davy, Director.
Perpignan	29.95	760.7	30.06	763.4	52.9	11.6	59	NW.	26.2	11.7			5		NW.	0.047	1.2		Dr. Fines.
Pic du Midi (summit), H. P																			M. Baylac.
Pic du Midi (plantade), H. P	22.41	569.1			30.0	— 1.1		N.			1		1			0	0	Clear	General de Nansouty.
Toulouse, Observatory	29.40	746.7	30.13	765.2	50.0	10.0	74	W.			3		8			0	0		M. Mercadier Julier.
Tours	29.85	758.1	30.04	763.1	45.6	7.6	83	WNW.			1		10		W.	0.063	1.6		Cousin-Marquet.
Zi-Ka-Wei (near Shanghai)	30.35	771.0	30.38	771.7	33.4	0.8	80	N.	9.4	4.2			10			0	0	Covered	Marc Dechevrens, S. J.

NOTE.—Generally, the originals give the wind-force by the scale 0 to 7; no distinction between upper and lower clouds, and in the official series, the amount in general terms, except Clermont-Ferrand and Greasque, on the scale 0 to 4, and Brest on the scale 0 to 10; Mirecourt apparently gives cloud direction towards instead of from; the rainfall as measured at 7, 8, or 9 a. m., except St. Maur 10 p. m., local time; at Clermont-Ferrand, 9 a. m. of the following day; the weather in general terms as published; at Saint Maur the observations have been taken at 1.00 instead of 0.53 p. m., local time. The elevation of Clermont-Ferrand is 388 meters, or 1,272.9 feet; Commune de Grèasque, 322 m., or 1,056.4 feet; Puy de Dome (summit), 1,467 m., or 4,812.8 feet; Tarbes 308 m., or 1,010 feet; Mont Louis, 1,586.40 m., or 5,204.8 feet; Pic du Midi (summit), 2,877 m., or 9,439.1 feet; Pic du Midi (Plantade), 2,366 m., or 7,762.1 feet. In correcting the Mont-Louis barometric observations for altitude the constant 135 millimeters has been added. * Bouches-du-Rhône.

GERMAN SERIES.

(Furnished by the co-operation of Professor Dr. G. Neumayer, Director of the German Naval Observatory, Hamburg.)

Bamberg	29.13	739.9	29.97	761.3	37.9	3.3	82	SW.			3		6	W.		0.039	1.0	Snowing	Prof. Du Hoh.
Berlin	29.74	755.4	29.92	760.0	32.9	0.5	76	S.			1		7					Rain & snow	Prof. Arndt.
Breslau	29.39	746.5	29.92	759.9	28.2	— 2.1	75	W.			2		10			0.126	3.20		Royal University Obs'y.
Carlsruhe	29.61	752.0	30.05	763.3	36.7	2.0	58	SW.			3		5	N.		0	0		Albert Senz.
Cassel	29.30	744.2	29.90	759.5	33.4	0.8	84	SW.			5		10	SW.		0.037	0.94	Snowing	Dr. H. Möhl.
Crefeld	29.79	756.6	29.95	760.7	39.2	4.0	88	SW.			2		9			0	0		Director Lose.
Emden																			Prof. Prestel.
Frankfort on the Main	29.67	753.5	30.04	763.6	36.1	2.3		WSW.			0		10			Inap.	Inap.		Physical Society.
Friedrichshafen	28.61	726.6	30.00	762.0	33.8	1.0	59	SW.			1		3	SW.		0.028	0.7	Snowing	M. Wilhelm.
Hamburg	29.78	756.5	29.86	758.4	34.7	1.5	93	SW.			3		10			0.031	0.8	Foggy	Captain F. Hegemann.
Kiel	29.82	757.4	29.84	757.8	34.3	1.3	93	W.			2		10			0.048	1.22	Snowing	Prof. G. Karsten.
Königsberg (Prussia)	29.73	755.2	29.82	757.4	33.8	1.0	74	SE.			1		4			0.008	0.2		Prof. E. Luther.
Köslin			29.81	757.1	31.5	— 0.3		S.			2		4			0	0		H. Müller.
Leipsic, Observatory	29.52	749.7	29.95	760.8	35.2	1.8	85	SW.			2		10			0.051	1.3	Snowing	Prof. Bruhns, P. C.
Memel, Naval School	29.75	755.6	29.80	756.8	29.7	— 1.3	90	S.			1-2		2k					Hazy	Skalweit.
Neufahrwasser	29.80	756.9	29.82	757.3	34.5	1.4	83	Calm.			0		10			0.012	0.3		A. Lothes.
Posen	29.63	752.7	29.94	760.4	29.3	— 1.5	81	W.			2		2			0.008	0.2	Snowing	Dr. Magener.

Bulletin of international meteorological observations, taken simultaneously on March 1, 1879.—Continued.

GERMAN SERIES—Continued.

Stations.	Barometer. Corrected for instrumental error and temperature. Inches.	Barometer. Corrected for instrumental error and temperature. Millimeters.	Barometer. Reduced to sea-level. Inches.	Barometer. Reduced to sea-level. Millimeters.	Temperature of the air. Fahrenheit.	Temperature of the air. Centigrade.	Relative humidity. Per cent.	Wind. Direction. From—	Wind. Velocity. Miles per hour.	Wind. Velocity. Meters per second.	Wind. Force. 0—10.	Clouds. Amount. Upper. 0—10.	Clouds. Amount. Lower. 0—10.	Clouds. Direction. Upper. From—	Clouds. Direction. Lower. From—	Rain-fall or melted snow in the past 24 hours. Inches.	Rain-fall or melted snow in the past 24 hours. Millimeters.	Weather.	Observer.
Strassburg (in Alsace)	29.53	750.1	30.10	764.6	37.8	3.2	69	SSW.	.....	.....	3	.....	6	W.	.....	0	0	.....	Imp. University Obs'y.
Stuttgart	29.05	737.9	29.97	761.3	39.7	4.3	51	W.	.....	.....	1	.....	4	W.	.....	0.028	0.7	Light rain	Prof. Schoder.
Treves (Trier)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Prof. Flesch.
Weissenburg (Bavaria)	28.47	723.1	30.03	762.8	35.2	1.8	68	W.	9	4	.....	.....	8ck	.....	WNW.	0	0	Clearing	Dr. Van Bebber.
Wustrow, Naval School	29.79	756.7	29.82	757.3	30.4	— 0.9	98	WSW.	.....	.....	3	.....	10s	.....	.....	0	0	.....	E. Schütz, Director.

NOTE.—The elevation of Friedrichshafen is 413.3 meters, or 1,355.9 feet; Weissenburg, 427 m., or 1,400.9 feet. In the originals the distinction between the amount of upper and lower clouds is not made; the wind-force at Carlsruhe is given by the scale 0 to 4, and at Crefeld by the scale 0 to 12. It is not always certain that the rain-fall has been measured at, and the remarks in the weather column refer to, the moment of observation. At Königsberg the observations have been taken at 2.0 instead of 2.5 p. m.; Memel, 2.1 instead of 2.7 p. m.; Posen, 2.0 instead of 1.51 p. m., local time.

GREEK SERIES.

[Furnished by the co-operation of Professor Dr. J. F. Julius Schmidt, Director of the Royal Observatory at Athens.]

Athens	29.27	743.4	29.66	753.3	61.5	16.4	....	SW.	.....	.....	1.0	.....	.....	.....	.....	.....	.....	Covered	Dr. J. F. J. Schmidt.

NOTE.—The originals give the barometer reduced to freezing but not to sea-level; the weather as published; occasionally the kind of clouds; they omit the humidity, amount of cloudiness, and rain-fall.

INDIAN SERIES.

[Furnished by the co-operation of H. F. Blanford, Meteorological Reporter to the Government of India.]

Deesa	29.30	744.1	29.77	756.1	78.7	25.9	31	WSW.	8.7	3.9	....	.....	0	.....	.....	0	0	Blue sky	
Bombay	29.82	757.3	29.86	758.3	78.3	25.7	49	NW.	27	12.1	....	.....	0	.....	.....	0	0	Blue sky	
Lahore	28.86	733.1	29.61	752.0	75.4	24.1	35	E.	2.3	1.0	....	.....	6	.....	.....	0	0	Cloudy	

Belgaum	27.28	693.0	29.78	756.4	83.2	28.4	61	W.	15.0	6.7			1			0	0	
Roorkee	28.78	731.0	29.68	754.0	74.8	23.8	37	SW.	2.6	1.2			10			0	0	Gloomy
Agra	29.15	740.4	29.71	754.7	81.2	27.3	27	NE.					0			0	0	
Nagpur	28.71	729.3	29.74	755.4	86.6	30.3	29	Calm.	3.2	1.4						0	0	Blue sky
Lucknow	29.33	745.0	29.71	754.6	78.3	25.7	23	NNW.	3.5	1.6			0			0	0	Blue sky
Allahabad	29.42	747.2	29.73	755.1	81.3	27.4	34	NW.	4.7	2.1			0			0	0	Blue sky
Patna	29.52	749.8	29.70	754.4	78.9	26.1	52	W.	5.4	2.4			0			0	0	Blue sky
Hazaribagh	27.72	704.1	29.74	755.3	76.0	24.4	27	WNW.	11.3	5.0			0			0	0	Blue sky
Cuttack	29.68	753.8	29.76	755.8	83.3	28.5	41	WNW.	1.9	0.8						0	0	Blue sky
Calcutta (Alipore)	29.70	754.3	29.72	754.9	78.2	25.7	46	NNE.	2.0	0.9			0			0	0	Blue sky
Goalpara	29.29	744.0	29.68	753.9	74.4	23.6	51	ENE.	4.4	2.0			0			0	0	Blue sky
Chittagong	29.68	753.7	29.77	756.1	78.4	25.8	74	Calm.	4.8	2.2			0			0	0	Misty
Sibsagar	29.36	745.9	29.71	754.6	64.4	18.6	92	ENE.	2.0	0.9			10	W.	W.	0.01	0.3	Threatening
Jubbulpore	28.38	720.8	29.73	755.1	84.8	29.3	29	Calm.	2.9	1.3			0			0	0	Blue sky

NOTE.—The barometric observations refer to the Calcutta standard, which is believed to read 0.011 inch, or 0.28 mm. higher than the Kew standard. All conversions are published as given in the originals, where the data are recorded to an additional decimal; the weather by the Beaufort notation, Vienna symbols, or special symbols; the distinction between the amount of upper and lower clouds is apparently not made. The elevation of Nagpur is 1,025 feet, or 312.4 m.; Hazaribagh, 2,010 feet, or 612.6 m.; Jubbulpore, 1,351 feet, or 411.8 m. The velocity given is the average rate of wind since last observation.

ITALIAN SERIES.

[Furnished by the co-operation of His Excellency the Minister of Public Instruction, and the respective observers.]

Udine	29.52	749.8	29.94	760.5	47.1	8.4	42	S.	1.3	0.6			3			0	0	Prof. Giovanni Clodig.
Padua	29.43	747.5	29.96	761.0	44.6	7.0	46	WSW.			2		2			0	0	Prof. Dott. Lorenzoni.
Milan	29.84	757.8	29.95	760.7	46.2	7.9	67	NE.	1.3	0.6			6	N.		0	0	Prof. Schiaparelli.
Moncalieri	29.04	737.6	29.97	761.3	42.3	5.7	55	SE.	1.9	0.8			5	N.		0	0	Prof. P. F. Denza.
Mondovi	29.76	755.8	29.95	760.8	49.6	9.8	54	SW.	4.3	1.8			2			0	0	Prof. D. C. Bruno.
Genoa	28.01	711.4	29.97	761.2	39.7	4.3	41	NW.			2		3	N.		0	0	Prof. G. M. Garibaldi.
Florence	29.91	759.7	29.96	761.0	45.1	7.3	67	NW.	9.8	4.4			4			0	0	Cav. F. Meucci.
Leghorn	29.69	754.1	29.95	760.8	48.2	9.0	59	SW.			2		3	N.		0.016	0.4	Prof. P. Monte.
Pesaro	29.84	757.9	29.93	760.1	49.6	9.8	79	W.			4		3			0	0	Prof. Luigi Guidi.
Rome	29.74	755.4	29.92	760.0	51.3	10.7	55	N.	0.7	0.3			3			0.039	1.0	Prof. P. S. Ferrari.
Lecce	29.60	751.9	29.86	758.5	53.6	12.0	60	NNW.	6.3	2.8			5	N.		0	0	Prof. C. De Giorgi.
Cagliari	28.97	735.8	29.87	758.8	50.7	10.4	73	SE.	1.8	0.8			10			0.083	2.1	Prof. A. Pacinotti.
Cosenza	29.76	756.0	29.96	761.0	51.1	10.6	71	NW.			2		7	NW.		0.020	0.5	Prof. D. Conti.
Palermo	29.68	753.9	29.94	760.5	52.5	11.4	50	WNW.	2.5	5.6			7	WNW.		0.016	0.4	Prof. G. Cacciatore.
Syracuse	29.80	756.9	29.87	758.7	55.9	13.3	67	NW.	2.5	1.1			10	NW.		0	0	Prof. V. Giuliano.
SUP-SERIES.																		
Naples, S. R.	29.35	745.5	29.91	759.6	52.2	11.2	52	WSW.	2.5	1.1			2			0	0	Prof. F. Brioschi.

NOTE.—The originals give the wind-force by the scale 0 to 4, or the velocity in kilometers per hour; no distinction between the amount of upper and lower clouds, and only the direction of the upper; they omit the weather. The elevation of Bergamo is 379.6 m., or 1,245.3 ft.; Mondovi, 556 m., or 1,824.2 ft.; Urbino, 451 m., or 1,479.7 ft.

Bulletin of international meteorological observations taken simultaneously on March 1, 1878—Continued.

JAPANESE SERIES.

[Furnished by the co-operation of I. Arai, Director of the Imperial Meteorological Observatory at Tokei.]

Stations.	Barometer. Corrected for instrumental error and temperature. Inches.	Barometer. Corrected for instrumental error and temperature. Millimeters.	Barometer. Reduced to sea-level. Inches.	Barometer. Reduced to sea-level. Millimeters.	Temperature of the air. Fahrenheit.	Temperature of the air. Centigrade.	Relative humidity. Percent.	Wind. Direction. From—	Wind. Velocity. Miles per hour.	Wind. Velocity. Meters per second.	Wind. Force. 0—10.	Clouds. Amount. Upper. 0—10.	Clouds. Amount. Lower. 0—10.	Clouds. Direction. Upper. From—	Clouds. Direction. Lower. From—	Rain-fall or melted snow in the past 24 hours. Inches.	Rain-fall or melted snow in the past 24 hours. Millimeters.	Weather.	Observer.
Hiroshima, I. M. Obs'y	30.05	763.3	30.07	763.8	49.2	9.6	67	NNE.	6.5	2.9	.....	.....	2cs	.....	.....	0	0	Fair	K. Sasaki.
Nagasaki, I. M. Obs'y	29.92	759.9	30.13	765.3	43.1	6.2	76	N.	8.3	3.7	.....	.....	1cs	.....	.....	0	0	Clear	S. Takehayashi.
Tokei (Yeddo) Observatory	29.88	758.9	29.95	760.7	55.8	13.2	97	SSE.	3.0	1.3	.....	.....	10n	.....	.....	0.320	8.13	Light rain	The Staff.

NOTE.—The data are published as given. The rain-fall is measured at 9.30 a. m., local time. For Nagasaki and Hiroshima no distinction is made between the amount of upper and lower clouds. The conversions are published as given in the originals.

MEXICAN SERIES.

[By authority of the Secretary of Public Works. Furnished by the co-operation of Senor Mariano Bárcena, Director of the Central Meteorological Observatory in the city of Mexico, and the respective observers.]

Stations.	Barometer. Corrected for instrumental error and temperature. Inches.	Barometer. Corrected for instrumental error and temperature. Millimeters.	Barometer. Reduced to sea-level. Inches.	Barometer. Reduced to sea-level. Millimeters.	Temperature of the air. Fahrenheit.	Temperature of the air. Centigrade.	Relative humidity. Percent.	Wind. Direction. From—	Wind. Velocity. Miles per hour.	Wind. Velocity. Meters per second.	Wind. Force. 0—10.	Clouds. Amount. Upper. 0—10.	Clouds. Amount. Lower. 0—10.	Clouds. Direction. Upper. From—	Clouds. Direction. Lower. From—	Rain-fall or melted snow in the past 24 hours. Inches.	Rain-fall or melted snow in the past 24 hours. Millimeters.	Weather.	Observer.
Cuernavaca	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	P. Ceballos.
Guadalajara	25.15	638.7	30.25	768.4	44.2	6.8	53	Calm.	.....	.....	0	0	0	.....	.....	0	0	Clear	Prof. L. Perez.
Leon	24.50	622.3	30.15	765.9	52.0	11.1	65	S.	.....	.....	1	0	0	.....	.....	0	0	Blue sky	Prof. M. Leal.
Mexico, Central Obs'y	23.12	587.2	30.33	770.4	42.8	6.0	63	Calm.	0	0	.....	0	0	.....	.....	0	0	Fine	The Staff.
Pabellon (Aguascalientes)	.....	.....	.....	.....	46.4	8.0	72	Calm.	.....	.....	0	0	0	.....	.....	0	0	Clear	M. V. de Leon, M. E.
Tlacotalpam	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	M. M. Cházaro.
San Luis Potòsi	24.28	616.7	30.27	768.9	42.0	5.6	65	E.	.....	.....	1	0	0	.....	.....	0	0	Foggy	G. Barroeta, M. D.
Vera Cruz	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Prof. J. Rossell.
Zacatecas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	T. G. de la Cadena.
Puebla (Catholic Institute)	23.45	595.5	30.21	767.3	40.3	4.6	31	ESE.	0.4	0.2	.....	0	0	.....	.....	0	0	Clear	Prof. P. Spina.

Durango																				
Colima	28.42	721.9	30.10	764.4	70.9	21.6	63	NE.			1		1				0	0	Clear	M. V. de Leon, C. E.
San Juan E. Michapam																				R. Banda, C. E.
																				Antonio Guerray Guerra.

NOTE.—The elevation of Cuernavaca, 1,556.5 m., or 5,106.5 ft.; Guadalajara, 1,566.9 m., or 5,140.6 ft.; Leon, 1,774 m., or 5,820 ft.; Mexico, 2,265.8 m., or 7,433.5 ft.; Pabellon, 1,924.4 m., or 6,313.3 ft.; San Luis Potosi, 1,893 m., or 6,210.4 ft.; Zacatecas, 2,496 m., or 8,188.6 ft.; Puebla, Catholic Institute, 2,201 m., or 7,220.9 ft.; Durango, 1,870 m., or 6,135 ft.; Colima, 532 m., or 1,745.4 ft. The data are published as given, except the conversions, which have been revised; and the barometer at Mexico, which has been corrected for the instrumental error, —0.88 mm.

NETHERLANDS SERIES.

[Furnished by the co-operation of Professor Buys Ballot, Director of the Royal Meteorological Institute of the Netherlands at Utrecht.]

Flushing	30.00	761.9	30.00	761.9	39.9	4.4		W.								0.008	0.2			
Groningen	29.89	759.1	29.94	760.5	36.7	2.6		N.			2					0.063	1.6			
Helder	29.96	761.0	29.96	761.0	37.4	3.0		NW.			2					0	0			
Hellevoetsluis	29.97	761.2	29.97	761.2	37.9	3.3		NW.			1									
Utrecht	29.93	760.1	29.97	761.3	37.6	3.1		SSW.			2		10			0.016	0.4	Dull		H. v. d. Brink.

NOTE.—The originals give the wind-pressure in kilograms per square meter, except Hellevoetsluis, which gives force by scale 0 to 12; they do not give the humidity; for Utrecht, they give the weather as published, from which is inferred the amount of cloudiness by the scale 0 to 10, without distinguishing between upper and lower clouds.

NORWEGIAN SERIES.

[Furnished by the co-operation of Professor H. Mohn, Director of the Royal Norwegian Meteorological Institute at Christiania.]

Bergen	29.62	752.3	29.67	753.7	37.8	3.2	73	NW.	20.1	9.0			5			0.787	20.0	Rain & snow		
Brönö	29.41	746.9	29.45	747.9	37.4	3.0	71	SSW.	18	8			9			0.012	0.3			
Christiania	29.48	748.8	29.63	752.7	21.4	— 5.9	98	SW.	0	0			10			0	0	Light fog		
Tromsö	29.31	744.4	29.35	745.5	28.8	— 1.8	84	Calm.	0	0			10			0	0			

NOTE.—The originals give the amount of cloudiness without distinguishing between upper and lower clouds; occasionally, the weather by the Vienna symbols. The cloudiness and weather at Bergen refer to 2h., p. m., local time, instead of 1 h. 4 m.

PORTUGUESE SERIES.

[Furnished by the co-operation of J. C. de Brito Capello, Director of the Meteorological Observatory of the Infante Don Luiz at Lisbon.]

Angra (Azores)	30.31	769.8	30.50	774.8	53.6	12.0	70	NNE.	9.4	4.2			4			0	0			Dr. J. A. Sampaio.
Campo Major	29.07	738.4	30.11	764.9	51.8	11.0	50	E.	6.3	2.8			7	SE.		0	0			Dr. A. M. R. dos Santos.
Funchal (Madeira)	29.79	756.7	29.88	758.9	55.6	13.1	72	W.	3.1	1.4			7			0.150	3.8			Capt. D. A. de Cunha.
Lisbon, Observatory	29.75	755.7	30.12	765.0	51.1	10.6	71	ENE.	2.5	1.1			9			0	0			The Staff.
Ponta Delgada (Azores)	30.35	770.8	30.42	772.6	56.8	13.8	58	NE.	24.8	11.1			4			0.039	1.0			

NOTE.—The originals give the wind-velocity in kilometers for the hour preceding the observation; occasionally, the weather by the Vienna symbols; the amount of cloudiness without distinguishing between upper and lower clouds. The rain-fall at Lisbon is measured at noon instead of 0 h. 6 m., p. m.

Bulletin of international meteorological observations, taken simultaneously on March 1, 1879—Continued.

PORTUGUESE SERIES—Continued.

Stations.	Barometer. Corrected for instrumental error and temperature. Inches.	Barometer. Corrected for instrumental error and temperature. Millimeters.	Barometer. Reduced to sea-level. Inches.	Barometer. Reduced to sea-level. Millimeters.	Temperature of the air. Fahrenheit.	Temperature of the air. Centigrade.	Relative humidity. Per cent.	Wind. Direction. From—	Wind. Velocity. Miles per hour.	Wind. Velocity. Meters per second.	Wind. Force. 0—10.	Clouds. Amount. Upper. 0—10.	Clouds. Amount. Lower. 0—10.	Clouds. Direction. Upper. From—	Clouds. Direction. Lower. From—	Sea or swell. Height scale 0-9.	Sea or swell. Direction from—	Weather.	Observer.
PORTUGUESE NAVAL SERIES.																			
Vessels.																			
Bartholomew Dias																			A. G. da Silva Costa, Commandant.
D. Fernando																			A. M. de Sande, Com'd't.
India																			A. D. Pedroso, Com'd't.
Mindello																			J. F. R. R. Bastos, Commandant.
Quanza (Ajuda, Gulf of Guinea.)			29.90	759.4	83.3	28.5		WSW.			2		2		WSW.	2	W.	Blue sky	A. J. de Mattos, Com'd't.
Rio Douro																			J. T. d'Oliveria, Com'd't.
Rio Lima, Capt. S. C. da Silva Costa (Porto Praya, Cape Verde Islands.)			30.00	762.0	72.7	22.6		Var.			3		1		NE.	2	NE.	D; clouds	A. Ferreira, 2d Lieut.
Sá da Bandeira (St. Paul de Loando.)			29.74	755.3	86.0	30.0		WSW.			4		3					Blue sky	F. Teixeira da Silva, Commandant.
Sado																			L. Ribeiro de Costa, Commandant.
Tejo (Macao, China)			29.89	759.2	67.1	19.5		NE.			2		10			1		Overcast	J. M. T. Guimaraes, Commandant.

NOTE.—In the originals the weather is given by the Beaufort notation; not any distinction between the upper and lower clouds; not any humidity. The Sá da Bandeirà gives the barometer reduced to freezing, but not to sea-level.

RUSSIAN SERIES.

(Furnished by the co-operation of Professor H. Wild, Director of the Imperial Central Physical Observatory of Russia at St. Petersburg.)

																Rain-fall or melted snow in the past 24 hours.			
																Inches.	Millimeters.		
Warsaw	29.41	747.0	29.85	758.2	29.8	— 1.2	86	WSW.	11	5			10ks						Astronomical Obs.
Wilna	29.39	746.4	29.82	757.4	35.2	1.8	78	Calm.	0	0			10					Heavy cld's.	Astronomical Obs.
Dorpat	29.54	750.2	29.79	756.6	34.2	1.2	83	SW.	9	4			10n						Prof. Dr. Weihrauch.
St. Petersburg	29.71	754.5	29.72	754.9	34.0	1.1	98	S.	9	4			10n					Snow & fog.	Central Physical Obs.
Kieff	29.15	740.5	29.79	756.7	47.1	8.4	70	SE.	9	4			sc; ck; ks)						Physical Cabinet.
Nikolaiev	29.81	757.2	29.88	759.0	56.3	13.5	63	SSW.	7	3			10n						Kurdakof.
Kertch	29.95	760.6	29.97	761.1	52.9	11.6	80	SE.	4	2			4						Lagorio.
Moscow	29.43	747.4	30.00	762.0	29.8	— 1.2	96	SE.	9	4			10s						Meteorological Obs.
Lugan	29.72	754.9	29.92	760.0	58.3	14.6	53	SE.	4	2			3					Light clouds	Meteorological Obs.
Archangel	29.73	755.2	29.75	755.7	34.9	1.6	85	S.	18	8			9k						Capt. Sseliwerstow.
Tiflis	28.71	729.1	30.12	765.1	57.6	14.2	34	E.	9	4			6s						Physical Observatory.
Astrakhan	30.19	766.7	30.10	764.6	48.7	9.3	65	SE.	4	2			8s						Capt. Wisganow.
*Krotkowo	29.56	750.8	30.05	763.3	32.0	0.0	72	W.	2	1			10						Cand. Fatjanow.
Kasan	29.77	756.2	30.06	763.5	24.6	— 4.1	93	Calm.	0	0			10						Physical Cabinet.
Ekaterinburg	29.33	744.9	30.39	772.0	7.0	—13.9	83	E.	7	3			10					Snowing	Meteorological Obs.
Nukuss	30.16	766.1	30.40	772.2	44.2	6.8	19	SW.	4	2			1k						
Tashkend	28.75	730.2	30.54	775.7	39.4	4.1	50	NW.	9	4			0						Teich, A. M.
Barnaul	29.93	760.2	30.49	774.4	3.9	—15.6	66	Calm.	0	0			0						Meteorological Obs.
Yeniseisk	30.24	768.0	30.56	776.1	12.2	—11.0	79	NW.	2	1			10						Marks.
Peking (China)	30.21	767.3	30.35	770.9	26.8	— 2.9	40	Calm.	0	0			0						Physical Observatory.
Nertchinsk																			Meteorological Obs.
Vladivostock																			
Nikolaievsk, on the Amoor																			

NOTE.—The originals give the amount and generally the kind of cloudiness without distinguishing between upper and lower clouds; occasionally, the weather by the Vienna symbols; they omit the rain-fall. The elevation of Tiflis is 409 meters, or 1,341.8 feet; Tashkend, 455 ? m., or 1,492.7 ? ft.; Irkutsk, 461.5 m., or 1,514.1 ft.; Nertchinsk, 660 ? m., or 2,165.2 ? ft. *N. 53° 47′, E. 48° 34′.

SPANISH SERIES.

(Furnished by the co-operation of Antonio Aguilar, Director of the Royal Observatory at Madrid, and the respective Observers.)

Barcelona, Met. Observat'y.	29.92	760.0	30.03	762.7	52.7	11.5	60	SSE.	3.5	1.58			0					Clear	Antonio Rave, Director.
Bilbao, Met. Observatory	30.06	763.6	30.12	765.1	56.1	13.4	75	N.	1.2	0.58		1	8	NE.		0.098	2.5	Almost cov'd	Prof. Manuel de Naveran.
Burgos, Met. Observatory	27.09	688.1			47.5	8.6	72	SW.	3.2	1.42		0	8			0	0	Cloudy	Domingo Martin y Perez
Madrid, Royal Observatory	27.84	707.1			49.8	9.9	69	S.	3.0	1.33		4	0	NW.		0	0	Light clouds	The Staff.

Bulletin of international meteorological observations, taken simultaneously on March 1, 1879—Continued.

SPANISH SERIES—Continued.

Stations.	Barometer. Corrected for instrumental error and temperature. Inches.	Barometer. Corrected for instrumental error and temperature. Millimeters.	Barometer. Reduced to sea-level. Inches.	Barometer. Reduced to sea-level. Millimeters.	Temperature of the air. Fahrenheit.	Temperature of the air. Centigrade.	Relative humidity. Per cent.	Wind. Direction. From—	Wind. Velocity. Miles per hour.	Wind. Velocity. Meters per second.	Wind. Force. 0—10.	Clouds. Amount. Upper. 0—10.	Clouds. Amount. Lower. 0—10.	Clouds. Direction. Upper. From—	Clouds. Direction. Lower. From—	Rain-fall or melted snow in the past 24 hours. Inches.	Rain-fall or melted snow in the past 24 hours. Millimeters.	Weather.	Observer.
Murcia, Met. Observatory	29.93	760.1	30.08	763.9	64.9	18.3	48	SW.	2.2	1.00	....	0	0	.....	.....	0	0	Clear	Olayo Diaz, Director.
Santiago, Met. Observatory	29.16	740.6	30.08	764.0	44.1	6.7	81	NE.	9.8	4.4	...	.....	10	.....	.....	0.024	0.6	Misty	R. Gil Villanueva, Dir.
SUB-SERIES.																			
Havana, Cuba, W. I.	30.12	764.9	30.18	766.6	71.8	22.1	73	NNE.	11.2	5.0	....	0	6k	.....	ENE.	0	0	Fair	Benito Vines, S. J.
Manilla, Philippine Islands	29.76	756.0	29.81	757.3	82.4	28.0	80	ESE.	2.9	1.3	...	0	0	.....	.....	0	0	Fair	Federico Faura, S. J.
San Fernando, Naval Obs'y	29.98	761.4	30.08	764.0	57.4	14.1	43	ESE.	5.4	2.4	....	0	4	.....	SE.	0	0	.....	Capt. C. Pujazon, R. N., Director.
San Juan de Porto Rico, W. I.	29.92	759.9	30.01	762.2	75.6	24.2	87	Calm.	0	0	....	3c	1k	S.	S.	0.039	1.00	Clear	Leonardo de Tejeda, Chief Engineer.

NOTE.—The originals give the weather in general terms, as published; wind-velocity, except for sub-series, in kilometers per hour; rain-fall for San Juan is measured at 4 p. m., instead of 8.19 a. m., local time, and for San Fernando at midnight following; at Barcelona, Bilbao, Burgos, Madrid, Murcia, and Santiago the barometer reduced to freezing but not to sea-level. The elevation of Burgos is 860 meters, or 2,821.4 feet; Madrid, 655.5 m., 2,150.5 ft.

SWEDISH SERIES.

(Furnished by the co-operation of Prof. R. Rubenson, Director of the Royal Swedish Meteorological Institute, at Stockholm, and of Dr. H. H. Hildebrandsson, Director of the Meteorological Observatory of the Upsala University.

Haparanda	29.55	750.5	29.59	751.5	20.5	− 6.4	....	Calm.	.....	.....	0	.....	10	.....	.....	0	0	.....	
Umea	29.79	756.6	29.60	751.9	21.9	− 5.6	100	SW.	.....	.....	2	.....	10	.....	.....	0	0	.....	
Hernosand	29.53	750.1	29.58	751.4	20.1	− 6.6	95	SSW.	.....	.....	2	.....	10	.....	.....	0	0	.....	
Stockholm	29.47	748.4	29.64	752.9	31.1	− 0.5	83	SSW.	.....	.....	2	.....	10	.....	.....	0	0	.....	
Wisby	29.64	752.9	29.70	754.4	33.1	0.6	89	SW.	.....	.....	4	.....	3	.....	.....	0	0	.....	
SUB-SERIES.																			
Upsala	29.55	750.6	29.63	752.5	26.2	− 3.2	89	SSW.	7.2	3.2	....	.....	10	.....	.....	0.008	0.21	Snowing	Nils Ekholm.

NOTE.—The originals give the wind-force by the scale 0 to 6, except Upsala; occasionally, the weather by the Vienna symbols, or in general terms; no distinction between the amount of upper and lower clouds. The rain-fall is measured at 8 a. m., local time, and apparently on the following day.

SWISS SERIES.

[Furnished by the co-operation of Prof. R. Wolff, Director of the Observatory at Zurich, and of Professor E. Plantamour, Director of the Observatory at Geneva.

Geneva	28.62	726.9	30.10	764.5	36.3	2.4	58	N.	.....	.....	2	.....	3	.....	.....	0	0	Vapory	The Observatory.
Zurich	28.41	721.6	30.11	764.8	36.0	2.2	65	W.	.....	.....	2	.....	1	.....	.....	0	0	Clear	The Observatory.

NOTE.—At Geneva the corresponding departures from the normal values are: Barometer, +1.4 mm.; thermometer, −3.3 cent.; relative humidity, −7 per cent.

NOTE.—The rain-fall is measured at Zurich at 7 a. m. on the following day. The originals give the barometer reduced to freezing but not to sea-level; the wind-force by the scale 0 to 4 for Zurich; the amount of cloudiness without distinguishing between upper and lower clouds; the weather in general terms. The elevation of Geneva is 408 meters, or 1,339 feet, and that of Zurich 470 meters, or 1,542 feet.

TURKISH SERIES.

[Furnished by the co-operation of A. Coumbary, Effendi, Director of the Central Observatory at Constantinople, and of Professor C. V. A. Van Dyck, Superintendent of the Lee Observatory at Beirut.]

Constantinople	.....	.....	29.78	756.3	61.7	16.5	44	ESE.	7	3.0	.....	.....	10	.....	SW.	0.472	12.0	.....	The Observatory.
Fao, Persian Gulf	.....	.....	30.49	774.4	67.6	19.8	.....	NW.	.....	.....	1	.....	0	.....	.....	.....	.....	.....	
Valona	.....	.....	29.84	757.8	55.6	13.1	.....	NW.	.....	.....	2	.....	2	.....	.....	0	0	Slightly cld'y.	A. Bertrand.
SUB-SERIES.																			
Beirut (Syria), Lee Obs'y	29.88	758.9	30.00	761.9	72.0	22.2	58	NE.	.....	.....	1	.....	9c	.....	.....	0	0	D. clouds	Prof. C. V. A. Van Dyck.

NOTE.—The originals give the velocity at Constantinople in meters per second; at Valona the wind-force by the scale 0 to 7; at Beirut by the scale 0 to 12; the weather in general terms as published, except Beirut by the Beaufort notation; no distinction between upper and lower clouds, and at Valona the amount by the scale 0 to 4. Valona does not state that the barometer is reduced to sea-level, but it is so assumed.

CANADIAN SERIES.

[Furnished by the co-operation of Prof. G. T. Kingston, Director of the Magnetic Observatory at Toronto and Superintendent of the Meteorological Office of the Dominion of Canada, and the respective observers. Those marked with a star (*) are also telegraphed daily to the Office of the Chief Signal Officer, U. S. A.]

Bathurst, New Brunswick	30.65	778.5	30.72	780.3	1.5	−16.9	83	NW.	3	1.3	.....	.....	9n	.....	.....	0.50	12.7	Cloudy	Hon. J. Ferguson.
Brockville, Ontario	30.00	762.0	30.33	770.4	8	−13.3	.....	Calm.	0	0	.....	.....	10s	.....	E.	0.10	2.5	Cloudy	W. R. Bigg.
*Chatham, New Brunswick	30.77	781.5	30.84	783.3	−8	−22.2	92	Calm.	0	0	.....	5c	0	W.	.....	0	0	Fair	G. A. Blair.
Charlottetown, P. E. Island	30.81	782.6	30.85	783.6	8	−13.3	100	Calm.	0	0	..	0	2s	.....	Calm.	0	0	Fair	H. J. Cundall, C. E.
Cornwall, Ontario	30.13	765.3	30.35	770.9	−5.5	−20.8	100	SE.	.....	.....	2	.....	10n	.....	.....	0.05	1.3	Overcast	James Smith, M. A.
Dalhousie, New Brunswick	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	H. A. Johnson.
Esquimault, Br. Columbia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0	0	.....	W. H. Bevis.
*Father Point, Quebec	30.65	778.5	30.67	779.0	3	−16.1	66	SE.	10	4.5	.....	.....	10n	.....	.....	Inap.	Inap.	Light snow	J. McWilliams.
Fredericton, New Brunsw'k	30.76	781.3	30.83	783.1	−4.9	−20.5	100	Calm.	0	0	.....	5cs; ck.	0	W.	.....	0.16	4.1	Fair	Prof. Harrison.
*Fort Garry, Manitoba	29.59	751.6	30.57	776.5	−18	−27.8	100	W.	7	3.1	.....	0	0	.....	.....	0	0	Clear	James Stewart.
Granton, Ontaria	28.95	735.3	30.09	764.3	35	1.7	.....	S.	.....	.....	2	.....	10n	.....	.....	Inap.	Inap.	Overcast	James Grant.
*Halifax, Nova Scotia	30.62	777.7	30.78	781.8	7	−13.9	86	N.	1	0.4	.....	0	0	.....	.....	0	0	Clear	F. Allison, M. A.
Hamilton, Ontario	29.81	757.2	30.20	767.1	32.7	0.4	73	SW.	.....	.....	3	10cs	0	SW.	.....	0.04	1.0	Cloudy	Geo. Dickson, M. A.

Bulletin of international meteorological observations, taken simultaneously on March 1, 1879—Continued.

CANADIAN SERIES—Continued.

Stations.	Barometer. Corrected for instrumental error and temperature. Inches.	Barometer. Corrected for instrumental error and temperature. Millimeters.	Barometer. Reduced to sea-level. Inches.	Barometer. Reduced to sea-level. Millimeters.	Temperature of the air. Fahrenheit.	Temperature of the air. Centigrade.	Relative humidity. Per cent.	Wind. Direction. From—	Wind. Velocity. Miles per hour.	Wind. Velocity. Meters per second.	Wind. Force. 0—10.	Clouds. Amount. Upper. 0—10.	Clouds. Amount. Lower. 0—10.	Clouds. Direction. Upper. From—	Clouds. Direction. Lower. From—	Rain-fall or melted snow in the past 24 hours. Inches.	Rain-fall or melted snow in the past 24 hours. Millimeters.	Weather.	Observer.
Heart's Content, N. F																			E. Weedon.
*Kingston, Ontario	29.98	761.5	30.35	770.9	19	− 7.2	94	SE.	15	6.7			10s		Calm.	0.06	1.5	Cloudy	S. Woods, M. A.
Little Glace Bay, N. S	30.72	780.3	30.76	781.3	16.0	− 8.9	93	NE.	10	4.5		6k		NE.		0	0	Fair	C. H. Rigby.
Moose Factory, Ontario																			J. R. Nason.
*Montreal, Quebec	30.24	768.1	30.47	773.9	3	−16.1	73	E.	10	4.5			10n			0	0	Cloudy	C. H. McLeod, C. E.
*Parry Sound, Ontario	29.33	745.0	30.07	763.8	22	− 5.6	93	S.	16	7.2			10n		S.	0.08	2.0	Light snow	Rev. R. Mosley.
Peterboro', Ontario	29.40	746.7	30.20	767.1	25.3	− 3.7	87	S.					10n			0	0	Overcast	J. F. Jeffers, B. A.
Port Dover, Ontario	29.48	748.8	30.21	767.3	29	− 1.7	89	SW.	12	5.4			Haze.			0	0	Cloudy	H. Morgan.
Port Hastings, Nova Scotia	30.72	780.3	30.78	781.8	9.9	−12.3		Calm.	0	0						0	0	Fine	Peter Grant.
Port Stanley, Ontario	29.50	749.3	30.18	766.6	29	− 1.7	87	SW.	12	5.4			10n		SW.	Inap.	Inap.	Cloudy	M. Payne.
*Quebec, Quebec	30.24	768.1	30.60	777.2	5	−15.0	75	NE.			5		10n		NE.	0	0	Cloudy	Capt. Ashe, R. N.
*Rockliffe, Ontario	29.72	754.9	30.23	767.8	2	−16.7	100	E.	10	4.5			10n			0.26	6.6	Light snow	W. H. McIntyre.
St. Andrews, N. Brunswick	30.70	779.8	30.75	781.0	11	−11.7	73	NW.			2	0	2s			0	0	Clear	Dr. Gove.
St. John, New Brunswick	30.70	779.8	30.88	784.3	6	−14.4	100	N.	6	2.7		0	1k			0	0	Clear	G. Murdock, C. E.
*Saugeen, Ontario	29.28	743.7	30.02	762.5	34	1.1	89	S.	16	7.2			10s			0	0	Cloudy	K. Stewart.
Stayner, Ontario	29.29	744.0	30.11	764.8	26	− 3.3	89	SE.	10	4.5			10n		SE.	0	0	Cloudy	R. J. Cole.
Stratford, Ontario	28.77	730.7	30.10	764.5	33.8	1.0	81	SE.	18.5	8.3			10s			0	0	Overcast	C. J. MacGregor, M. A.
*Sydney, Cape Breton	30.76	781.3	30.81	782.6	11	−11.7	82	N.	10	4.5		5k	0	N.		0	0	Fair	T. C. Hill.
*Toronto, Ontario	29.78	756.4	30.18	766.6	30	− 1.1	85	SE.	10	4.5			10n		Calm.	0.01	0.3	Cloudy	Magnetic Observatory.
Windsor, Nova Scotia	30.69	779.5	30.79	782.0	7.5	−13.6	89	N.	12	5.4		1cs	0			0	0	Fine	Prof. John E. Oram.
SUB-SERIES.																			
St. John's, Newfoundland					18.0	− 7.8	100	N.					10			0.44	11.2	Fair	John Delany.

NOTE.—The originals for Brockville, Charlottetown, Port Dover, Port Stanley, St. Andrews, Staynor and those telegraphed, give the amount of cloudiness by the scale 0 to 4: at St. Andrews, the velocity of the wind is estimated. The elevation of Granton is 1,015 feet, or 309.4 meters, Stratford, 1,182 feet, or 360.3 meters.

UNITED STATES SERIES.

[By authority of the Secretary of War. Furnished by the co-operation of Brvt. Brig. Gen. Albert J. Myer, Chief Signal Officer, U. S. A.]

Albany, N. Y	30.37	771.4	30.63	778.0	19	— 7.2	69	S.	12	5.4			10s		SW.	0	0	Cloudy
Alpena, Mich	29.28	743.7	29.95	760.7	25	— 3.9	87	S.	5	2.2			10s		Calm.	0.10	2.5	Cloudy
Atlanta, Ga	29.36	745.7	30.60	777.2	32	0.0	79	NE.	15	6.7		2k	Sm'e.	Calm.	Calm.	0	0	Clear
Atlantic City, N. J	30.70	779.8	30.72	780.3	27	— 2.8	76	SE.	8	3.6			10s		Calm.	0	0	Cloudy
Augusta, Ga	30.44	773.2	30.63	778.0	34	1.1	52	E.	5	2.2		0	0			0	0	Clear
Baltimore, Md	30.69	779.5	30.74	780.8	26	— 3.3	88	SE.	3	1.3		Haze.	Sm'e.	Calm.	Calm.	0	0	Smoky
Barnegat, N. J	30.67	779.0	30.69	779.5	28	— 2.2	88	SE.	11	4.9		10k	0	E.		0	0	Cloudy
Bismarck, Dak	28.60	726.4	30.45	773.4	—19	—28.3	100	Calm.	0	0		0	0			0.08	2.0	Clear
Boerne, Texas	28.66	728.0	29.96	761.0	61	16.1	88	SE.	16	7.2			10s		S.	0	0	Cloudy
Boise City, Idaho	27.35	694.7	30.31	769.9	28	— 2.2	80	S.	3	1.3		0	0			0	0	Clear
Boston, Mass	30.58	776.7	30.76	781.3	13	—10.6	62	NW.	5	2.2			10s		SE.	0	0	Cloudy
Bracketville, Tex	28.97	735.8	30.00	762.0	62	16.7	83	SE.	8	3.6			10s		E.	0	0	Cloudy
Breckenridge, Minn	29.48	748.8	30.69	779.5	—20	—28.9	90	NW.	12	5.4		1cs.	0	Calm.		0.06	1.5	Clear
Brownsville, Tex	30.08	764.0	30.15	765.8	66	18.9	95	S.	4	1.8			Fog.		Calm.	0	0	Foggy
Buffalo, N. Y	29.48	748.8	30.20	767.1	33	0.6	61	S.	18	8.0			9s		SW.	0	0	Cloudy
Burkes, Ariz					50	10.0	19	S.			1	0	0			0	0	Clear
Burlington, Vt	30.20	767.1	30.52	775.2	16.5	— 8.6	42	S.	24	10.7		2cs	8s	W.	W.	0	0	Cloudy
Cairo, Ill	30.00	762.0	30.41	772.4	49	9.4	51	S.	15	6.7		10ck	0	W.		0	0	Cloudy
Camp Apache, Ariz																		
Camp Grant, Ariz	25.21	640.3	30.01	762.2	50	10.0	52	N.	8	3.6		0	0			0	0	Clear
Camp Verde, Ariz					49	9.4	37	S.			1	0	0			0	0	Clear
Campo, Cal	27.43	696.7	30.00	762.0	39	— 1.1	67	E.	4	1.8		0	0			0	0	Clear
Cape Hatteras, N. C	30.62	777.7	30.62	777.7	40	4.4	82	NE.	16	7.2			10s		NE.	0	0	Cloudy
Cape Henry, Va	30.64	778.2	30.66	778.8	34	1.1	79	N.	13	5.8			10s		NE.	0	0	Cloudy
Cape Lookout, N. C	30.56	776.2	30.58	776.7	37	2.8	91	NE.	23	10.3		0	0			0	0	Clear
Cape May, N. J	30.66	778.8	30.70	779.8	28	— 2.2	77	NE.	5	2.2			8s		NE.	0	0	Cloudy
Castroville, Tex	29.36	745.7	30.06	763.5	64	17.8	83	S.	8	3.6			10ks		S.	0	0	Cloudy
Charleston, S. C	30.55	776.0	30.61	777.5	37	2.8	71	NE.	8	3.6			10s		NE.	0	0	Cloudy
Cheyenne, Wyo	24.15	613.4	30.09	764.3	15	— 9.4	100	S.	8	3.6			10n		Calm.	0.12	3.0	Light snow
Chicago, Ill	29.43	747.5	30.14	765.5	38	3.3	72	W.	14	6.3			10s		Calm.	0.07	1.8	Cloudy
Cincinnati, Ohio	29.72	754.9	30.39	771.9	44	6.7	41	S.	6	2.7		1c	0	W.		0	0	Clear
Cleveland, Ohio	29.49	749.0	30.24	768.1	40	4.4	56	SE.	21	9.4		5cs	0	W.		0	0	Fair
Coleman City, Tex	28.31	719.1	29.96	761.0	58	14.4	82	S.	12	5.4		2c	5s	SW.	SW.	0	0	Fair
Columbus, Ohio	29.48	748.8	30.36	771.1	38	3.3	54	S.	7	3.1		0	Sm'e.		Calm.	0	0	Clear
Concho, Tex	28.19	716.0	29.85	758.2	61	16.1	76	S.	12	5.4		10k	0	S.		0	0	Cloudy
Corsicana, Tex	29.70	754.4	30.17	766.3	60	15.6	88	SE.	10	4.5			10s		SE.	0	0	Cloudy
Davenport, Iowa	29.64	752.8	30.33	770.4	24	— 4.4	61	NW.	17	7.6			10s		W.	0	0	Cloudy
Deadwood, Dak	25.56	649.2			11	—11.7	80	Calm.	0	0			10s		Calm.	0.04	1.0	Cloudy
Decatur, Tex	29.08	738.6	30.26	768.6	59	15.0	96	SW.	12	5.4			10s		SE.	0	0	Cloudy
Denison, Tex	29.36	745.7	30.15	765.8	58	14.4	88	SE.	10	4.5			10s		Calm.	0	0	Cloudy
Denver, Colo	24.96	634.0	30.18	766.6	22	— 5.6	86	NE.	4	1.8			10n		Calm.	0.05	1.3	Light snow
Des Moines, Iowa	29.52	749.8	30.49	774.4	16	— 8.9	83	N.	15	6.7			10s		NW.	0	0	Cloudy
Detroit, Mich	29.43	747.5	30.13	765.3	36	2.2	61	SW.	8	3.6			10s		SW.	0.03	0.8	Cloudy
Dodge City, Kans	29.70	754.4	30.20	767.1	17	— 8.3	83	N.	24	10.7			10s		N.	0	0	Cloudy
Dubuque, Iowa	29.59	751.6	30.35	770.9	19	— 7.2	69	N.	12	5.4			10s		Calm.	0	0	Cloudy
Duluth, Minn	29.65	753.1	30.41	772.4	7	—13.9	77	Calm.	0	0		0	0			0.43	10.9	Clear
Eagle Pass, Tex	29.29	744.0	30.03	762.7	61	16.1	88	SE.			1		10s		SE.	0	0	Cloudy

Bulletin of international meteorological observations, taken simultaneously on March 1, 1879—Continued.

UNITED STATES SERIES—Continued.

Stations.	Barometer. Corrected for instrumental error and temperature. Inches.	Barometer. Corrected for instrumental error and temperature. Millimeters.	Barometer. Reduced to sea-level. Inches.	Barometer. Reduced to sea-level. Millimeters.	Temperature of the air. Fahrenheit.	Temperature of the air. Centigrade.	Relative humidity. Per cent.	Wind. Direction. From—	Wind. Velocity. Miles per hour.	Wind. Velocity. Meters per second.	Wind. Force. 0—10.	Clouds. Amount. Upper. 0—10.	Clouds. Amount. Lower. 0—10.	Clouds. Direction. Upper. From—	Clouds. Direction. Lower. From—	Rain-fall or melted snow in the past 24 hours. Inches.	Rain-fall or melted snow in the past 24 hours. Millimeters.	Weather.	Observer.
Eastport, Maine	30.68	779.3	30.75	781.0	15	— 9.4	82	NE.	12	5.4			10n		NE.	Inap.	Inap.	Light snow	
Edinburg, Tex					66	18.9	95	S.			6		8s		S.	0	0	Cloudy	
El Paso, Tex	26.27	667.2			52	11.1	23	NW.	4	1.8		0	0			0	0	Clear	
Erie, Pa	29.49	749.0	30.23	767.8	36	2.2	61	S.	22	9.8		5c	0	W.		0	0	Fair	
Escanaba, Mich	29.38	746.2	30.08	764.0	21	— 6.1	86	NW.	22	9.8			10s		NW.	0.46	11.7	Cloudy	
Florence, Ariz	28.50	723.9	30.10	764.5	54	12.2	43	SW.	4	1.8		0	0			0	0	Clear	
Fort Buford, Dak	28.35	720.1			—22	—30.0	60	SW.			2	0	0			0.01	0.3	Clear	
Fort Craig, N. Mex	25.49	647.4	29.55	750.6	40	4.4	47	Calm.	0	0		0	0			0	0	Clear	
Fort Davis, Tex	25.24	641.1	30.20	767.1	42	5.6	48	W.	1	0.4		0	0			0	0	Clear	
Fort Gibson, Ind. Ter	29.61	752.1	30.15	765.8	56	13.3	63	S.	14	6.3			10ks		SW.	0	0	Cloudy	
Fort Griffin, Tex	28.72	729.5	29.97	761.2	58	14.4	88	NW.	3	1.3			10ks		NW.	0	0	Cloudy	
Fort Keogh, Mont	27.77	705.4			—17	—27.2	Inap.	Calm.	0	0		0	0			0.01	0.3	Clear	
Fort McKavett, Tex																			
Fort St. Michael, Alaska																			
Fort Sill, Ind. Ter	28.93	734.8	30.09	764.3	34	1.1	90	N.	20	8.9			10n		Calm.	0.02	0.5	Light rain	
Fort Stevenson, Dak	28.54	724.9			—26	—32.2	100	NW.	4	1.8		0	0			0.12	3.0	Clear	
Fredericksburg, Tex	28.38	720.8	29.93	760.2	62	16.7	77	S.	12	5.4			10ks		Calm.	0	0	Cloudy	
Galveston, Tex	30.19	766.8	30.23	767.8	61	16.1	94	E.	12	5.4		0	8s		E.	0	0	Cloudy	
Graham, Tex	29.69	737.9	30.10	764.5	60	15.6	94	NE.	1	0.4			10s		Calm.	0	0	Cloudy	
Grand Haven, Mich	29.43	747.5	30.10	764.5	37	2.8	71	W.	20	8.9			10s		Calm.	0.03	0.8	Threatening	
Indianapolis, Ind	29.47	748.5	30.27	768.8	42	5.6	50	SW.	7	3.1			10s		SW.	0	0	Cloudy	
Indianola, Tex	30.16	766.1	30.19	766.8	63	17.2	94	SE.	12	5.4		0	Haze.		Calm.	0	0	Clear	
Jacksboro', Tex	28.96	735.6	30.08	764.0	60	15.6	94	SE.	3	1.3			10s		S.	0	0	Cloudy	
Jacksonville, Florida	30.46	773.7	30.48	774.2	52	11.1	86	NE.	12	5.4			10s		NE.	0	0	Cloudy	
Keokuk, Iowa	29.67	753.6	30.33	770.4	25	— 3.9	75	N.	14	6.3			10s		W.	0	0	Cloudy	
Key West, Florida	30.19	766.8	30.23	767.8	68	20.0	79	NE.	20	8.9		1k	Haze.	NE.	Calm.	0	0	Clear	
Kittyhawk, N. C	30.63	778.0	30.65	778.5	38	3.3	81	NE.	16	7.2		0	8s		NE.	0	0	Fair	
Knoxville, Tenn	29.81	757.2	30.59	777.0	30.5	— 0.8	84	E.	1	0.4		Haze.	Fog.			0	0	Foggy	
La Crosse, Wis	29.59	751.6	30.40	772.1	15	— 9.4	82	NW.	8	3.6			8s		Calm.	0.02	0.5	Fair	

La Mesilla, N. Mex	26.10	662.9	30.25	768.3	38	3.3	63	Calm.	0	0		5cs	0	Calm.		0	0	Fair
Laredo, Tex	29.65	753.1	29.99	761.7	63	17.2	89	SE.	8	3.6		10ck	0	SE.		0	0	Cloudy
Leavenworth, Kans	29.50	749.3	30.42	772.6	21	— 6.1	100	N.	19	8.5			10n		N.	0.01	0.3	Sleeting
Los Angeles, Cal	29.68	753.9	30.02	762.5	49.0	9.4	85	N.	3	1.3			10s		Calm.	0	0	Cloudy
Louisville, Ky	29.81	757.2	30.39	771.9	43	6.1	36	SW.	10	4.5		2ck	2s	SW.	Calm.	0	0	Fair
Lynchburg, Va	29.97	761.2	30.72	780.3	27	— 2.8	66	Calm.	0	0		0	0			0	0	Clear
Madison, Wis	29.19	741.4	30.25	768.3	22	— 5.6	72	NW.	23	10.3			10s		Calm.	0.14	3.6	Cloudy
Marquette, Mich	29.39	746.5	30.14	765.5	19	— 7.2	100	NW.	28	12.5			10n		Calm.	0.39	9.9	Light snow
Mason, Tex	28.45	722.6	30.19	766.8	63	17.2	78	S.	12	5.4			10s		S.	0	0	Cloudy
Memphis, Tenn	30.12	765.0	30.45	773.4	46	7.8	54	S.	5	2.2			10s		Calm.	0	0	Cloudy
Milwaukee, Wis	29.37	746.0	30.14	765.5	32	0.0	79	NW.	18	8.0			10s		Calm.	0.01	0.3	Cloudy
Mobile, Ala	30.42	772.6	30.46	773.7	48	8.9	63	E.	6	2.7			10s		S.	0	0	Cloudy
Montgomery, Ala	30.31	769.9	30.56	776.2	39	3.9	55	E.	4	1.8		2c	2s; sm'	SW.	Calm.	0	0	Fair
Morgantown, W. Va	29.33	745.0	30.44	773.2	37	2.8	63	Calm.	0	0		2cs	0	NW.		0	0	Fair
Mt. Washington, N. H	23.88	606.5	30.24	768.1	2	—16.7	86	SW.	48	21.5			10s		SW.	0	0	Cloudy
Nashville, Tenn	29.96	761.0	30.53	775.4	39	3.9	55	Calm.	0	0		0	Sm'c			0	0	Clear
New Haven, Conn	30.62	777.7	30.75	781.0	18	— 7.8	83	NE.	5	2.2		0	0			0	0	Clear
New London, Conn	30.69	779.5	30.75	781.0	18	— 7.8	78	NE.	6	2.7			9ks		NE.	0	0	Cloudy
New Orleans, La	30.32	770.1	30.38	771.6	51	10.6	86	E.	6	2.7		0	5s		SE.	0	0	Fair
Newport, R. I	30.69	779.5	30.74	780.8	22	— 5.6	72	N.	4	1.8			10s		E.	0	0	Cloudy
New York, N. Y	30.54	775.7	30.73	780.5	24	— 4.4	74	SE.	9	4.0			10ks		NW.	0	0	Cloudy
Norfolk, Va	30.63	778.0	30.68	779.3	33	0.6	79	NE.	4	1.8			10s		Calm.	Inap.	Inap.	Cloudy
North Platte, Nebr	27.46	697.5	30.30	769.6	14	—10.0	64	N.	12	5.4			10s		N.	0	0	Cloudy
Olympia, Wash	30.03	762.7	30.08	764.0	34.2	1.2	100	W.	1	0.4			Fog		Calm.	0	0	Dense fog
Omaha, Nebr	29.28	743.7	30.52	775.2	10	—12.2	79	N.	20	8.9			10s		NW.	0	0	Cloudy
Oswego, N. Y	30.01	762.2	30.36	771.1	25	— 3.9	87	SE.	21	9.4		10ck	0	W.		0	0	Cloudy
Pembina, Dak	29.59	751.6	30.56	776.2	—18	—27.8	100	NW.	3	1.3		0	0			0	0	Clear
Philadelphia, Pa	30.64	778.2	30.70	779.8	23	— 5.0	73	NE.	4	1.8		2cs	Haze	Calm.	Calm.	0	0	Fair
Phœnix, Ariz	28.79	731.3	30.57	776.5	60	15.6	34	E.	3	1.3		2cs	0	SW.		0	0	Fair
Pike's Peak, Colo	17.60	447.0	29.81	757.2	10	—12.2	100	SW.	8	3.6			10n		SW.	0.04	1.0	Light snow
Pioche, Nev	24.07	611.4	29.84	757.9	25	— 3.9	38	N.	3	1.3		0	0			0	0	Clear
Pittsburg, Pa	29.55	750.6	30.41	772.4	35	1.7	61	S.	7	3.1		5c	0	W.		0	0	Fair
Port Huron, Mich	29.40	746.7	30.08	764.0	36	2.2	90	S.	16	7.2			10s		Calm.	0.04	1.0	Cloudy
Portland, Me	30.69	779.5	30.75	781.0	15	— 9.4	65	NW.	8	3.6		5k	0	Calm.		0	0	Fair
Portland, Oreg	30.01	762.2	30.12	765.0	37.0	2.8	86	NW.	3	1.3		Haze	0	Calm.		0	0	Clear
Prescott, Ariz	24.61	625.1	29.97	761.2	42	5.6	58	W.	2	0.9		0	0			0	0	Clear
Pilot Point, Tex	29.15	740.4	29.98	761.5	50	10.0	78	SE.	28	12.5		0	0			0	0	Clear
Punta Rassa, Fla	30.30	769.6	30.32	770.1	61	16.1	77	NE.	16	7.2		0	0			0	0	Clear
Red Bluff, Cal	29.65	753.1	30.02	762.5	42	5.6	50	N.	5	2.2		0	Haze		Calm.	0	0	Clear
Rio Grande City, Tex	29.90	759.4	30.12	765.0	64	17.8	88	SE.	12	5.4			10s		SE.	0	0	Cloudy
Rochester, N. Y	29.61	752.1	30.26	768.6	31	— 0.6	89	SW.	12	5.4			10s		Calm.	0	0	Cloudy
Roseburg, Oreg	29.46	748.3	30.05	763.3	33.0	0.6	95	W.	1	0.4		Haze	1s		Calm.	0	0	Fair
Sacramento, Cal	29.91	759.7	29.99	761.7	43	6.1	67	Calm.	0	0		0	0			0	0	Clear
Saint Louis, Mo	29.66	753.4	30.25	768.3	48	8.9	49	S.	12	5.4			10s		W.	0	0	Cloudy
Saint Marks, Fla	30.45	773.4	30.47	773.9	41	5.0	82	NE.	7	3.1		0	0			0	0	Clear
Saint Paul, Minn	29.52	749.8	30.44	773.2	10	—12.2	58	NW.	6	2.7		8cs	0	NW.		0.13	3.3	Fair
Salt Lake City, Utah	25.75	654.0	30.08	764.0	29	— 1.7	45	NE.	4	1.8		0	0			0	0	Clear
San Antonio, Tex	29.43	747.5	30.01	762.2	64	17.8	89	SE.	4	1.8			10ks		SE.	Inap.	Inap.	Cloudy
San Diego, Cal	29.97	761.2	30.04	763.0	56	13.3	81	Calm.	0	0			10s		Calm.	0	0	Cloudy
Sandusky, Ohio	29.53	750.0	30.22	767.6	41	5.0	57	SW.	19	8.5			10s		Calm.	0	0	Cloudy
Sandy Hook, N. J	30.67	779.0	30.70	779.8	27	— 2.8	76	SE.	16	7.2			10ks		S.	0	0	Cloudy
San Francisco, Cal	29.93	760.2	30.00	762.0	49.7	9.8	75	S.	2	0.9		0	0			0	0	Clear

Bulletin of international meteorological observations, taken simultaneously on March 1, 1879—Continued.

UNITED STATES SERIES—Continued.

Stations.	Barometer. Corrected for instrumental error and temperature. Inches.	Barometer. Corrected for instrumental error and temperature. Millimeters.	Barometer. Reduced to sea-level. Inches.	Barometer. Reduced to sea-level. Millimeters.	Temperature of the air. Fahrenheit.	Temperature of the air. Centigrade.	Relative humidity. Per cent.	Wind. Direction. From—	Wind. Velocity. Miles per hour.	Wind. Velocity. Meters per second.	Clouds. Force. 0—10.	Clouds. Amount. Upper. 0—10.	Clouds. Amount. Lower. 0—10.	Clouds. Direction. Upper. From—	Clouds. Direction. Lower. From—	Rain-fall or melted snow in the past 24 hours. Inches.	Rain-fall or melted snow in the past 24 hours. Millimeters.	Weather.	Observer.
Santa Fé, N. Mex	23.24	590.3	29.78	756.4	38	3.3	54	E.	5	2.2		0	0			0	0	Clear	
Savannah, Ga	30.48	774.2	30.58	776.7	41	5.0	82	NE.	12	5.4			10s		NE.	0	0	Cloudy	
Shreveport, La	30.09	764.3	30.31	769.9	55	12.8	68	SE.	6	2.7			10s		Calm.	0	0	Cloudy	
Silver City, N. Mex	24.30	617.2	30.57	776.5	40	4.4	40	Calm.	0	0		0	2s		Calm.	0	0	Fair	
Smithville, N. C	30.60	777.2	30.64	778.2	32	0.0	79	N.	12	5.4			10s		Calm.	0	0	Cloudy	
Springfield, Mass																			
Stockton, Tex	27.00	685.8	30.00	762.0	49	9.4	71	SE.	4	1.8		0	0			0	0	Clear	
Thatcher's Island, Mass	30.66	778.8	30.73	780.5	23	— 5.0	60	SW.	4	1.8			10s		SW.	0	0	Cloudy	
Toledo, Ohio	29.46	748.3	30.10	766.1	40	4.4	56	S.	20	8.9			10s		Calm.	Inap.	Inap.	Cloudy	
Tucson, Ariz	27.55	699.8	30.10	764.5	50	10.0	44	S.	2	0.9		0	0			0	0	Clear	
Umatilla, Oreg	29.83	757.7	30.30	771.1	31.5	— 0.3	89	SE.	4	1.8		0	0			0	0	Clear	
Unalashka, Aleutian Isl'ds					22	— 5.6	86	W.			6		10s		NW.			Cloudy	
Uvalde, Tex	29.23	742.4	30.04	763.0	62	16.7	77	SE.	8	3.6			10s		S.	Inap.	Inap.	Cloudy	
Vicksburg, Miss	30.17	766.3	30.44	773.2	47	8.3	70	SE.	12	5.4		0	8s		SE.	0	0	Fair	
Virginia City, Mont	24.30	617.2	29.78	756.4	15	— 9.4	65	SE.	1	0.4		0	0			0.12	3.0	Clear	
Visalia, Cal	29.65	753.1	30.02	762.7	42.5	5.8	77	Calm.	0	0		0	0			0	0	Clear	
Washington, D. C	30.59	770.0	30.72	780.3	26	— 3.3	75	SE.	1	0.4		2cs	Fog	SE.	SE.	0	0	Fair	
Wickenburg, Ariz					45	7.2	61	NW.			1	0	0			0	0	Clear	
Wilmington, N. C	30.52	775.2	30.61	777.5	27	— 2.8	76	N.	7	3.1			10s		Calm.	0	0	Cloudy	
Winnemucca, Nev	25.77	654.6	30.13	765.3	19	— 7.2	85	E.	13	5.8		0	0			0	0	Clear	
Wood's Holl, Mass	30.68	779.3	30.72	780.3	27	— 2.8	77	N.	3	1.3			10ks		NW.	Inap.	Inap.	Cloudy	
Yankton, Dak	29.25	742.9	30.74	780.8	— 1	—18.3	84	NW.	12	5.4		10k	0	SW.		0	0	Cloudy	
Yuma, Ariz	29.76	755.9	29.92	760.0	58	14.4	53	W.	1	0.4		0	0			0	0	Clear	
SUB-SERIES.																			
Fayetteville, Ark	28.62	726.9	30.03	762.7	53	11.7	93												J. B. Gordon.
Havana, Cuba, W. I	30.14	765.5	30.19	766.8	73	22.8	71	NE.	4.8	2.1		4k	4ks	NE.	NE.	0	0	Cloudy	Chas. Hasselbrink.

Kingston, Jamaica, W. I																				James Gall.
Medellin, Colombia, S. A	25.24	641.1			63.5	17.5	79	Calm.	0	0		3c	cs	1s			0.01	0.3		Thomas Herran.
Navassa, W. I	29.94	760.5	30.02	762.5	77	25.0		S.									0.02	0.5	Partly cl'dy	W. H. W. Jones.
Paramaribo, D. Guiana, S. A	29.98	761.5	29.98	761.5	81	27.2	74	NE.			3	3c	5k	E.			0	0	Fair	C. J. Hering.
Santiago de Cuba, W. I																				Robert Mason.
St. Thomas, W. I																				G. O. Gellich.
York Factory, B. A	30.22	767.6	30.27	768.8	-28.0	−33.3		W.	7	3.1		2ck	1s	NW.	W.		0	0	Fair	J. Fortesque & W. Wood.

NOTE.—The originals give the amount of cloudiness by the scale 0 to 4, except York Factory, Medellin, and Paramaribo. The elevation of the barometer at Atlanta is 1,131.3 feet, or 344.8 meters: Bismarck, 1,704.3 feet, or 519.5 meters; Boerne, 1,333 (?) feet, or 406.3 (?) meters; Boise City, 2,877 (?) feet, or 876.9 (?) meters; Brackettville, 1,026 (?) feet, or 312.7 (?) meters: Camp Grant, 4,823 (?) feet, or 1,470.0 (?) meters; Campo, 2,500 (?) feet, or 762.0 (?) meters; Cheyenne, 6,057.3 feet, or 1,846.2 meters; Coleman City, 1,727 (?) feet, or 526.4 (?) meters; Concho, 1,750 (?) feet, or 533.4 (?) meters; Deadwood, (?); Decatur, 1,160 (?) feet, or 353.6 (?) meters; Denver, 5,269 feet, or 1,606.0 meters; Dodge City, 2,486 feet, or 757.8 meters: Fort Craig, 4,622 (?) feet, or 1,408.8 (?) meters; Fayetteville, 1,422 feet, or 433.4 meters; Fort Davis, 5,203 (?) feet, or 1,585.9 (?) meters; Fort Griffin, 1,270 (?) feet, or 387.0 (?) meters; Fort McKavett, 2,050 (?) feet, or 624.9 (?) meters: Fort Sill, 1,100 (?) feet, or 335.3 (?) meters: Florence, 1,550 (?) feet, or 472.4 (?) meters: Fredericksburg, 1,614 (?) feet, or 492.0 (?) meters; Graham, 1,040 (?) feet, or 317.0 (?) meters: Jacksboro', 1,119.2 (?) feet, or 341.1 (?) meters; Mason, 1,800 (?) feet, or 548.7 (?) meters; Morgantown, 1,027.9 feet, or 313.3 meters; Medellin, 4,876 feet, or 1,485.2 meters: Mount Washington, 6,285 feet, or 1,915.6 meters; North Platte, 2,838.2 feet, or 865.1 meters: Omaha, 1,077.4 feet, or 328.4 meters; Phœnix, 1,800 (?) feet, or 548.7 (?) meters; Pike's Peak, 14,150.7 feet, or 4,313.1 meters; Pioche, 5,778.6 (?) feet, or 1,761.4 (?) meters; Prescott, 5,700 (?) feet, or 1,737.3 (?) meters; Salt Lake City, 4,362.2 feet, or 1,329.6 meters; Santa Fé, 6,851 (?) feet, or 2,088.1 (?) meters; Silver City, 6,896 (?) feet, or 2,102.0 (?) meters: Stockton, 3,100 (?) feet, or 944.9 (?) meters; Tucson, 2,542 (?) feet, or 774.8 (?) meters: Virginia City, 5,480 (?) feet, or 1,670.3 (?) meters; Wickenburg, 2,050 (?) feet, or 624.9 (?) meters; Winnemucca, 4,335.3 feet, or 1,321.4 meters: Yankton, 1,275 feet, or 388.6 meters. The following constants are added in correcting the barometric observations for altitude: Bismarck, 1.856 inches; Boise City, 2.96 inches: Camp Grant, 4.809 inches: Camp Verde, 3.488 inches; Campo, 2.57 inches; Cheyenne, 5.94 inches; Denver, 5.22 inches: Florence, 1.60 inches; Fort Craig, 4.964 inches; Fort Davis, 4.96 inches; La Mesilla, 4.15 inches; Mount Washington, 6.36 inches; Pike's Peak, 12.21 inches; Pioche, 5.77 inches; Prescott, 5.36 inches; Salt Lake City, 4.33 inches; Santa Fé, 6.54 inches; Stockton, 3.00 inches; Tucson, 2.59 inches; Wickenburg, 2.09 inches; Winnemucca, 4.36 inches; Virginia City, 5.48 inches. The instrumental error of the barometer at Medellin is not known.

Bulletin of international meteorological observations, taken simultaneously on March 1, 1879—Continued.

UNITED STATES NAVAL SERIES.

[By authority of the Secretary of the Navy. Furnished by the co-operation of the Navy Department, through Commodore William D. Whiting, U. S. N., Chief of Bureau of Navigation.]

Stations and vessels.	Barometer. As read off. Inches.	Barometer. As read off. Millimeters.	Barometer. Attached thermometer. Fahrenheit.	Barometer. Attached thermometer. Centigrade.	Temperature of the air. Fahrenheit.	Temperature of the air. Centigrade.	Relative humidity. Per cent.	Wind. Direction. From—	Wind. Velocity. Meters per hour.	Wind. Velocity. Meters per second.	Wind. Force. 0—10.	Clouds. Amount. Upper. 0—10.	Clouds. Amount. Lower. 0—10.	Clouds. Direction. Upper. From—	Clouds. Direction. Lower. From—	Rain-fall or melted snow in the past 24 hours. Inches.	Rain-fall or melted snow in the past 24 hours. Millimeters.	Sea-swell. Character.	Sea-swell. Direction from—	Weather.	Observer.
Navy Yard (Mare Island, Cal.)	29.92	760.0	47	8.3	47	8.3	62	SE.	5	2.2			5		SE.	0	0			Fair	
Navy Yard (Pensacola, Fla.)	30.52	775.2	48	8.9	48	8.9	78	NE.	16	7.2			10		NE.	0	0			Threatening	
Navy Yard (Portsmouth, N. H.)	30.70	779.8	54	12.2	16	— 8.9	83	NNW.					0							Clear	
Naval Hospital, (Yokohama, Japan).*	30.03	762.7			55	12.8	97	Calm.			0		10n		W.	0.48	12.2			Raining	
Adams (Panama)	30.00	762.0	77	25.0	76	24.4	95	NW.			1		5		N; W.					Fair	
Alaska (Pichilinque Bay, Mexico)	30.12	765.0	73	22.8	62	16.7	83	SSE.			3							Smooth.		Blue sky	
Alliance (Villafranca, France)	29.95	760.7			55	12.8	44	SSW.			0-1		2		S; W.			Light.	S.	Clear	
Ashuelot (Hong-Kong, China)	29.94	760.5			59	15.0	88	E.			4		10		Calm.			Smooth.		Rainy	
Canonicus (New Orleans, La.)	30.35	770.9	42	5.6	50	10.0	93	NE.			2		5		NE.					Fair	
Colorado (New York, N. Y.)	30.64	778.2	24	—4.4	23	— 5.0	100	E.	5	2.2			10		SSE.	0	0			Overcast	
Constitution (Lisbon, Portugal)	30.11	764.8			54	12.2	87	ENE.			1		4		Calm.					Light haze	
Despatch (Constantinople, Turkey).	29.71	754.6			62	16.7	51	Calm.			0		10		NW.			Smooth.		Cloudy	
Franklin (Norfolk, Va.)	30.85	783.6	73	22.8	35	1.7	80	N.	3.8	2.1			10		E.	0	0			Cloudy	
Gettysburg (Genoa, Italy)	29.88	758.9			56	13.3	75	SW.			1		2			0	0	Smooth.		D. clouds	
Hartford (Montevideo, Uruguay)	29.93	760.2	76	24.4	78	25.6	61	NW.			2		5		NW.	0	0	Smooth.		Fair	
Lackawana (Panama)*	29.75	755.6			75	23.9	95	NNW.			1		5			0	0			Clear	
Michigan (Erie, Pa.)†	30.09	764.3			36	2.2	90	S.			6		5		S.					Cloudy	
Monocacy (Ning-Po, China)*	30.32	770.1			39	3.9	75	NNW.			2-5		10		NW.					Cloudy	
Monongahela (Yokohama, Japan).*	29.91	759.7			56	13.3	81	SSE.			1		10			Mod.	Mod.			Raining	
New Hampshire (Port Royal, S.C.)	30.55	776.0	40	4.4	39	3.9	90	N.	19	8.5			8		NNE.					Cloudy	
Onward (Callao, Peru)†	30.01	762.2			67	19.4	95	Calm.			0		10					Long.	W.	Foggy	
Palos (Tientsin, China)	30.35	770.9	32	0.0	25	— 3.9	100	S.			2		0							Clear	

Passaic (Washington, D. C.)					25	— 3.9	62	Calm.			0		8							Cloudy
Pensacola (S. 38° 28′, W. 80° 04′)	29.82	757.4			65	18.3	89	SW.	6	2.7			8		SW.	0.1	3.	Smooth.	W.	Fair
Powhatan (Key West, Fla.)	30.21	767.3			70	21.1	75	NE.			3		0			0	0	Moderate.	NE.	Clear
Quinnebaug (Villafranca, France)	29.96	761.0			54	12.2	55	SW.			1		0					Smooth.		Clear
Ranger (Kobe, Japan)*	29.98	761.5			62	16.7	77	WNW.			1		2		Calm.			Smooth.		Fair
Richmond (Naples, Italy)	29.91	759.7			54	12.2	54	NNW.			1		5		NNW.	0	0	Smooth.	SSE.	Fair
Rio Bravo (Brownsville, Tex.)	30.10	764.5	68	20.0	67	19.4	95	SE.			2		10		SE.					Misty
Santee (Annapolis, Md.)	30.71	780.0			34	1.1		E.			1		0			0	0			Clear
Saratoga (Washington, D. C.)	30.78	781.8			23	— 5.0	86	Calm.			0		1		Calm.	0	0			D. clouds
St. Louis (League Island, Pa.)	30.49	774.4	43	6.1	26	— 3.3		ESE.	4	1.8			5		SE.	0	0			Fair
Supply (N. 23° 19′, W. 63° 56′)	30.10	764.5			78	25.6	86	S.			4		5		NNW.			Smooth.		Fair
Trenton (Villafranca, France)	29.90	759.4			55	12.8	62	SSW.			0–1		2		SW.	0	0	Moderate	S.	Clear
Tuscarora (Acapulco, Mexico)	29.98	761.5			78	25.6	69	N.			1		0			0	0	Smooth.		Clear
Wabash (Boston, Mass.)	30.78	781.8			13	—10.6	62	NW.	2	0.9			10							Cloudy
Wyoming (Smyrna, Turkey)	29.77	756.1			64	17.8	75	S.			1–2		10					Smooth.	S.	

NOTE.—The originals generally give the wind-force by the scale 0 to 12; amount of cloudiness by the scale 0 to 4; weather by the Beaufort notation; the distinction between the amount of upper and lower clouds is not made, and, apparently, the direction is frequently given as toward instead of from; they do not give the humidity.

* The error of the barometer is not known. † Aneroid.

‡ Reduced to sea-level; corrections applied at this office. It is believed that the positions given are generally for noon, local time, instead of 7.35 a. m., Washington time. The elevation of Naval Hospital at Yokohama is 115 feet, or 35.1 meters, for which the constant reduction is 0.125 inches, or 3.18 millimeters.

Bulletin of international meteorological observations, taken simultaneously on March 1, 1879—Continued.

UNITED STATES MARINE SERIES.

REPORTED TO THE OFFICE OF THE CHIEF SIGNAL-OFFICER OF THE ARMY.

PACIFIC MAIL STEAMSHIP COMPANY MARINE SERIES.

[Furnished by the co-operation of David S. Babcock, president; Williams, Blanchard & Co., agents.]

Name of vessels.	True course toward—	Barometer reduced to sea-level.		Temperature of the air.		Relative humidity.	Wind.				Clouds.				Rain-fall or melted snow in the past 24 hours.	Sea-swell.		Weather.	Observer.
							Direction.	Velocity.		Force.	Amount.		Direction.						
		Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second.	0—10.	Upper. 0—10.	Lower. 0—10.	Upper. From—	Lower. From—		Character.	Direction from—		
Steamship China																			Capt. Cobb.
Steamship City of New York																			Capt. Seabury.
Steamship City of Panama																			Capt. Berry.
Steamship City of Peking																			Capt. Dearborn.
Steamship City of Sydney																			Capt. Maury.
Steamship City of Tokio																			Capt. Searle.
Steamship Colima																			Capt. Whitebury.
Steamship Costa Rica																			Capt. Morse
Steamship Dakota																			Capt. Connolly.
Steamship Georgia																			Capt. Austin.
Steamship Granada, N. 15° 22′, W. 94° 2′.*†		30.15	765.9	72	22.2	95	N.			6		0			0	Short chop.	NNW.	Hazy	
Steamship Wilmington																			Capt. A. Fuller.
Steamship Zealandia																			R. C. Ghest, 1st officer.

NOTE.—The originals give the barometer as read off; wind-force by the scale 0 to 12, and weather by the Beaufort notation; no distinction between upper and lower clouds.

* Aneroid. † The error of the barometer is not known. ‡ Correction for temperature and elevation applied at this office.

WHITE STAR LINE MARINE SERIES.

[Furnished by the co-operation of Ismay, Imrie & Co., agents, Liverpool, and R. J. Cortis, agent, New York.]

Steamship Adriatic																			
Steamship Baltic																			Capt. J. W. Jenning.
Steamship Britannic																			Capt. H. Perry.
Steamship Celtic																			Capt. B. Gleadell.
Steamship Germanic																			Capt. C. W. Kennedy.

NOTE.—The originals give the barometer as read off; wind-force by the scale 0 to 12; for the Britannic, amount of cloudiness by the scale 0 to 4.

OCCIDENTAL AND ORIENTAL STEAMSHIP COMPANY MARINE SERIES.

[Furnished by the co-operation of Leland Stanford, president; Charles F. Crocker, vice-president; D. D. Stubbs, secretary.]

Steamship Belgic, Capt. L. Meyer, Hong-Kong, China.*		29.82‡	757.4‡	60	15.6	88	ENE.			5		cs.		NE.		Moderate.	NE.	Raining.	J. A. Thompson, 2d officer.
Steamship Gaelic, N. 38° 10′, W. 176 35′†		29.97‡	761.2‡	60	15.6	??	SE.			5		kn.		SE.	Heavy.	Swell.	W.	Raining.	Capt. W. H. Kidley.
Steamship Oceanic, Capt. J. Metcalf																			J. G. Cameron.

NOTE.—The originals give the barometer as read off; wind-force by the scale 0 to 12; do not distinguish between upper and lower clouds. The position given for the Oceanic is that at noon, local time, instead of that at 7.35 a. m., Washington time, and the sea-swell by the scale 0 to 9.

* The error of the barometer is not known. † Aneroid. ‡ Correction for temperature and elevation applied at this office.

NORTH GERMAN LLOYD OF BREMEN MARINE SERIES.

[Furnished by the co-operation of A. Schumacher & Co., agents.]

Steamship Baltimore																			Capt. H. Andressen.
Steamship Berlin																			Capt. T. H. Lamke.
Steamship Braunschweig, N. 26° 46′, W. 24° 5′.		30.20*	767.1*	70.5	21.4	59	NE.			5		8		NE.		Moderate.	NNW.	Fine	Capt. C. Undütsch.
Steamship Leipzig																			Capt. F. Pfeiffer.
Steamship Nurnberg																			Capt. A. Jaeger.
Steamship Ohio																			Capt. G. Meyer.

NOTE.—The originals give the barometer as read off; wind-force by the scale 0 to 12; weather as published; do not generally give amount of cloudiness, except S. S. Braunschweig and Leipzig, by the scale 0 to 4, nor distinguish between upper and lower clouds. The steamship Braunschweig gives sea-swell in general terms or occasionally by the scale 0 to 9; the steamship Leipzig by the scale 0 to 12.

* Correction for temperature and elevation applied at this office.

Bulletin of international meteorological observations, taken simultaneously on March 1, 1879—Continued.

UNITED STATES MARINE SERIES—Continued.

AMERICAN STEAMSHIP COMPANY MARINE SERIES.

[Furnished by the co-operation of H. D. Welsh, president; Peter Wright & Sons, general agents.]

Name of vessels.	True course toward—	Barometer reduced to sea-level.		Temperature of the air.		Relative humidity.	Wind.				Clouds.				Rain-fall or melted snow in the past 24 hours.	Sea-swell.		Weather.	Observer.
							Direction.	Velocity.		Force.	Amount.		Direction.						
		Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second.	0—10.	Upper. 0—10.	Lower. 0—10.	Upper. From—	Lower. From—		Character.	Direction from—		
Steamship Indiana, N. 39° 55′, W. 65° 25′	....	30.61*	777.5*	40	4.4	....	NE.	....	....	6	....	9	....	NE.	0	Smooth.	NE.	Cloudy..	Capt. Sargent.
Steamship Ohio	....	.....	.....	.....	.....	....	.....	....	....	....	....	.....	....	.....	.....	.....	.....	.....	Wm. Shackford, chief officer.
Steamship Pennsylvania, Capt. Harris	....	.....	.....	.....	.....	....	.....	....	....	....	....	.....	....	.....	.....	.....	.....	.....	G. H. Dodge.

NOTE.—The originals give the barometer as read off; wind-force by the scale 0 to 12; amount of cloudiness without distinguishing between upper and lower; for Pennsylvania, the cloud direction as toward instead of from; sea-swell in general terms as published; rain-fall for Indiana and Ohio in general terms.

* Correction for temperature and elevation applied at this office.

RED STAR LINE MARINE SERIES.

[Furnished by the co-operation of James A. Wright, president; Peter Wright & Sons, agents.]

Steamship Nederland	....	.....	.....	.....	.....	....	.....	....	....	....	....	.....	....	.....	.....	.....	.....	.....	Capt. Randle.
Steamship Switzerland	....	.....	.....	.....	.....	....	.....	....	....	....	....	.....	....	.....	.....	.....	.....	.....	Capt. Jackson.
Steamship Vaderland	....	.....	.....	.....	.....	....	.....	....	....	....	....	.....	....	.....	.....	.....	.....	.....	Capt. Nichols.

ALLAN LINE MARINE SERIES.

[Furnished by the co-operation of A. Schumacher & Co., agents.]

Steamship Austrian	
Steamship Hibernian	Capt. W. Richardson.

NOTE.—The originals give the barometer as read off; wind-force by the scale 0 to 12; weather by the Beaufort notation.

MARINE SERIES. (Miscellaneous.)

[Furnished by the co-operation of the observer named.]

Schooner Addie Fuller	Capt. Jas. Jorgensen.

NOTE.—The originals give the barometer as read off; amount of cloudiness by the scale 0 to 4, without distinguishing between upper and lower.

Collated at the office of the Chief Signal-Officer of the Army, Washington, D. C.

The records which appear in this bulletin are copied from the regular exchanges of this office, made in each instance in compliance with an especial request, and are published for the uses of the co-operating observers.

The barometric readings in the first two columns are reduced to freezing and their respective standards; those in the second two also to mean sea-level. For United States Marine Series the correction for instrumental error and the reduction to sea-level have been applied whenever they could be ascertained by means of reliable comparisons, made when the vessel was at or near land stations. The weather is generally published as given, D. clouds for detached clouds. When the distinction between the upper and lower strata of clouds is not reported, the kinds or types, viz: cirrus, cumulus, stratus, nimbus, scud, fracto, pallio, haze, fog, and smoke, as indicated, respectively, by the letters c., k., s., n., d., f., p., hz., fg., and sm'e, are generally published with the amount in the lower-cloud column. The distinction between the upper and lower strata is carefully made in the United States Series and a portion of the Canadian Series, and the types are indicated by the above letters and their combinations in the proper column.

ALBERT J. MYER,
Brigadier-General (Brevet Assigned), Chief-Signal Officer, U. S. A.

PAPER 26.

List of military posts from which meteorological reports have been received monthly at the office of the Chief Signal-Officer during the year ending June 30, 1879.

Post.	State.	Post.	State.
Abraham Lincoln, Fort	Dakota.	Lowell, Fort	Arizona.
Adams, Fort	Rhode Island.	Lyon, Fort	Colorado.
Alcatraz Island	California.	Madison Barracks	New York.
Angel Island	Do.	McDermit, Fort	Nevada.
Apache, Fort	Arizona.	McDowell, Fort	Arizona.
Atlanta	Georgia.	McHenry, Fort	Maryland.
Barrancas, Fort	Florida.	McKavett, Fort	Texas.
Baton Rouge Barracks	Louisiana.	McPherson, Fort	Nebraska.
Benicia Barracks	California.	Mojave, Fort	Arizona.
Brady, Fort	Michigan.	Monroe, Fort	Virginia.
Benton, Fort	Montana.	Niagara, Fort	New York.
Bidwell, Fort	California.	Oglethorpe Barracks	Georgia.
Bliss, Fort	Texas.	Pembina, Fort	Dakota.
Boise Barracks	Idaho.	Plattsburg Barracks	New York.
Bowie, Fort	Arizona.	Point San José	California.
Brown, Fort	Texas.	Porter, Fort	New York.
Buford, Fort	Dakota.	Preble, Fort	Maine.
Canby, Fort	Washington.	Presidio of San Francisco	California.
Columbus, Fort	New York.	Randall, Fort	Dakota.
Colville, Fort	Washington.	Rice, Fort	Do.
Concho, Fort	Texas.	Ringgold, Fort	Texas.
Craig, Fort	New Mexico.	Sanders, Fort	Wyoming.
Davis, Fort	Texas.	Shaw, Fort	Montana.
Douglas, Fort	Utah.	Sheridan, Camp	Nebraska.
Duncan, Fort	Texas.	Sidney, Fort	Do.
Ellis, Fort	Montana.	Sill, Fort	Indian Territory.
Fetterman, Fort	Wyoming.	Sisseton	Dakota.
Foote, Fort	Maryland.	Snelling, Fort	Minnesota.
Fred Steele, Fort	Wyoming.	Stevenson, Fort	Dakota.
Garland, Fort	Colorado.	Saint Augustine	Florida.
Gaston, Fort	California.	Sully, Fort	Dakota.
Grant, Fort	Arizona.	Totten, Fort	Do.
Griffin, Fort	Texas.	Townsend, Fort	Washington.
Hale, Fort	Dakota.	Union, Fort	New Mexico.
Halleck, Fort	Nevada.	Verde, Fort	Arizona.
Hamilton, Fort	New York.	Walla Walla, Fort	Washington.
Harney, Fort	Oregon.	Wallace, Fort	Kansas.
Hartsuff, Fort	Nebraska.	Warren, Fort	Massachusetts.
Hays, Fort	Kansas.	Wayne, Fort	Michigan.
Independence, Fort	Massachusetts.	West Point Military Academy	New York.
Keogh, Fort	Montana.	Whipple, Fort	Arizona.
Klamath, Fort	Oregon.	Willet's Point	New York.
Lapwai, Fort	Idaho.	Wingate, Fort	New Mexico.
Leavenworth, Fort	Kansas.	Yuma, Fort	California.
Logan, Fort	Montana.		

PAPER 27.

List of voluntary observers who have forwarded monthly reports to the Chief Signal-Officer during the year ending June 30, 1879.

Name of observer.	Post-office address.	State.
Albree, George	Pittsburgh, Allegheny County	Pennsylvania.
Anderson, Rev. John	Clarksville, Red River County	Texas.
Arden, Thomas B	Garrison's, Putnam County	New York.
Allan, W. T	Geneseo, Henry County	Illinois.
Allison, Dr. John A	Statesville, Iredell County	North Carolina.
Abbott, Dr. E. K	Salinas City, Monterey County	California.
Armstrong, Rev. G. C	Fayette, Jefferson County	Mississippi.
Andrews, Luman	Southington, Hartford County	Connecticut.
Ashby, M. V	Afton, Union County	Iowa.
Allin, Lucius C	Springfield, Hampden County	Massachusetts.
Adriance, Charles E	Hector, Schuyler County	New York.
Amos, Franklin	Ringgold, Morgan County	Ohio.
Agricultural College Farm	New Brunswick, Middlesex County	New Jersey.
Altaffer, J. M	Independence, Montgomery County	Iowa.
Andrews, George W	Williamstown, Berkshire County	Massachusetts.
Alden, Lyman P	Coldwater, Branch County	Michigan.
Beans, Thomas J	Moorestown, Burlington County	New Jersey.
Breed, J. E	Embarrass, Waupaca County	Wisconsin.
Bently, E. T	Tioga, Tioga County	Pennsylvania.

List of voluntary observers, &c.—Continued.

Name of observer.	Post-office address.	State.
Bateman, J. H	Dover, Kent County	Delaware.
Beal, William	Murphy, Cherokee County	North Carolina.
Bullard, R	Litchfield, Hillsdale County	Michigan.
Barringer, William	Bellefontaine, Logan County	Ohio.
Blanchard, O. A	Elmira, Stark County	Illinois.
Bell, Joseph	Franklin, Venango County	Pennsylvania.
Bowman, Peter	Savannah, Ashland County	Ohio.
Boerner, Prof. Charles G	Vevay, Switzerland County	Indiana.
Beall, Dr. and Mrs. R. L	Lenoir, Caldwell County	North Carolina.
Brendell, Frederick	Peoria, Peoria County	Illinois.
Barker, Ebenezer	Saint Mary's, Camden County	Georgia.
Bryant, A. F	Clear Creek, Saunders County	Nebraska.
Bartlett, E. B	Vermillion, Oswego County	New York.
Beloit College	Beloit, Rock County	Wisconsin.
Blodgett, Charles	Howard, Nemaha County	Nebraska.
Bullock, Thomas	Coalville, Summit County	Utah.
Blood, Charles F	Waltham, Middlesex County	Massachusetts.
Benedictine Fathers	Saint Meinrad, Spencer County	Indiana.
Baker, D. W. C	Austin, Travis County	Texas.
Bower, Dr. William W	Mount Sterling, Brown County	Illinois.
Brewster, James	Okalooska, Ouachita County	Louisiana.
Bently, David	Princeton, Colusa County	California.
Baylies, Mrs. R. H	Independence, Montgomery County	Kansas.
Brainerd, H. G	Independence, Buchanan County	Iowa.
Brown, C. C	Cape Vincent, Jefferson County	New York.
Bradley, W. R	Georgetown, Clear Creek County	Colorado.
Briggs, John	Albany, Linn County	Oregon.
Boies, A. H	Hudson, Lenawee County	Michigan.
Blake, Dr. J	Calistoga, Napa County	California.
Ballou, N. E	Sandwich, De Kalb County	Illinois.
Breedon, Jacob	Adrian, Lenawee County	Michigan.
Bomar, Thomas H	Limestone Springs, Spartanburgh County	South Carolina.
Child, Dr. A. L	Plattsmouth, Cass County	Nebraska.
Clark, Dr. J. T	Mount Solon, Augusta County	Virginia.
Chandler, Dr. William J	South Orange, Essex County	New Jersey.
Cutting, Dr. Hiram A	Lauenburg, Essex County	Vermont.
Cummings, James	Tarentum, Allegheny County	Pennsylvania.
Cheney, William	Minneapolis, Hennepin County	Minnesota.
Crane, George W	Bethel, Clermont County	Ohio.
Cutler, J. L	Quitman, Brooks County	Georgia.
Cook, E. R	Trenton, Mercer County	New Jersey.
Couch, E. D	Contoocookville, Merrimac County	New Hampshire.
Chase, Dr. D. H	Louisville, Clay County	Illinois.
Curtis, George G	Fallston, Harford County	Maryland.
Clark, T. A	Weldon, Halifax County	North Carolina.
Chappellsmith, John	New Harmony, Posey County	Indiana.
Colby, Alfred	Amoskeag, Merrimac County	New Hampshire.
Chamberlain, S. N	Daytona, Volusia County	Florida.
Cutler, Rev. B. B	Schroon Lake, Essex County	New York.
Calhoun, P. B	Austin, Wilson County	Tennessee.
Cornell University	Ithaca, Tompkins County	New York.
Colt, Henry H	Nora Springs, Floyd County	Iowa.
Caldwell, John W	Clarksville, Montgomery County	Tennessee.
Child, H. P	Kansas City, Jackson County	Missouri.
Carlovitz, John	Milton, Santa Rosa County	Florida.
Clark, J. Morton	Arlington, Rush County	Indiana.
Cline, F. P	Terrill, Kaufman County	Texas.
Cook, F. S	Jersey City, Hudson County	New Jersey.
Crawford, George B	Wellsburgh, Brooke County	West Virginia.
Clinton Wire Cloth Company	Clinton, Worcester County	Massachusetts.
Cobb, Lee S	Nirvana, Lake County	Michigan.
Caulkins, John S	Thornville, Lapeer County	Do.
Calkins, Dr. H. T	Petoskey, Emmett County	Do.
Collin, Prof. Alonzo	Mount Vernon, Linn County	Iowa.
Chestnut, Mrs. J. M	Brookville, Jefferson County	Pennsylvania.
Castelhun, Karl	Newburyport, Essex County	Massachusetts.
Carlton, A. Y	Wet Glaze, Camden County	Missouri.
Crosier, Adam	Laconia, Harrison County	Indiana.
Cooke, Dr. William H	Carlisle, Cumberland County	Pennsylvania.
Curtiss, W. W	Rocky Run, Columbia County	Wisconsin.
Dawson, William	Spiceland, Henry County	Indiana.
Doton, Hosea	Woodstock, Windsor County	Vermont.
Dunn, William	Syracuse, Otoe County	Nebraska.
Dickenson, J. P	Guttenburg, Clayton County	Iowa.
Dewhurst, Rev. E	Mystic, New Haven County	Connecticut.
Davis, Jacob	Rowe, Franklin County	Massachusetts.
Dunning, I. S	Vail, Crawford County	Iowa.
Davies, Mrs. D. D	Forest Hill, Jackson County	North Carolina.
Doak, Miss Julia A	Tusculum, Greene County	Tennessee.
Daboll, Solon M	Olivet, Hutchinson County	Dakota.
Draper, Daniel	Central Park Observatory, New York City	New York.

List of voluntary observers, &c.—Continued.

Name of observer.	Post-office address.	State.
Diffendorffer, W. S.	Lebanon, Laclede County	Missouri.
Deming, H. D	Wellsborough, Tioga County	Pennsylvania.
Edwards, Daniel	Nile, Allegany County	New York.
Engelstad, R. M	Mount Carmel, Kane County	Utah.
Ellicott, James F	Saint Inigoes, Saint Mary's County	Maryland.
Ellis, Edwin	Ashland, Ashland County	Wisconsin.
Earlham College	Richmond, Wayne County	Indiana.
Edgington, R. P	Morse, Johnson County	Kansas.
Eddy, L	Danville, Boyle County	Kentucky.
Emmet, Thomas A	Carmel, Putnam County	New York.
Fleming, John	Readington, Somerset County	New Jersey.
Foster, H	Cleveland, Bradley County	Tennessee.
Ferris, E. J	Painesville, Lake County	Ohio.
Fallon, J	Lawrence, Essex County	Massachusetts.
Foster, R. W	Springfield, Hampden County	Do.
Fuller, A. N	Hermosa, La Plata County	Colorado.
Fernald, Prof. M. C	Orono, Penobscot County	Maine.
Fortescue, Joseph	York Factory	British America.
Farquhar, Allan	Sandy Springs, Montgomery County	Maryland.
Fox, Fred. E	Mount Fairview, San Diego County	California.
Failyer, G. H	Manhattan, Riley County	Kansas.
Fowler, William C	Milton, Northumberland County	Pennsylvania.
Goodlander, Harry	Milford, Kosciusko County	Indiana.
Gardiner, R. H	Gardiner, Kennebec County	Maine.
Gillingham, C	Accotink, Fairfax County	Virginia.
Green, H. A	Atco, Camden County	New Jersey.
Gedding, Dr. W. H	Aiken, Aiken County	South Carolina.
Grathwohl, John	Blooming Grove, Pike County	Pennsylvania.
Glasco, J. M	Gilmer, Upshur County	Texas.
Gleitsmann, Dr. W	Asheville, Buncombe County	North Carolina.
Green, Dr. J. C	Westchester, Chester County	Pennsylvania.
Gillespie, Dr. S. W	Sterling, Whiteside County	Illinois.
Gowey, H. D	North Lewisburg, Champaign County	Ohio.
Gillingham, Milnor	Fallsington, Bucks County	Pennsylvania.
Gibboney, A. H	Tazewell, Tazewell County	Virginia.
Gray, F. R	Yorktown, De Witt County	Texas.
Hyde, G. A., and wife	Cleveland, Cuyahoga County	Ohio.
Hoskinson, R. M	Port Blakeley, Kitsap County	Washington.
Harper, George W	Cincinnati, Hamilton County	Ohio.
Howard, S. A	Greensborough, Guildford County	North Carolina.
Hurlin, Rev. William	Antrim, Hillsborough County	New Hampshire.
Hammitt, John W	College Hill, Hamilton County	Ohio.
Haworth, John	Philadelphia, Philadelphia County	Pennsylvania.
Higgins, F. W	Detroit, Wayne County	Michigan.
Hunt, G. M	North Argyle, Washington County	New York.
Haywood, John	Westerville, Franklin County	Ohio.
Hubbs, Dr. J. A	Brownsville, Fayette County	Pennsylvania.
Hopkins, Dr. Howard H	New Market, Frederick County	Maryland.
Hills, F. T	Manchester, Rockingham County	New Hampshire.
Howard, jr., T. T	East Orange, Essex County	New Jersey.
Hering, C. J	Paramaribo, colony of Surinam, Dutch Guiana.	South America.
Hyland, William	Baxter Springs, Cherokee County	Kansas.
Harcourt, Jay	Wappinger Falls, Dutchess County	New York.
Hoadley, James H	Santa Cruz, Santa Cruz County	California.
Hinrichs, Prof. G	Iowa City, Johnson County	Iowa.
Hardy, R. T	Troy, Rensselaer County	New York.
Horne, Dr. C. F	Watertown, Middlesex County	Massachusetts.
Harvard College Observatory	Cambridge	Do.
Havens, Jonathan	Newton, Sussex County	New Jersey.
Hatch, Dr. F. W	Sacramento, Sacramento County	California.
Howard, May	Healdsburg, Sonoma County	Do.
Harrington, Charles A	Dover Mines, Goochland County	Virginia.
Hull, F. V	Okahumpka, Sumter County	Florida.
Hughes, G. S	Ringtown, Schuylkill County	Pennsylvania.
Hess, F	Fort Dodge, Webster County	Iowa.
Hilton, J. T	Paterson, Passaic County	New Jersey.
Hunt, P. L	Nichols, Tioga County	New York.
Helm, Thomas B	Logansport, Cass County	Indiana.
Ingram, Dr. John	Vineland, Cumberland County	New Jersey.
Ingalsbe, Granville	South Hartford, Washington County	New York.
Iowa Agricultural College	Ames, Story County	Iowa.
James, John W	Marengo, McHenry County	Illinois.
Jennison, H. L	Starkey, Yates County	New York.
Jones, Ira B	Neillsville, Clark County	Wisconsin.
Johnson, J. A	Emory Grove, Baltimore County	Maryland.
Kauffman, C. C	Greencastle, Franklin County	Pennsylvania.
Kirkpatrick, James A., A. M	Philadelphia, Philadelphia County	Do.
Keeler, W. F	Mayport, Duval County	Florida.
Kentgen, Charles	Stapleton, Richmond County	New York.

List of voluntary observers, &c.—Continued.

Name of observer.	Post-office address.	State.
Kedzie, R. C	Lansing, Ingham County	Michigan.
Kedzie, Prof. W. K	Manhattan, Riley County	Kansas.
Keese, G. P	Cooperstown, Otsego County	New York.
Keenan, Mrs. W. E. A	Brookhaven, Lincoln County	Mississippi.
Kohler, Edward	Egypt, Lehigh County	Pennsylvania.
Kaucher, William	Oregon, Holt County	Missouri.
Kendall, Henry T	Reading, Berks County	Pennsylvania.
Kennuier, J. P	Kansas City, Jackson County	Missouri.
Kellogg, J. H	Battle Creek, Calhoun County	Michigan.
Lueps, Misses C. and J	Manitowoc, Manitowoc County	Wisconsin.
Lafferty, John F	Martinsville, Clark County	Illinois.
Lewis, Miss Blanche L	McMinnville, Warren County	Tennessee.
Lines, Dr. L. H	Okahumpka, Sumter County	Florida.
Lewis, James	Kanab, Kane County	Utah.
Luthur, S. M	Garrettsville, Portage County	Ohio.
Lincoln, J. R	Boonsboro', Boone County	Iowa.
Lapham, A. Milton	Springfield, Greene County	Missouri.
Lovewell, Prof. J. T	Washburn College, Topeka, Shawnee Co	Kansas.
Metcalf, John G	Mendon, Worcester County	Massachusetts.
Moore, C. R	Johnsontown, Northampton County	Virginia.
Mead, S. B	Augusta, Hancock County	Illinois.
Martin, Horace	Corning, Holt County	Missouri.
McConnell, E. M	New Castle, Lawrence County	Pennsylvania.
Mueller, Dr. R	Saint Mary's Home, New Corydon, Jay Co.	Indiana.
Marshall, Gregory	Cresco, Howard County	Iowa.
McCready, Miss Lucy	Fort Madison, Lee County	Do.
Merriwether, C. J	Boonsborough, Bedford County	Virginia.
Meehan, Thomas	Germantown, Philadelphia County	Pennsylvania.
McGill College	Montreal	Canada.
Merritt, J. C., jr	Farmingdale, Queens County	New York.
Mathews, J. McD	Hillsboro', Highland County	Ohio.
McIlvaine, C. J	Kensico, Westchester County	New York.
Morris, Rev. John	Morriston, Davison County	Dakota.
Mount Saint Mary's College	Emmettsburgh, Frederick County	Maryland.
Moulton, M. M	Monticello, Jones County	Iowa.
McDonough School	Owings Mills, Baltimore County	Maryland.
Mead, E. C	Keswick, Albemarle County	Virginia.
McSwain, L. S	Thomasville, Thomas County	Georgia.
Maxwell, Samuel A	Fulton, Whitesides County	Illinois.
Morgan, William J	Somerville, Somerset County	New Jersey.
McCulny, Charles L	Empire City, Cherokee County	Kansas.
Mass, G. B	Belvidere, Boone County	Illinois.
Morelle, Rev. Daniel	Wilmington, New Hanover County	North Carolina.
Morris, John W	Fancy Gap, Carroll County	Virginia.
Miller, Mr. and Mrs. L. O	West Liberty, Logan County	Ohio.
McLouth, Prof. Lewis	Ypsilanti, Washtenaw County	Michigan.
Munn, A. M	Kalamazoo, Kalamazoo County	Do.
McNeill, M	Princeton, Mercer County	New Jersey.
Moorman, C. H	Cloverport, Breckenridge County	Kentucky.
Madlem, W. F	Ephrata, Lancaster County	Pennsylvania.
Newcomb, G. S	Westborough, Worcester County	Massachusetts.
Noll, A. B	Linden, Union County	New Jersey.
Nettleton, E. S	South Pueblo, Pueblo County	Colorado.
Neill, Thomas	Sandusky, Erie County	Ohio.
Nason, Rev. Elias	North Billerica, Middlesex County	Massachusetts.
Nixon, J. Sharpe	Chambersburg, Franklin County	Pennsylvania.
Newbegin, Dr. John D	Anna, Union County	Illinois.
Nipher, Prof. F. E	Director Missouri Weather Service, Saint Louis.	Missouri.
National Deaf Mute College	Washington	District of Columbia.
Norton, Miss Mary	Pontiac, Livingston County	Illinois.
Osborn, Ethan	Hennepin, Putnam County	Do.
Owsley, Dr. J. B	Jacksonburg, Butler County	Ohio.
O'Hagan, J	Greenville, Pitt County	North Carolina.
Ogden College	Bowling Green, Warren County	Kentucky.
Oehler, Arthur	Highland, Madison County	Illinois.
Owens, T. B	Gatesville, Coryell County	Texas.
Partrick, J. M	North Volney, Oswego County	New York.
Parker, J. D	Mount Desert, Hancock County	Maine.
Pearce, T	Eola, Polk County	Oregon.
Parnell, George W	Poway, San Diego County	California.
Pitman, C. H	Farmington, Strafford County	New Hampshire.
Quarterman, E. A	Flushing, Queens County	New York.
Richardson, C. F	Freehold, Monmouth County	New Jersey.
Robertson, Thomas D	Rockford, Winnebago County	Illinois.
Rodman, Miss Susan	New Bedford, Bristol County	Massachusetts.
Robertson, R. S	Fort Wayne, Adams County	Indiana.
Runge, C	New Ulm, Austin County	Texas.
Rockwell, Charlotte	Colebrook, Litchfield County	Connecticut.
Remington, C. V. S	Fall River, Bristol County	Massachusetts.
Ring, John J	San Bernardino, San Bernardino County	California.

List of voluntary observers, &c.—Continued.

Name of observer.	Post-office address.	State.
Rotch, William	Fall River, Bristol County	Massachusetts.
Robins, C. E	Summit, Rio Grande County	Colorado.
Reynolds, A	Independence, Buchanan County	Iowa.
Rogers, O. P	Marengo, McHenry County	Illinois.
Rogers, Jesse D	Nile, Allegany County	New York.
Rockwood, Prof. C. G	Princeton, Mercer County	New Jersey.
Reeves, James S	Niles, Berrien County	Michigan.
Rogers, David D	Daytona, Volusia County	Florida.
Russell, George W	Wellsburg, Brooke County	West Virginia.
Seltz, Charles	De Soto, Washington County	Nebraska.
Smith, E. Allan	Moriches, Suffolk County	New York.
Shriver, E. T	Cumberland, Alleghany County	Maryland.
Streng, L. H	Grand Rapids, Kent County	Michigan.
Stern, Jacob F	Logan, Harrison County	Iowa.
Scott, Thomas G	Forsyth, Monroe County	Georgia.
Scott, T. M	Melissa, Collins County	Texas.
Snell, S. C	Amherst, Hampshire County	Massachusetts.
Slenker, Elmira D	Snowville, Pulaski County	Virginia.
Smith, Rev. George N	Northport, Lenawee County	Michigan.
Slade, Elisha	Somerset, Bristol County	Massachusetts.
Smith, C. J	Hudson, Summit County	Ohio.
Sessions, Lewis	Norfolk, Madison County	Nebraska.
Stephenson, Dr. M. F	Gainesville, Hall County	Georgia.
Spaulding, John	Wautoma, Waushara County	Wisconsin.
Snow, Prof. Frank H	Lawrence, Douglas County	Kansas.
Sturtevant, E. T	Biscayne, Dade County	Florida.
Smith, Rev. W	Spartanburgh, Spartanburgh County	South Carolina.
Scribner, H. F. J	Strafford, Orange County	Vermont.
Shriver, Howard	Wytheville, Wythe County	Virginia.
Siler, Mrs. A	Franklin, Macon County	South Carolina.
Sanborn, J. F	Tabor, Fremont County	Iowa.
Stucky, Dr. C. F	Helvetia, Randolph County	West Virginia.
Straight, Isaac	Walla Walla, Walla Walla County	Washington T.
Stebbins, George H	Fresno City, Fresno County	California.
Saxby, J. I	San Buenaventura, Ventura County	Do.
Spillman, J. J	Pierce City, Lawrence County	Missouri.
Swann, James G	Neah Bay, Clallam County	Washington T.
Stoddard, Prof. O. N	Wooster, Wayne County	Ohio.
Stearns, Dr. J	Templute, Lincoln County	Nevada.
Stringfield, W. William	Waynesville, Haywood County	North Carolina.
Smyth, B. B	Great Bend, Kansas County	Kansas.
Searle, L. B	Cloudland Post-office, Mitchell County	North Carolina.
Somerville, W. B	Wilsonville, Shelby County	Alabama.
Truman, George F	Genoa, Black County	Nebraska.
Tutwiler, H., LL. D	Green Springs, Hale County	Alabama.
Thompson, Rev. D	Arkansas City, Cowley County	Kansas.
Thralls, George R	Houston, Suwanee County	Florida.
Townsend, Isaac	Capeville, Northampton County	Virginia.
Trowbridge, D	Waterbury, Tompkins County	New York.
Telle, A. K	Blue Hill, Norfolk County	Massachusetts.
Turner, Ernest	Point Pleasant, Tensas County	Louisiana.
Trembly, Dr. J. B	Oakland, Alameda County	California.
Todd, D. P	Naval Observatory, Washington	District of Columbia.
Townsend, L. P	Hulmeville, Bucks County	Pennsylvania.
University of Wisconsin	Madison, Dane County	Wisconsin.
Valente, Rev. A. X., S. J	Woodstock, Howard County	Maryland.
Vermillion, W. W	Frankford, Pike County	Missouri.
Walters, Dr. James	Holton, Jackson County	Kansas.
West, Silas	Cornish, York County	Maine.
Wild, Rev. E. P	Newport, Orleans County	Vermont.
Walton, J. P	Muscatine, Muscatine County	Iowa.
White, I. H	Cincinnati, Hamilton County	Ohio.
Wilbur, Benjamin F	West Waterville, Kennebec County	Maine.
Williams, Milo G	Urbana, Champaign County	Ohio.
Whiting, William H	Geneva, Walworth County	Wisconsin.
Wing, Miss Minerva E	West Charlotte, Chittenden County	Vermont.
Willis, O. R	White Plains, Westchester County	New York.
Wylie, William	Mount Forest, Ontario County	Canada.
Whittington, Granville	Mount Ida, Montgomery County	Arkansas.
Whitney, C. E	Creswell, Marion County	Kansas.
Winnipiseogee Lake Cotton and Woolen Manufacturing Company.	Weir's Landing, Belknap County	New Hampshire.
	Wolfeborough, Carroll County	
	Lake Village, Belknap County	
	Bristol, Grafton County	
	Belmont, Belknap County	
	Ashland, Grafton County	
White, T. Baxter	Highlands, Macon County	North Carolina.
Walters, W	Mechanic Falls, Androscoggin County	Maine.
Washington Aquedact	Receiving reservoir	District of Columbia.
	Great Falls	
	Distributing reservoir	
	Rock Creek	

List of voluntary observers, &c.—Continued.

Name of observer.	Post-office address.	State.
Wolfe, John W	Wellington, Sumner County	Kansas.
Worth, J. M	Fayetteville, Cumberland County	North Carolina.
Wells, J. M	Vernon Centre, Oneida County	New York.
Woodward, Augustus	Otter Creek, Levy County	Florida.
Wilcox, C. M	Norwalk, Huron County	Ohio.
Watkins, Joseph C	Ashley, Pike County	Missouri.
Williams, Rev. C. Foster	Ashwood, Maury County	Tennessee.
Wheaton, Mrs. Daniel B	Hinsdale, Du Page County	Illinois.
Winchell, Prof. N. H	Minneapolis, Hennepin County	Minnesota.
Whitehead, W. A	Newark, Essex County	New Jersey.
Wymer, J. H	Judsona, White County	Arkansas.
Woodworth, Dr. A	Empire City, Cherokee County	Kansas.
Young, George R	Pen Yan, Yates County	New York.
Yetter, W. G	Catawissa, Columbia County	Pennsylvania.
Young, John	Piegan Post-office, Choteau County	Montana.

PAPER 28.

(Circular.)

THE WEATHER CASE, OR FARMERS' WEATHER INDICATOR.

DESCRIPTION.

Stand facing and look at the weather case. Now:

The right of the case is at your right hand, the left of the case is at your left hand.

The pointer or index at the top of the case (No. 1) slides on the brass arc; it is known as the "sunset barometer index," and indicates, when set, by the figures to which it points on the "main barometer scale," which is just below it, the reading of the barometer at the time of the sunset yesterday.

The "main barometer scale" (No. 2) exhibits all the barometric readings likely to be used with this instrument.

The pointer (No. 3) just below the "main barometer scale" is called the "mean barometer index," and indicates, when set, the mean or average reading of the barometer at the place at which the instrument is set and for each separate month. When the barometer reads above or below this reading at any place, such reading is said to be "above the mean" or "below the mean" for that place in that month. This index is set once for each month in the year.

When the barometer pointers go toward the right from this mean or average reading the barometer is said to be "rising." When the barometer pointers go toward the left from the mean or average reading the barometer is said to be "falling."

The mean barometer reading for each district for each month is stated in the Farmers' Bulletin, or can be had by application to this office.

The long brass hand over the glass face of the barometer is known as the "long pointer," and indicates, by the figures of the "main barometer scale" to which it points when set, the reading of the barometer when last set.

The black pointer on the face of the barometer under the glass face is known as the "short pointer," and indicates the existing pressure of the atmosphere at any time the instrument may be examined.

TO READ THE BAROMETER.

If the observer stands facing the barometer the "short pointer" (black) moves toward the right as the pressure of the atmosphere (or weight of the air) increases, and to the left as the pressure of the atmosphere (or weight of the air) diminishes. The "long pointer" (brass) should be moved by the turning screw so as to coincide with, or exactly cover, the "short pointer" (black). The barometer is now set for reading, and the "barometer reading" is found by reading from the left to right on the "main barometer scale" from the lowest figures (or readings) on that scale to that exact division or mark upon that scale to which the "long pointer" points or which it covers. The inches and hundredths of inches are marked on the scale. The inches and hundredths are counted from left to right, or in the same direction as the hands of a watch move, and they are counted in the same way as the hours and minutes on a watch-face are counted. The inches and hundredths are written down, if they are to be written, in the same manner as dollars and cents are written, thus: one dollar

and seventy-five cents; that is, one dollar and seventy-five hundredths of a dollar would be written $1.75, or one and seventy-five hundredths; $29.35, twenty-nine dollars and thirty-five hundredths. The "long pointer" pointing on the "main barometer scale" to twenty-nine inches and thirty-five hundredths, the barometer reading would be twenty-nine inches and thirty-five hundredths of an inch, and would be written 29.35 inches, and so for other readings.

RAIN WINDS AND DRY WINDS.

There are for each place and for each month two kinds of winds:

First. Winds which, blowing from certain directions, are at that place and in that month more likely than any other winds to be followed by rain. These are called "rain winds."

Second. Winds which, blowing from certain directions, are at that place and in that month less likely than other winds to be followed by rain. These are called "dry winds."

The "rain winds" and the "dry winds" for each district and for each month are stated in the Farmers' Bulletin, or can be had by application to this office.

The wind direction for any day or time must be seen and taken at each place or station by a vane as well located as practicable.

The "wind disk" (No. 8) consists of a brass circle, on which slide freely two arcs—a red arc, called the "dry wind arc" (No. 9), and a blue arc, called the "rain wind arc" (No. 11). In the center of the disk is a pointer, turning with a turning-screw, and called the "wind disk pointer" (No. 10). Around the disk are letters to show directions, as N. for north, E. for east, NE. for northeast, &c.

The wind disk is made ready for use as follows: If, for instance, the Farmers' Bulletin, or other report, states that, for any district or place, and for any month, "winds blowing from south or east, or from directions between those points, are found to be the winds most likely to be followed by rain; winds blowing from north or west, or from directions between those points, are found to be the winds least likely to be followed by rain;" or, in other words, "winds blowing from east or south, or from directions between those points, are rain winds. Winds blowing from north or west, or from directions between those points, are dry winds;" then, if the instrument is to be used in that month and in that district or place, the rain-wind arc No. 11 (the blue) is moved on the brass circle until one end of the arc is at the letter E., which stands for "east," and the other is at the letter S., which stands for "south;" the dry-wind arc No. 9 (the red) is moved on the circle until one end of that arc is at the letter N., which stands for "north," and the other is at the letter W., which stands for "west." The arcs remain as they are thus placed for the whole of the month.

At the beginning of the next month, the rain-wind direction and dry-wind direction must be located for that month, and the arcs must be again moved on the circle in the same manner until the rain-wind arc and the dry-wind arc touch, respectively, with their ends, the letters for the points named for the rain-winds and the dry-winds for that month. The arcs then remain so placed for that month—so for each month of the year.

Now, when the wind disk is thus ready, and on any day, the weather case is to be used. (1) The direction in which the wind is blowing is seen by a vane. It is noticed from what direction the wind is blowing, as from the north, south, east, &c. (2) The wind disk pointer (No. 10) is moved by the turning screw to point to the compass letters on the disk, or between them, showing as nearly as practicable by those letters the same direction, *i. e.*, that *from* which the wind is blowing when observed. If this pointer, so set, points at either of the ends of either arc, or any part of either arc, it shows, if it so points at the *red* arc, that the wind is at that time in the *dry*-wind direction or is a *dry* wind; if it so points at the *blue* arc, that the wind is at that time in the *rain*-wind direction or is a *rain* wind.

The hour is noted by a clock or watch and the time at which a rain wind or a dry wind commenced to blow or was first noticed is written down.

It must be also noticed if the wind shifts, as from blowing from a rain direction to blowing from a dry direction, or is blowing from such direction as not to be within either arc.

The length of time for which the wind has blown continuously from a rain direction or a dry direction is of importance to be considered with other local signs and indications.

The pointer and scale (No. 5) on the right of and below the barometer are called the dry-wind time record, and the pointer (No. 7) is called the "record pointer," and indicates, when set, the length of time the wind has been blowing continuously from a "dry" direction by the figures showing the number of hours on the scale to which it points.

The pointer and scale (No. 4) on the left of and below the barometer are called the rain-wind time record, and the record pointer (No. 6) indicates when set the length of

time the wind has been blowing continuously from a "rain" direction by the figures showing the number of hours on the scale to which it points.

The record pointer on the rain-wind time record (No. 6) is always turned by the thumb-screw, and set pointing at the figure 0 on the scale when the wind is not blowing in the rain-wind direction. In the same way the "record pointer" on the dry-wind time record (No. 7) is always set pointing at the figure 0 when the wind is not blowing in the dry direction.

When in actual use, the hour at which the *wind-disk pointer* has been set is carefully noted. When the weather-case is next examined, the wind-vane is again noticed and the wind-disk pointer again *examined* or adjusted. If it still continues to point at any part of the same arc as before, the number of hours which have elapsed since the last setting and during which the wind-disk pointer has been so pointing is noticed, and the record pointer on either the rain-wind time record or dry-wind time record is turned to show *the number of hours* the wind has been thus noticed as blowing from the *rain* direction or from the *dry* direction, as the case may be. This proceeding is repeated every time the instrument is set. It can thus be seen at a glance whether the wind is or not blowing in a rain-wind or a dry-wind direction, and for how long it has been so blowing. Whenever, on noticing the wind vane, it is seen that the wind has shifted, the wind-disk pointer is set accordingly. If it now points at neither arc or points to the different arc from that at which it pointed at its last setting, the time-record pointer on the rain-wind time record or dry-wind time record (whichever may have been in use at the last setting), is turned to point at the figure 0 (zero).

The wind-disk pointer and the time-record pointer ought to be set thrice daily at least: early in the morning, at noon, and at sunset.

The sunset-disk (No. 12) consists of a circular disk, one-half of which is colored red and one-half of which is colored blue. The disk turns upon a central turning screw in such manner that half of the disk shows through a semicircular opening in the face of the weather case. The sunset disk is set as follows: At the exact time of every sunset the western sky and the character of the sunset is carefully observed. The examination ought to be minute and careful, lasting for about fifteen minutes. If the sunset sky is clear or red, or markedly what is known as a "fair-weather sunset," a sunset such as is generally held to indicate a clear or fair day to follow on the next day—a day on which it will not rain—the sunset disk is turned by the turning screw until the semi-ciircular opening shows all red. The sunset-disk, thus turned, is described as set for a "fair-weather sunset."

If the sunset sky (the western) is cloudy or foul, or markedly what is known as a "foul-weather sunset," a sunset such as is generally held to indicate foul weather to follow on the next day—a day on which it will rain—the sunset disk is turned by the turning screw until the semicircular opening shows all blue. The sunset disk thus turned is described as set for a "foul-weather sunset." If the appearance of the western sky and the character of the sunset are neither markedly those of a "fair-weather sunset" nor of a "foul-weather sunset," but such as to leave the observer in doubt how to style it, the sunset disk is turned to show half red and half blue, or "doubtful." The sunset disk, thus set, is described as set for a "doubtful-weather sunset."

The term "fair-weather sunset" expresses such condition of the sky, particularly the western, and such character of the sunset as is considered to indicate a fair day, a day on which it does not rain for the day ensuing.

The term "foul-weather sunset" indicates that the appearances are such as to presage a rainy day, a day on which rain falls, for the ensuing day.

The term "doubtful-weather sunset" indicates that the conditions are such as to leave the mind of the observer in doubt as to what the sunset presages for the following day. The indication is considered to be for the period of time from "sunset" of the day on which the character of the sunset is examined until the "sunset" of the following day.

DRY-BULB AND WET-BULB THERMOMETERS.

In the lower part of the weather case there are two thermometers, a dry-bulb thermometer (No. 13) on the left-hand side of the case, and a wet-bulb thermometer (No. 14) on the right-hand side.

The dry-bulb thermometer is like any other thermometer, and shows by its readings the temperature of the air.

The wet-bulb thermometer is one the bulb of which is kept constantly moist by the water passing up from the glass reservoir through the wicking which covers the thermometer bulb.

The readings of the dry-bulb thermometer and those of the wet-bulb thermometer are more and more unlike or farther and farther "*apart*," as it is called, in proportion as the air contains less and less moisture, that is, is becoming *drier*.

The readings of the dry-bulb thermometer and those of the wet-bulb thermometer become more and more *alike*, and nearer and nearer together, in proportion as the air contains more and more *moisture*. That is, is becoming saturated or *wet*.

By the side of the dry-bulb thermometer (No. 13) is the dry-bulb pointer, which slides on the brass slide (No. 15). By the side of the wet-bulb thermometer is the wet-bulb pointer, which slides on the brass slide (No. 16). In the center of the case is the "dry and wet bulb scale," marked on the paper on which is the central brass slide-bar (No. 19), and on this slide move the dry-bulb keeper (No. 17) and the wet-bulb keeper (No. 18). To set the thermometers, examine first the dry-bulb thermometer and move the "dry-bulb pointer" (No. 15) on the slide until the outside point is exactly level with the top of the mercury in the thermometer—as near to it as practicable. Examine next the wet-bulb thermometer, and move the wet-bulb pointer (No. 16) on the slide until the outside pointer is exactly level with the top of the mercury in the wet-bulb thermometer, or as near to it as practicable, then turn to the "dry and wet bulb scale," and on the "central brass slide-bar" (No. 19) move one of the keepers until it touches, as nearly as possible—is on an exact level with the inside pointer of the "dry-bulb pointer," then move the other keeper until it touches, as nearly as practicable—is on an exact level with the inside pointer of the "wet-bulb pointer." The thermometers are now set, and the difference between their readings can be known by counting on the "dry and wet bulb scale" the number of degrees between the keepers.

When the thermometers are examined and set again, following the same plan, it will be easily seen whether the "keepers" are, when set, *farther apart* than they were at the previous setting, or whether they are, when set, *nearer together* than at the previous setting.

If they are farther apart the themometers are said to be "separating." If they are nearer together the thermometers are said to be "approaching." Other things being equal, the themometers show, when they are "separating," that the air is becoming more dry, one sign of approaching fair weather. The thermometers show, when they are "approaching," that the air is becoming more moist or damp—one sign of approaching rain.

The reservoir at the bottom of the weather case ought to be kept half filled always with pure water. The wicking must be kept clean and changed occasionally—say, once in each month.

USES OF THE WEATHER CASE.

The weather case is not intended to be used independently of the official weather reports. It is to be used always in connection with them. The weather case is for the purpose of supplementing the official reports by showing the local instrumental indications, and giving other information. It is intended especially for use at farmers, post-offices and places reached with difficulty by the printed reports. It will supplement often whatever knowledge there be of local signs, with the indications of the instruments. Its careful use taken either with the furnished reports or even without them (if they chance to fail), will often enable the character of the coming weather on the coming day to be so judged as to determine what kind of work or undertaking it is wise to plan for or to omit. The case gives the local instrumental indications and will frequently aid in making fair forecasts for the next day.

It is well to limit the forecasting to the attempt to tell only whether it will or will not *rain* on the next day. Days on which it does not rain at all are rated "fair," though the sky may be covered with clouds. Days on which there is rain enough to injure crops in the harvesting, are rated "foul."

It must never be forgotten that the weather case is only to aid, sometimes, in making up one's mind as to what the weather of the next day will be. While it will often be very useful there will be many instances in which everything will be left in doubt.

LOCATION.

The weather case should be hung or stand in a fair light, where it will be always shaded, preferably on the northern side or part of the house, where it will not be exposed to artificial heat, and where there will be a free circulation of the air. It will be easier to find good locations in summer than in winter. As the readings of the instruments are examined for their general indications only, the great care as to the location will not be so needed for general use as if the readings were for exact record. For particular uses the case may be particularly sheltered.

TO USE THE WEATHER CASE AT SUNSET.

(1) Read the description: See that the mean-barometer index is set to the mean-barometer reading for the place and for the month.

(2) Set the rain-wind segment (or arc) and the dry-wind segment (or arc) at the proper places on the wind-disk circle for the place and month.

At sunset turn the "long barometer pointer" until it covers the "short barometer

pointer." Note whether on the "main barometer scale" the long pointer is then at a reading *above* or *below* (greater or less than) the mean-barometer reading for the place and for the month. Move the "sunset-barometer index" until it points to the same reading on the "main-barometer scale" with the "long-barometer pointer."

Note the direction of the wind and set the wind-disk pointer.

Set the sunset disk.

Set the dry and wet bulb thermometers.

Endeavor to apply the "indications" printed on the face of the case, to determine what is to be the character of the next day. Read these "indications" carefully and see how many of the instruments or disks *agree* in showing one or another kind of weather as to be expected.

Study the character of the clouds. The scud cloud is one of the prominent signs of coming rain. Learn to apply the local signs of weather changes, the more the better.

Examine the case frequently during the day.

It can always be found whether the "pointer" is moving toward the right or left—that is, whether the barometer is rising or *falling*—by turning the long pointer so as to cover exactly the black barometer pointer; if then, on next examination, the black pointer is found to have moved toward the right, the barometer is rising. If the black pointer has moved toward the left, the barometer is falling.

At sunset of the next day set the case again; note whether the barometer has risen since the "sunset-barometer index" was set at the last sunset, whether the wind is in the rain or the dry direction, and for how many hours it has been in either, approximately. Study and record the character of the sunset and what it foretells. Set the wet and dry bulb thermometers, and note from the "keepers" whether the thermometers are approaching or separating.

Endeavor to make a forecast whether it WILL or NOT rain for the ensuing day; as well as a more general forecast.

For instance, if with a "fair-weather sunset," there is a "high and rising barometer," "winds in dry direction," and "thermometers separating," the chances for a fair day for the next ensuing are increased; four indications of pleasant weather coincide. If, with a "foul-weather sunset," the barometer is "falling" (the pointer moving toward the left), the winds are in the rain-wind direction and "thermometers approaching;" four indications of rainy or unpleasant weather coincide. So three indications may coincide, as, with "thermometers approaching" there may be "fair-weather sunset"—barometer pointer moving toward the right or high barometer—wind steady in the dry direction. The indications may be divided. In such cases weight must be given the different indications as experience may show their correctness. The purpose of the case is to be one aid only in making up a forecast.

The greater the number of the "indications," as stated on the face of the case, which are found when the instrument is set, to coincide in indicating dry or clear weather or rainy or stormy weather, the more likely the success of the forecast.

Continue this practice at sunset from day to day. Skill will be found to increase with the knowledge and the use of the instrument and the habit of close observation of local signs which such use makes necessary.

In instances where the printed synopses and indications are had regularly, or where official weather charts, bulletins, &c., can be consulted, the weather case must be used with careful study of those papers. Locate the areas of high and low barometer on the map, and in reference to any location, as nearly as is practicable from the descriptions or data. Areas of cloudiness, rain-areas, areas of unusual temperature, &c., may be similarly located. When any such areas are found to the westward of and at all near any place, it is rare that the effects of them fail to be shown at such place by weather conditions similar to those within the areas noticed, and in a short time, as of hours or days. As the movements of the areas, easterly, have a certain regularity, it is soon learned to tell nearly *when* the effect of any area noticed as approaching will commence to be felt. The instrumental signs of the weather case will show the changes commencing, and it may be judged whether or when the weather conditions noticed in the approaching area are likely to prevail. Some elementary knowledge of meteorology is needed; but much can be done by a careful watching, solely. The instruments of the weather case will show the changes anticipated when they begin to be felt and before they have arrived in their full force.

If the area noticed has been large or small, with weather conditions decided or variable, it can, from these facts, be judged often if the "coming weather," of whatever kind it may be, will be steady for a day or for days, or more rapidly changing. The case makes practicable other and many studies.

ALBERT J. MYER,
Brigadier-General (Brevet Assigned), Chief Signal-Officer, U. S. A.

WAR DEPARTMENT, OFFICE OF THE CHIEF SIGNAL-OFFICER,
Washington, D. C., July 21, 1878.

PAPER 29.

(This bulletin must not be disturbed nor the blanks removed therefrom.)

DAILY WEATHER REPORT.

——— ———, 1879.

The following report was telegraphed from the United States Signal-Office, Washington, D. C., to the Pittsburgh, Fort Wayne and Chicago Railroad Company, and is now posted for the benefit of farmers, merchants, and the traveling public:

OFFICE OF THE CHIEF SIGNAL-OFFICER, WASHINGTON, D. C.,
———, 1879, 1 *a. m.*

PAPER 29½.

(Form 29.)

WAR DEPARTMENT, SIGNAL SERVICE, UNITED STATES ARMY.

DAILY WEATHER REPORT FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

(Published by co-operation of the Saint Louis and Southeastern Railroad.)

Report of bulletins received and posted by station operator at ———, county of ———, State of ———, during the fortnight ending Saturday ———, 187—.

Day and date.	Number of copies received daily.	Time of receipt.	Time at which displayed in frame or on bulletin board.	Remarks.
Sunday				
Monday				
Tuesday				
Wednesday				
Thursday				
Friday				
Saturday				
Sunday				
Monday				
Tuesday				
Wednesday				
Thursday				
Friday				
Saturday				

(Signature) ——— ———,
Operator.

NOTE.—Under the head of Remarks will be noted all delays in the prompt receipt of the dispatch, with cause of delay, when known. One copy of this form will be mailed at the close of each fortnight to the Chief Signal-Officer, U. S. A., Washington, D. C.

(Indorsed:) Form 29. Report of railway bulletins, for the fortnight ending ———, 187—. Station, ———. Rec'd O. C. S. O. ———, 187—.

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RAILWAY BULLETIN SERVICE.

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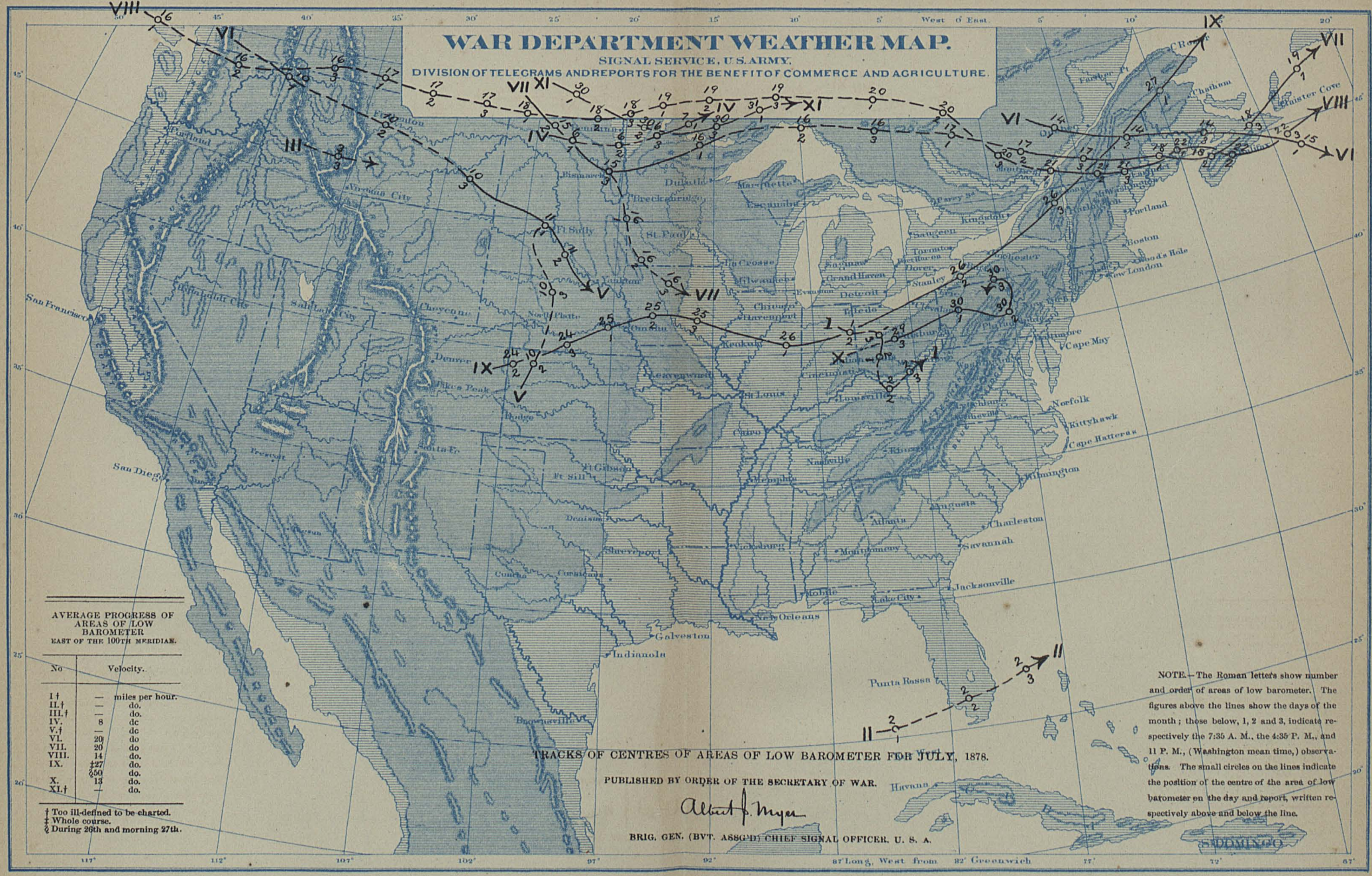
No. I.



AVERAGE PROGRESS OF AREAS OF LOW BAROMETER EAST OF THE 100TH MERIDIAN.

No	Velocity.
I †	— miles per hour.
II. †	— do.
III. †	— do.
IV.	8 do.
V. †	— do.
VI.	20 do.
VII.	20 do.
VIII.	14 do.
IX.	‡27 do.
	§50 do.
X.	13 do.
XI. †	— do.

† Too ill-defined to be charted.
‡ Whole course.
§ During 26th and morning 27th.

NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7:35 A. M., the 4:35 P. M., and 11 P. M., (Washington mean time,) observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.

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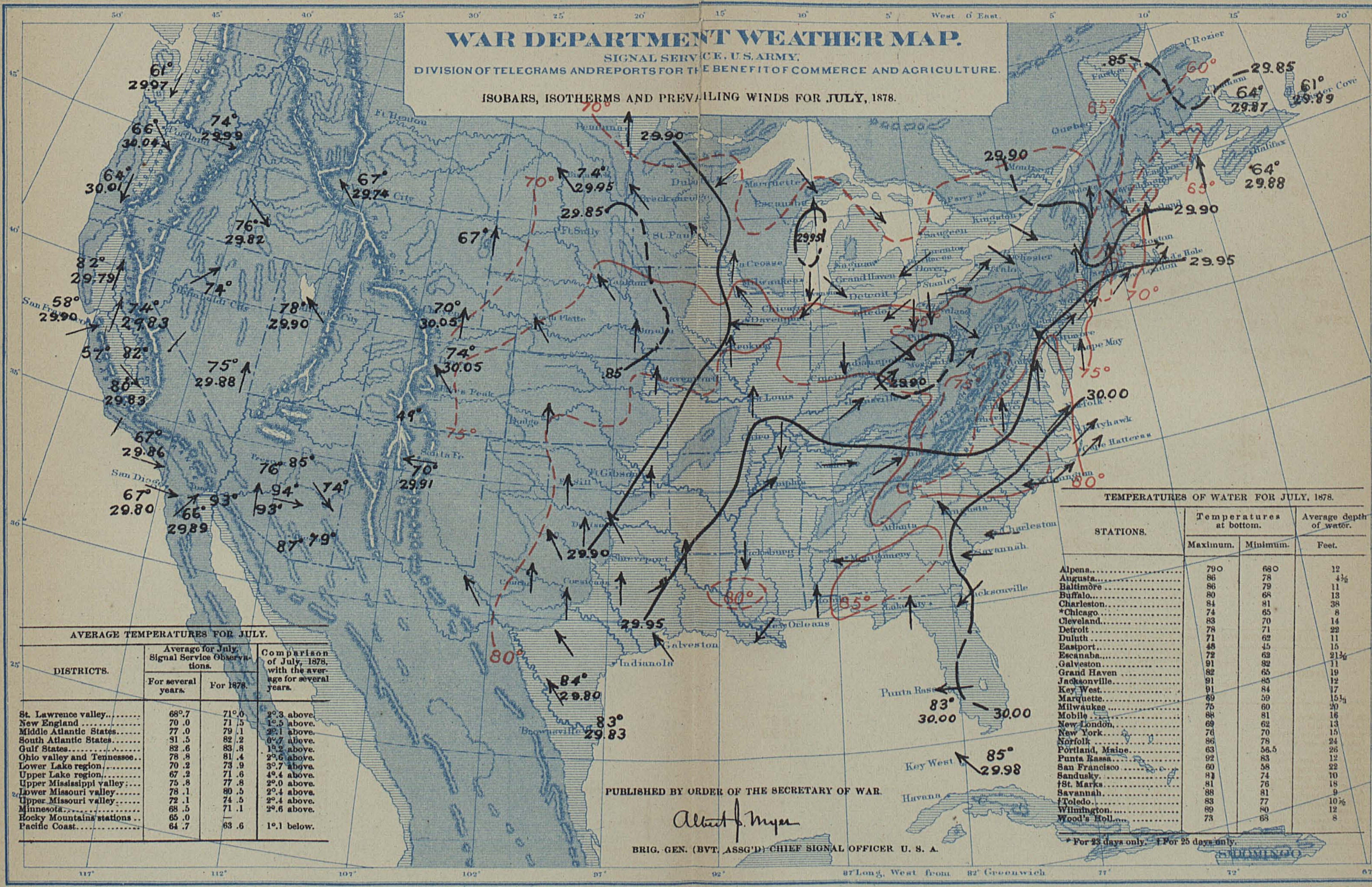
No. II.



AVERAGE TEMPERATURES FOR JULY.

DISTRICTS.	Average for July. Signal Service Observations. For several years.	For 1878.	Comparison of July, 1878, with the average for several years.
St. Lawrence valley	68°.7	71°.0	2°.3 above.
New England	70 .0	71 .5	1°.5 above.
Middle Atlantic States	77 .0	79 .1	2°.1 above.
South Atlantic States	81 .5	82 .2	0°.7 above.
Gulf States	82 .6	83 .8	1°.2 above.
Ohio valley and Tennessee	78 .8	81 .4	2°.6 above.
Lower Lake region	70 .2	73 .9	3°.7 above.
Upper Lake region	67 .2	71 .6	4°.4 above.
Upper Mississippi valley	75 .8	77 .8	2°.0 above.
Lower Missouri valley	78 .1	80 .5	2°.4 above.
Upper Missouri valley	72 .1	74 .5	2°.4 above.
Minnesota	68 .5	71 .1	2°.6 above.
Rocky Mountains stations	65 .0	—	
Pacific Coast	64 .7	63 .6	1°.1 below.

TEMPERATURES OF WATER FOR JULY, 1878.

STATIONS.	Temperatures at bottom. Maximum.	Minimum.	Average depth of water. Feet.
Alpena	79°	68°	12
Augusta	86	78	4½
Baltimore	86	79	11
Buffalo	80	68	13
Charleston	84	81	38
*Chicago	74	65	8
Cleveland	83	70	14
Detroit	78	71	22
Duluth	71	62	11
Eastport	48	45	15
Escanaba	72	62	21½
Galveston	91	82	11
Grand Haven	82	65	19
Jacksonville	91	85	12
Key West	91	84	17
Marquette	69	59	15⅓
Milwaukee	75	60	20
Mobile	88	81	16
New London	69	62	13
New York	76	70	15
Norfolk	86	78	24
Portland, Maine	63	56.5	26
Punta Rassa	92	83	12
San Francisco	60	58	22
Sandusky	81	74	10
†St. Marks	81	76	18
Savannah	88	81	9
†Toledo	83	77	10½
Wilmington	89	80	12
Wood's Holl	73	68	8

* For 23 days only. † For 25 days only.

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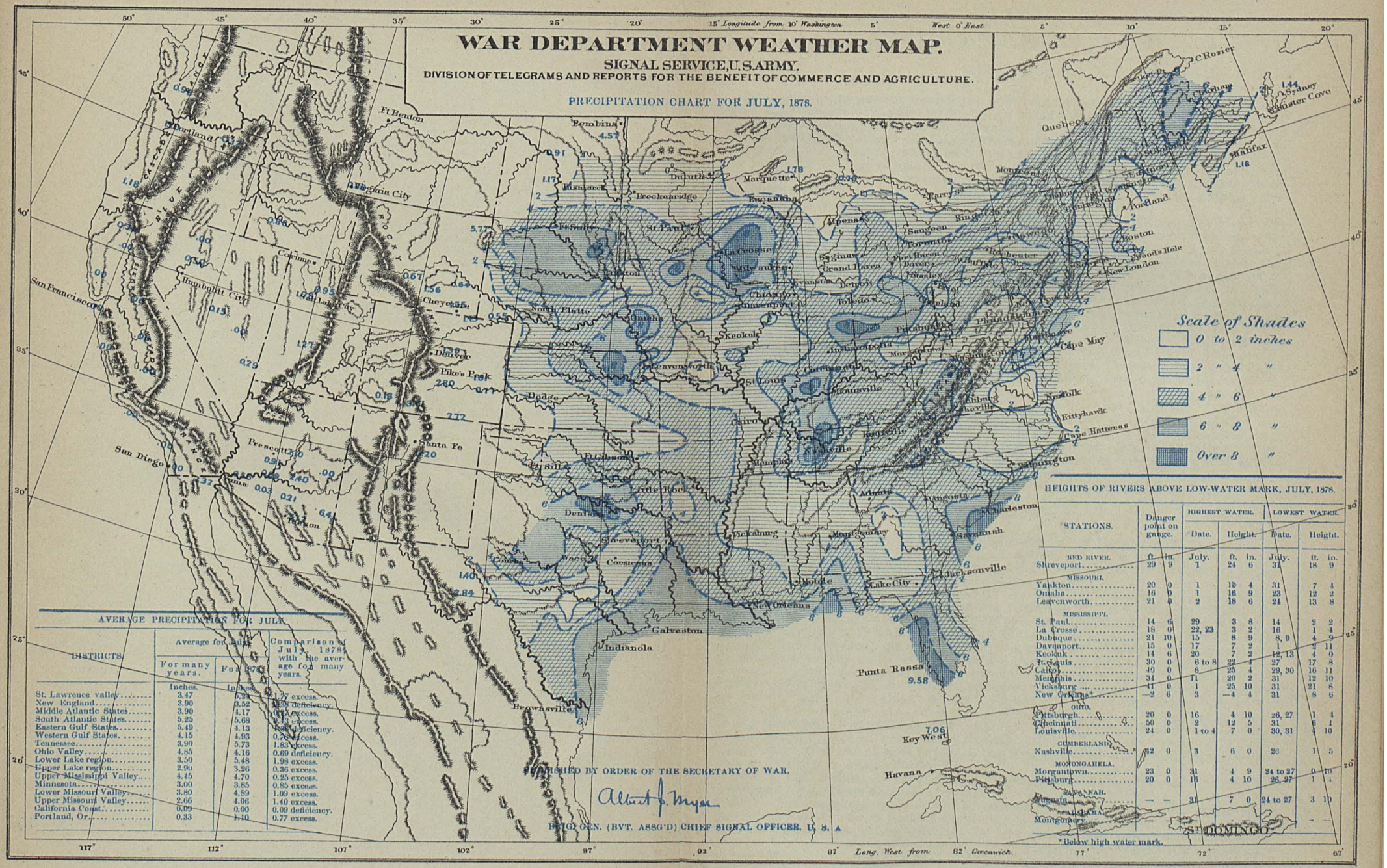
WAR DEPARTMENT WEATHER MAP.

SIGNAL SERVICE, U.S. ARMY.

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

PRECIPITATION CHART FOR JULY, 1878.



AVERAGE PRECIPITATION FOR JULY.

DISTRICTS.	Average for July. For many years.	Average for July. For 1878.	Comparison of July, 1878, with the average for many years.
	Inches.	Inches.	
St. Lawrence valley	3.47	4.74	1.27 excess.
New England	3.90	3.52	0.38 deficiency.
Middle Atlantic States	3.90	4.17	0.27 excess.
South Atlantic States	5.25	5.68	0.43 excess.
Eastern Gulf States	5.49	4.13	1.36 deficiency.
Western Gulf States	4.15	4.93	0.78 excess.
Tennessee	3.90	5.73	1.83 excess.
Ohio Valley	4.85	4.16	0.69 deficiency.
Lower Lake region	3.50	5.48	1.98 excess.
Upper Lake region	2.90	3.26	0.36 excess.
Upper Mississippi Valley	4.45	4.70	0.25 excess.
Minnesota	3.00	3.85	0.85 excess.
Lower Missouri Valley	3.80	4.89	1.09 excess.
Upper Missouri Valley	2.66	4.06	1.40 excess.
California Coast	0.09	0.00	0.09 deficiency.
Portland, Or.	0.33	1.10	0.77 excess.

HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, JULY, 1878.

STATIONS.	Danger point on gauge.		Highest water.			Lowest water.		
			Date.	Height.		Date.	Height.	
	ft.	in.	July.	ft.	in.	July.	ft.	in.
RED RIVER.								
Shreveport	29	9	1	24	6	31	18	9
MISSOURI.								
Yankton	20	0	1	10	4	31	7	4
Omaha	16	0	1	16	9	23	12	2
Leavenworth	21	0	2	18	6	24	13	8
MISSISSIPPI.								
St. Paul	14	6	29	3	8	14	2	2
La Crosse	18	0	22, 23	3	2	16	1	4
Dubuque	21	10	15	8	9	8, 9	4	9
Davenport	15	0	17	7	2	1	2	11
Keokuk	14	6	20	7	2	12, 13	4	0
St. Louis	30	0	6 to 8	22	4	27	17	8
Cairo	40	0	8	25	4	29, 30	16	11
Memphis	34	0	11	20	2	31	12	10
Vicksburg	41	0	1	25	10	31	21	8
New Orleans*	—2	6	3	—4	4	31	8	6
OHIO.								
Pittsburgh	20	0	16	4	10	26, 27	1	4
Cincinnati	50	0	2	12	5	31	6	1
Louisville	24	0	1 to 4	7	0	30, 31	4	10
CUMBERLAND.								
Nashville	42	0	3	6	0	26	1	5
MONONGAHELA.								
Morgantown	23	0	31	4	9	24 to 27	0	10
Pittsburg	20	0	16	4	10	26, 27	1	4
SAVANNAH.								
Augusta	—	—	31	7	0	24 to 27	3	10
ALABAMA.								
Montgomery								—

*Below high water mark.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

Albert J. Myer

BRIG. GEN. (BVT. ASS'G'D) CHIEF SIGNAL OFFICER, U. S. A.

PAPER 30.

MONTHLY WEATHER REVIEW JULY, 1878.

INTRODUCTION.

In compiling the present Review the following data, received up to August 13, have been made use of, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at 116 Signal-Service stations and 12 Canadian stations, as telegraphed to this office; monthly journals and means, 121 and 141 respectively, from the former, and monthly means from 14 of the latter; reports from 22 special sunset stations; 228 monthly registers from voluntary observers; 36 monthly registers from United States Army post surgeons; marine records; international simultaneous observations; monthly report of the weather service of the State of Iowa; reliable newspaper extracts; special reports.

Instructions have been issued establishing stations of the first class, as follows: May 18, 1878, Deadwood to be discontinued, and Lead City, Dak., to be established; June 22, establishing Columbus, Ohio; July 8, Atlanta, Ga., Des Moines, Iowa, and Madison, Wis.; July 10, Chattanooga, Tenn., and Charlotte, N. C. Lead City began reporting June 1; Columbus, July 1; Des Moines, August 1. The following have been announced as *Display Stations* (for displaying Cautionary Signals), viz: September 16, 1877, Menomonee, Mich., and Sturgeon Bay, Horn's Pier, Kewaunee, Sheboygan, Racine, Green Bay, Kenosha, and Manitowoc, Wis., as *Section One*, with Milwaukee as a center. August 8, 1878, New Buffalo, Mich., to repeat Chicago signals. January 20, Ludington, Mich.; July 8, Pentwater, Traverse City, Frankfort, and Northport, Mich.; July 23, Saint Joseph and South Haven, Mich., as *Section Three*, with Grand Haven as the center. July 8, Mackinac, Mich. July 15, Bay City, East Tawas, Forrester, Port Austin, and Rogers City, Mich., as *Section Four*, with Detroit as the center. July 8, Monroe, Mich., Fairport and Ashtabula, Ohio, and Dunkirk, N. Y., as *Section Five*, with Cleveland as the center. July 8, Charlotte, N. Y., to repeat the Rochester signals. July 8, Cape Vincent, N. Y., as *Section Six*, with Oswego as the center. August 1, Millbridge, Belfast, Deer Island, and Booth Bay, Me., and Portsmouth, N. H., as *Section Seven*, with Portland as the center. August 1, Newburyport, Thatcher's Island, Marblehead, Highland Light, Chatham, Hyannis, and New Bedford, Mass., as *Section Eight*, with Boston as the center. August 1, Watch Hill, R. I., to repeat the New London signals. February 25, Lewes, Del. July 1, Old Topsail Inlet (Fort Macon), N. C.

BAROMETRIC PRESSURE.

Upon chart No. II is shown the general distribution of the atmospheric pressure for the month by the isobaric lines. Compared with the means for July of previous years, the pressure for the present month averages slightly lower for all the districts, except along Lake Superior, where it has been slightly higher.

The local barometric ranges, as reduced to sea-level, for the month, vary as follows: New England, from 0.68 of an inch at New Haven to 0.97 at Burlington; Middle Atlantic States, 0.46 at Cape Henry to 0.69 at Albany; South Atlantic States, 0.36 at Jacksonville to 0.46 at Wilmington; Gulf States, 0.30 at New Orleans to 0.33 at Key West, 0.42 at Corsicana, and 0.54 at Camp Stockton; Ohio Valley and Tennessee, 0.42 at Memphis to 0.69 at Pittsburg; Lower Lake region, 0.75 at Sandusky to 0.90 at Oswego; Upper Lake region, 0.59 at Alpena to 0.70 at Chicago; Upper Mississippi Valley, 0.57 at Saint Paul to 0.69 at Davenport; Red River of the North Valley, 0.76 at Breckenridge and Pembina; Missouri Valley, 0.60 at Leavenworth to 0.79 at Bismarck; plains of Nebraska and Kansas, 0.68 at Dodge City to 0.78 at North Platte; Rocky Mountains, 0.32 at Santa Fé to 0.39 at Denver; Utah, 0.55 at Salt Lake City; Idaho Territory, 0.46 at Boise City; Nevada, 0.39 at Winnemucca to 0.43 at Pioche; California, 0.25 at Los Angeles to 0.29 at San Francisco and 0.33 at Red Bluff; Oregon, 0.43 at Roseburg to 0.49 at Portland.

Areas of high barometer.—Of these, six are described. None of them were very decided, and little interest attaches to them.

No. I.—This is a continuation of the area of high pressure described in the June Review as No. IX. 1st, it covered the northwest with cool, clear or clearing weather. At midnight the barometers, corrected for temperature and instrumental errors, read about 0.20 of an inch above the normals from Minnesota to Western Kansas. 2d, the central highest pressure advanced to Lake Superior, with cool, northerly winds and clear weather, thence toward Texas; midnight barometer at Marquette, 30.20 inches, or 0.25 above normal. 3d, the pressure continued nearly stationary over the Upper Lakes and increasing toward the Saint Lawrence Valley. 4th, a. m. barometers at Duluth and Montreal 0.30 and 0.31, respectively, above the normals. During the day

the pressure rapidly diminished in the Saint Lawrence Valley, and by midnight the highest covered Lake Superior. 5th, continued over the lake region, with diminished pressure. 6th and 7th, it disappeared in advance of low pressure No. II.

No. II.—9th, it advanced southeastward over Manitoba and Northern Dakota. 10th, it reached the Lake region, with cool, northerly winds; p. m. barometer at Marquette 0.21 above normal. 11th, moved to the Saint Lawrence Valley; midnight barometers at Montreal and Quebec 0.33 above normals. 12th, disappeared southeastward over New England.

No. III.—From the 7th to the 11th the pressure was above the normal along the South Atlantic coast, with generally clear weather. 12th, it reached its maximum; a. m. barometer at Cape Hatteras 30.24 inches, or 0.21 above normal.

No. IV.—During the 12th and 13th the pressure rose in Oregon. 14th, a. m. barometer at Portland 30.26 inches, or 0.28 above normal. During the day it apparently withdrew to the northward.

No. V.—19th, following storm No. VIII, it was observed at night as advancing southeastward over Manitoba and Dakota. 20th, northerly winds, generally cool, clear weather and rising barometer prevailed in the northwest; p. m. barometer at Pembina 0.28 above normal. 21st, a. m. barometer at Pembina 30.26 inches, or 0.36 above normal. In connection with the area of low pressure in its advance, high northerly winds and gales were frequently produced in the Lake region. 22d, by midnight the pressure was highest over the upper lakes, with high northwesterly winds and gales thence east and southeastward to the Atlantic coast. 23d, the pressure was above the normal from the Upper Mississippi Valley and lakes to Virginia, with cool, clear weather, and highest in the lake region. 24th, it disappeared off the Middle Atlantic coast.

No. VI.—26th, it appeared in the extreme northwest. 27th, advanced eastward over the lake region. 28th, a. m. barometer at Alpena 30.15 inches, or 0.20 above normal. During the day it extended toward Southern New England. 29th, passed to the New England coast and the eastern British Provinces. 30th, a. m. barometer at Chatham 0.28 above normal, after which it slowly passed to the eastward.

Areas of low barometer.—As shown on chart No. I, eleven have been sufficiently well marked to be charted and described. Nos. VIII and IX were particularly extensive and destructive, having been accompanied by violent thunder-storms in many sections.

No. I.—This disturbance developed from the storm described in the June Review as No. X. 1st, in the afternoon it appeared as an extensive barometric trough, reaching from the Eastern Gulf coast northward over Lake Huron into Canada, with the lowest pressure over Indiana and Ohio; p. m. barometers at Cincinnati and Columbus, Ohio, 29.79 inches. Threatening and rainy weather prevailed from the Upper Lakes to the Gulf and South Atlantic States, with frequent thunder-storms and occasionally high winds. 2d, the central pressure rose somewhat. Frequent light rains fell from Lakes Huron and Erie to the Gulf and South Atlantic States, with occasional thunder-storms and high winds. 3d, it was dissipated by area of high pressure No. I, which succeeded it, but with the same conditions over the same area as on the previous day. 4th, in a slight barometric trough, which extended from Southern New England to Western Pennsylvania, heavy and destructive thunder-storms occurred, with large hail in latter. At Pittsburg, 3 to 5 p. m., heavy thunder-storm passed from southwest to northeast up the Allegheny Valley; maximum velocity of wind, thirty miles per hour at 3:30 p. m.; total rainfall, 2.80 inches; several buildings swept away, houses flooded, &c.; eight miles up the valley, at Ross Grove, large maple trees were uprooted, killing seven and injuring eighteen persons; on Sandy Creek, twelve miles up the valley, a house was swept away, drowning five inmates. No signals were displayed or needed. The following maximum hourly velocities were recorded in the interior: Cairo, E. 30; Fort Sill, N. 36; Saint Louis, N. 25 miles.

No. II.—1st, frequent rains, easterly winds, and diminishing pressure in Florida indicated the advance of this storm. 2d, the pressure reached its minimum; p. m. barometer at Punta Rassa 29.77 inches, or 0.30 below normal. Threatening and rainy weather continued in Florida with frequent gales, and extended to South Carolina. 3d, easterly gales and rainy weather prevailed along the South Atlantic coast from Cape Hatteras southward. Signals were ordered to be displayed, morning of the 2d, at Key West and Saint Mark's; 3d, thence north along the coast to Cape Hatteras. Excepting Saint Mark's and Jacksonville, they were justified. Maximum velocities: Key West, W. 36; Tybee Island, E. 37; Charleston, E. 36; Smithville, E. 38; Cape Lookout, SE. 36 miles.

No. III.—The barometer, which had been falling along the Pacific coast for two days previous, reached its lowest point during the morning of the 1st; a. m. barometer at San Francisco 0.22 below normal, and a high westerly wind in the afternoon. Light rains fell in Washington Territory and Northern Oregon. 2d, it advanced toward the Rocky Mountain region. High winds or gales prevailed from the northern half of California to Colorado, Dakota and Western Nebraska; light rains in Washington Territory and Oregon. 3d, the pressure fell to its minimum in Utah and Montana; p. m. barometer at Salt Lake City 0.38 at Virginia City 0.41 below the normals. High

winds and gales continued over the same area as the previous day, and in Western Minnesota. The rain-area extended eastward to Montana Territory. 4th, the central pressure increased, but high winds and gales were frequent from Nevada to Colorado, Western Nebraska and Dakota. 5th, it disappeared apparently to the northward, with continued high southerly winds and gales from Colorado and Western Nebraska northward. Maximum velocities: San Francisco, W. 32; Winnemucca, SW. 40; Pioche, S. 33; Salt Lake City, NW. 44; Denver, SE. and NW. 36; North Platte, S. 54; Bismarck, SE. 48; Breckenridge, SE. 36 miles.

No. IV.—It is quite possible that this is a continuation of the storm just described, and was forced to take a northerly course by the high pressure area in its front and covering the lake region. 6th, occasional rains fell in the northwest, with high southerly winds, and frequent rains in the southwest. 7th, it disappeared into Canada. Occasional rains prevailed from the northwest and Upper Lakes to the Ohio Valley, with thunder-storms at places. 8th, as the central depression progressed eastward to the north of the limit of the stations, frequent rains, with thunder-storms, resulted over the northern half of the country; at Grand Island, Nebr., a destructive wind-storm; at Nashville, a very heavy thunder-storm. 9th, the center disappeared to the northeastward of the Saint Lawrence Valley. Frequent rains, thunder-storms, and high winds accompanied it as far south as the Middle States. Signals were displayed the 10th along the New Jersey and North Carolina coasts, but too late, and the former were not justified. Maximum velocities: Dodge City, S. 40; North Platte, NW. 60; Bismarck, W. 36; Pembina, S. 30; Stockton, Texas, SE. 35; Knoxville, SW. 28; Grand Haven, SW. 48; Port Huron, NE. 30; Kittyhawk, SW. 30; Cape May, E. 30; Sandy Hook, W. 32; Boston, SW. 30; Mount Washington, W. 48 miles.

No. V.—As shown on the chart, this storm was formed by the union of two disturbances. 9th, the midnight barometer at Portland, Oreg., fell to 0.25 below the normal. High southwest winds prevailed at San Francisco, and Fillmore, Utah; at Kit Carson, Col., a heavy wind, rain, and hail-storm; heavy hail-storm east of North Platte; heavy and destructive thunder-storms in the eastern portion of Nebraska at night. 10th, the rain-area extended to Lake Michigan, with frequently high winds; in Columbus County, Wisconsin, heavy hail. 11th, threatening and rainy weather with thunder-storms, prevailed over the lake region, the northwest, Wyoming, Colorado, New Mexico, and Arizona. In Iowa, Wisconsin, and Northwestern Illinois much destruction was caused by floods. At Dubuque, Iowa, midnight to 5:15 a. m., severe thunder-storm; numerous houses, barns, &c., struck by lightning; country in vicinity of Centralia (ten miles west) flooded for miles around; railroad bridges damaged and all trains delayed from two to twelve hours. At Tucson, Ariz., 4:45 to 6:30 p. m., heavy thunder and rain-storm; 4:45 p.m., lowest barometric reading this year; total rain-fall, 5.10 inches; damage to town estimated at from $25,000 to $40,000; buildings completely ruined; west of town one vast lake; the arroyos, north of town, resembled huge rivers. Throughout Arizona, from 12th to 14th, very heavy thunder-storms, accompanied by heavy rains and waterspouts; houses unroofed and fences blown down. At Aqua Fria, twenty-seven telegraph-poles reduced to fragments. At Phœnix, office struck and portion of battery destroyed. 12th, although the movement of the central depression could not be traced, a barometric trough formed eastward to the Middle States, in which unusually severe and destructive rain and thunder-storms occurred. No signals were ordered. Maximum velocities: San Francisco, SW. 28; Salt Lake City, SW. 28; Cheyenne, NW. 32; Denver, S. and NW. 36; Stockton, Texas, SE. 40; North Platte, S. 48; Breckenridge, SE. 36; Cape May, S. 44; Atlantic City, E. 43; Barnegat, NE. 32 miles.

No. VI.—14th, the pressure having rapidly diminished during the preceding night, this storm was central near to and west of Quebec in the morning, with rainy weather in the Lower Saint Lawrence Valley, and a southeast gale, veering to northeast, at Father Point. During the day and night the rain-area extended to New England and Nova Scotia. 15th, it disappeared beyond Nova Scotia. Signals were displayed at Eastport, but not justified. Maximum velocities: Mount Washington, NW., 60; Father Point, NE., 43 miles.

No. VII.—14th, rapidly diminishing pressure, increasing southeasterly winds and rain-areas from Montana to the Upper Mississippi Valley indicated the approach of a storm. During the night a heavy rain-storm at Dubuque flooded the surrounding country. 15th, frequent gales, mostly southerly, and occasional rains prevailed from Utah and Colorado to Manitoba, Minnesota, and Wisconsin, with a continued fall in the barometer; p. m. barometer at Bismarck 0.51 below normal. 16th, two distinct depressions developed, one passing into Canada and north of Lake Superior, the other advancing southeastward to Iowa. Frequent rains and thunder-storms accompanied them from the northwest and upper lakes southwestward to Arizona and New Mexico, with high winds and gales at places. 17th, the southern branch gradually disappeared, after having produced heavy thunder-storms from the northwest to Indian Territory. The northern branch took a southeasterly course toward New England, with frequent rains and thunder-storms from Northeastern New York north and east-

ward. 18th, as the center moved toward Nova Scotia light rains were frequent from the lower lake region eastward, with thunder-storms, which were reported as violent and destructive at places in New York. 19th, a. m. barometer at Sydney, Cape Breton, 29.56 inches, or 0.40 below normal, after which the center disappeared northeastward. Cautionary signals were ordered for the Eastern New England coast on the afternoon of the 17th, but reported as not justified. Warnings were sent at the same time to Toronto for the Canadian stations in the provinces of Quebec, New Brunswick, Nova Scotia, Cape Breton, and Newfoundland. Maximum velocities: Denver, SE. 36; Dodge City, S. 40; North Platte, S. 48; Bismarck and Saint Paul, E. 36; Duluth, SW. 32; Sandusky, SW. 35; Cape Lookout, SW. 30; Morgantown, S. 43; Mount Washington, W. 75 miles.

No. VIII.—16th, frequent light rains fell in Oregon and Washington Territory, with falling barometer. High westerly winds prevailed at San Francisco, and southwest gales in Northern Nevada. At Olympia, p. m. barometer 29.67 inches, or 0.29 below normal. By midnight it was probably central in Northwestern Montana. 17th, it advanced into Eastern Montana, followed by clearing weather in Oregon, Washington Territory, and Idaho. 18th, the center moved into the Red River of the North Valley, producing high winds or gales and thunder-storms from thence to Kansas. 19th, although the main depression was north of Lake Superior, a barometric trough extended southwestward toward New Mexico, in which thunder-storms were frequent. 20th, light rains and high winds were occasionally reported from the northwest, lakes, and Saint Lawrence Valley to the South Atlantic and East Gulf States. 21st, the storm center took a southeastward course into Maine; midnight barometer at Portland 29.42 inches, or 0.53 below normal. At New Orleans and Knoxville heavy thunder-storms prevailed; along the North Carolina coast, southwest gales. From the northern portion of the Middle States and New England to the provinces of Quebec, New Brunswick, and Nova Scotia heavy rains, gales, and destructive thunder and hail storms were frequent, with much damage to crops, buildings, trees, railroads, &c. At Northampton, Mass., a tornado; Napanee, Ontario, hurricane. At North Albany, N. Y., "about 1:20 p. m., most terrific cyclone, lasting ten seconds, leaving desolation and ruin; unroofed and destroyed sixteen buildings, &c.;" observers saw "two storms approach in nearly opposite directions, one from the northeast, accompanied by a heavy black cloud, moving swiftly, and another from a point a little south of west; the two met in the vicinity of West Albany, where the cyclone apparently formed." The Signal Service observer (half a mile south of storm) observed "a funnel-shaped cloud moving rapidly from the west, too high to do much damage until it reached North Albany, when it seemed to come to the earth's surface; it moved with such velocity that everything was carried in an easterly direction regardless of its whirling motion;" at the station a velocity of seventy miles per hour was registered for a few minutes from the west. Boston and vicinity, Mass., 4:30 to 6:30 p. m., "severe thunder-storm, doing considerable damage north of city; numerous buildings and trees were struck in Cambridge, Lexington, Charlestown, Chelsea, Newton, Malden, and Medford; a violent wind was reported at Winthrop, and a yacht was overturned off Rainsford Island, drowning one person; near Salem tents were blown down and buildings unroofed." Over the lakes northwesterly gales were also frequent. 22d, p. m. barometer at Eastport 29.26 inches, or 0.65 below normal. Light rains continued from the northern portions of New York and New England northeastward; high northwesterly winds and gales from the lower lakes and North Carolina to the Gulf of Saint Lawrence. 23d, the storm disappeared eastward, with diminishing winds along the Atlantic coast. Cautionary signals were ordered on the morning of the 21st for the Eastern New England coast, and reported as justified from a few stations only. The same morning warnings were sent to Toronto for the stations in the provinces of Quebec, New Brunswick, Nova Scotia, Cape Breton, and Newfoundland. On the 22d, off-shore signals were displayed along the North Carolina and Eastern New England coasts, but were ordered too late. Maximum velocities: San Francisco, W. 28; Winnemucca, SW. 34; Denver, NW. 36; North Platte, NW. 60; Breckenridge, S. 32; Escanaba, N. 29; Grand Haven and Saugeen, NW. 38; Sandusky, N. 36; Cape Lookout, SW. 45; Cape May, NW. 38; Sandy Hook, NW. 41; Boston, W. 30; Mount Washington, NW. 62; Father Point, NE. 55 miles.

No. IX.—23d, this storm began developing in the country between the Missouri Valley and California. In Nevada and Utah thunder-storms were frequent, and southerly gales in Colorado and Western Nebraska. 24th, the center passed into Nebraska, with rain from Indian Territory and the northwest to Montana; midnight barometer at Omaha 0.16 below normal. 25th, the central pressure diminished; midnight barometer at Keokuk 29.45 inches, or 0.44 below normal. The rain-area reached from the lake region to Montana, Wyoming, Colorado, and Indian Territory, and was heavy in Iowa and Illinois. 26th, its movement northeastward was very rapid, with a continued diminution of the pressure at its center; midnight barometer at Burlington 29.28, or 0.64 below normal. From Indian Territory and Tennessee northeastward to Lake Huron, the Saint Lawrence Valley, and New England, rainy weather, gales and de-

structive thunder-storms were frequent. At Chicago a heavy northeast wind-storm, followed at night by heavy rain—over four inches in about seven hours—flooding cellars and causing damage estimated at $100,000; southwestern portion of city under water. On Lake Michigan the storm was quite severe. "At 5:30 p. m. a tornado developed two or three miles west of South Hartford, Washington County, New York, in which position dark, heavy clouds, from east and north, were observed to meet; it then moved northeastward, with a terrific noise, over the northern part of Hartford Village, passed to the southwest of Middle Granville, and thence across the State line into Vermont, when it appeared to divide; barns, trees, fences. &c., were entirely demolished, and, as it passed over 'Martin Pond' and Meltowe River, large quantities of water were scooped up and carried some distance; it traveled about fourteen miles in an almost straight line; was about five rods in width, and passed any one point in about fifty seconds." 27th, it disappeared over the Gulf of Saint Lawrence, producing gales from thence southwestward to the North Carolina coast. In Northern Texas very heavy rains fell, accompanying thunder-storms, on this day and the following day. Cautionary signals were ordered for Lake Michigan stations on the 25th; for those along Lakes Huron, Erie, and Ontario and the coast from North Carolina to Maine, the 26th; and were very generally justified. Warnings were also sent to Toronto for the Canadian stations in the provinces of Quebec, New Brunswick, Nova Scotia, Cape Breton, and Newfoundland. Maximum velocities: Salt Lake City, NE. 28; Denver, S. 36; Dodge City, W. 40; Saint Louis, S. 40; North Platte, NE. 36; Chicago, NE. 25; Cleveland, SE. 45; Oswego, S. 25; Cape Lookout, SW. 40; Cape Henry, SW. 32; Cape May, S. 44; Barnegat and Sandy Hook, SW. 32; New London, SW. 30; Wood's Holl, SW. 38; Portland, NW. 36; Eastport, S. 35; Mount Washington, NW. 100 miles.

No. X.—28th, the pressure diminished in the northwest, with frequent rains. 29th, a barometric trough formed toward the Ohio Valley. Thunder-storms were occasionally reported from the Gulf and South Atlantic States, and frequent rains from thence northward to the Middle States and Lower Lake region; occasionally high winds from the coast. By midnight it had developed into a slight depression, which was central in Ohio. 30th, it moved into the Middle States, where it was dissipated on the following day. The cautionary signals displayed the 30th from North Carolina to Massachusetts were ordered rather late. Maximum velocities: Shreveport, S. 32; Saint Mark's, S. 28; Cape Lookout, SW. 40; Cape Hatteras, SW. 34; New London, E. 26; Boston, E. 30; Mount Washington, SE. 50 miles.

No. XI.—29th, it advanced eastward toward the Northwest, producing high winds, and in Dakota and Western Minnesota thunder-storms. 30th, the center apparently passed over the northern portion of Minnesota, with frequent rains in the Northwest and Wisconsin. In Carver, Rice, and Dakota Counties, Minnesota, severe hail-storms, doing much damage; track ten to twelve miles wide, traveling from northwest to southeast. Wadena County, Minnesota, great damage to crops from heavy rain and wind storm. 31st, occasional rains, thunder-storms, and gales were reported from the lake region to the northwest, and large hail from Independence, Iowa. Not any signals were displayed, and would have been justified at only two lake stations. Maximum velocities: North Platte, S. 36; Bismarck, W. 26; Breckenridge, SE. 37; Leavenworth, NW. 28; Saint Louis, E. 30; Davenport, SW. 50; Milwaukee, W. 28; Sandusky, SW. 27 miles.

INTERNATIONAL METEOROLOGY.

April 8, off Cape Horn, very heavy weather, seas swept decks.

May 5, 77° S., 86° W., ship Royal Dane encountered gale lasting seven days. United States flagship Hartford, at Montevideo, reports, 8th, night barometer 29.57 inches; NW. and W. fresh, heavy rain-squalls, thunder and lightning; 9th, a. m. barometer 29.55, strong W. and WSW. gales; 12th, evening barometer 29.64, W. fresh, increasing to moderate WSW. gale, rain-squalls, thunder, and lightning; 13th, 1 to 2 p. m. barometer 29.50, heavy WSW. gale, blowing heaviest from 2 to 7 p. m., with rising pressure; 14th, heavy SW. gale; 15th, moderate S. by W. gale. 18th, 34° 46′ N., 60° 11′ W. (by dead reckoning), 8 a. m., WNW. gale and heavy sea. 22d, Pacific Mail steamship City of Peking, reports, at Hong-Kong, from a little before midnight of the 21st to 2.30 a. m. of 22d, severe thunder-storms, with very heavy rain, doing serious damage to roads, buildings, &c., by rush of water down hill-side, and considerable loss of life by rise in creek where boats were moored for the night. 25th, 42° S., 100° W., heavy SE. gale, lasting twenty-four hours. 26th, off Cape of Good Hope, heavy westerly gales.

June 7, 26° 30′ N., 55° 20′ W., high sea. 10th, 60° N., 20° W., heavy squall; 60° 34′ N., 19° 30′ W. (night of 10th and 11th), severe squalls and heavy seas. 20th, United States steamship Gettysburg at Ben Ghazi, North Africa, reports heavy white squall (force 8), from W. by N., lasting four minutes.

July 1, 43° 29′ N, 43° 50′ W., fresh NW. gale and heavy W. sea. 2d, 48° 30′ N., 35° 58′ W., squally; 46° 14′ N., 40° 14′ W., WNW. gale, heavy W. sea. 3d, 48° 21′ N., 33°

36′ W., SW. strong breeze, high sea. 4th, 46° 40′ N., 40° 54′ W., increasing WNW. storm; 45° 54′ N., 37° 41′ W., fresh WNW. gale. 5th, 44° 47′ N., 46° 01′ W., westerly wind and sea decreasing; 49° 45′ N., 24° 40′ W., high WSW. sea; 50° 47′ N., 26° 09′ W., high W. sea; 17° 43′ N., 101° 40′ W., 6:30 to 8 p. m., thunder-storm, wind veering from NE. to SW., with gale from SE. at 7 p. m., heavy rain throughout watch, sea rough, barometer at 6 and 7 p. m. 29.49 inches. 6th, 49° 43′ N., 30° 45′ W., high W. sea. 7th, 48° 55′ N., 40° 18′ W., heavy southerly gale, high sea, rain; 48° 16′ N., 38° 15′ W., moderate to fresh WNW., SW. and W. gale, and high westerly sea. 8th, 47° 46′ N., 46° 42′ W., heavy SW., WNW., gale, very high sea, squally; 47° 30′ N., 30° 08′ W., moderate westerly gale, heavy W. sea; 46° 42′ N., 45° 29′ W., fresh SW. gale, high W. sea. 10th, 46° 16′ N., 48° 18′ W., heavy rain. 13th, ship Garelock, on July 3, latitude 23° N., longitude 58° W., thence to Bermuda July 13, reports had variable winds, squalls, and frequent water-spouts. 20th, 44° 17′ N., 55° 08′ W., fresh SSE. gale; about 130 miles west of Saint John's, Newfoundland, moderate gale and high sea; off the Banks, Newfoundland, heavy NW. squall. 21st, 48° 38′ N., 41° 47′ W., fresh SW. to WSW. gales; 50° 02′ N., 38° 39′ W., strong SW. and W. wind, rough sea, ship pitching hard. 22d, 46° 28′ N., 47° 29′ W., fresh W. gale; 49° 0′ N., 42° 40′ W., NW. strong gales, heavy squalls, high sea, and from noon to 4 p. m. three hurricane-like squalls; 52° 07′ N., 32° 32′ W., noon, moderate W. gale, midnight, fresh NW. gale. 23d, 50° 22′ N., 38° 30′ W., moderate NW. gale; 48° 23′ N., 23° 54′ W., stormy, rain. 24th, 47° 31′ N., 30° 47′ W., stormy. 25th, 46° 02′ N., 37° 45′ W. stormy.

TEMPERATURE OF THE AIR.

The isothermal lines on chart No. II illustrate the general distribution of the temperature of the air for the month. By a reference to the table upon the left side of the same chart it will be seen that the average for the month is slightly lower than usual for the Pacific coast. For all the other districts the average is higher, especially for the Lake region. To give an idea of the effect of the warm weather during the month, the following data, relative to sun-strokes, have been generally extracted from newspapers, and may not be strictly accurate: 1st, New York City, 1 case. 2d, Oswego, N. Y., 1; Springfield, Mass., 1; New York City, 10. 3d, Boston, 7, 5 fatal; New York City, 12, 1 fatal. 4th, New York City, 5. 5th, Newport, R. I., several, 1 fatal; New York City, 15, 2 fatal. 8th, New York City, 2. 9th, Saint Louis, 2 fatal. 10th, Saint Louis, 2 fatal; New York City, 4. 11th, Saint Louis, 3 fatal; New York City, 2, 1 fatal. 12th, Cincinnati, 6, 2 fatal; Saint Louis, 20, 4 fatal. 13th, Little Rock, Ark., 1 fatal; Ellston, Mo., 1 fatal; Saint Louis, about 30, 16 fatal; Burlington, Iowa, 2 fatal. 14th, Dubuque, Iowa, 2; Little Rock, 2 fatal; Quincy, Ill., 7, 5 fatal; Saint Louis, 41 fatal. 15th, Kirkwood, Mo., East Saint Louis, and Venice, Ill., numerous; Saint Paul, Saint Joseph, Mo., Naples, Ill., and Chicago, 1 fatal; Omaha, many, 3 fatal; Leavenworth, 14, 6 fatal; Peoria, Ill., 2 fatal; Bloomington, Ill., 24, 4 fatal; Marquette, several; Saint Louis, hundreds, 49 fatal; Nashville, numerous, 2 fatal; New York City, 2. 16th, Memphis, 1 fatal; Saint Louis, 35 fatal; Dubuque, 3; DeWitt, Iowa, 2 fatal; Galesburg, Ill., several fatal; Chicago, 9 fatal; Milwaukee, 20, 3 fatal. 17th, Ottumwa, Iowa, 4, 1 fatal; Saint Louis, numerous, 8 fatal; Milwaukee, 103, 9 fatal; Chicago, 59, 20 fatal; Grand Rapids, Mich., Rochester, and Louisville, several; Cincinnati and Columbus, Ohio, 3; Detroit, numerous, several fatal; Wheeling, W. Va., 2 fatal; Pittsburgh and Buffalo, 1 fatal; Toronto, large number. 18th, cases were frequent from the New England and Middle States westward to Missouri and Iowa; 21 fatal in Saint Louis, 3 in Terra Haute and Indianopolis, Ind., 2 in Cincinnati, and 1 in Baltimore, Pittsburgh, and Philadelphia. 19th, frequent as on previous day, but more numerous in the Eastern States; from 1 to 3 fatal cases in many towns and cities. 20th, Memphis, 1 fatal; Saint Louis, 5 fatal; Cincinnati, 3 fatal; in the Middle Atlantic and New England States, from 1 to 4 cases fatal in the larger cities. 21st, Memphis, 3 fatal; New York City, 4 fatal. 22d, 3 fatal at Memphis. 24th, Bismarck, 1 fatal. For Saint Louis, the total number of deaths reported as from sun-stroke is 163. At Iowa City, Iowa, 12th, sun thermometer rose to 156°; for fifteen days the temperature in the shade rose above 86°. Fort Yuma, Arizona Ter., the mean of the daily minima temperatures for the month is 77°; of the daily maxima temperatures, 109°.4. At Memphis, between 4 and 5 a. m., 22d, temperature began decreasing rapidly; the past eleven days have been fearful, causing numerous deaths and a partial suspension of business.

Minimum and maximum temperatures, respectively: *Maine*—at Eastport, 47° and 83°; Portland, 55°, 96°; Orono, 51°, 93°. *New Hampshire*—Mount Washington, 35°, 68°; Dunbarton, 55°, 98°; Auburn, 50°, 98°. *Vermont*—Burlington, 53°, 96°; Woodstock, 45°, 97°. *Massachusetts*—Boston, 54°, 98°; Somerset, 56°, 102°; Waltham, 46°, 96°. *Rhode Island*—Newport, 56°, 92°; Fort Adams, 54°, 91°. *Connecticut*—New Haven, 55°, 92°; Colebrook, 50°, 92°. *New York*—Albany, 54°, 92°; New York City, 61°, 94°; Oswego, 59°, 100°; West Point, 52°, 101°; Plattsburg Banks, 49°, 92°; Buffalo, 56°, 90°. *New Jersey*—Atlantic City, 61°, 87°; Linden, 63°, 99°; Cape May, 66°, 90°. *Pennsylvania*—

Philadelphia, 64°, 97°; Pittsburgh, 57°, 101°; Tioga, 50°, 100°; Chambersburg, 62°, 99°. *Delaware*—Dover, 70°, 95°. *Maryland*—Baltimore, 65°, 98°; New Market, 67°, 100°; Cumberland, 60°, 92°. *District of Columbia*—Washington, 63°, 98°. *Virginia*—Norfolk, 66°, 101°; Lynchburg, 60°, 97°; Snowville, 51°, 99°. *West Virginia*—Morgantown, 56°, 95°; Helvetia, 48°, 93°. *North Carolina*—Wilmington, 66°, 97°; Cape Hatteras, 68°, 84°; Weldon, 70°, 104°; Asheville, 59°, 90°. *South Carolina*—Charleston, 73°, 95°; Spartanburg, 70°, 98°. *Georgia*—Augusta, 71°, 105°; Gainesville, 68°, 101°; Tybee Island, 71°, 98°. *Florida*—Jacksonville, 72°, 97°; Key West, 73°, 93°; Fort Barrancas, 73°, 102°. *Alabama*—Montgomery, 73°, 100°; Mobile, 72°, 98°. *Mississippi*—Vicksburg, 71°, 100°. *Louisiana*—New Orleans, 75°, 93°; Shreveport, 71°, 98°. *Texas*—Clarksville, 73°, 101°; Galveston, 73°, 95°; San Antonio, 58°, 99°; Corsicana, 67°, 102°; Concho, 66°, 102°; Stockton, 56°, 105°; Eagle Pass, 65°, 101°. *Tennessee*—Memphis, 69°, 97°; Knoxville, 65°, 97°; near Cleveland, 70°, 99°. *Kentucky*—Louisville, 64°, 97° *Ohio*—Cincinnati, 65°, 96°; Cleveland, 57°, 96°; Westerville, 50°, 95°; Jacksonburg, 63°, 100°. *Indiana*—Indianapolis, 58°, 96°; Vevay, 55°, 97°; New Corydon, 64°, 100°. *Illinois*—Cairo, 66°, 96°; Chicago, 59°, 97°; Hennepin, 63°, 102°; Riley, 54°, 95°. *Arkansas*—Judsonia, 73°, 96°; Mount Ida, 72°, 94°. *Missouri*—Saint Louis, 64°, 98°; Wet Glaze, 60°, 100°; Lebanon, 60°, 95°; Oregon, 58°, 94°. *Indian Territory*—Fort Sill, 61°, 98°; Fort Gibson, 62°, 99°. *Kansas*—Leavenworth, 61°, 100°; Dodge City, 64°, 102°; Fort Wallace, 62°, 106°; Fort Hays, 50°, 99°. *Michigan*—Detroit, 56°, 100°; Alpena, 49°, 90°; Grand Rapids, 60°, 97°; Marquette, 45°, 100°. *Wisconsin*—Milwaukee, 56°, 95°; Embarrass, 58°, 98°; Neillsville, 42°, 94°. *Iowa*—Dubuque, 55°, 96°; Tabor, 66°, 100°; Boonsboro, 62°, 104°; Nora Springs, 52°, 99°. *Minnesota*—Saint Paul, 57°, 96°; Breckenridge, 49°, 97°. *Nebraska*—Omaha, 57°, 96°; Fort McPherson, 46°, 100°. *Dakota*—Yankton, 56°, 94°; Pembina, 45°, 89°; Bismarck, 47°, 100°; Fort Rice, 44°, 103°; Olivet, 55°, 104°. *Colorado*—Denver, 54°, 100°; Summit, 37°, 72°; Fort Lyon, 53°, 108°. *Wyoming Territory*—Cheyenne, 44°, 92°; Fort Sanders, 38°, 88°. *New Mexico*—Santa Fé, 50°, 95°. *Utah*—Salt Lake City, 52°, 96°; Coalville, 50°, 91°. *Nevada*—Pioche, 51°, 98°; Winnemucca, 37°, 97°; Fort McDermit, 41°, 101°. *Idaho*—Boise City, 46°, 97°. *Oregon*—Portland, 49°, 85°; Roseburg, 48°, 84°. *California*—Alcatraz Island, 47°, 69°; Fresno, 58°, 117°; Red Bluff, 54°, 105°; Campo, 35°, 102°; San Francisco, 51°, 73°; San Diego, 56°, 77°. *Arizona*—Yuma, 70°, 118°; Florence, 62°, 113°; Pœnix, 81°, 109°; Camp Verde, 62°, 106°; Camp Grant, 51°, 102°; Camp Mojave, 67°, 117°. *Montana*—Virginia City, 42°, 92°.

Ranges of temperature.—The *monthly* ranges will generally appear from an examination of the above minima and maxima temperatures. The *greatest daily ranges* vary as follows: in New England from 19° at Wood's Holl to 33° at Burlington; Middle Atlantic States, 17° at Cape May to 28° at Lynchburg; South Atlantic States, 12° at Cape Lookout to 27° at Augusta; Gulf States, 14° at Key West to 22° at Montgomery, 27° at Corsicana, and 35° at Camp Stockton; Ohio Valley and Tennessee, 19° at Cairo to 33° at Pittsburgh; Lower Lake region, 21° at Erie to 31° at Oswego; Upper Lake region, 20° at Milwaukee to 36° at Marquette; Upper Mississippi Valley, 19° at Davenport to 26° at Dubuque; Red River of the North Valley, 33° at Pembina to 36° at Breckenridge; Missouri Valley, 25° at Yankton to 33° at Bismarck; Plains of Nebraska and Kansas, 31° at North Platte to 35° at Dodge City; Rocky Mountain stations, 30° at Santa Fé to 39° at Cheyenne and Virginia City; Utah, 40° at Salt Lake City; Idaho, 38° at Boise City; Nevada, 35° at Pioche to 49° at Winnemucca; California, 17° at San Diego to 21° at San Francisco, 35° at Sacramento and 58° at Campo; Oregon, 30° at Portland to 36° at Roseburg; Arizona, 40° at Yuma.

Frosts.—Coalville, Utah, on the 11th, slightly injured potato vines.

PRECIPITATION.

On chart No. III is illustrated the general distribution of the rain fall for the month. On the left side of the same chart will be found a table giving the average precipitation for July by districts. For the Eastern Gulf States the deficiency has been quite large. There have been decided excesses in the Saint Lawrence Valley, Tennessee and Lower Lake region.

Special heavy rains.—1st, Louisville, Ill., 5.00 inches in two hours. 1st and 2d, New Harmony, Ind., 4.22 inches. 4th, Pittsburgh, Pa., 2.80 inches in about two hours. 7th and 8th, Bellefontaine, Ohio, 3.00 inches. 8th, Nashville, Tenn., 3.05 inches in 80 min. 9th and 10th, Plattsmouth, Neb., 4.81 inches. 10th, Logan, Ia., 8.00 inches. Buffalo, N. Y., 1.00 inches in 30 min. 10th and 11th, Beloit, Wis., 5.25 inches; Madison, Wis., 3.82 inches. 11th, Tucson, Ariz., 5.10 inches in about one hour. 11th and 12th, New Corydon, Ind., 5.05 inches; Riley, Ill., 4.26 inches. 13th, Campo, Cal., 2.32 inches in 95 min., only rain-fall at station during month; Cape Hatteras, N. C., 2.10 inches in 90 min. 14th, Charleston, S. C., 5.14 inches in 3½ hours; Cape Lookout, N. C., 1.26 inches in 65 min. 19th, Sandy Spring, Md., 2.00 inches in one hour. 21st, New Orleans, La., 2.63 inches. 21st and 22d, Mount Washington, N. H., 4.24 inches. 22d, San Antonio, Tex., 2.20 inches in 75 min. 22d and 23d, Morriston, Dak., 8.00 inches. 23d and 24th,

Manhattan, Kans., 8.00 inches. 26th, Hudson, Ohio, 3.00 inches; Chicago, Ill., 4.14 inches; Ruggles, Ohio, 3.20 inches. 27th, Denison, Tex., 6.62 inches in two heavy storms; Coleman, Tex., 2.98 inches; Graham, Tex., 3.44 inches. 27th to 29th, Fort Griffin, Tex., 6.68 inches; Decatur, Tex., 6.14 inches. 28th and 29th, Wytheville, Va., 4.40 inches. 29th, New Corydon, Ind., 3.71 inches; Corsicana, Tex., 2.27 inches; St. Meinrad, Ind., 5 30 inches. 29th and 30th, Washington, D. C., 5.93 inches (over one inch fell from 12.30 to 1.30 p. m. of the 30th); Fort Whipple, Va., 4.71 inches. 30th, Barnegat, N. J., 3.42 inches; Accotink, Va., 3.50 inches. 31st, Detroit, Mich., 2.48 inches; Cape Lookout, N. C., 1.80 inches in 60 min.; Phœnix, Ariz., 2.22 inches; heaviest ever recorded.

Largest monthly rain-falls.—New Corydon, Ind., 14.71 inches; Logan, Iowa, 13.00 inches; Manhattan, Kans., 12.71 inches; St. Meinrad, Ind., 12.35 inches; Charleston, 12.10 inches; Emerson, Nebr., 11.61 inches; Mount Washington, N. H., 11.00 inches; Cresco, Iowa, 10.92 inches; Tabor, Iowa, 10.46 inches; Morriston, Dak., 10.20 inches; Denison, Tex., 9.95 inches; Bellefontaine, Ohio, 9.78 inches; Punta Rassa, 9.58 inches; Nashville, 9.43 inches; Hudson, Ohio, 9.30 inches; Henrietta, Tex., 9.13 inches.

Smallest monthly rain-falls.—At Healdsburg, San Francisco, Sacramento, Monterey, Fresno, Nisalia, Santa Barbara, Los Angeles and San Diego, Cal., Fort McDermit and Hamilton, Nev., and Camp Apache, Ariz., none; Red Bluff, Cal., light sprinkle; Burkes, Arizona, 0.03 inches; Wickenburg, Ariz., 0.09 inches; Hermosa, Col., 0.13 inches; Austin, Nev., 0.15 inches; Florence, Ariz., 0 21 inches; Yreka, Cal., and Boise City, Idaho, 0.31 inches; Pioche, Nev., 0.29 inches; Austin, Tex., and near Forsythe, Ga., 0.32 inches. The observer at Dubuque reports that at Gangowen, twenty miles south of Dubuque, no rain has fallen since latter part of June.

Floods.—2d and 3d, Missouri Pacific Railroad track 18 inches under water between Leavenworth and Kansas City; crops in low lands washed out and destroyed. 3d, at Atchison, Kans., higher than for twelve years past; great damage along banks; at Saint Joseph's, Mo., higher than since 1844, considerable damage to railroad bridge. east abutment sunk 8 to 10 feet by current washing foundations. 4th, Sandy Creek and portions of low-lands in Alleghany Valley inundated, house swept away and five persons drowned; wash-outs on West Pennsylvania and Alleghany Valley Railroads. 9th, Rapid City, forty miles north of Deadwood, Dak., p. m., water spout, rising river 15 feet in 1½ hour, deluging farms, carrying away bridges, two men drowned, and much damage done to freight trains. 10th, near Russell's station, Ohio, 500 feet of railroad track and bridges swept away. 11th, on Illinois Central Railroad, near Seven Miles, 500 feet of track and three or four bridges washed away; Geneva Lake, Wis., rose 20 inches in eight hours (unknown before), flooding Kay's Park, Russells, &c.; at Genoa Junction, mill-dam carried away; along Maquoketa and Turkey Rivers, Iowa, streams generally 3 feet higher than before recorded, doing much damage; at McGregor, Iowa, Mississippi River rose 3 feet, trains suspended by wash-outs, street waist deep. 12th, in Green, Sauk, Dane, Columbia, Rock and Crawford Counties, Wis., land badly washed and some crops lodged beyond recovery; in Kosciusko and Allen Counties, Northern Indiana, streams high, country flooded; in Auglaize Valley, Ohio, destructive floods. 15th, Illinois Central Railroad, two bridges carried away in Northern Illinois. Neillsville, Wis., 20th, the recent rains made a 6 foot rise in Black River, logs running good. 21st, New Orleans, streets flooded 3 to 4 feet deep. 22d, Silver Lake, Dak., forty miles north of Yankton, cloud-burst, submerging country and drowning seven persons; west branch of Vermillion River spread out to a width of over one mile, and 10 to 30 feet deep. 28th, Missisquoi and other streams near Richford, Vt., much swollen; southwestern railroad track badly washed; trains delayed.

Droughts.—Gainesville, Ga., severe drought from 6th to 27th; no rain; crops half destroyed. Somerset, Mass., very severe and injurious. Frankford, Mo., no rain of any amount has fallen within eighteen miles of this station; vegetation seriously injured by drought; early corn entirely cut short, later crops much damaged, and some completely ruined. Greenville, N. C., month very dry; no rain from the 4th to 28th. Near Cleveland, Tenn., vegetation suffering severely for want of rain; 21st, severe drought, everything drying up; 26th, very dry, vegetation parched; 27th, hottest and dryest weather ever seen in the State. Wytheville, Va., 13th, drought fairly commenced; corn in fields curling and suffering; garden vegetables suffering still more; flowers entirely destroyed in large numbers where watering was impossible; no rain from 1st to 17th. Crops on Long Island suffering from drought, 7th. Dorchester County, Maryland, rain much needed, pastures failing, corn suffering, 19th.

Hail.—Fort Wallace, Kans., 28th; Camp Sheridan, Nebr., 7th; Fort Sanders, Wyo., 6th, 10th; Summit, Col., 5th, 11th, 13th, 16th, 21st, 25th, 27th; Byron, Ia., 31st; Vail, Ia., 10th; Independence, Ia., 31st; Tabor, Ia., 25th, 28th, 30th, 31st; Sandy Springs, Md., 31st; Amherst, Mass., 21st; Fall River, Mass., 21st; De Soto, Neb., 31st; Clear Creek, Neb., 10th; near Genoa, Neb., 8th; Scarsdale, N. Y., 21st; Starkey, N. Y., 10th; South Hartford, N. Y., 16th, 21st, 26th; near Chambersburg, Pa., 12th; Catawissa, Pa., 18th, 21st; Kit Carson, Col., 9th; Salt Lake City, Utah, 15th; Winnemucca, Nev.,

23d; Denver, Col., 28th; Cheyenne, Wyo., 27th; Detroit, Mich., 31st; Charleston, S. C., 14th; Washington, D. C., 19th.

Rainy days.—The number of days on which rain has fallen varies as follows: New England, 7 to 15; Middle States, 7 to 15; South Atlantic States, 8 to 15; Gulf States, 7 to 18; Ohio Valley and Tennessee, 9 to 16; Lower Lake region, 9 to 18; Upper Lake region, 9 to 15; Upper Mississippi Valley, 6 to 16; Lower Missouri Valley, 6 to 14; eastern slope, 5 to 16; Rocky Mountain stations, 7 to 18; western plateau, 1 to 4; Pacific coast, 0 to 6.

Cloudy days.—New England, 5 to 14; Middle States, 3 to 11; South Atlantic States, 3 to 9; Gulf States, 1 to 10; Ohio Valley and Tennessee, 5 to 12; Lower Lake region, 5 to 11; Upper Lake region, 5 to 11; Upper Mississippi Valley, 3 to 10; Lower Missouri Valley, 7 to 10; eastern slope, 3 to 7; Rocky Mountain stations, 0 to 5; western plateau, 1 to 4; Pacific coast, 0 to 11.

Snow.—Summit, Col., 27th, snow fell thickly at the station, covering all the surrounding summits.

RELATIVE HUMIDITY.

The average percentage of relative humidity for the month ranges as follows: New England, 62 to 83; Middle States, 62 to 84; South Atlantic States, 67 to 83; Gulf States, 65 to 81; Ohio Valley and Tennessee, 63 to 72; Lower Lakes, 68 to 74; Upper Lakes, 66 to 77; Upper Mississippi Valley, 63 to 75; Lower Missouri Valley, 63 to 71; eastern slope, 59 to 75; western plateau, 13 to 34; Pacific coast, 32 to 78. High stations report as follows: Mount Washington, 97.6; Virginia City, 36.9; Cheyenne, 52.1; Denver, 46.2; Colorado Springs, 54; Santa Fé, 40.4.

WINDS.

The prevailing winds at the Signal Service stations are shown by the arrows, flying with the wind, on chart No. II. The *maximum* velocities in miles per hour have been given in the description of the movements of areas of low pressure. On Mount Washington the highest velocity, NW. 100 miles, was recorded on the 27th.

Total movements of the air.—The following are the *largest* monthly movements recorded at the Signal Service stations, viz: Mount Washington, 17,600 miles; Cape Lookout, 12,940; North Platte, 10,569; Cape Hatteras, 10,296; Portsmouth, N. C., 10,226; Dodge City, 9,285; San Francisco, 9,183; Stockton, Tex., 8,862; Cape May, 8,692. The *smallest* are: Montgomery, 1,614 miles; Knoxville, 1,803; San Antonio, 2,092; Lynchburg, 2,180; Shreveport, 2,260; Visalia, 2,277; Nashville, 2,462; Dubuque, 2,626; Graham, Tex., 2,693; Roseburg, Oreg., 2,716; Vicksburg, 2,708. Lieut.-Commander Chas. H. Craven, U. S. Navy, observer at United States Navy Yard, Mare Island, Cal., remarks: "I think it worthy of special remark the following record of the average force of the winds of this first half of *June*. * * * Average wind per hour is 17.42 miles. According to the oldest inhabitants it has been unprecedented. From 4:36 a. m., 11th to 12th, an average of 26.4 miles per hour. At 5 p. m., 6th, SW. 62 miles; at 5:30 p. m., 11th, SSW. 56 miles; at 9 p. m., 14th, WSW. 45 miles;" "also total movement of the wind for July, 13,548 miles."

Local storms.—Rowe, Mass., 4th, heavy rain, doing considerable damage. Camp Sheridan, Neb., 7th, 4:07 to 4:16 p. m., severe thunder-storm from the east, with hail stones covering the ground like snow, largest measuring 7 inches in circumference and the smallest 6; the heaviest weighed after the storm 1¼ ounces; 640 panes of glass broken at the post, chickens killed, corn and vegetables cut down. Boone County, Iowa, 8th, storm of rain and hail, causing almost total destruction of crops. St. Thomas, West Indies, 9th and 10th, heavy rains, strong winds, almost a hurricane. Oregon, Mo., 9th, 4 a. m., strong gale from NW., with thunder and lightning, destroying crops, trees, buildings, &c. From 10th to 12th, severe rains in northeastern portion of Iowa, much damage to crops. Chambersburg, Pa., 12th, heavy storm of wind and rain; six miles southwest, very destructive hail-storm. During the night (11th and 12th) a severe NE. gale prevailed at the mouth of Saint John's River, Flor da; Schr. Sarah R. Thomas broke loose at 11:30 p. m., and after crossing bar went ashore at daylight south of Mayport; at Mayport a very high sea prevailed during morning, and two pilot-boats were landed high and dry. At Saint Augustine, Fla., p. m. 11th to 7 a. m. 12th, NE. to SE. gale. At Abaco, Bahamas, evening 11th, NE. gale. 14th, Charleston, S. C., severe thunder and hail-storm from 1 p. m. to 2:15 p. m.; rainfall from 1 to 2 p. m. 4 inches, and from 2 to 4:30 p. m. 1.13 inches, total, 5.13 inches; hail at 1:30 p. m. very heavy in low portion of city; wind constantly veering and backing between NE. and SW. by the SE.; maximum velocity, S. 42 at 1:40 p. m.; in Meeting street 7 inches of rain is reported to have fallen in 15 minutes, and the streets in this portion of city were flooded over 3 feet deep; buildings, shipping, and trees were considerably damaged by wind and lightning. At Tybee Island, Ga., 14th, a heavy NE. gale prevailed from 4:15 to 5 p. m. Scarsdale, N. Y., 21st, severe gale, with hail, uprooting trees and destroying

vegetation. Near Cleveland, Tenn., 31st, heavy wind-storm six miles north of station, peach orchards severely injured.

Water-spouts.—June 4, Denver, Col., water-spout observed up Platte Cañon, about ten miles to the southwest; visible about ten minutes; most damage occurred in vicinity of Littleton; Platte River raised slightly and inundated a portion of railroad track. June 24, Indianola, at 7:10 a. m., two large water spouts were observed about three or four miles southeast of station, moving northward over the bay, at about twelve or fifteen miles per hour; they appeared about two or three miles apart; the columns were complete from surface of bay to the clouds and broke up respectively at 7:25 and 7:35 a. m. Mayport, Fla., July 24, eight miles NE. of station; no progressive motion visible.

VERIFICATIONS.

Indications.—As worked up and issued to the public three times daily, they have been carefully compared with the actual conditions during the succeeding twenty-four hours, with the following result: the percentage verified averages 80.6 for New England; 77.8, Middle Atlantic States; 83.5, South Atlantic States; 89.8, Eastern Gulf States; 86.7 Western Gulf States; 81.6, Ohio Valley and Tennessee; 84.9, Lower Lake region; 83.1, Upper Lake region; 84.3, Upper Mississippi Valley; 82.9, Lower Missouri Valley. For all the districts the average verified is 83.7 per cent. By elements the percentage verified averages 86.1 for the weather; 86.8, wind-direction; 81.1, temperature; 80.9, barometer. There were 23 omissions to predict (8 for weather, 4 for wind-direction, 5 for temperature, and 6 for barometer), out of 3,720, or 0.62 per cent. Of the predictions made, 3.0 per cent. are recorded as having completely failed; 3.0 per cent., as one-fourth verified; 14.3 per cent. as one-half verified; 15.3 per cent. as three-fourths verified; 64.4 per cent. as fully verified.

Cautionary signals.—During the month 88 cautionary signals were displayed: 67, or 76 per cent., were justified by subsequent hourly velocities of 25 miles or over, at or within 100 miles of the station. Two signals were ordered up late. Sixty-three cases were reported, generally from scattered stations, of winds of 25 miles or over when signals were not ordered.

NAVIGATION.

Stages of water in rivers.—In the table upon the right side of chart No. III are given the highest and lowest readings of the signal-service gauges for the month, with the dates. Generally the changes in the rivers have been gradual and slight. The Cumberland rose 3 feet on the 2d and 3d at Nashville. The Ohio rose 3 feet 5 inches the 18th and 19th at Cincinnati. In the Lower Missouri and Lower Mississippi there has been almost a steady fall throughout the month. The Upper Mississippi rose nearly 4 feet at Dubuque from the 11th to the 13th; over 4 feet at Davenport from the 13th to the 16th; nearly 3 feet at Keokuk from the 14th to the 17th; over 3 feet at Saint Louis on the 30th and 31st. At Omaha the channel of river changed during month toward Nebraska shore and is now between piers Nos. 3 and 5. Fort Gibson, 16th, steamer Big Rock arrived from Little Rock, being the first arrival in eight years. Shreveport, navigation good throughout month for largest class of boats. La Crosse, 13th, "water getting so low that navigation is exceedingly difficult." Dubuque, a good boating and rafting stage during month. Savannah River, at Augusta, Ga., 27th, lower than since 1876, forded by a man on horseback.

ATMOSPHERIC ELECTRICITY.

Thunder storms.—1st, Illinois, Indiana, Michigan, Missouri, Ohio, Tennessee, Texas, Mississippi, Florida, Georgia, South Carolina. 2d, Tennessee, Virginia, Indiana, New York, Ohio, Georgia, Virginia. 3d, Maine, Mississippi, New York, Montana, Michigan, West Virginia, Georgia, Virginia, Maine, Dakota, Ohio, South Carolina. 4th, Connecticut, Kansas, Massachusetts, New Jersey, New York, Pennsylvania, Texas, Florida, Louisiana, Missouri, West Virginia, Georgia, Utah. 5th, Illinois, Kansas, Virginia, Colorado, Texas, Florida, Georgia, Missouri, Utah. 6th, Alabama, Illinois, Missouri, Ohio, Tennessee, Virginia, Indiana, Nebraska, Dakota, Texas, Mississippi, Louisiana, Iowa, Minnesota, Kentucky, Georgia. 7th, Alabama, Dakota, Indiana, Nebraska, Ohio, Virginia, Florida, Iowa, Minnesota, Illinois, Georgia, Missouri, South Carolina, Texas, Wisconsin. 8th, Alabama, Connecticut, Indiana, Kansas, Maryland, Massachusetts, Nebraska, New Jersey, New York, Ohio, Pennsylvania, Tennessee, Virginia, Wisconsin, Dakota, Montana, Indian Territory, Florida, Minnesota, Michigan, West Virginia, Illinois, Kentucky. 9th, Connecticut, Dakota, Delaware, Kansas, Maine, Maryland, Massachusetts, Nebraska, New Jersey, New York, Pennsylvania, Virginia, Wisconsin, Rhode Island, Texas, Florida, Alabama, Mississippi, Minnesota, Michigan, Illinois, Iowa. 10th, New York, Colorado, Connecticut. Dakota, Iowa, Massachusetts, Michigan, New Jersey, Ohio, Pennsylvania, Vermont, Virginia, Montana, Texas, Alabama, West Vir-

ginia, Maryland, Wyoming Territory, Illinois, Nebraska. 11th, Alabama, Colorado, Illinois, Indiana, Iowa, Massachusetts, Ohio, Virginia, Wisconsin, New Mexico, Dakota, Texas, Minnesota, New York. 12th, Colorado, Delaware, Indiana, Maryland, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Virginia, Florida, New Mexico, Texas, Minnesota, Dakota, Michigan, West Virginia, Wyoming Territory, Illinois, South Carolina. 13th, Colorado, Indiana, Kansas, Mississippi, Ohio, Virginia, Dakota, Texas, West Virginia, Illinois, Kentucky, Florida, Georgia, North Carolina. 14th, Colorado, Dakota, Iowa, Kansas, Maine, Massachusetts, Nevada, Texas, Minnesota, Wisconsin, Michigan, Tennessee, Georgia, South Carolina, Illinois. 15th, Illinois, Massachusetts, Florida, Utah, Colorado, Texas, Dakota, Minnesota, Wyoming Territory, Iowa. 16th, Dakota, Virginia, Nebraska, Kansas, Florida, Minnesota, Wisconsin, Michigan, Iowa. 17th, New York, Illinois, Indiana, Kansas, Maine, Michigan, Missouri, New Hampshire, Vermont, Virginia, Wisconsin, Florida, Iowa. 18th, Dakota, Indiana, Massachusetts, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Virginia, Illinois, Texas, Minnesota, Iowa, Michigan, Kentucky, Georgia, Missouri, Nebraska. 19th, Colorado, Iowa, Maryland, New Jersey, North Carolina, Pennsylvania, Tennessee, Virginia, Dakota, New Mexico, Texas, Florida, West Virginia, South Carolina, Massachusetts, Illinois, Missouri, Nebraska. 20th, Colorado, Florida, Illinois, Maryland, Nebraska, New York, Ohio, Tennessee, Virginia, Rhode Island, Indiana, Wyoming Territory, New Mexico, Alabama, Georgia, Iowa. 21st, New York, Colorado, Connecticut, Kansas, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, North Carolina, Pennsylvania, Tennessee, Vermont, Virginia, Louisiana, Georgia, Rhode Island, South Carolina, Texas. 22d, Colorado, Dakota, Mississippi, Virginia, Wyoming Territory, Montana, Florida, Texas, South Carolina, Georgia, Utah. 23d, Colorado, Dakota, Kansas, Vermont, Utah, Nevada, Montana, Texas, Alabama, Louisiana, Florida, New Hampshire, Wyoming Territory, Nebraska. 24th, Colorado, Kansas, Florida, Montana, Texas, Wyoming Territory, Iowa. 25th, Colorado, Kansas, New Hampshire, Wisconsin, Florida, Utah, Wyoming Territory, Nebraska, Minnesota, Iowa. 26th, Colorado, Georgia, Illinois, Indiana, Missouri, New York, Tennessee, Indian Territory, Texas, Alabama, Florida, Iowa, Kentucky, Utah. 27th, Colorado, Georgia, North Carolina, Tennessee, Virginia, New Mexico, Nebraska, Dakota, Texas, Alabama. 28th, Georgia, Kansas, Nebraska, North Carolina, Tennessee, Virginia, Dakota, Texas, Alabama, Mississippi, Louisiana, Missouri. 29th, Dakota, Delaware, Georgia, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, Florida, Minnesota, West Virginia, Illinois, Maryland, New Jersey, Texas. 30th, Alabama, Indiana, Nebraska, New Jersey, Ohio, Virginia, Kansas, Minnesota, Missouri, Michigan, Georgia, Illinois, Iowa, South Carolina. 31st, Dakota, Illinois, Indiana, Iowa, Michigan, New Jersey, Ohio, Virginia, Alabama, Texas, West Virginia, Georgia, South Carolina, North Carolina, Maryland, Nebraska.

Auroras.—Clear Creek, Neb., 1st, 2d, 3d; Milwaukee, Wis., 15th; Flushing, N. Y., 25th; Vevay, Ind., 21st, 31st.

Magnetic phenomena.—Prof. G. Hinrichs, Iowa City, Iowa, reports the average magnetic diurnal range in declination as 8.7 minutes.

Telegraphic communication interfered with by atmospheric electricity.—Santa Fé, 5th, 15th, 17th, 18th, 21st, 24th; 11th, severe thunder-storm, telegraphic instruments cut out; 12th, severe thunder-storm, lines worked with difficulty; 19th, 20th, 27th, severe thunder-storm, wires cut out. Concho, Tex., 13th, 14th, 26th. Griffin, Tex., 26th. Laredo, Tex., 25th. Boerne, Tex., 26th to 29th. Burlington, Iowa, 31st. Pembina, Dak., 6th, electricity intense, wires entirely unmanageable, "sparks from switch-board to lightning arrester two feet in length; 18th, instruments and wires completely unmanageable, continually emitting sparks, although cut out, lightning arrester fused; at Grand Forks wires were burned up; 25th, earth currents very strong, interfered with lines; 29th to 31st, electrical disturbance continued throughout entire days. Sandy Hook, N. J., 9th, 21st.

OPTICAL PHENOMENA.

Solar eclipse.—A summary of the observations of the solar eclipse of July 29 will appear in the Review for August.

Solar halos.—1st, Texas. 3d, Ohio. 4th, Ohio, South Carolina. 5th, Ohio, Mississippi. 6th, Alabama, Rhode Island, Indiana, Mississippi, Ohio. 7th, Alabama, Louisiana, Ohio, Georgia, Indiana, Mississippi. 8th, Ohio, Nebraska. 9th, Illinois, Pennsylvania. 10th, Illinois. 11th, Ohio, Illinois, New Hampshire, New York. 12th, Alabama, Ohio, Georgia, New Hampshire. 13th, Georgia. 16th, Nebraska, New York, Rhode Island, Connecticut, New Hampshire. 19th, Illinois, New York. 20th, Ohio, Florida, Illinois, Indiana. 21st, Dakota. 22d, Ohio. 23d, Illinois, Missouri. 25th, Ohio, New York, Rhode Island, Connecticut. 26th, Georgia, Ohio. 27th, New York. 28th, Texas, South Carolina, Illinois, Indiana, Michigan, New York, Ohio, Pennsylvania. 29th, Texas, South Carolina, New York, Rhode Island, Connecticut, Massachusetts, New Hampshire, Maine, Vermont. 30th, Florida, Ohio, Wisconsin. 31st, New York.

Lunar halos.—3d, Indiana. 4th, Texas, Indiana. 5th, Texas, New York, Ohio. 7th, Texas, Louisiana, Ohio. 7th, Texas, South Carolina, Dakota. 8th, Texas, Iowa, Georgia, Virginia, Ohio, Utah. 9th, Kansas, Texas, Alabama, Missouri, Kentucky, Ohio. 10th, Colorado, Texas, Louisiana, Missouri, Pennsylvania, Kentucky. 11th, Texas, Louisiana, Missouri, Minnesota, Ohio, North Carolina. 12th, California, Texas, Florida, Missouri, Ohio. 13th, Texas, Georgia, Missouri, Virginia. 14th, Minnesota, Michigan. 15th, Dakota, Iowa, Minnesota, Ohio. 16th, Michigan, New York, New Jersey, Maine, Tennessee. 17th, Georgia, North Carolina, Virginia. 18th, Ohio, Connecticut. 19th, New York, Ohio. 20th, Texas, Iowa.

Mirage.—New Haven, Conn., 31st, over Long Island Sound.

Miscellaneous.—On the 2d, at Tybee Island, Georgia, 5 p. m., "a double rainbow was observed in an apparently cloudless sky." 29th, at Louisville, Ky., "the following curious phenomenon was observed during the solar eclipse: a bow, almost complete and somewhat similar to a rainbow, formed on the translucent clouds about 10° west of zenith, in the reverse position to that of a rainbow; had the circle been complete, the zenith would have been near the center." Lieut. Commander Chas. H. Craven, U. S. Navy, observer at United States Navy Yard, Mare Island, California, reports as follows: "June 7th—although the sky was completely overcast, the hills and all objects on them were completely visible. I could distinguish trees (single) at more than twenty miles, and see the chimneys and windows in houses over eighteen miles; even the posts and rails of fences could be counted at eight or ten miles to the eastward."

MISCELLANEOUS PHENOMENA.

BOTANICAL.—*Alabama*—1st, in the northern portion of State, wheat crop seriously cut off by rust; cotton generally good, and blooming well, some abandoned on account of successive rains; corn crops fine. These conditions also obtain in Western Tennessee, Northern Mississippi and Northern Arkansas. *Canada*—11th, Ontario, fall wheat crop large and excellent; spring wheat, good but less promising; oats and barley good; peas abundant; rye favorable; corn fine; hay crop large; potatoes, great crop, somewhat damaged by Colorado beetles; all fruits except apples rather short by severe June frosts. Quebec, fall wheat, small crop but good; spring crops suffered from late frosts and droughts; barley, peas, and oats very good; potatoes injured by frosts, droughts, and Colorado beetles, crop will probably be quite poor; hay crop in eastern part abundant; wheat reduced by local droughts; fruit crop uneven, injured in sections by frosts and insects. *California*—San Diego County, winter wheat badly rusted, will not get more than half a crop; barley will do better, not a full crop. *Connecticut*—New London, blooming, 2d, oleander; 20th, passion flower, 22d, cutting hay commenced. *Colorado*—Summit, 17th, peas up in garden; 20th, potatoes up; 25th, corn, beets, and spinach growing well; 31st, radishes ripe. *Dakota*—Minnehaha County, wheat harvest commenced, very little rust: oats very heavy and lodged some; flax splendid; barley good, cutting. Olivet, harvesting, 8th, barley, 15th, oats; 17th, field corn in tassel. Pembina, 15th, new potatoes and peas; 24th, wheat crop excellent, barley almost ripe, haying begun; 25th, harvesting barley. *Delaware*—1st, wheat crop throughout the State the largest ever harvested. *Florida*—Milton, 30th, corn ripe and harvested. Houston, corn crop good; cotton very promising. *Georgia*—Forsyth, 24th, crops maturing rapidly; season exceedingly favorable to vegetation. *Illinois*—Meredosia, 26th, wheat, corn, and potatoes promise well; oats heavy; hay good. Virden, corn very spotted, but little good. Griggsville, winter wheat very heavy, all threshed; oats nearly all cut, yield good. Wheaton, corn growing amazingly; oats heading out very full. Metropolis, wheat only half a crop; oats good, all cut; corn equal to last year. Avon, no rust in wheat; oats heading out well; corn looks splendid. Atlanta, some rust in spring wheat; rye all cut; corn about the average. Prophetstown, oat crop very heavy; no rust in spring wheat, condition excellent; corn equal to last year. Wyoming, winter wheat of very superior quality; rye, all cut, very large yield; some rust in spring wheat; corn in good condition. Riley 8th, commenced haying; 15th, corn in tassel and silk; 22d, wheat harvest begun. *Indiana*—Benton County, wheat, very large crop; oats, best ever raised in this county; corn, prospect magnificent for very large crop; potatoes, prospect splendid; fruit crop good. Boone County, corn, average crop; potatoes, fair; apples, half crop; no peaches. Cass County, wheat crop very superior; oats, prospect for a very heavy yield; corn in excellent condition; fruit of all kinds abundant and promise well, except grapes, which were generally killed by frost. Clinton County, oat crop immense; corn, fair; fruit, of all kinds, plentiful; apples and pears, big crop; no peaches or grapes; flax and hay in splendid condition. Greene County, apples, scarcely an average crop; peaches in abundance, trees breaking down; plums, pears, and smaller fruits never more abundant. Knox County, wheat, decrease in yield, but increase in quality; oats, better than ever known before; corn, fair; potatoes, remarkably good; apples, not half a crop and rather poor; peaches, good, large yield; pears, small crop, trees largely killed by pear-blight, appearing as if struck by lightning. Madison County,

wheat, nearly double the yield of last year; oat crop, very large; corn crop, prospect never better; potatoes, fair; fruit, of all kinds, will yield a full crop, except peaches; there will be a large increase of flax. Monroe County, oat crop, the best ever harvested; corn crop, good; potatoes, prospect flattering; apples, average crop; peaches, enormous yield, with trees breaking down, but fruit not so large as usual; all other fruits and berries plenty. Montgomery County, corn crop promises an immense yield; peach crop, largest in five years; apples will be very abundant; grapes, not as good as last year; all small fruits in great abundance. Rush County, oat crop greater than has been known for many years; corn, about the average; potatoes fair; not many peaches; an abundance of apples, pears and plums; grapes scarce, on account of June frosts. Tippecanoe County, wheat crop the largest since 1864; oats fair; corn, magnificent prospect for large yield; potatoes, best crop known for several years; fruits fair, average crop. Wayne County, fruit crop unusually heavy, except apples, which are falling badly; the crop of hemp and hay is unusually abundant. *Indian Territory*—Fort Gibson, 2d, peaches ripe; 20th, watermelons in market. *Iowa*—McGregor, 24th, winter wheat and rye, yield enormous; oats lodged; barley fair. In northeastern portion of State not a single field of wheat but what is more or less damaged by either blight, rust, or chinch-bugs, 27th. Dubuque County, wheat crop a failure owing to rust and chinch bugs, 27th. Humboldt County, oats heading well, corn growing wonderfully; wheat somewhat injured by the hot weather. Scott County, rye and barley nearly all cut; rye good; barley colored; oats heading well, heavy crop; spring wheat injured by rust and hot weather. Emmett County, barley fit to cut, oats heavy both in head and straw; wheat very much damaged by hot weather; corn half a crop. Keokuk County, rye harvested; spring wheat excellent, heads well filled; oats very heavy, in many instances lodged. Butler County, oats only a fair crop; all crops will be poor owing to blight and rust. Clear Lake, crops suffering greatly from heat and storm; much of the grain is badly rusted, and oats and wheat are flat. Nora Springs, the ground is so wet as to seriously impede harvesting with machines, and the hot weather prevents the grain from filling and blights it very badly. Fort Madison, 4th, apples ripe. Vail, corn very promising. *Kansas*—Labette County, wheat yielding from 16 to 23 bushels per acre. Neosho County, winter wheat yielding from 15 to 30 bushels; corn doing well. Elk County, winter wheat yielding 25 bushels; oats all cut; corn better than last season. Chautauqua County, winter wheat yielding 18 bushels; corn equal to last year. Butler County, winter wheat mostly in stack, some threshed, yielding 24 bushels; corn far ahead of last year. Cresswell, wheat harvested; timothy ripe. Holton, 31st, wheat harvested and threshed, best crops ever known in this locality; wheat yields from 20 to 26 bushels per acre. Independence, 30th, grapes ripe. *Kentucky*—Boyd County, oat crop very fine, heavy yield; corn fair; potatoes, prospects good; apples show but one-half of a crop, while peaches are a total failure; small fruits in abundance. Carroll County, oat crop, yield very large of fine heavy grain; corn, prospects very flattering; potatoes show an unusually fine condition; tobacco very good, topping has begun; rye and hay crops unprecedentedly heavy; fruit on high lands unusually good. Fayette County, oats excellent; fruit crop very small; apples are not plentiful, and peaches are very scarce; hemp crop promises well. Fleming County, potatoes, best crop for many years; apples scarce; peaches, plums, and pears one-fourth of a crop; tobacco good. Franklin County, tobacco crop very poor; potatoes promise a heavy yield; oats very heavy, yield large. Garrard County, apples, very heavy crop, but very few peaches; grapes not good; corn crop never better. Graves County, apples poor; peach crop very heavy; potatoes, average crop. Hart County, corn crop, prospects for an extraordinary yield; oat crop, very light, owing to rust; wheat only medium. Harrison County, heaviest harvest known for years; potatoes excellent; apples, half a crop; peaches, two-thirds of a crop; cherries, total failure. Jessamine County, apples good, but other varieties of fruit an entire failure; corn, prospect flattering. Larue County, oat crop splendid; potatoes excellent; fruit of all kinds the best for years; rye crop unusually large. Marion County, corn crop promises to be one of almost unparalleled abundance, fruit crop good, except peaches, which are rotting. Mercer County, potato crop promises to be unusually heavy. *Massachusetts*—Somerset, harvesting, 5th, rye, 17th, oats; 20th, sweet corn for use. *Maryland*—Fallston, 16th, oats harvested; 1st, timothy cut; ripe, 5th, raspberries, 12th, blackberries, 19th, tomatoes, 23th, sweet corn. *Michigan*—Detroit, crops of all kinds in excellent condition; one of the most favorable seasons for vegetation; wheat considerably above the average in quantity and quality; oats and hay both above the average; corn, average crop; potatoes very good; fruit below the usual yield. *Minnesota*—24th, Hokah, wheat very good. Mound Prairie, 24th, wheat generally injured by blight and rust. Banesboro, 24th, wheat greatly injured by hot weather. Lake City, 24th, wheat harvesting begun, much injured by blight. In southern portion of State wheat much blighted, 27th. Blue Earth County, the best fields of wheat are lodged, tangled, and more or less rusted; barley and oats are all lodged. Meeker County, rye and barley harvested, crop heavy and good; winter wheat is very heavy; spring wheat rusted on the leaves.

Missouri—Osage County, wheat all stacked; no effort made to thresh or sell; oats all cut, very good crop; corn not as good as last year. Oregon, 8th, peaches ripe; ripening, 14th, apples, 17th, tomatoes; blooming, 7th, phlox, 11th, tiger lilies. Springfield, 24th, sweet potatoes, and 30th, grapes in market; 31st, melons ripe; wheat and oats very good; magnificent prospect for corn; fruit in great abundance. *Nebraska*—Boone County, rye, barley, and wheat harvested, prospects very good; oats, very good; no injury to grain from rust. Franklin County, rye and barley harvested, rye is an average crop, but barley is very heavy; oats are well headed and promise a large crop; no injury from rust, and no grain lodged; corn never looked better. Clear Creek, harvesting, 5th, barley, poor crop, 15th, wheat. *New Jersey*—Vineland, month very favorable to growth of vegetation; corn, grass, and potatoes in excellent condition. *New Hampshire*—Dunbarton, apples and corn fair; wheat below the average; largest crop of hay for ten years; potatoes damaged by Colorado bugs; 30th, wheat harvest begun. *New York*—12th, in northern portions of the State, wheat plentiful; straw tall but stout; heads full; harvest commenced some weeks early; hay-cutting begun, crop large but much mixed with dasies; potatoes fine; oats heading well, quite heavy; apples, large yield; all crops somewhat injured by a cold snap. Palermo, 9th, corn in tassel; 19th, harvesting oats; ripe, 19th, early apples; 20th, blackberries; 28th, early pears. Kensico, blooming, 4th, chestnut. Wappingers' Falls, 1st, cutting hay; 2d, sowing buckwheat; blooming, 3d, morning glories, catnip; 7th, hollyhocks; harvesting, 5th, wheat and rye; 7th, sweet corn topping out; ripe, 15th, early apples and tomatoes; 8th, gooseberries; 9th, blackberries; 8th, corn 2½ feet high, oats in good condition; 11th, apple crop being destroyed by black lice; 15th, field corn topping out; 19th, corn in silk, cutting oats. Starkey, harvesting, 6th, wheat; 13th, barley; 20th, oats; 16th, threshing wheat; ripe, 18th, blackberries. Vernon Centre, 18th, haying finished; 20th, wheat harvest nearly completed, crop very light; 31st, hops just out of the burr; oat harvest begun, crop fair. *New Brunswick*—11th, spring grains, potatoes, roots, and fruits promise abundant harvest. *Nova Scotia*—11th, canker-worm seriously damaged apples and plums. *Ohio*—Allen County, wheat, an unprecedented crop; oats promise a very heavy yield; corn, prospects good; potatoes, crop will fall short of last year, owing to rot, which has already set in; fruit prospects encouraging. Ashtabula County, wheat, very heavy yield; oats, heavy yield; grain of superior quality; corn, good crop; potatoes, prospect for a good crop; fruit of all kinds in fine condition. Belmont County, wheat very good; oats, better quality than last year; potatoes, below average; apples very promising, excellent crop of peaches, pears, and plums and great abundance of grapes. Clermont County, wheat, excellent in quantity and quality; oats, prospects fair; corn, never looked better; potatoes very fine; fruit in the finest condition, except peaches, which are almost a failure. Gallia County, wheat and oats about the same as last year; corn crop very uneven, prospects poor; potatoes, whole crop in desperate condition, vines dying and dead from bug and drought; fruit, every kind excellent, except peaches. Guernsey County, fruit never better, except in low lands, where it was injured somewhat by frost. Harrison County, wheat crop all harvested, largest and best for many years; apples, peaches, cherries, and plums are in great abundance, particularly the two former, which is the largest crop in many years. Hancock County, potatoes a failure, on account of the plant being attacked by a small louse, that destroyed both roots and vines. Highland County, grapes, very heavy yield; peaches, best yield for many years. Hocking County, fruit, condition and prospects for all kinds never better, except grapes; there never was such an abundance of all crops in this county. Montgomery County, wheat crop extraordinary; oats in splendid condition; corn never in better condition; potatoes growing excellently; an unexampled year for gardening; fruits of all kinds show a great increase. Wyandot County, apples and peaches immense, other fruits plenty. Putnam County, wheat crop the largest yield ever known in this locality; corn considerably damaged on bottom-lands; potatoes below average on uplands, but on prairie lands an immense yield; fruit crop hardly up to average. *Tennessee*—Davidson County, the sale of wheat is very slow, only about half a crop; oats very good; corn is better than last year; tobacco growing well. *Texas*—Melissa, weather very favorable to the growth of cotton, prospects of a very large crop; from north to south, throughout the State, all crops look very fine; corn crop as good as ever seen in the State; farmers plowing stubble land. Clarksville, corn crop, prospect excellent; cotton far above the average; small fruit abundant. *Virginia*—Broad Oak, 15th, corn in silk; 31st, harvesting oats, grapes ripening. *Wisconsin*—La Crosse, 16th, wheat and oat crop severely reduced by rust, lodging, and shrinkage; similar reports from several adjoining counties. Burns, 24th, owing to frequent rains, intense heat, rust, and grubs, spring wheat is badly blighted; oats badly lodged and hay much damaged. Bangor, 24th, winter wheat good, spring wheat poor, barley and oats lodged, corn partly injured by grubs. West Salem, 24th, wheat poor, from blight, rust, and lodging; corn looks well. Arcadia, 24th, wheat injured by rains and heat; corn looks well; oats and rye good; potatoes well; hay much ruined by water. Barron County,

winter wheat and barley nearly ready to cut, average crop; spring wheat, heaviest crop ever raised, if it escapes rust, of which there is some danger owing to hot and moist weather. Eau Claire County, rye and wheat being harvested, very good crop; spring wheat in good condition, heavy growth; oats good; corn not as good as last year Embarrass, weather very favorable to growth of vegetation, all crops unusually fine.

MISCELLANEOUS.—*Locusts:* Olivet, Dak., flying from NE., 20th and 27th; NW., 30th. Coalville, Utah, flying NE., 1st, 9th, 11th, 17th in large numbers, 18th in large numbers, 19th in large numbers; SE., 6th, 12th, 15th in large numbers, 27th air full of them, 23d, 25th and 26th in immense numbers; E., 8th, 9th, 12th, 14th in immense numbers, 29th immense swarms, 31st; S., 14th in immense numbers, 27th air full of them. Locusts destroyed nearly all the crops in Summit County, Utah. Salt Lake City, 20th, vast numbers, between 2 and 3 p. m., flying S., against the wind, very few lighted. North Platte, 15th, 1 to 3 p. m., flying NW., in small numbers, but none lighted; 17th and 22d, flying NW. with the winds. Dodge City, 9th, from 10 a. m. to 3 p. m., small numbers seen at an elevation varying from 200 to 800 feet, flying SW. with the wind. Jacksboro, Tex., 30th, quite a large number have appeared, large size, light yellow and pale green color, came from the N. during preceding night. Winnemucca, Nev., 11th, great numbers made their appearance; 13th, all disappeared; 18th and 19th, large swarms; have not been so numerous for many years. Virginia City, Mont., 25th, flying NW.; 27th, 28th, large numbers, doing some damage to gardens; 30th, disappeared. Pembina, 23d, in small numbers, a few west of station. *Katydids:* Holton, Kans., 13th; Baxter Springs, Kans., 5th; Murphy, N. C., 12th; Webster, N. C., 24th; Ringgold, Ohio, 13th; Jacksonburg, Ohio, 27th. *Crickets:* Ringgold, Ohio, 14th. *Grasshoppers:* Palermo, N. Y., 24th, plenty; Newark, N. J., 14th. *Bobolinks:* Palermo, N. Y., 30th. *Army cotton-worm:* Virginia Point, near Galveston, Tex., 1st, first appearance this season.

Meteors.—Winnemucca, 25th, 26th; Castroville, Tex., 2d; Davis, Tex., 28th, 30th, 31st.; New Orleans, 8th, 9:10 p. m., very brilliant meteor, orange color, motion from W. to E., leaving a trail of about 8°; Saint Paul, 29th; Chicago, 6th, large and brilliant meteor at 3:05 a. m., appeared within the constellation Ursa Minor, and disappeared near the horizon a little south of Libra, size of full moon, visible 12 seconds, gave light three times the intensity of moon on clear night, left luminous cloud covering entire track, which disappeared gradually from W. to E., lasting 11 seconds; Indianapolis, 6th, at 3:00 a. m. large areolite struck the earth north of the city, leaving brilliant train visible nearly one minute, 27th; Logansport, Ind, 6th; Savannah, Ga., 19th; Fort Whipple, Va., 26th; Vevay, Ind., 31st; Monticello, Iowa, 12th; Baxter Springs, Kans., 9th; Holton, Kans., 11th; Creswell, Kans, 26th; near Woodstock, Md., 17th, 25th, 26th; Fallston, Md., 26th; Rowe, Mass., 28th; Northport, Mich., 25th; Litchfield, Mich., 29th; near Brookhaven, Miss., 23d, 25th, 29th; near Fayette, Miss., 26th; Corning, Mo., 22d., 25th; Emerson, Nebr., 30th; Clear Creek, Nebr., 26th, 29th, 30th; Wappinger's Falls, N. Y., 16th; Aiken, S. C., 31st; near Melissa, Tex., 3d, 20th; near Dover Mines, Va., 26th; Petersburg, Va., 9th, 3 a. m., brilliant meteor in SE., altitude 30°, accompanied by a sharp, hissing noise for 15 seconds; Austin, Nev., 29th.

Polar bands.—New Corydon, Ind., 1st, 20th, 23d, 28th; Tabor, Iowa, 23d; Gardiner, Me., 11th, 12th, 18th; near Fayette, Miss., 15th, 16th; Auburn, N. H., 29th; Jacksonburg, Ohio, 17th; Wytheville, Va., 11th, 26th; Burlington, N. H., 29th.

Zodiacal light.—Daytona, Fla., 1st, 2d, 3d, 16th to 19th, 21st, 22d; Monticello, Iowa, 1st.

Prairie and forest fires.—Creswell, Kans., 19th; Barnegat, N. J., 23d, large fires in pine woods inland; 26th, pine forest on fire in upper Ottawa Valley, Canada; 6th, Quebec, Canada, bush-fires in all directions, occasioned by drought, dense smoke in city; 7th, fires continued to spread, smoke on Saint Lawrence delayed steamer from Montreal fourteen hours, immense fire back of Three Rivers, destroying miles of North Shore Railroad track.

Earthquakes.—United States Naval Hospital, Yokahama, Japan, reports, June 17, 5:20 a. m., shock of earthquake, duration 40 seconds; 22d, 12 m., smart shock, duration about 35 seconds; 28th, 6:35 p. m., smart shock. At Tanna, New Hebrides Island, South Pacific (date not given), "great earthquake, which raised the land along the shore and harbor about 20 feet. Millions of fish were thrown up and destroyed." July 11, at Saint Thomas, W. I., midnight, severe shock of earthquake. 26th, Los Angeles, Cal., 8:25 a. m., slight shock, motion N. to S., lasting one second; San Gorgonio, Cal., 9:15 a. m., slight shock, direction S. to N., duration about 5 seconds, house shook and crockery rattled; slight tremor also felt at Cotton, Riverside, and San Bernardino; 2d, Campo, Cal., 5:55 p. m., two light shocks, from SE. to NW., first shock of 2 seconds duration, second of 3 seconds duration; heavy noise resembling thunder.

Sunsets.—The characteristics of the sky, at sunset, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from 120 stations show 3,635 observations to have been made, of which 63 were reported doubtful. Of the remainder 2,991, or 82.3 per cent., were followed by the expected weather.

United States Signal Service telegraph lines.—In illustration of the usefulness of this branch of the service, the following letter is published, viz:

"SMITHVILLE, N. C., *July* 31, 1878.

"*Chief Signal Officer of the Army:*

"SIR: I have the honor to forward herewith copies of International Code Signals exchanged between this station and the Spanish brig Dos Cunados, while the latter was ashore and in distress near Caswell Beach, about three miles south of Smithville.

"The Dos Cunados, bound from Wilmington, N. C., to Antwerp, with naval stores, ashore on the bar July 26, and, getting afloat the following day, drifted into a dangerous shoal close to the beach. She sprung a leak and filled early on the morning of the 29th; discharged cargo, and finally got afloat at 6:25 p. m. of the same day. She was towed back to Wilmington for repairs.

"The signals were valuable in procuring the aid of tugs and lighters whenever wanted; especially so, because the captain of the brig was ignorant of the English language.

"Very respectfully, your obedient servant,

"ROBERT SEYBOTH,
Sergeant Signal Service, U. S. A."

The signals exchanged referred to requests from the captain for lighters and tugs, and the position and condition of his vessel. The facts were at once telegraphed to the Chief Signal Officer, and by him to the wrecking companies and others.

Sun-spots.—Prof. Gustavus Hinrichs, Iowa City, Iowa, reports that the sun's disk was examined on sixteen days, and not a spot was seen. Observations were also made at Fort Whipple, Va., on the 1st, 2d, 3d, 4th, 5th, 6th, 8th, 9th, 11th, 13th, 22d, 23d, 25th, 26th, and 28th, and no spots observed.

Published by order of the Secretary of War.

ALBERT J. MYER,
Brigadier-General (Brevet Assigned), Chief Signal Office, U. S. A.

PAPER 31.

MONTHLY WEATHER REVIEW, AUGUST, 1878.

INTRODUCTION.

In compiling the present review the following data, received up to September 14, have been made use of, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at 118 Signal Service stations and 12 Canadian stations, as telegraphed to this office; monthly journals and means, 122 and 139 respectively, from the former, and monthly means from 13 of the latter; reports from 22 special sunset stations; 240 monthly registers from voluntary observers; 48 monthly registers from United States Army post-surgeons; marine records; international simultaneous observations; monthly reports of the weather services of the States of Iowa and Missouri; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

Upon chart No. II is shown the general distribution of the atmospheric pressure for the month by the isobaric lines. Compared with the means for August of previous years, the pressure of the present month is decidedly lower in all sections, except in the extreme northwest and at the Rocky Mountain and Pacific coast stations, where it is slightly above the normal.

The local barometric ranges, as reduced to sea-level, for the month, vary as follows: New England, from 0.66 of an inch at Newport and New London to 0.76 at Eastport and 0.77 at Mount Washington; Middle Atlantic States, 0.43 at Lynchburg to 0.68 at Albany; South Atlantic States, 0.30 at Jacksonville to 0.47 at Cape Hatteras; Gulf States, 0.25 at New Orleans to 0.28 at Key West, 0.31 at Mobile and Corsicana, and 0.21 at Galveston; Ohio Valley and Tennessee, 0.30 at Louisville to 0.50 at Pittsburgh; Lower Lake region, 0.39 at Sandusky to 0.61 at Oswego; Upper Lake region, 0.34 at Chicago to 0.61 at Alpena; Upper Mississippi Valley, 0.28 at Saint Louis to 0.57 at Saint Paul; Red River of the North Valley, 0.60 at Pembina to 0.67 at Breckenridge; Missouri Valley, 0.52 at Bismarck to 0.57 at Yankton; Plains of Nebraska and Kansas, 0.64 at Dodge City to 0.72 at North Platte; Rocky Mountains, 0.25 at Pike's Peak to 0.44 at Denver; Utah, 0.38 at Salt Lake City; Idaho, 0.55 at Boise City; Montana,

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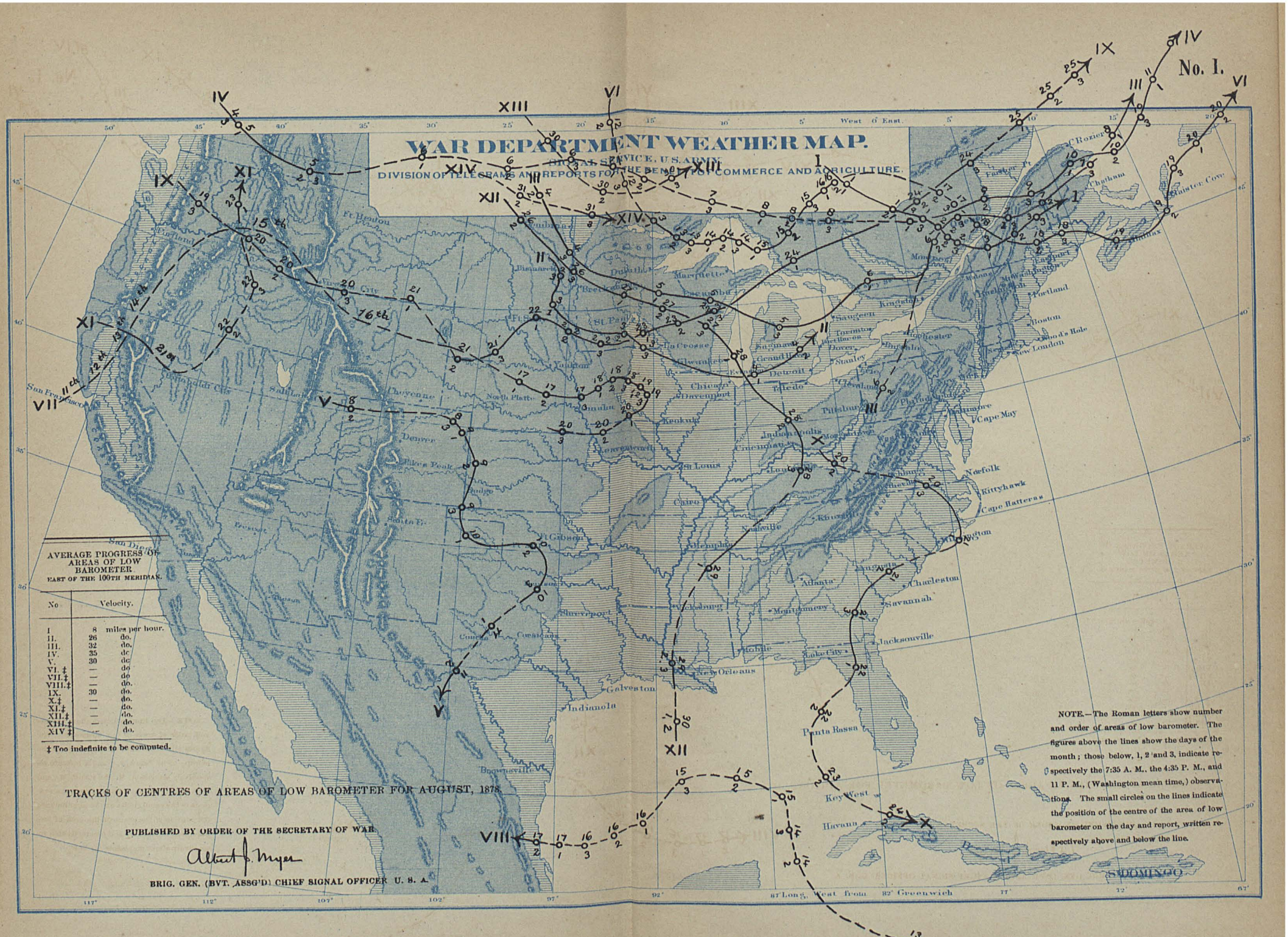
No. I.
WAR DEPARTMENT WEATHER MAP.
SIGNAL SERVICE, U.S. ARMY.
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.
AVERAGE PROGRESS OF AREAS OF LOW BAROMETER
EAST OF THE 100TH MERIDIAN.
No | Velocity.
I | 8 miles per hour.
II. | 26 do.
III. | 32 do.
IV. | 35 do.
V. | 30 do.
VI. ‡ | — do.
VII. ‡ | — do.
VIII. ‡ | — do.
IX. | 30 do.
X. ‡ | — do.
XI. ‡ | — do.
XII. ‡ | — do.
XIII. ‡ | — do.
XIV ‡ | — do.
‡ Too indefinite to be computed.
TRACKS OF CENTRES OF AREAS OF LOW BAROMETER FOR AUGUST, 1878.
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
Albert J. Myer
BRIG. GEN. (BVT. ASSG'D) CHIEF SIGNAL OFFICER U. S. A.
NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7:35 A. M., the 4:35 P. M., and 11 P. M., (Washington mean time,) observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.
S. DOMINGO
West 0° East.
87° Long. West from 82° Greenwich

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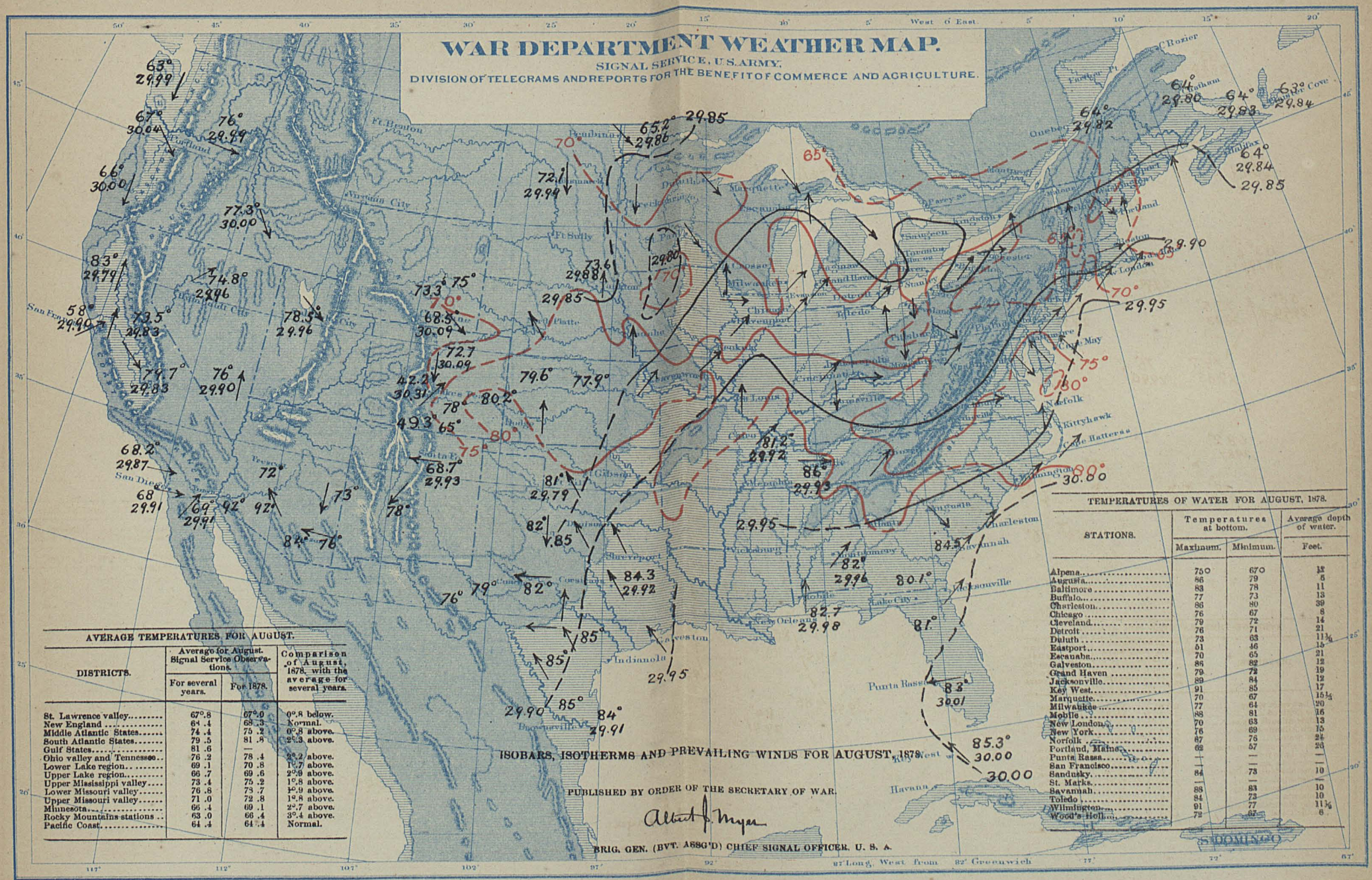
WAR DEPARTMENT WEATHER MAP.

SIGNAL SERVICE, U.S. ARMY.

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.



AVERAGE TEMPERATURES FOR AUGUST.

DISTRICTS.	Average for August. Signal Service Observations. For several years.	For 1878.	Comparison of August, 1878, with the average for several years.
St. Lawrence valley	67°.8	67°.0	0°.8 below.
New England	64 .4	68 .3	Normal.
Middle Atlantic States	74 .4	75 .2	0°.8 above.
South Atlantic States	79 .5	81 .8	2°.3 above.
Gulf States	81 .6	—	
Ohio valley and Tennessee	76 .2	78 .4	2°.2 above.
Lower Lake region	69 .1	70 .8	1°.7 above.
Upper Lake region	66 .7	69 .6	2°.9 above.
Upper Mississippi valley	73 .4	75 .2	1°.8 above.
Lower Missouri valley	76 .8	78 .7	1°.9 above.
Upper Missouri valley	71 .0	72 .8	1°.8 above.
Minnesota	66 .4	69 .1	2°.7 above.
Rocky Mountains stations	63 .0	66 .4	3°.4 above.
Pacific Coast	64 .4	64 .4	Normal.

TEMPERATURES OF WATER FOR AUGUST, 1878.

STATIONS.	Temperatures at bottom. Maximum.	Minimum.	Average depth of water. Feet.
Alpena	75°	67°	12
Augusta	86	79	6
Baltimore	83	78	11
Buffalo	77	73	13
Charleston	86	80	39
Chicago	76	67	8
Cleveland	79	72	14
Detroit	76	71	21
Duluth	73	63	11½
Eastport	51	46	15
Escanaba	70	65	21
Galveston	86	82	12
Grand Haven	79	72	19
Jacksonville	89	84	12
Key West	91	85	17
Marquette	70	67	15½
Milwaukee	77	64	20
Mobile	88	81	16
New London	70	63	13
New York	76	69	15
Norfolk	87	76	24
Portland, Maine	62	57	26
Punta Rassa	—	—	—
San Francisco	—	—	—
Sandusky	84	73	10
St. Marks	—	—	—
Savannah	88	83	10
Toledo	84	73	10
Wilmington	91	77	11½
Wood's Holl	72	67	6

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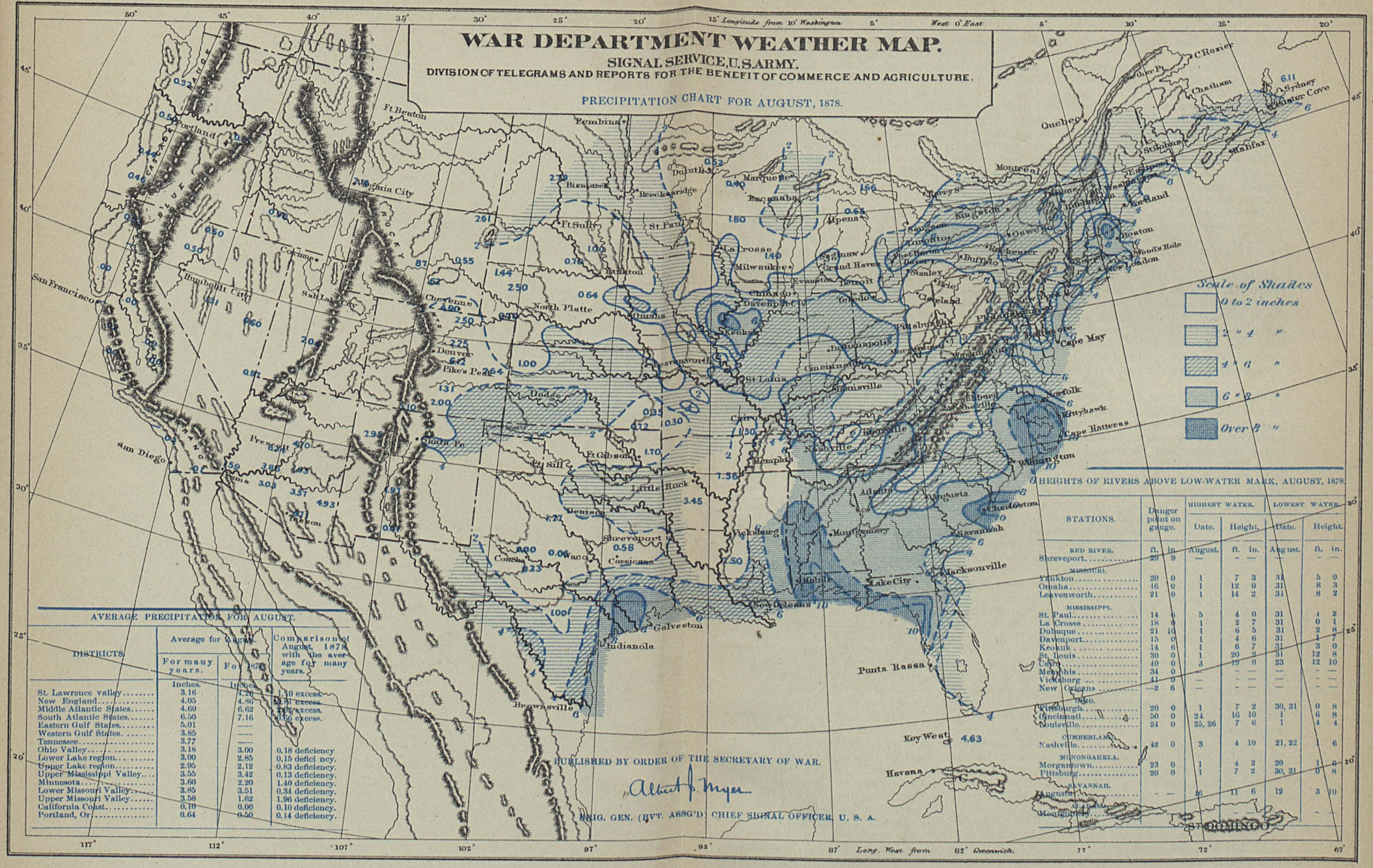
WAR DEPARTMENT WEATHER MAP.

SIGNAL SERVICE, U.S. ARMY.

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

PRECIPITATION CHART FOR AUGUST, 1878.



AVERAGE PRECIPITATION FOR AUGUST.

DISTRICTS	Average for August. For many years.	Average for August. For 1878.	Comparison of August, 1878, with the average for many years.
	Inches.	Inches.	
St. Lawrence valley	3.16	4.26	1.10 excess.
New England	4.05	4.86	0.81 excess.
Middle Atlantic States	4.60	6.62	2.02 excess.
South Atlantic States	6.50	7.16	0.66 excess.
Eastern Gulf States	5.01	——	
Western Gulf States	3.85	——	
Tennessee	3.77	——	
Ohio Valley	3.18	3.00	0.18 deficiency.
Lower Lake region	3.00	2.85	0.15 deficiency.
Upper Lake region	2.95	2.12	0.83 deficiency.
Upper Mississippi Valley	3.55	3.42	0.13 deficiency.
Minnesota	3.60	2.20	1.40 deficiency.
Lower Missouri Valley	3.85	3.51	0.34 deficiency.
Upper Missouri Valley	3.58	1.62	1.96 deficiency.
California Coast	0.10	0.00	0.10 deficiency.
Portland, Or	0.64	0.50	0.14 deficiency.

HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, AUGUST, 1878.

STATIONS.	Danger point on gauge.		Highest water. Date.	Highest water. Height.		Lowest water. Date.	Lowest water. Height.	
	ft.	in.	August.	ft.	in.	August.	ft.	in.
RED RIVER.								
Shreveport	29	9	—	—	—	—	—	—
MISSOURI.								
Yankton	20	0	1	7	3	31	5	0
Omaha	16	0	1	12	0	31	8	3
Leavenworth	21	0	1	14	2	31	8	2
MISSISSIPPI.								
St. Paul	14	6	5	4	0	31	1	2
La Crosse	18	0	1	2	7	31	0	1
Dubuque	21	10	1	6	5	31	2	8
Davenport	15	0	1	4	6	31	1	7
Keokuk	14	6	1	6	7	31	3	0
St. Louis	30	0	1	20	2	31	12	8
Cairo	40	0	3	19	0	23	12	10
Memphis	34	0	—	—	—	—	—	—
Vicksburg	41	0	—	—	—	—	—	—
New Orleans	2	6	—	—	—	—	—	—
OHIO.								
Pittsburgh	20	0	1	7	2	30, 31	0	8
Cincinnati	50	0	24	16	10	1	6	8
Louisville	24	0	25, 26	7	6	1	4	4
CUMBERLAND.								
Nashville	42	0	3	4	10	21, 22	1	6
MONONGAHELA.								
Morgantown	23	0	1	4	2	20	1	0
Pittsburg	20	0	1	7	2	30, 31	0	8
SAVANNAH.								
Augusta	—	—	26	11	6	12	3	10
Atlanta								
Montgomery								

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

Albert J. Myer

BRIG. GEN. (BVT. ASSG'D) CHIEF SIGNAL OFFICER, U. S. A.

0.39 at Virginia City; Nevada, 0.31 at Pioche to 0.45 at Winnemucca; California, 0.37 at San Diego to 0.53 at Red Bluff; Oregon, 0.53 at Portland to 0.54 at Roseburg.

Areas of high barometer.—Six have been sufficiently well marked to justify a brief description: two of them, Nos. II and IV, moved southward along the Atlantic seaboard, while the other four were mostly confined to the northwest and eastern slope of the Rocky Mountains. The heavy rains or "cloud bursts" in the mountains of Colorado and New Mexico occurred while high pressures were to the north of this section as follows: The heavy rains of the 10th in New Mexico on the approach of area No. I; of the evenings of the 23d and 24th in Colorado and New Mexico on the approach of No. V, and of the 27th in Southern Colorado on the approach of No. VI.

No. I.—This area appeared on the Pacific coast on the morning of the 8th, and probably took the course indicated by the following barometric readings: 8th, a. m. barometers at Olympia, Wash., and Portland, Oreg., respectively, 30.11 and 30.18, or 0.14 and 0.11 inches above normal. 9th, a. m. barometers at Olympia and Virginia City, Mont., 30.13 and 29.91 or 0.16 and 0 10 inches above normals. 10th, a. m. barometers at Virginia City and North Platte, 29.93 and 29.72 or 0.13 and 0.17 inches above normals, following closely in rear of low-pressure area No. V, with lower temperatures and clearing weather. 11th, a. m. barometers at North Platte, Dodge City, and Santa Fé, 29.80, 29.82, and 30.03 or 0.21, 0.20, and 0.18 above normals; minimum temperature on summit of Pike's Peak, 29°. 12th, a. m. barometers at Dodge City and Santa Fé, 29.77 and 30.02 or 0.15 and 0.17 above normal; minimum temperature at Santa Fé, 52°. 13th, a. m. barometer at Santa Fé, 29.97 or 1.12 above normal.

No. II.—After the passage northeastward of storm area No. IV the pressure continued gradually rising over the Canadian Maritime Provinces, and on the morning of the 14th exceeded the normal at Halifax and Sydney. 15th, the a. m. barometer at Sydney was 30.21 or 0.21 above normal, and the line of 30.00 included the whole Atlantic States; during the day the pressure increased along the coast and over the East Gulf States, with east to south winds and numerous rains and fog; midnight barometers at Halifax and Cape Henry, 30.19 or 0.21 above normal. 17th, the pressure fell over the northeastern section in advance of storm area No. VI, but continued decidedly above normal in the Southern States until the 19th.

No. III—appeared during the 14th in the extreme northwest, preceded by brisk to high winds in Dakota and Minnesota. 15th, a. m. barometer at Bismarck 30.20 or 0.21 above normal; the minimum temperature of the month, 44°, occurred at this station, and frost was reported. 16th, a. m, barometers at Pembina, Omaha, and Fort Gibson were 30.14, 30.06, and 30.05 or 0.21, 0.13, and 0.10 above normal; the temperature fell below 40° in the Red River of the North Valley, and frost was reported at Bismarck in the morning, but during the day the pressure fell in advance of storm-area No. VII.

No. IV—probably existed over over Hudson Bay territory prior to the 20th, on which day the pressure rose over the lake region, with notherly winds, and, by night, clear weather. 21st, pressure rose rapidly throughout the Saint Lawrence Valley. 22d, a. m. barometer at Farther Point 30.14 or 0.20 above normal. During the day the pressure rose decidedly, southward, over New England and the Middle States, with easterly winds, cloudy and threatening weather and light rains, followed at night by generally clear weather. 23d, a. m. barometers at Farther Point and Boston, 30.14 and 30.21, respectively, or 0.20 above normal. Frost occurred on the summit of Mount Washington, minimum temperature 35°, and at places in Massachusetts. During the day the pressure fell in the Saint Lawrence Valley, and by night the highest pressure was off the southern coast of New England. 24th, in the early morning light frosts occurred in New York and Connecticut, but during the day the pressure fell along the entire coast in advance of storm-area No. IX.

No. V.—During the 23d the pressure rose from California to Minnesota, and thence northwestward in rear of low-pressure areas Nos. XI and IX. Light rains and thundershowers prevailed during the day from Wyoming to Minnesota, with northerly winds and falling temperatures; southerly winds and high temperatures prevailed along the eastern slope of the Rocky Mountains from Nebraska to Northern Texas, the thermometer reaching 100° at Kit Carson, Col., and North Platte, Nebr. 24th, the pressure increased rapidly over the Northwest, and at 11 p. m. (Washington time) the highest barometric reading for the month was recorded at Bismarck, namely, 30.32, or 0.35 above normal. Cooler northerly winds gradually extended south and eastward during the day; the temperature fell at North Platte 42° in 24 hours and at Dodge City 45° (the maximum range of temperature during the month) from afternoon of the 24th to the morning of the 25th. During these days heavy rains fell in New Mexico and Colorado, as follows: on the 23d, at Silver City, N. Mex., 3:45 to 5:30 p. m. 2.00 inches, and at Santa Fé, 5:50 to 7:10 p. m., 1.02; on the 24th, about 2 p. m., it commenced raining in Colorado, and about 5 p. m. very heavy rains fell in southern part of State, resulting in most destructive floods along the courses of the Greenhorn, Cucharas, Huerfano, Apache, and all creeks draining the Greenhorn range of mountains; "horses and crops were washed away, and about fifteen miles of the Denver and Rio Grande Railroad, almost totally destroyed." At Trinidad 1.83 inches of rain

fell from 3:30 to 6 p. m. In Iowa the variation of temperature was very great, as is shown by the following records: at Cresco, in the northern part of the State, the a. m. minimum temperature was 50°, and frost was recorded; at Afton, in southern part of State, 2:35 p. m., thermometer exposed to the sun, registered 123°; in Grundy County, in the center of the State, a severe tornado was reported, accompanied by hail 4½ inches in circumference. Light rains and winds, with a temperature ranging from 40° to 50°, prevailed on the summit of Pike's Peak. 25th, the pressure fell from the Rocky Mountain stations to the Upper Lake region, and rose, with clearing weather and brisk to high northerly winds, in rear of low area No. IX, in Ohio Valley, Lower Lake region, and the Saint Lawrence Valley. 26th, the highest pressure moved southeastward during the early part of the day from Michigan to the Middle Atlantic coast, and frost was reported at Grand Haven, Detroit, and on the summit of Mount Washington, at which places the minimum temperatures were, respectively, 46°, 51°, and 30°. Although the pressure attending this area, after it left the Northwest, was generally below the normal, the decrease in temperature was well marked, the minimum temperatures of the month occurring at nearly all stations from Eastern Missouri and Southern Michigan to the Middle States and New England.

No. VI.—During the 25th the pressure was highest on the coast of Oregon; a. m. barometer at Portland, 30.17, or 0.16 above normal. 26th, the pressure rose in Idaho, Utah, Montana, and Wyoming, and during the 27th much more rapidly from Montana to Minnesota, Iowa, Kansas, and Colorado; heavy rains fell during latter part of day in southern portions of Colorado and Kansas. 28th, a. m. barometer at Bismarck and North Platte, 30.23 and 29.85, or 0.24 and 0.23 above normal; at the latter place the minimum temperature of the month, 54°, occurred; during the day this area moved southward, with clearing, followed by clear weather from Montana to Indian Territory and Michigan. 29th, a. m. barometers at North Platte and Dodge City, respectively, 0.26 and 0.24 above normals; minimum temperature of month, 56°, occurred at Dodge City; during the day the pressure rose northeastwardly, with clear weather over the lake region, and on the morning of the 30th the maximum pressure was over Michigan. 30th, the pressure rose southeastward over the Atlantic States, and during the 31st the highest pressure was off the coast, the barometric line of 30:10, running almost parallel with the coast line.

Areas of low barometer.—Fourteen are shown on chart No. III, but of these only four developed into severe storms within the limits of the United States.

No. I is a continuation of No. XI, partly described in the July review. 1st, it was central north of the lower lakes; during the morning a barometric trough extended southwestward to Illinois and Iowa, where severe thunder-storms occurred as the winds changed from southerly to northwest in advance of high pressure No. I; as the depression moved eastward, violent thunder-storms, accompanied by high winds and heavy rains, continued to prevail in the southwest quadrant, namely, in Illinois, Indiana, Ohio, Pennsylvania, and Maryland, in which States much damage was done to buildings and crops; in Saginaw County, Michigan, a terrific hail-storm. 2d, was central in the Saint Lawrence Valley, and the area of severe thunder-storms passed over the Atlantic coast; at 4:45 a. m., latitude 38° 32′ N., longitude 70° 24′ W., brig Kaluna struck by lightning; at Albany, N. Y., 11:45 a. m., most violent rain and hail storm, lasting 20 minutes, accompanied by heavy hail, course of storm from west to east, rainfall 1.25 inches; houses struck by lightning and burned, roofs blown off, basements and streets flooded; in the vicinity of Plymouth, N. C., p. m., terrific tornado, with extraordinary fall of hail; buildings, fences, and largest trees prostrated, live stock killed; great damage to growing crops; Baptist church at Plymouth blown down; at Cape Lookout a NW. wind of 60 miles per hour was recorded; at Holly Springs, Miss., heavy thunder-storm, two men killed by lightning; at Manchester, N. H., terrific thunder-storm, with hail, streets flooded. 3d, probably remained central over Northern Maine, with slight rise in pressure and clearing weather.

No. II appeared in the northwest during the evening of the 2d; a small depression also existed in Eastern Kansas, where severe thunder-storms were reported. 3d, it moved south and eastward, and was followed in Central Minnesota by a heavy rain and hail storm, doing much damage to crops. 4th, it moved eastward, and thunder-storms were general from Iowa, in the early morning, to New England during latter part of day; at Anna, Ill., severe wind and hail storm, three persons killed by falling trees; Saint Louis, severe wind-storm, maximum velocity, NW. 72 miles; at Toronto, Can., 3 to 6 p. m., severe storm commenced, with terrific fall of hail in center of city, stones 5 inches in circumference, weighing over one ounce, lasting 15 to 20 minutes; lightning struck and badly damaged two churches; cellars flooded, sewers bursted; in Saratoga County, New York, about 5 p. m., severe thunder-storm, lasting 20 minutes, with heavy hail; at Philadelphia, 1:15 p. m., thunder-storm, two persons killed; at Morristown, N. J., p. m., severe hail and wind storm, doing much damage; southwest of town, fifty corn-fields cut to the ground. In Connecticut the storm was very severe, a heavy hail-storm passing over Litchfield, Hartford, and Tolland Counties; at Colebrook, 11 a. m. to 5 p. m., severe rain and hail storm, rain-fall, 6.67 inches; at

Windsor cattle were killed by lightning, hail-storm two miles wide; in this neighborhood the hail was very heavy, doing great damage to the tobacco crop in Farmington, Ellington, and Vernon townships.

No. III appeared in Manitoba on the afternoon of the 4th and moved southeastward, with thunder-storms in Minnesota. 5th, it advanced eastward to Michigan, and cloudy or threatening weather, with numerous thunder-showers, prevailed thence to the Atlantic coast; the heaviest rain fell from Pennsylvania to North Carolina; at Washington, D. C., 2.45 to 5 p. m., severe thunder-storm, with heavy wind, rain, and hail; houses unroofed and unfinished buildings badly damaged, cellars flooded, sewers bursted, and one life lost by drowning; maximum velocity of wind, N. 53 miles; 40° 01′ N., 64° 36′ W., wind southwest, heavy rain squalls; at Phœnixville, Pa., at night, terrific thunder-storm, two persons killed; Canton, Pa., at night, heavy rain, destructive floods, barns and bridges carried away. 6th, it moved eastward, the pressure being lowest, during afternoon, in Pennsylvania and New York; severe thunder-storms and heavy rains in Maryland, New Jersey, New York, and Massachusetts, with much destruction of property; at Providence, R. I., 4 p. m., severe thunder-storm, with very heavy rain; different reports say 2 inches fell in thirty minutes and nearly 4 inches in one hour; streets were badly flooded and much damage done. On Mount Washington the wind continued from the S. all day; maximum velocity, 66 miles. 7th, center passed eastward over Maine and New Brunswick, and severe squalls were experienced along the New England coast; at Portland, Me., 3 p. m., wind W. 30 miles, two sail-boats capsized and several driven ashore; Newburyport, Mass., violent thunder-storm and high wind; steamer blown one mile down river; in Narragansett Bay schooners were driven ashore in Dutch Island Harbor during a terrific E. wind, and at Newport during a NW. squall; on Mount Washington the wind changed during the preceding night to NW., and increased to 60 miles per hour.

No. IV was probably north of Montana during the night of the 5th; 11 p. m., barometer at Virginia City 29.68, or 0.10 below normal; rain-fall, 4 to 6.30 p. m., 0.97 inch; light rains, with south to west winds, prevailed in Washington Territory and Oregon; at Umatilla, Oreg., the wind reached a velocity of 36 miles from the west. 6th, the pressure fell rapidly in Manitoba; 11 p. m., barometer at Pembina, 29.70, or 0.15 below normal; during the night a thunder-storm passed southward up the Red River of the North Valley. 7th, center passed eastward north of Lake Superior; brisk to high winds prevailed in Minnesota, Breckenridge N. and Saint Paul SW. 36 miles. 8th, pressure continued lowest north of the lakes, and falling in the Saint Lawrence Valley; during the day the maximum temperatures of the month occurred at most lake stations, and four cases of sunstroke were reported at Cincinnati. During latter part of day and during the night severe thunder-storms, with high winds, occurred in Upper Michigan and Massachusetts, and with hail in Ontario and West Virginia; at Norwood, Ont., terrific wind, rain, and hail storm, unroofing and leveling houses and doing great damage to crops; at Belleville, Ont., severe thunder and hail storm, doing great damage to crops; in Wetzel County, West Virginia, very destructive wind and hail storm; track two miles wide, corn and fruit crops destroyed, houses unroofed and cattle killed; high winds at Saint Louis, 32; Indianapolis, NW. 34; Louisville, 8.30 p. m., NE. 36; Columbus, 9.23 p. m., NW. 36; Mount Washington, NW. 58. 9th, center of depression moved eastward over Maine and New Brunswick to the Gulf of Saint Lawrence; minimum pressure during afternoon about 29.40, or 0.55 below normal, and the isobar of 29.60, including Northern New York and the New England States; during the whole day a series of very severe thunder-storms, with high winds and heavy rains, prevailed over this region, and about 6 p. m. a very destructive tornado passed over Wallingford, Conn. The maximum temperatures of the month occurred at most stations from Maryland to New Haven, Conn., and Springfield, Mass., and ranged from 93°, at Washington, D. C., to 84°, at Springfield; over this region and along the southern coast of New England fresh to brisk southwest winds continued until after the 4.35 p. m. observation, but north of this area the direction was more southerly, and occasionally east and northeast. The barometric gradient was greatest over Connecticut and Eastern Massachusetts, and especially so from noon to 4:35 p. m. The following are condensed newspaper extracts and reports of voluntary and Signal-Service observers: *Canada.*—Dispatches from various parts of Ontario reported a severe thunder-storm, accompanied by heavy winds and hail, doing great damage; at Belleville houses and barns were greatly injured. *New York.*—At Cape Vincent, thunder-storm during night, (8th–9th,) doing great damage; several buildings struck by lightning—storm on the Saint Lawrence terrific; at Dexter, barns struck by lightning; Watertown, most terrific thunder and rain storm from the west, the rain-fall varying from 4 to 5 inches in different localities—houses and streets flooded, buildings struck by lightning; at Brownville, streets flooded and barn fired—"thousands of people visited Brownville August 11 to view the devastation by Friday's storm;" one mile south of Florida, Montgomery County, afternoon, terrific wind and rain storm, with track about 100 feet wide, unroofing buildings and uprooting trees, &c. *Vermont.*—Burlington, thunder-storms from 4 to 11 a. m. and from 5 to 6 p. m.; South Royalton and Derby line, thun-

der-storm, barns struck and burned; Newbury, 6 a. m. to noon, very heavy rain, with lightning; Woodstock, West Charlotte, Lunenburg, and Newport, thunder-storms. *New Hampshire.*—On the summit of Mount Washington, thunder-storms from 6.50 to 8 a. m. and 9.15 to 9.40 p. m.; maximum velocity of wind, NW. 52° at 7 a. m.; Summit House struck by lightning at 7.15 a. m.; in Cheshire, Merrimac, Hillsboro', and Rockingham Counties, and at Keene, severe thunder shower during afternoon, houses struck; Andover Centre, 8 a. m., heavy thunder-storm, house struck; Contoocookville, heavy thunder-storms, continuing throughout day, heavy rains; Milford, noon, terrific thunder and hail storm, much damage to roads and crops; Mount Vernon, barn struck and burned; Nashua, afternoon, severe thunder-storm, with heavy rain—several buildings struck, railroads badly washed; Manchester, afternoon, several places struck by lightning; Auburn, thunder-storm, with hail; Exeter, terrific thunder-storm, with hail, barn struck: Stratham, barns struck and burned; off Boon Island, near Portsmouth, terrific thunder-storm at noon, schooner struck and sunk, four cattle struck. *Massachusetts.*—Adams, Berkshire County, 4 to 5 p. m., barn struck by lightning and burned; Northfield, Franklin County, a. m., barn and house struck and burned; West Farms, Hampden County, tobacco crop damaged, trees, fences, and roof blown away; Springfield, 12:25 to 1:05 p. m., heavy thunder-storm; Spencer, Worcester County, afternoon, house struck by lightning; Fitchburg, two heavy thunder-storms during the afternoon, houses, &c., struck by lightning, streets flooded; Lowell, Middlesex County, three severe thunder-storms during afternoon, the first most violent, accompanied by hail, houses struck, railroads washed, total rain-fall in 24 hours exceeded 4 inches, streets and cellars flooded; Waltham, thunder-storm, with hail, windows and skylights broken; Woburn, severe thunder-storm 3 p. m., man struck by lightning and killed, several buildings damaged; at 5:30 p. m. heavy fall of hail, some stones 2 inches in diameter; Melrose, severe thunder-showers at 3, 5, and 7 p. m., accompanied by very heavy hail, houses struck by lightning; Malden, 6 p. m., house struck by lightning and burned, one person killed; Somerville, evening, severe thunder-storm, with hail size of walnuts; Chelsea, evening, very furious thunder-storm, considerable wash-outs; Peabody, heavy thunder-storm, house struck, tanneries flooded; Boston, 5:40 to 8 p. m., severe thunder storm, with strong NW. wind; rain-fall, 3.27 inches, light hail; Cambridge, during the afternoon large hail fell, some stones being 2 to 3 inches in length and 1 inch in diameter, one weighed 4 ounces, much damage to glass, &c.; Revere Beach, severe thunder-storm, accompanied by heavy hail, some stones measuring over an inch in diameter; in Essex County, Salem, 9:30 a. m. to 3:30 p. m., severe thunder-storm, house and tree struck by lightning; during evening a second storm; Magnolia, 12:40 to 4 p. m., severe wind and thunder storm; rain-fall, 6.8 inches; Wenham Lake, day's rain-fall, 7.84 inches—6.5 inches in three hours; surface of lake raised 12 inches in thirty hours; Beverly, thunder-storm, house struck; Danvers, afternoon, thunder-storm, houses struck; Lynn, two severe thunder-storms from 1 to 3 p. m., and from 6 to 8 p. m., both accompanied by heavy hail, some stones measuring 1 inch in diameter; streets and cellars flooded, houses struck by lightning during last shower. Nahant, from noon to 8 p. m., tremendous thunder-storms, accompanied by violent winds, trees uprooted and roads badly washed; at 5:50 p. m., house near Bass Point struck by lightning. Swampscott, 6 a. m., unusually large solar halo, with two sun-dogs N. and S.; 10 a. m. to 1 p. m., incessant thunder and lightning, with torrents of rain; often two or three storms in different directions at same time, the wind changing several times. Marblehead, during afternoon, unusually severe thunder-storm, three houses struck. At Chebacco Lake, Hamilton, about 1 p. m., most terrific thunderbolt, house badly damaged, persons injured. Gloucester, afternoon, heavy thunder-storm, lasting three hours; schooner struck by lightning. Haverhill, very heavy thunder-storm, with hail, doing much damage—the pumping station of the Silver Hill Aqueduct Company was blown down, trees and fences demolished. Lawrence, from noon to 7 p. m., severe thunder-storms, houses struck, rain in torrents, flooding streets, &c. North Andover, house struck by lightning. Newburyport, violent thunder-storms, with heavy wind, rain and hail all afternoon. Newbury, two men struck by lightning. *Connecticut.*—Colebrook, 3:40 to 4:30 p. m., thunder-storm. Meriden, between 5 and 7 p. m., severe thunder-storm, with heavy wind and rain, building struck by lightning, trees blown down. Southington, thunder-showers from 11 a. m. to night, heavy rain from 5:45 to 6:30 p. m., rain-fall 1.20 inch. New Haven, evening, heavy thunder-cloud to north, with continual discharge of electricity. New London, 7 a. m., large well-defined solar halo; 6:55 to 8:39 p. m., brisk southwest thunder-storm, large hail fell in vicinity, rain-fall 1.98 inch; steamer Ella reports severe thunder-storm off Block Island and Watch Hill, R. I.; sea exceedingly rough. In regard to the Wallingford tornado, a special report from Sergeant Reed of the Signal Service, numerous newspaper extracts, and an excellent paper by Prof. W. H. Brewer, of New Haven, have been studied with the following results: It appears that during the afternoon heavy clouds began to collect in the hills to the northwest and southwest; about 5 p. m. or later a heavy thunder-storm was noticed in the northwest moving toward the village—at first slowly but afterwards more rapidly; a second is said to have come from the southwest and to have met the

one from the northwest over a dam situated on the Quinnipiac River, to the west of the village; it was here that the tornado commenced between 6 and 6:30 p. m., having the appearance of a water-spout; it then moved eastward up the east bank, a steep precipice about 35 feet in height, uprooting some of the trees and leaving them lying towards the E.; on the summit of the bank the track of destruction was about 400 feet wide; it then moved S. 70° E. over the sandy plain about 175 rods, and it was in this part of the track that the greatest destruction occurred; its path gradually widened to 600 feet as it traversed the first 40 rods, and to 750 feet about 100 rods from the dam; it here totally destroyed a wooden church and prostrated several of the marble headstones in the cemetery; all the large monuments were thrown down and appeared to have been lifted up first; two were laid to the east and the rest to the northeast; the débris of the church was also carried north and easterly; a row of wooden buildings with brick foundations was next destroyed, and it was here that all the destruction of life occurred; the tornado then ascended a gentle elevation, about 123 feet above the surface of the plain, at the foot of which an immense amount of débris was deposited, with pieces lying in the direction of the track; trees here appeared to have been pulled up rather than overturned. Near the northern edge of the track, on the plain, houses or débris were carried toward the SSE.; the only house left standing, however, was moved slightly toward the NNE., and appeared to have been literally bombarded with flying missiles and mud; a house at the foot of the incline was also moved slightly NNE., roof carried W. and sides thrown outward. On the summit of the incline (about 210 or 215 rods from the origin) the track was from 1,150 to 1,200 feet wide; here the houses were more substantially built, and less destruction occurred. From this position the track appeared to widen, and the destruction was confined mostly to vegetation. The tornado was preceded during the day by a southwest wind, and immediately by a lull and light fall of rain, during which period great commotion was noticed in the clouds; it was accompanied by a blinding dust and followed by heavy rain; in its course over the plains it was conical in shape, and whirled to the left, the greatest destruction apparently occurring near the northern margin of the whirl. Thirty-one persons were killed and forty or fifty wounded. Several buildings are reported to have been blown down in southern portions of Durham and Killingworth, to the southeast of Wallingford. 10th, center moved northeastward over the Gulf of Saint Lawrence; northwest to southwest winds, cloud and rain continued southwestward to North Carolina, the Ohio Valley and Lower Lake region; from 2 to 4 p. m. a severe wind, rain and hail-storm passed over the District of Columbia, and a terrific tornado was reported in Anne Arundel County, Maryland; 45° 33′ N., 55° 21′ W., fresh SW. and W. gales, heavy sea; Mount Washington, NW., 60 miles; Saint Pierre, Miquelon, severe thunder-storm, schooner struck by lightning. 11th, clearing weather gradually extended southeastward in advance of high pressure No. I, but occasional high winds and rains continued along the coast; off Cape Ann, Mass., severe squall; 42° 10′ N., 61° 57′ W., westerly storm, high westerly sea. 12th, heavy rains fell, during the morning, on the North Carolina coast, and the observer at Capeville, Va., reports, 9 a. m., three water-spouts on Chesapeake Bay, moving south.

No. V appeared in Colorado during the 8th; high temperature prevailed over this section; Fort Fetterman, 103°, maximum temperature of month; Denver, 105°, ditto; North Platte, 101°; (103° on the 7th, ditto;) Dodge City, 101°, ditto; Omaha, 97°, ditto, four cases of sunstroke, one fatal; at Fort Rice, Dak., 4:10 to 4:20 p. m., most terrific hurricane, accompanied by rain and hail, storm-cloud from SW. to E., buildings unroofed and garden crops destroyed, rain-fall 1.20 inch in 25 minutes, temperature fell from 99° at 3 p. m. to 65° shortly before storm commenced; at 4:35 p. m., thunder-storm, at Yankton, and at 11 p. m. at Omaha with wind NW., 35 miles. 9th, moved southward over Kansas, in front of high area No. I.; severe storms occurred with the change of the wind; at Hannibal, Mo., 5 p. m., terrific wind and heavy rain; Saint Joseph, evening, tremendous wind and heavy rain, temperature fell 20° in ten minutes; Dodge City, maximum temperature of month, 101°; Saint Louis, 8:30 p. m., severe thunder-storm from NW. 10th, moved south to Northern Texas, followed by cold northerly winds and heavy rains, during the night and early morning from Missouri to Southern Colorado, and during the day from Indian Territory to New Mexico. 11th, continued southwestward over Central Texas, with occasional heavy rains to the coast; at Mason, 1.90 inches rain in three hours; Fort Sill, NW., 36 miles.

No. VI, appeared in Manitoba during the latter part of the 12th, accompanied by a severe thunder-storm north of Pembina, the electricity being sufficiently intense at that station to interfere seriously with telegraphic communication. 13th, central north of Lake Superior, with thunder-storms in the Upper Mississippi Valley and Upper Lake region, and followed by brisk to high northerly winds in Minnesota and Dakota; Milwaukee, NW. 42 miles; during this day a severe hail-storm occurred in Southeastern Wyoming, passing over Fort Laramie and Cheyenne; Cheyenne, 3:35p. m., terrific hail-storm from NW. to SE., traveling at about 32 miles per hour, demolishing all windows to the north, stones size of hens' eggs, some weighing half a pound; hail fell for ten minutes and was followed by heavy rain. 14th, continued central

north of the lake region, with partly cloudy weather and occasional rains from Dakota to Kansas and thence to the Saint Lawrence Valley. 15th, center remained north of the Lakes; light rains and thunder-showers from Missouri to Wisconsin, and thence over the lake region to the Middle States and Southern New England; heavy thunder-showers at Sault Ste. Marie, and occasional high westerly winds; Milwaukee.—36; Alpena, SW. 30; Sandusky, NW. 38 miles. 16th, central north of Lower Lakes; severe wind and rain storms from Ohio to Virginia; at Columbus, Ohio, 1 p. m., wind W. 42 miles; Fremont and Dayton, Ohio, terrible wind and hail storms; Swissdale, Allegheny County, Pennsylvania, afternoon, violent wind-storm, path very narrow, buildings blown down; at Hazlewood considerable hail fell. 17th, moved eastward to the Saint Lawrence Valley, with severe thunder-storms in Pennsylvania, New York and along southern coast of New England; Champlain, N. Y., afternoon, fearful wind, rain and hail storm, streets flooded. 18th, center moved southeast to Maine, with decreasing pressure; 11 p. m., barometer at Eastport, 29.69 or 0.31 below normal, calm; light rains from New England northeastward. 19th, the pressure fell along the entire Atlantic coast, and rapidly in New Brunswick, Nova Scotia and Cape Breton; 7:35 a. m., barometers at Eastport and Halifax, 29.57 and 29.53, or 0.44 and 0.45 below normal; 4:35 p. m., barometers at Halifax and Sydney, 29.27 and 29.18 or 0.68 and 0.80 below; and 11 p. m., 29.20 and 28.44 or 0.78 and 1.56 below, respectively; 3.29 inches of rain fell at Sydney, the wind backing from E. to NE. and SW. The following notes of the day's weather will show the severity of the storm outside the limits of our stations: 41° 10′ N. 66° 13′ W., strong NW. wind, heavy rain; 41° 27′ N. 65° 36′ W., SSW., squally; 41° 45′ N. 61° 22′ W., W. by N. moderate gale; 42° N. 60° W., violent gale from NW.; near Sable Island, hurricane from SE. to SW., lasting 5 hours; 42° 40′ N., 59° W., hurricane from ESE., lasting 5 hours and settling into NW. gale, lasting 48 hours, high seas making clean breach over ship; 40° 32′ N., 57° 30′ W.; a. m., rainy weather, wind SE. increasing,—noon, hurricane lasting 3 hours, wind veering round to SW.—1 p. m., tempest at its height, barometer 29.075, steamer with head to south against a tremendous sea—4 p. m., wind W. blowing gale until noon of 20th; 42° 45′ N., 57° W., hurricane from SSE. to SW., lasting 3 hours; 42° 35′ N., 56° 30′ W., heavy gale commencing at SSE. and blowing hurricane for one hour; 37° 51′ N., 59° 52′ W.; bark Arvid lost masts in squall and was abandoned next day; furious gale off Cape Breton; Magdalen Islands, violent storm commenced during morning of 19th and lasted to 23d, wind SE., veering to NE., with great fury; at Etang du Norde a number of boats were damaged or destroyed, and crops suffered severely. 20th, westerly to northerly winds and light rains prevailed from New England, northeastward, with rising pressure.

No. VII.—This area probably had its origin in the Pacific coast States from the 11th to the 15th. During these days the following maximum temperatures of the month occurred: 11th, Winnemucca, Nev., 100°; 12th, Visalia, Sacramento, and Red Bluff, Cal., 106°, 100°, and 110°.5, respectively; 13th, Red Bluff, 110°.5. 13th, light rains fell during the morning along the coast of California. 14th and 15th, light rains northeastward to Idaho, and during the evening very heavy rains on the mountains in Central Nevada; in the towns of Austin and Eureka, situated in cañons, considerable destruction of property by flooding occurred. 16th, rains extended northeastward to Montana and continued in Idaho, Nevada and Utah; at Saint George, Utah, 3 to 4:30 a. m., heavy thunder-storm; at Austin, Nev., 11 to 11:30 a. m., "cloud burst." 17th, rain commenced in the northwest, and the lowest pressure moved to Northern Nebraska. 18th to 20th, probably central in Iowa, accompanied by numerous rains and thunder-showers eastward to Illinois and the Ohio Valley; afternoon of 19th a very severe thunder-storm, with heavy rains, occurred in Eastern Iowa.

No. VIII.—From the 13th to the 17th a low pressure area probably traversed the Gulf of Mexico about in the track indicated on chart. 13th, heavy squalls at Santiago de Cuba. 14th, thunder-storm with southeast winds at Havana. 15th, Punta Rassa, Fla., wind SE. 26 miles, two cattle schooners left, but were compelled to put back, and reported very severe storm in the Gulf. 17th, northeasterly winds and rain along West Gulf coast. Indianola, Tex., 4:35 p. m., E. 29 miles, easterly gales continued throughout the 18th, causing the waters in the bay to be driven in, overflowing streets in several places. Cautionary signals were ordered at Indianola and Galveston, and were justified as above.

No. IX appeared in the extreme northwest on the 20th, and during the 21st and 22d remained in that section. 23d, moved eastward to Wisconsin, with light rain in Upper Lake region. 24th, moved northeastward into Canada, with increasing energy; rains and thunder-showers prevailed from Central Mississippi Valley to the Saint Lawrence and New England; cautionary signals were ordered on the Lower Lakes and coasts of New England and New Jersey, and were justified on Lake Erie and along the coast from Boston to Portland. 25th, continued central over the mouth of the Saint Lawrence; cautionary signals were ordered from Baltimore to Smithville, and were generally justified.

No. X, probably originated in the Ohio Valley during the afternoon of the 20th, where

heavy rains fell in advance of high area No. IV: 21st was over the South Atlantic States, and on the 22d probably over the Eastern Gulf.

No. XI.—Existed in Northern California on the 21st, and moved northward during the 22d; it was accompanied by light rain in this section.

No. XII appeared in Dakota on the 26th; at Fargo a tornado occurred, accompanied by heavy rain and large hail from NW. to SE., width one mile, length 30 miles; barometer fell ½ inch in ten minutes preceding passage; seven houses blown down, five horses killed, and north window panes broken, railroad cars heavily loaded overturned. 27th, moved southeastward to Wisconsin, accompanied by light thunder-showers; 28th, thence to the Ohio Valley, and during the 29th and 30th, southward to the Gulf of Mexico, accompanied by generally rainy weather.

Nos. XIII and XIV probably existed in Manitoba on the 30th and 31st, respectively.

No. XV developed in the Lower Ohio Valley on the 30th, and moved northward to Michigan during the 31st, accompanied by generally rainy weather.

INTERNATIONAL METEOROLOGY.

March.—Ship Garelock left Calcutta March 1, passed Cape of Good Hope March 17; reports March 11 heavy gale from W. and WNW., lasting two days, with terrific squalls; ship hove to 57 hours.

April 3.—Bark Kedar wrecked in hurricane off Cook's Islands, South Pacific Ocean

May.—The Argomene, from San Francisco to Liverpool, passed Cape Horn May 11 and reports, had southerly gale May 13, 14, and 15, with heavy snow squalls.

Bark Pym passed Sandy Hook at 3:30 p. m., March 25, and arrived at Anjer, Java, July 1, reports, March 28, heavy gales and high seas; May 8, heavy gales and squalls; 9th, seas carried away cargo, derrick, and everything movable on deck; hurricane increasing; barometer 29.40; 19th, 0:15 p. m., latitude 36° 18′ S., longitude 10° 40′ E.; 20th, high seas; 22d, heavy squall; June 2, heavy gale and high seas; 10th, hard gale and squally; 11th, 4:09 a. m., increasing gale, with terrific squalls; wind veered suddenly to NW.; barometer 29.40; 29th, hard squalls, terrific thunder and lightning.

July 4.—United States Naval Hospital, Yokohama, during morning, strong SW. gale, with squalls and rain; 12th, off Rio Grande del Norte, Brazil, heavy squall. Ship Garelock, on July 3, in latitude 23° N., longitude 58° W., thence to Bermuda, July 13, reports variable winds, squalls, and frequent waterspouts during these days. 16th, Port Elizabeth, Cape Colony, South Africa, SE. gale. 21st, during a gale, a dory, containing part of crew of schooner Rich, was blown away from vessel and picked up July 25 in latitude 47° 11′ N., 50° 02′ W. Bark Clifton, on July 21, in latitude 37° 52′ N., longitude 58° 46′ W., reports, July 22, "heavy gale from WSW., lasting 36 hours." Bark Osage reports "heavy squall to the westward of Cape Race." 23d, 54° 41′ N., 25° 22′ W., W. and NW. squally. 28th, 49° 30′ N., 15° 15′ W., NW. to S. W. moderate gale, squally, high beam sea, ship rolling heavily and shipping water over all; 41° 10′ N., 49° W., heavy southerly gale. 29th, 48° 51′ N., 22° 02′ W., NNE. moderate gale and cloudy; 49° 51′ N., 18° 33′ W., NW. wind, high sea. 30th, Batabano, Cuba, heavy NE. storm during night; nine vessels lost—six ashore; vessel also ashore at Cayo Buva, near Cardenas. 31st, 47° 43′ N., 31° 23′ W., rain squalls.

August.—3d, 49° 30′ N., 34° 53′ W., NW., strong breeze and swell, fog and rain; 50° 30′ N., 33° 15′ W., squally; 43° 50′ N., 54° 42′ W., high sea; 6° N., 30° 30′ W., heavy squall, "carried away all spars by the deck." 5th, 45° 46′ N., 50° 32′ W., NW. thunder-storm. 6th, off Pernambuco, Brazil, gale. 8th, Point a Pitre, Guadeloupe, 2 a. m., barometer 29.77, high wind, squalls, and rain; 35° N., 54° 30′ W., bad weather, SW. winds, squalls and high seas until afternoon of the 11th; 44° 27′ N., 54° 48′ W., heavy W. sea all day. 9th, 42° 22′ N. 60° 49′ W., heavy SW. sea during latter part of day; 47° 56′ N., 50° 14′ W., stiff SW. gale during afternoon; 49, 26′ N., 21° 06′ W., variable wind, heavy rain. 10th, Point a Pitre, Guadeloupe, during last few days threatening weather, much rain and thunder; 45° 33′ N., 55° 21′ W., fresh gales from SW. and W., heavy sea; 51° 22′ N., 15° 47′ W., NNW. squally. 11th, 50° 51′ N., 24° 08′ W., squally and cloudy. 12th, Calcutta dispatch: "recent heavy rains have caused destructive floods throughout India, doing much damage in Scinde, Patna, &c."; 49° 44′ N., 33° 25′ W., light rain; 46° 04′ N., 46° 58′ W., WNW. squally, high W. sea; 49° 01′ N., 34° 03′ W., WNW., strong breeze, heavy rain; 52° 52′ N., 31° 30′ W., heavy sea. 13th, 51° 07′ N., 36° 47′ W., strong NW. gale, heavy sea; 29° 08′ N., 23° 49′ W., high sea. 14th, 49° 11′ N., 41° 48′ W., strong NNW. gale, heavy sea; 48° 01′ N., 30° 31′ W., W. moderate storm; 49° 18′ N., 29° 24′ W., WNW. fresh gale, cloudy; 49° 27′ N., 29° 04′ W., W. fresh gale, squally, high sea; 50° 30′ N., 29° 26′ W., W. fresh gale, very heavy W. sea; 49° 54′ N., 5° W., SW. to W. fresh gale, rough sea. 15th, 47° 30′ N., 36° 10′ W., confused sea; 50° 02′ N., 12° 32′ W., WNW. high sea, stormy. 16th, 51° 07′ N., 24° 42′ W., N. squally, rain; 50° 10′ N., 20° 44′ W., heavy westerly swell. 17th, 33° N., 43° W., hurricane from SE., backing to NE. and NW., high seas; 50° 15′ N., 32° 30′ W., high sea. 18th, 48° 32′ N., 39° 51′ W., N. moderate gale, high sea; 49° 50′ N., 8° 30′ W., high W. sea swell. 19th, 47° 38′ N., 37° 40′ W., fresh northerly gale; 49° 45′

N., 16° 41′ W., increasing SW. winds. 20th, 42° N., 62° W., hard W. gale, of short duration; 44° 27′ N., 54° 54′ W., confused sea; 48° 34′ N., 38° 42′ W., fresh northwesterly gale, squalls and rain: 50° 10′ N., 31° to 34° W., hurricane veering from S. by W. to N.; 51° 46′ N., 24° 44′ W., W. to S. squally, high W. sea; 49° 12′ N., 23° 10′ W. stormy, very high sea. 21st, 48° 03′ N., 29° 21′ W., W. stormy, very high sea. 22d, 51° 14′ N., 15° 50′ W., fresh SE., squally; 50° 25′ N., 16° 22′ W., at night, SE. breeze, stormy. 25th, 53° 24′ N., 25° 36′ W., a. m., strong WSW. breeze, heavy rain squalls; noon, moderate westerly gale, cloudy; p. m., stormy N. breeze. 26th, 50° 40′ N., 32° 35′ W., fresh W. to N. gale; 51° 58′ N., 32° 50′ W., a. m., hard northerly gale and tremendous sea. 27th, 51° 50′ N., 25° 26′ W., strong N. breeze, squally. 29th, 49° 31′ N., 42° 40′ W. SE. to N. strong breeze, rainy. 30th, 46° 57′ N., 50° 16′ W., S. rain and fog.

Abstracts from log of schooner San Diego, beached at Wolf Island, Behring Sea, during winter; observations were commenced October 20, 1877, and continued until April 30, 1878, at 7 a. m. noon, and 6 p. m. *October* 20 to 31, mean daily barometer, lowest, 28.70; highest, 29.55; mean daily temperature, lowest, 28°; highest, 44°; northerly bail squalls, 23d and 24th; NE. gales, 20th and 21st. *November*, mean daily barometer, lowest, 28.20; highest, 29.60; mean daily temperature, lowest, 22°; highest, 40°; snow on 9 days; rain, 4 days; hail, 1 day; gales on 10 days. *December*, mean daily barometer, lowest, 28.20; highest, 29.80; minimum reported temperature, 2°; maximum daily mean temperature, 37°; snow, 9 days, hail, 1 day; gales on 11 days. *January*, mean daily barometer, lowest, 28.10; highest, 29 50; minimum temperature, 2°; maximum, 42°; snow, 5 days; rain, 1 day; gales, 5 days. *February*, mean daily barometer, lowest, 28.40; highest, 29.50; minimum temperature, -8°; maximum, 49°; snow, 4 days; gales, 4 days. *March*, mean daily barometer, lowest, 28.50; highest, 29.30; minimum temperature, 4°; maximum, 56°; snow, 4 days; gale, 1 day *April*, mean daily barometer, lowest, 28.40; highest, 29.90; minimum temperature, 18°; maximum, 52°; snow and rain, 13 days; gales, 7 days.

Monthly reports from York Factory, Hudson's Bay, Canada, contain the following items: *March*, mean barometer, 29.79; maximum, 30 66; minimum, 29.50; mean temperature, 8°.9; maximum, 30°; minimum, —18°.5; snow-fall, 17.9 inches in 22 days; the Aurora Borealis observed on 12 days, generally very faint; depth of ice in river on the 31st, 5 feet 8 inches. *April*, mean barometer, 29.97; maximum, 30.35; minimum, 29.01; mean temperature, 27°.3; maximum, 53°.5; minimum, 6°.0; total rainfall or melted snow, 0.41 inch; rain on 3 days; snow on 10 days; the Aurora Borealis observed on 7 days, generally faint. *May*, mean barometer, 29.92; maximum, 30.33; minimum, 29.51; mean temperature, 32°.8; maximum, 75°; minimum, 10°.5; total rain and melted snow, 2.21; rain on 9 days; snow on 6 days; aurora on 3 days; ice in river broke up from the 14th to 16th; 21st, woods on fire. *Zoological.*—March 17, snow-birds; April 22, geese; 23d, ducks; 25th, snipe; 27th, robins.

Ice at sea.—Captain Dollard, of schooner Stag Hound, reports, "June 15, north of St. Paul's Island, Behring Sea, spoke schooner Legal Tender, bound for Point Hope, Arctic Ocean, which vessel had fallen in with ice, and, finding it impossible to proceed further, was bound across Behring Sea to try the Asiatic shore. Captain Dollard also reports, "July 3, as far north as King's Island, Behrings Straits, found ice very heavy; could not proceed further north."

Ocean current.—The maritime sub-delegate of the bay of Coronel, Chili, reports: "June 22, at low tide, a strong current was noted to the northwest of Point Pucocho, coast of Chili, which reached three miles an hour in the direction of the bay of Coronel. This extraordinary current was purely accidental, and had its origin in the continued winds from the 4th quadrant, which blew during the month, and in the great discharge from the river Bio Bio, in consequence of heavy rains.

TEMPERATURE OF THE AIR.

The isothermal lines on chart No. II illustrate the general distribution of the temperature of the air during the month. By a reference to the table on the left side of same chart, it will be seen that the average for the month has been above the mean in all sections, except in Lower Canada, New England, and on the Pacific coast; the average for the Gulf States is not obtainable, owing to the monthly reports from the Lower Mississippi Valley not having come to hand, but the means of stations situated elsewhere show it to be about 2° above normal. Since the chart was printed, New Orleans has come to hand, mean temperature, 83°. 5′; barometer, 29.96.

Maximum and minimum temperatures, respectively.—*Maine*—At Orono, 44° and 82°; Cornish, 53°, 86°. *New Hampshire*—Mount Washington, 30°, 60°; Dunbarton, 42°, 90. *Vermont*—Woodstock, 41°, 87°; West Charlotte, 55°, 94°. *Massachusetts*—Rowe, 42°, 80°; Somerset, 49°, 91°. *Rhode Island*—Fort Adams, 53°, 80°; Newport, 54°, 81. *Connecticut*—New London, 52°, 84°; Southington, 56°, 83°; New Haven, 52°, 85°. *New York*—Plattsburg Barracks, 47°, 83°; Waterburg, 48°, 90°; Willett's Point, 62°, 93; Rochester, 52°, 87°; Albany, 49°, 85°; New York City, 59°, 88°. *New Jersey*—Freehold, 53°, 86°; Jersey City, 63°, 95; Vineland, 57°, 92°. *Pennsylvania*—Franklin, 40°, 84°;

Tioga, 47°, 90°; Pittsburgh, 52°, 94°; Philadelphia, 58°, 89°. *Delaware*—Dover, 52°, 90°. *Maryland*—Woodstock, 52°, 91°; Owing's Mills, 54°, 86°; New Market, 64°, 92°. *District of Columbia*—Washington, 57°, 93°. *Virginia*—Wytheville, 54°, 88°; Capeville, 70°, 98°; Cape Henry, 68°, 99°. *West Virginia*—Morgantown, 56°, 90°. *North Carolina*—Highlands, 60°, 85°; Wilmington, 62°, 99°; Weldon, 64°, 100°. *South Carolina*—Aiken, 68°, 98°; Charleston, 69°, 97°. *Georgia*—Augusta, 69°, 105°; Forsyth, 75°, 100°; Tybee Island, 72°, 101°. *Florida*—Daytona, 63°, 97°; Fort Barrancas, 68°, 103; Key West, 76°, 94°. *Alabama*—Montgomery, 70°, 97°; Green Spring, 70°, 98°. *Mississippi*—Fayette, 68°, 94°; Brookhaven, 72°, 101°. *Louisiana*—New Orleans, 73°, 94°. *Texas*—Fort Concho, 50°, 99°; Fort McKavett, 55°, 98°; Boerne, 65°, 104°; Terril, 72°, 105°; Melissa, 74°, 107°. *Ohio*—Westerville, 46°, 88°; Cleveland, 52°, 89°; Cincinnati, 60°, 94°; Jacksonburg, 62°, 96°. *Kentucky*—Louisville, 59°, 96°; Danville, 60°, 94°. *Tennessee*—Nashville, 63°, 97°; Austin, 66°, 96°; Cleveland, 66°, 100°. *Arkansas*—Mount Ida, 66°, 96°; Judsonia, 70°, 95°. *Michigan*—Grand Haven, 46°, 83°; Detroit, 45°, 90°; Alpena, 50°, 92°. *Indiana*—Indianapolis, 53°, 92; New Harmony, 55°, 97°; Laconia, 58°, 99°. *Illinois*—Rockford, 53°, 87°; Chicago, 57°, 91°; Louisville, 60°, 100°; Peoria, 58°, 97°. *Missouri*—Lebanon, 54°, 97°; Saint Louis, 60°, 96°; Corning, 58°, 98°; Frankford, 65°, 99°. *Kansas*—Fort Hays, 47°, 102°; Leavenworth, 58°, 99°; Baxter Springs, 70°, 100°; Fort Wallace, 61°, 104°. *Wisconsin*—Neillsville, 42°, 91°; Bloomfield, 53°, 84°; Manitowoc, 60°, 94°. *Iowa*—Nora Springs, 50°, 94°; Keokuk, 61°, 97°; Vail, 52°, 95°; Tabor, 56°, 100°. *Nebraska*—Camp Sheridan, 42°, 99°; Fort Hartsuff, 43°, 100°; North Platte, 54°, 103°; Fort McPherson, 50°, 104°. *Indian Territory*—Fort Sill, 51°, 98°; Fort Gibson, 58°, 99°. *Minnesota*—Duluth, 49°, 92°; Saint Paul, 52°, 94°; Breckenridge, 41°, 90°. *Dakota*—Fort Pembina, 36°, 89°; Fort Rice, 43°, 100°; Yankton, 48°, 97°; Olivet, 45°, 103°. *Colorado*—Summit, 39°, 72°; Pike's Peak, 29°, 62°; Denver, 54°, 105°. *Wyoming*—Fort Sanders, 43°, 86°; Cheyenne, 45°, 91°; Fort Fred Steele, 49°, 96°; Fort Fetterman, 48°, 103°. *Utah*—Coalville, 51°, 96°; Salt Lake City, 60°, 97°. *Nevada*—Pioche, 54°, 94°; Winnemucca, 44°, 100°; Camp McDermit, 52°, 102°. *Arizona*—Yuma, 69°, 114°. *California*—Santa Cruz, 47°, 73°; Visalia, 49°, 106°; Sacramento, 53°, 100°; San Francisco, 52°, 73°; San Diego, 55°, 80°; Red Bluff, 57°, 110°. *Oregon*—Roseburg, 44°, 88°; Portland, 47°, 87°. *New Mexico*—Fort Union, 45°, 89°; Fort Wingate, 48°, 92°; Fort Craig, 60°, 105°; La Mesilla, 64°, 107°. *Idaho*—Boise City, 53°, 98°. *Montana*—Virginia City, 50°, 90°.

Ranges of temperature.—The *monthly ranges* will appear, from examination of the minima and maxima temperatures just given. Greatest *daily ranges* vary in New England from 16° least on Mount Washington to 25° at Boston; Middle Atlantic States, 19° at Cape May to 26° at Fort Whipple, Va; South Atlantic States, 15° at Cape Hatteras to 28° at Augusta; East Gulf States, 16° at Key West to 23° at Jacksonville; West Gulf States, 17° at Galveston; Ohio Valley and Tennessee, 21° at Cairo and Cincinnati to 29° at Pittsburgh; Lower Lake region, 22° at Sandusky to 28° at Rochester; Upper Lake region, 21° at Chicago to 28° at Marquette; Upper Mississippi Valley, 21° at Davenport to 27° at Dubuque and Saint Paul; Lower Missouri Valley, 27° at Omaha to 39° at Yankton, and 42° at North Platte; Minnesota and Dakota, 37° at Bismarck to 41 at Pembina; Colorado, 22° on Pike's Peak to 45° at Denver; Utah and Nevada, 32° at Salt Lake City and Pioche to 46° at Winnemucca; California, 17° at San Francisco and San Diego to 41° at Visalia; Oregon, 35° at Roseburg; Idaho, 38° at Boise City; Montana, 36° at Virginia City.

Frost occurred as follows: Pike's Peak, every day; Bismarck, Dak., 15th, 16th, hoar frost on bottom lands; Pembina, Dak., 25th; Grand Haven, Mich., 26th; Mount Washington, 23d and 26th; New London, Conn., 24th; Cresco, Iowa, 24th; Fall River, Mass., 23d; Rowe, Mass., 5th; Grand Rapids, Mich., 26th; Keuseco, N. Y., 24th, on low ground; Chambersburg, Pa., 26th; Lunenburg, Vt., 26th.

Ice is reported to have formed on Pike's Peak, on the 11th, ¼ inch.

PRECIPITATION.

On chart No. III is illustrated the general distribution of the rain-fall for the month. On the left side of the same chart is a table giving the average precipitation for August by districts, which shows a general deficiency over the interior, but a decided excess in the Atlantic States. The monthly records from several stations in the Gulf States are not yet at hand, but those received, except New Orleans, show a large excess.

Special heavy rains.—1st, Jersey City, N. J., 3.08; Flushing, N. Y., 3.65 inches in 3½ hours. 2d, Albany, N. Y., 1.25 inches in 10 minutes. 3d, Fort Barrancas, Fla., 3.75 inches. 4th, Mendon, Mass., 5.90 inches; Colebrook, Conn., 6.67 inches in 6 hours. 6th, Newark, N. J., 3.04 inches; South Orange, N. J., 3.47 inches; Waltham, Mass., 2.50 inches in 90 minutes. 8th and 9th, Boston, 4.04 inches; Watertown, Mass., 3.30 inches; Contoocookville, N. H., 3.30 inches. 10th, Saint Louis, 2.57 inches in 88 minutes. 12th, Weldon, N. C., 12th, 13th, 4.83 inches; Portsmouth, N. C., 12 to 14th, 5.47 inches; Fort Barrancas, Fla., 12th, 13th, 3.15 inches. 14th, Charleston, 13th, 14th, 7.71 inches; Fort Barrancas, Fla., 3.75 inches. 16th, Fort Monroe Va., 4.58 inches; Vineland, N. J., 16th,

17th, 5.40 inches. 17th, Mount Sterling, Ill., 4.00 inches; Mount Desert, Me., 17th, 18th, 3.15 inches. 18th, Wood's Holl, Mass., 5.11 inches. 19th, Elmira, Ill., 3.29 inches in 1 hour and 55 minutes. 20th, Mount Sterling, Ill, 2.50 inches. 21st, Freehold, N. J., 2.65 inches; Savannah, Ga., 1.75 inches in 60 minutes; Springfield, Mo., 3.30 inches. 27th, Dodge City, Kans., 2.01 inches in 73 minutes. 29th, Green Springs, Ala., 29th, 30th, 3.10 inches; Mount Solon, Va., 2.40 inches in 6½ hours; Fort Barrancas, Fla., 9.75 inches. 30th, Cape Lookout, 2.05 inches in 1 hour; Spring Garden, Tenn., 4.70 inches.

Largest monthly rain-falls.—At Fort Barrancas, Fla., 30.73 inches; Cape Lookout, N. C., 14.30 inches; Portsmouth, N. C., 11.76 inches; Mount Washington, N. H., 11.35 inches; Gulf Hammock, Fla., 11.15 inches; Colebrook, Conn., 11.07 inches; Charleston, S. C., 10.73 inches; Auburn, N. H., 10.14 inches; Cape Hatteras, N. C., 10.07 inches; Norfolk, Va., and Mobile, Ala., 9.95 inches; Weldon, N. C., 9.15 inches; Washington, D. C., 8.89 inches; Mendon, Mass., 8.50 inches; Waltham, Mass., 8.40 inches; Vineland, N. J., 8.46 inches; Green Spring, Ala., 8.32 inches; Willett's Point, N. Y., 8.34 inches; Newark, N. J., 8.06 inches.

Smallest monthly rain-falls.—At Fort San José, Alcatraz Island, San Francisco, Los Angeles, Sacramento, Visalia, Salinas City, Fresno, and Healdsburg, Cal., and Fort Concho, Tex., none; San Diego, Red Bluff, and Twin Oaks, Cal., trace; Campo, Cal., 0.01 inch; Santa Cruz, Cal., 6.02 inches; San Buenventura, Cal., 0.03 inch; Coleman, Tex., 0.06 inch; Tarentum, Pa., 0.10 inch; Umatilla, Oreg., 0.15 inch; Concho, Tex., 0.23 inch; Pierce City, Mo., 0.30 inch; Olympia, Wash., 0.32 inch; Empire City, Kans., 0.35 inch; Corning, Mo., 0.40 inch; Roseburg, Oreg., 0.46 inch; Portland, Oreg., Boise City, Idaho, and Winnemucca, Nev., 0.50 inch; La Mesilla, N. Mex., 0.61 inch.

Floods.—9th, Black River at Watertown, N. Y., rose 5 feet, during rain-storm; bridges and buildings swept away along the river and small streams; highways and railroads in Jefferson County badly damaged; in Eastern Massachusetts wash-outs occurred on several railroads. 10th, in Northern New York, Western and Southern Vermont, and Western Massachusetts, all streams much swollen; tributaries of the Hudson, Hoosic, and Mohawk Rivers, higher than since 1850; Lakes Champlain, Schroon, George, and Lucerne several feet above usual height; millions of dead fish found, supposed to be from the effects of Paris green washed from potato fields. Laredo, Tex., 21st, arroyos south of station much swollen and road bed washed away in many places; Rio Grande River unusually high for several days; heavy rains reported by traders from the interior of Mexico and small streams were much swollen. Davenport, Iowa, 19th, severe thunder-storm, flooding city and damaging crops. Charleston, S. C., 14th, heavy thunder-storm; streets flooded. Baltimore, Md., 16th, heavy rains; streets flooded. Philadelphia, 1st, 5:40 p. m., heavy thunder-storm; streets flooded. Albany, N. Y., 2d, 11:43 to 11:53 a. m., severe thunder-storm; much damage by wind and water. South Pueblo, Cal., 24th, terrific flood SW. of station; great damage on the Greenhorn, Cucharas, Huerfano, and Apache Creeks; crops and houses washed away; two men drowned; also numbers of cattle. Mount Solon, Va., 29th, heavy rain, damaging fences, washing cornfields badly. Beloit, Wis., 18th, heavy rain; damage to roads; washed away railroad culvert.

Drought.—Clear Creek, Nebr., 31st, has continued for three weeks, injuring corn and potatoes; no fall plowing done. Contoocookville, N. H., 15th, early potatoes injured by drought; wells and streams very low. Ephrata, Lancaster County, Pennsylvania, 21st, many wells dry, great scarcity of water in some sections of the county. West Charlotte, Vt., 31st, drought has affected potato and apple crop severely; small fruits destroyed, except grapes. Corsicana, Tex., 31st, cotton cut short and stock ranges dried up by drought, cattle suffering for water. Creswell, Kans., 31st, ground very dry, everything suffering for rain. Coleman, Tex., 20th, no rain for a long time, ground very dry, grass in many places quite dead. Sloop Point, N. C., 2d, drought continues, crops in much danger, no rain since July 4.

Hail.—Wadena, Minn., 3d; Pike's Peak, 1st, 2d, 17th; Burlington, Iowa, 4th; Davenport, Iowa, 4th, 13th; Port Huron, Mich., 5th; Detroit, Mich., 1st; Buffalo, N. Y., 9th; Cincinnati, Ohio, 5th; Albany, N. Y., 2d; Portland, Me., 18th; Newbury, Vt., 17th; Mount Washington, 7th, 9th; Boston, 9th; Fort Rice, Dak., 7th; Summit, Colo., 2d, 5th, 30th, 31st; Colebrook, Conn., 4th; Anna, Ill., 4th; Lyndon, Ill., 14th; Saint Meinrad, Ind., 10th; Cresco, Iowa, 27th; Nora Springs, Iowa, 26th; near West Waterville, Me., 18th; near Woodstock, Md., 5th; Sandy Springs, Md., 1st; Springfield, Mass., 13th; Waltham, Mass., 4th, 9th; Cambridge, Mass., 9th; Watertown, Mass., 9th; Litchfield, Mich., 8th; Norfolk, Nebr., 8th; Plattsmouth, Nebr., 2d; Auburn, N. H., 9th; Freehold, N. J., 4th; Palermo and North Volney, N. Y., 15th; Vernon Centre, N. Y., 9th; Tioga, Pa., 6th; Blooming Grove, Pa., 1st; Carlisle, Pa., 3d; Greencastle, Pa., 17th; Clarksville, Tenn., 2d; Lunenburg, Vt., 18th; Strafford, Vt., 7th, 17th; Ashland and Neillsville, Wis., 13th; Boise City, Idaho, 16th; Pioche, Nev., 16th; Cheyenne, 13th; Lead City, Dak., 2d; Pembina, Dak., 6th, 26th; Fort Whipple, Va., 1st.

Rainy days.—The number of days on which rain or snow has fallen varies as follows: New England, 8 to 20; Middle States, 7 to 20; South Atlantic States, 12 to 21; Gulf States, 11 to 22; Ohio Valley and Tennessee, 9 to 18; Lower Lake region, 8 to 16;

Upper Lake region, 8 to 14; Upper Mississippi Valley, 11 to 13; Lower Missouri Valley, 5 to 6; Northwest, 10 to 12; Rocky Mountains, 7 to 18; Western Plateau, 5 to 17; and Pacific coast, 0 to 4.

Cloudy days.—For New England the number varies from 5 to 16; Middle States, 4 to 16; South Atlantic States, 6 to 14; Gulf States, 2 to 10; Ohio Valley and Tennessee, 3 to 9; Lower Lake region, 3 to 15; Upper Lake region, 3 to 8; Upper Mississippi Valley, 4 to 8; Lower Missouri Valley, 2 to 7; Northwest, 3 to 5; Rocky Mountains, 3 to 8; Western Plateau, 2 to 8; and Pacific coast, 0 to 3.

Snow.—Summit, 15th, snow fell on the surrounding summits and a trifle near the station.

Rain from a cloudless sky.—McKavett, Tex., 2:30 p. m., light rain for five minutes while not a cloud was visible in the zenith, but a small cumulo-stratus in the western horizon.

RELATIVE HUMIDITY.

The average percentage of relative humidity for the month ranges as follows: New England, 73 to 83; Middle Atlantic States, 70 to 83; South Atlantic States, 71 to 83; East Gulf States, 70 to 76; West Gulf States, 68 to 76; Lower Lake region, 66 to 73; Upper Lake region, 64 to 73; Ohio Valley and Tennessee, 59 to 72; Upper Mississippi Valley, 64 to 71; Lower Missouri Valley, 65 to 71; Red River of the North Valley, 57 to 75; Eastern Slope, from Dakota to interior of Texas, 52 to 65; Western plateau, 25 to 40; California, 37 to 79. High stations report the following: Mount Washington, 91; Pike's Peak, 55; Cheyenne, 59; Denver, 50; Santa Fé, 48; Virginia City, 45.

WINDS.

The prevailing winds at Signal Service stations are shown by arrows, flying with the wind, on chart No. II. West of the Mississippi the prevailing direction is southeasterly and southerly; along the Atlantic coast, southwesterly, and over the Ohio Valley and Lake region, variable. The maximum velocities have already appeared under the description of storm-areas.

Total movements of the air.—The following are the *largest* monthly movements of the air as recorded at the Signal Service stations, viz.: Mount Washington, 16,408 miles; Cape Lookout, 11,556; Portsmouth, N. C., 9,266; Cape Hatteras, 9,013; San Francisco, 8,780; Dodge City, 8,664; Stockton, Tex., 8,418; Smithville, N. C., 7,644; Cape May, 7,334; Sandy Hook, 7,267; Cape Henry, 7,123; Pike's Peak, 6,157. The *smallest* are: La Mesilla, N. Mex., 936 miles; Knoxville, 1,209; Visalia, Cal., 1,343; Montgomery, 1,354; Uvalde, Tex., 1,453; Lynchburg, 1,806; Nashville, 2,153; Springfield, Mass., 2,290; Eagle Pass, Tex., 2,317; Augusta, 2,346; Davenport, 2,438; Fredericksburg, Tex., 2,481; Griffin, Tex., 2,560.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily weather indications with the telegraphic reports for the succeeding twenty-four hours shows a general percentage of omissions of 0.1 per cent., and of verifications of 87.1 per cent. The percentage of verifications for the four elements have been: weather, 92.7; wind, 89.7; temperature, 85.1; barometer, 81.0. The percentages of verifications by geographical districts have been: New England, 84.4; Middle States, 87.6; South Atlantic States, 89.5; East Gulf States, 91.9; West Gulf States, 91.2; Lower Lake region, 86.7; Upper Lake region, 87.6; Tennessee and Ohio Valley, 82.3; Upper Mississippi Valley, 86.8; Lower Missouri Valley, 83.2. Of the 3,716 predictions that have been made, 99, or 2.7 per cent. are considered to have entirely failed; 124, or 3.3 per cent. were one-fourth verified; 450, or 12.1 per cent. were half verified; 242, or 6.5 per cent. were three-fourths verified; 2,801, or 75.4 per cent. were fully verified, so far as can be judged from the weather maps.

Cautionary signals.—During the month 39 cautionary signals were displayed; 30, or 77 per cent. were justified by subsequent hourly velocities of 25 miles or over at or within 100 miles of the station. Forty-five cases were reported, generally from scattered stations, of winds of 25 miles or over, when signals were not ordered.

NAVIGATION.

Stages of water in rivers.—In the table on the right-hand side of chart No. III are given the highest and lowest readings of the Signal Service river gauges during the month, with the dates of same. An examination of this table shows that the highest waters generally occurred on the 1st of the month, after which the rivers generally continued falling. Omaha, during month, river channel has been gradually changing

toward Nebraska shore and old channel filling with sand; on the 26th the river gauge was surrounded by a substantial sand bar. Pembina, Dak., 27th, navigation on Red River becoming difficult, owing to low water. Pittsburgh, 26th, navigation entirely suspended, river one foot and falling.

High tides.—Mount Desert, Me., 2d, extremely high tides.

ATMOSPHERIC ELECTRICITY.

Thunder-storms.—1st, Maryland, Massachusetts, New Jersey, New York, Pennsylvania, Michigan, Canada, Colorado, Connecticut, Illinois, Indiana, Kansas, Ohio, Vermont, Iowa, West Virginia, Georgia, South Carolina, Rhode Island, Kentucky. 2d, Massachusetts, Virginia, Rhode Island, Alabama, Dakota, Georgia, New York, Canada, Colorado, Connecticut, Florida, Illinois, Indiana, Iowa, Kansas, Maine, Missouri, Nebraska, New Hampshire, New Jersey, North Carolina, Ohio, Tennessee, Texas, Vermont, Kentucky, Minnesota, Indian Territory. 3d, Canada, Colorado, Indiana, Iowa, Kansas, Maine, Massachusetts, Michigan, Nebraska, New York, Ohio, Pennsylvania, Texas, Vermont, Virginia, Wisconsin, Alabama, West Virginia, Florida, Georgia, South Carolina, North Carolina, Kentucky. 4th, New Jersey, New York, Virginia, Dakota, Canada, Connecticut, Florida, Illinois, Indiana, Iowa, Kansas, Maine, Massachusetts, Michigan, Missouri, Nebraska, Ohio, Pennsylvania, Vermont, Wisconsin, West Virginia, Georgia, Minnesota, Texas, Wyoming Territory. 5th, Maryland, New Jersey, Virginia, Michigan, New York, Colorado, Indiana, Maine, North Carolina, Ohio, Pennsylvania, Vermont, Wisconsin, New Mexico, Tennessee, South Carolina, Georgia, New Hampshire, Montana. 6th, Maryland, Massachusetts, New Jersey, New York, Pennsylvania, Dakota, Canada, Colorado, Connecticut, Florida, New Hampshire, Vermont, Virginia, Utah, Alabama, Michigan, West Virginia, Wyoming Territory. 7th, New York, Colorado, Florida, Iowa, Massachusetts, New Hampshire, Tennessee, Vermont, Minnesota. 8th, New York, Massachusetts, Dakota, Canada, Colorado, Connecticut, Florida, Illinois, Indiana, Iowa, Michigan, Nebraska, New Hampshire, New Jersey, Ohio, Pennsylvania, Vermont, Wisconsin, North Carolina. 9th, Maryland, Kansas, New York, Dakota, Nebraska, Colorado, Connecticut, Illinois, Indiana, Iowa, Maine, Massachusetts, Missouri, New Hampshire, Ohio, Vermont, Florida, Kentucky. 10th, Maryland, Virginia, Colorado, Illinois, Indiana, Kansas, Michigan, Mississippi, New Jersey, Ohio, Tennessee, New Mexico, Georgia, Missouri, Indian Territory. 11th, Virginia, Alabama, Indian Territory, Colorado, Illinois, Maine, Massachusetts, New Hampshire, New York, North Carolina, Pennsylvania, Texas, Ohio, Tennessee, Florida, Rhode Island, Dakota, Minnesota. 12th, Dakota, Iowa, Texas, Alabama, Michigan, North Carolina, Minnesota, Wisconsin. 13th, Georgia, New York, Alabama, Kansas, Illinois, Indiana, Iowa, Maine, Michigan, Nebraska, South Carolina, Vermont, Wisconsin, Florida, Dakota, Wyoming Territory, Nevada. 14th, Kansas, Michigan, Georgia, Canada, Florida, Illinois, Indiana, Iowa, Missouri, Nebraska, New York, Ohio, South Carolina, Tennessee, Alabama, Nevada. 15th, Virginia, Michigan, New York, Alabama, Colorado, Kansas, Canada, Illinois, Indiana, Iowa, Nebraska, North Carolina, Ohio, Pennsylvania, Vermont, Kentucky, Idaho, Nevada. 16th, New Jersey, Virginia, Michigan, New York, Dakota, Canada, Connecticut, Florida, Indiana, Massachusetts, North Carolina, Ohio, Pennsylvania, Utah, Alabama, West Virginia, Tennessee, Montana, Idaho, Nevada. 17th, Virginia, New York, Dakota, Connecticut, Illinois, Iowa, Maine, Massachusetts, New Hampshire, New Jersey, Pennsylvania, Vermont, Wisconsin, Utah, Rhode Island, New Mexico. 18th, Virginia, New York, Rhode Island, Illinois, Indiana, Georgia, Maine, Massachusetts, Ohio, Vermont, Wisconsin, Georgia, North Carolina, Texas. 19th, Virginia, Dakota, Florida, Illinois, Indiana, Iowa, Mississippi, Nebraska, North Carolina, Ohio, Tennessee, Kentucky. 20th, Georgia, Pennsylvania, Virginia, Florida, Illinois, Indiana, Iowa, Maine, Nebraska, North Carolina, Tennessee. 21st, New Jersey, New York, Alabama, Dakota, Georgia, Connecticut, Florida, Missouri, Pennsylvania, Tennessee, Virginia, Illinois, North Carolina, Minnesota, Texas, Montana. 22d, Minnesota, Wyoming Territory, Florida, Mississippi, Utah, Iowa, North Carolina. 23d, Alabama, Dakota, California, Illinois, Iowa, Kansas, Massachusetts, Michigan, New Jersey, Wisconsin, New Mexico. 24th, Pennsylvania, Kansas, California, Illinois, Indiana, Iowa, Ohio, New York. 25th, Maryland, New Jersey, Rhode Island, Colorado, Connecticut, Illinois, Indiana, Iowa, Kansas, Massachusetts, Ohio, Tennessee, Vermont, New Mexico, Indian Territory. 26th, Alabama, Dakota, Iowa, Kansas, New Mexico, Texas, Tennessee, Nevada. 27th, Georgia, Minnesota, Nebraska, Colorado, Iowa, Kansas, North Carolina, Wisconsin, Michigan. 28th, Minnesota, Alabama, Indian Territory, Indiana, Michigan, New York, Ohio, Pennsylvania, Tennessee, Texas, Montana, Idaho. 29th, Virginia, New York, Colorado, Florida, Maine, Mississippi, Pennsylvania, South Carolina, Texas, Vermont, Tennessee, Georgia, North Carolina. 30th, Georgia, Dakota, Florida, Maine, Ohio, Tennessee, North Carolina. 31st, Dakota, Nebraska, Colorado, Florida, Illinois, Indiana, North Carolina, Ohio.

Auroras.—Pembina, Dak., 1st, 2d; Escanaba, Mich., 6th; Newbury, Vt., 2d; Mount

Washington, 3d; Bangor, Me., 8th; Empire City, Kans., 21st; Springfield, Mass., 23d; Clear Creek, Neb., 1st, 2d, 7th, 18th, 24th, 27th

Magnetic phenomena.—Prof. G. Hinrichs, Iowa City, Iowa, reports the average magnetic diurnal range in declination as 10.20 minutes.

Telegraphic communication interfered with by atmospheric electricity.—Santa Fé, N. Mex., 5th, 7th, 10th, 11th, 17th, on wires; 23d, 25th, instrument cut out; 26th, 27th, 28th, 29th, on wires. Boerne, Tex., 4th, 12th; Pembina, Dak., 12th, 27th, strongly felt on line; Grand Haven, Mich., 13th; Barnegat, N. J., 21st, 3 p. m. instruments cut out; Mount Washington, N. H., 2d, 2 p. m., severe on wires.

OPTICAL PHENOMENA.

Solar halos.—2d, Mississippi, Ohio. 3d, Indiana, Ohio, Connecticut. 4th, Maine, North Carolina. 5th, Connecticut, New York. 6th, Florida. 8th, New York, Connecticut. 9th, Ohio, Rhode Island, Connecticut. 10th and 11th, Connecticut. 12th, Mississippi, Alabama, Connecticut. 13th, Indiana, Rhode Island. 14th, Ohio. 15th, Indiana, Maine, Ohio, Florida. 16th, Maine, Mississippi, Ohio, Vermont. 17th, Florida, Mississippi, Alabama, Vermont. 18th and 19th, Alabama. 21st, New Jersey. 23d, Georgia. 24th, New York, Ohio, Kentucky, Vermont. 25th, Connecticut. 28th, Texas. 29th, New Jersey, New York, Ohio, Connecticut. 30th, Kentucky, Ohio. 31st. Connecticut, New York, Dakota, Rhode Island.

Lunar halos.—2d, Virginia. 3d, Texas, Iowa, Minnesota. 4th, Virginia, Texas, Minnesota. 5th, Virginia, Minnesota. 6th, Nebraska, Minnesota. 7th, Maryland, Dakota, Nebraska, Ohio, South Carolina, Utah, Texas, Florida, Minnesota, North Carolina, New Jersey. 8th, New Jersey, Pennsylvania, Illinois, Kentucky. 9th, Maryland, New Jersey, Virginia, Texas, Iowa. 10th, Virginia, Illinois, Iowa, Minnesota, Ohio, New York. 11th, Ohio, Texas, Minnesota. 12th, Virginia, Minnesota, Mississippi, Texas, Alabama, Florida. 13th, Nebraska, Florida, Connecticut, Rhode Island. 14th, Nebraska, Tennessee, Virginia, Iowa, Minnesota. 15th, Indiana, New Jersey, Tennessee, Georgia, Virginia. 16th, West Virginia, Georgia, South Carolina. 17th, Wisconsin, Maine. 18th, Maryland, Maine. 21st, Maine. 22d, Maine.

Mirage.—New London, Conn., 26th, 27th.

MISCELLANEOUS PHENOMENA.

BOTANICAL.—*Colorado*—Summit, in bloom, 1st, wild strawberries, ripe; 8th, radishes' 9th, wild strawberries. *Dakota*—Randolph, 3d, 35 to 50 per cent. of the wheat crop damaged by rust, blight, and storm. Pembina, 15th, wheat and oat harvest completed; 29th, ripe melons and squashes. *Indiana*—Laconia, 31st, corn and potatoes very much injured by drought, apples and peaches are falling off badly. *Illinois*—Marengo, 31st, oats and wheat, fine yield, grass good, except on bottom lands, where it is spoiled by floods; corn, very heavy crop, commenced cutting. *Indian Territory*—Fort Gibson, 22d, corn ripe, very large crop reported. *Iowa*—Clayton, 3d, wheat much damaged by hot weather, rust, and chinch-bugs. Irving, 3d, late hot weather killed the straw. Greenville, 3d, harvest delayed by extreme wet weather. Red Oak, 3d, spring wheat damaged by rain and chinch-bugs. Guttenburg, 31st, wheat crop better on timber land than last year, but very poor on prairies; corn, good crop; oats excellent; potatoes rotting considerably; buckwheat very promising. Vail, 31st, some corn ripe; ground so hard and dry that no plowing can be done. *Kansas*—Holton, 31st, early planted corn is hard, late planted doing finely; potato crop somewhat injured by dry weather. Creswell, 17th, chinch-bugs injuring corn; 26th, commenced sowing wheat. *Maryland*—Montgomery County, 1st, wheat damaged by insects; corn fine; hay good. Fallston, Harford County, 31st, farmers plowing in the southern half of county, but with some difficulty; 25th, clover-seed harvested. *Massachusetts*—Mendon, 31st, crops look well, apples in abundance. *Michigan*—Northport, 31st, corn and potatoes, light crop, on account of drought; apples, very small crop, some trees liable to die from drought. *Minnesota*—Utica, 3d, wheat damaged one-third by hot weather. Belle Plaine, 3d, much rain, little sun, wheat badly blighted. Sauk Centre, 3d, much rust and blight. Brown County, 9th, wheat badly blighted. *Mississippi*—Brookhaven, 18th, cotton picking generally begun. *Missouri*—Oregon, ripe, 3d, plums; 2d, early apples; 7th, elderberries; 8th, grapes; 15th, Bartlett pears; 17th, a few strawberries gathered; 31st, Lawton blackberries; in bloom, 1st, sumac. Springfield, 31st, all crops enormous. Pierce City, 31st, wheat nearly all threshed, yield about twelve bushels per acre, grain very fine. *Nebraska*—Sutton, Clay County, 3d, harvest greatly delayed by wet weather. Near Howard, 31st, wheat crop injured by wet weather and chinch-bug, yield only fair; corn crop excellent. Emerson, in bloom, 3d, lilacs, and choke cherries second time this season. *New Hampshire*—Contoocookville, 31st, grapes ripening; 15th, early potatoes harvested. *New York*—Wappingers Falls,

1st, green corn in market; 23d, peaches decaying on the trees, attributed to early frosts; in bloom, 3d, white pond lilies, buckwheat; 12th, 13th, night-blooming cereus; ripe, 1st, wild cherries; 2d, Lawton blackberries; 9th, plums; 10th, summer squashes; 18th, summer pears; 20th, Concord grapes; 21st, melons and peaches; 27th, Bartlett pears; 13th, Lima beans in market. Starkey, 16th, prospect of potatoes rotting badly because of warm, wet weather; 20th, threshing oats and barley, poor yield; 31st, corn crop best for many years. Waterburg, 25th, wheat somewhat injured by Hessian fly; corn good; Vernon Centre, 9th, hops blighting; 11th, green corn fit for table use; ripe, 15th, tomatoes; 25th, summer squashes, cabbage for table use; 31st, hop harvest well advanced, crop only one-third of last year, but quality extra. *Ohio*—Bellefontaine, 30th, wheat crop heaviest and best ever known. North Lewisburg, 31st, wheat, rye, oats, corn, and potatoes excellent; all kinds of fruits more abundant than for thirty years. Ringgold, 31st, vegetables of all kinds excellent; corn and tobacco good. *Pennsylvania*—Ephrata, 31st, wheat crop heavy; oats poor; rye tall and good; corn, about half a crop; tobacco very good; potatoes suffered from Colorado beetle and drought, crop only moderate; peaches plenty; apples and pears scarce; vegetables very fair. *Texas*—Melissa, 31st, cotton picking commenced; considerable quantity already on the market; no worms; weather very favorable; corn crop very fine. Clarksville, 31st, cotton crop promises to be very fair, though somewhat damaged by excessive heat. *Vermont*—West Charlotte, 31st, heaviest hay crop for many years; early potatoes small and poor. *Virginia*—Wytheville, 10th, wheat crop only fair. Broad Oak, 31st, corn crop very good; grass good; vegetables abundant; no peaches; pear crop moderate; grapes only fair; tobacco crop rather backward, very little planted in the county. *Wisconsin*—Black River Falls, 3d, wheat badly injured by rust and chinch-bugs. Kenosha, wheat damaged by blight and rust. Tecumseh, 3d, spring wheat slightly damaged by rust. Embarrass, ripe, 30th, corn, beans; crop never better; all crops excellent.

INSECTS.—*Locusts:* Summit, Colo., 26th, flying SW., during most of forenoon at an elevation of 12,000 feet, wind SW. Olivet, Dak., 1st, large numbers from the N.; 5th, a few from the N.; 7th, a few from the S.; 8th, disappeared; 13th, flying S., some alighted; 14th, large numbers from NW., many came down; 15th, an immense flight from NW., damaging corn and vegetables; 17th, eating corn, &c., rapidly; 27th, nearly disappeared to the southward; 31st, late crops somewhat damaged by locusts. Norfolk, Nebr., 15th, from the N., first of the season; 25th, flying S.; 26th, NE.; 27th, SE; 28th, S. Genoa, Nebr., 15th, flying S.; 18th, E.; 20th, SW.; 28th, SW. Yankton, Dak., 15th, 17th, from N., few alighting; 20th, flying N.; 22d, flying N., and alighting; 23d, became plentiful; 25th, numerous; 31st plentiful; locusts appeared about the 15th and were seen almost daily during the remainder of month, considerable alighted and did some damage to gardens and corn; appeared not so numerous toward the end of the month. Morristown, Dak., 1st, small numbers from NW., none alighted; 5th, flying SE., very few alighted; 13th, came down from 11 a. m. to 3 p. m.; 18th, disappearing, some damage done; 28th, flying S. Virginia City, Mont., 1st, 11 a. m., small hordes flying NW. against wind; 2d, flying NW., against wind, some alighting; 3d, continued flying NW.; 4th, disappeared. Coalville, Utah, 31st, all grain destroyed on north side of Chalk Creek by locusts. Cheyenne, Wyo., 30th, reported flying over city to the SE. Bismarck, Dak., 3d, 1.30 p. m., numerous, flying E., about three-fourths of a mile high, evening some alighted; 4th, flying and alighting; 5th, abundant, flying E. and alighting, doing much damage at Fort Lincoln, and is reported they have destroyed all crops yet in ground; 6th, few flying E., others alighted and made great havoc with crops in city and vicinity; swarms flying E. in vicinity of Jamestown, 100 miles east of station; 7th, abundant on ground and in the air to a height of 25 feet, unfledged locusts noticed; devouring everything on ground; 8th, still on ground mating, destroying and preparing to hatch; 10th, hatching; 11th, hatching, many took wing toward the E.; 12th, few in air or on ground; 13th, flying SE., a few yet remain on ground, but not hatching; 14th, on ground and flying SE.; 15th, flying southerly; 19th, a few on ground, and those in the air flying southerly; 20th, abundant on ground, few in the air; 22d, unfledged seen in city and vicinity, still numerous without city; 23d, flying S., unfledged on ground; 24th, flying S. in large numbers, some unfledged on ground; 25th, on ground and flying southerly; 26th to 30th, disappearing, flying southerly; 31st, but few on ground, none in the air. *Cotton-worm:* Green Springs, Hale County, Alabama, 20th, began its work in lower part of this county later than last year, it has stripped the stalks of their leaves and stopped the growth and blooming; there will result only about two-thirds of a crop. Brookhaven, Miss., 18th, very bad on many plantations throughout the State, but none as yet in this vicinity. *Tobacco-worm:* Ringgold, Ohio, 31st, most destructive since 1853. Bismarck, Dak., 6th, observed feeding on potato-vines and tomato-vines and cotton-trees. *Katydids:* Somerset, Mass., 20th; Oregon, Mo., 6th; Flushing, N. Y., 2d; Bellefontaine, Ohio, 4th; Logansport, Ind., 12th. *Potato-bugs:* Broad Oak, Va., 24th. *Fire-flies:* Pembina, Dak., 31st.

BIRDS.—*Swallows:* Cornish, Me., 1st, S.; Oregon, Mo., 25th; Corning, Mo., 22d;

Waterburg, N. Y., 25th, disappeared; Flushing, N. Y., 20th; West Charlotte, Vt., 22d, disappeared; Daytona, Fla., 19th, 21st, S.; Pembina, Dak., 5th, previously numerous, have entirely disappeared; New London, Conn., 4th. *Cranes:* Creswell, Kans., 28th, S. *Blackbirds:* Ephrata, Pa., 31st, in large flocks. *Ducks:* Indianola, Tex., 15th, SSW.; Pembina, 15th, numerous. *Geese:* Broad Oak, Va., 26th, S. *Orioles:* Cornish, Me., 4th, S. *Bobolinks:* Cornish, Me., 8th, S. *Martins:* Cornish, Me., 1st, S.; Genoa, Neb., 15th, disappearing; Bellefontaine, Ohio, 27th, S.; Jacksonburg, Ohio, 28th, disappearing. *Humming-birds:* Cornish, Me., 11th, S.; Coalsville, Utah, 16th. *Field-plovers:* Cornish, Me., 13th, S. *Night-hawks:* Cornish, Me., 26th; Bellefontaine, Ohio, 20th.

Meteors.—Near Woodstock, Md., 2d, 3d, 4th, 12th, 18th, 19th, 20th; Gainesville, Ga., 10th; Titusville, Pa., 11th, 10.30 p. m., meteor from W. to N., color greenish, brilliancy outshining full moon, dividing into three fragments, two of which were reddish, distance calculated from the report on exploding, 25 miles; Dodge City, Kans., 20th; Davenport, Iowa, 3d, 10th, 23d; Detroit, Mich., 19th; Indianapolis, Ind., 22d, 23d; Savannah, Ga., 11th; New Haven, Conn., 10th; Eastport, Me., 11th; Green Springs, Ala., 6th, 9th, 10th; Anna, Ill., 19th; Lyndon, Ill., 5th; Vevay, Ind., 17th; Monticello, Iowa, 31st; Tabor, Iowa, 23d; Creswell, Kans., 31st; Fall River, Mass., 12th; Springfield, Mass., 2d, 20th; Rowe, Mass., 2d, 23d, 29th, 31st; Brookhaven, Miss., 19th; Fayette, Miss., 6th, 22d, 23d, 25th, 28th, 30th; Corning, Mo., 17th, 21st; Oregon, Mo., 17th, 18th, 20th 22d, 23d, 26th; Lebanon, Mo., 19th, 22d; Emerson, Nebr., 23d, 29th; Clear Creek, Nebr., 4th, 5th, 20th to 25th, 26th; Freehold, N. J., 5th; Waterburg, N. Y., 1st, 2d, 3d, 10th, 20th, 22d; Hector, N. Y., 8th; Starkey, N. Y., 1st; Flushing, N. Y., 18th, 21st; Vernon Centre, N. Y., 3d; Jacksonburg, Ohio, 11th, 12th, 13th, 14th to 28th; Limestone Springs, S. C., 3d; McMinnville, Tenn., 19th; Melissa, Tex., 22d, 29th; Boise City, Idaho, 25th; Bismarck, Dak., 14th; Pembina, Dak., 1st; Saint Louis, Mo., 4th. Chicago, Ill., 12th, 10.15 p. m. to midnight, meteoric showers in every quarter of the horizon, the number, even for a fraction of a second, could not be computed; the display is considered one of the most remarkable ever seen here. Dubuque, Iowa, 23d, 10:50 p. m., brilliant meteor, from W. to N., with fan-shaped tail; head small, greenish-blue; tail yellowish-white; small cloud floated in track of meteor from W. to E. Sacramento, Cal., 10th, 11 p. m., brilliant meteor, size and brightness of full moon, moved from N. to S.; 11th, 8 p. m., brilliant meteor from NE. to SW., with zig-zag motion. Indianola, Tex., 13th, 9:10 p. m., meteor nearly due W., altitude 30 to 40°; train bright red, about 5° long; path downward nearly perpendicular; exploded into several fragments of various and brilliant colors; duration 4 to 6 seconds; no cloud visible. Fort Davis, Tex., 1st, 2d, 3d; 27th, 8:30 p. m., brilliant meteor passed NE. and exploded. Portland, Oreg., 19th.

Polar bands.—Portland, Oreg., 7th; New Corydon, Ind., 7th, 22d, 27th; Gardiner, Me., 12th, 24th, 26th; Clear Creek, Neb., 9th, 10th, 13th; Auburn, N. H., 24th, 31st; Freehold, N. J., 8th, 11th, 24th; Wytheville, Va., 14th, 28th.

Zodiacal light.—Daytona, Fla., 6th, 7th, 10th, 11th, 14th to 18th, 20th, 23d to 25th, 27th to 31st; Ephrata, Pa., 21st, 23d, 25th; Newbury, Vt., 25th, 26th.

Prairie and forest fires.—Roseburg, Oreg., large fires in mountains; Portland, Oreg., 14th, 28th, 31st; Umatilla, Oreg., 3d; Creswell, Kans, 1st, 17th, 27th; Independence, Kans., 23d, 28th; Oregon, Mo., 3d; Boise City, Idaho, 3d, on mountains; Bismarck, Dak., 9th, E., 10th, ESE., 11th, SE., 12th, ESE., 15th, SE., SW., 16th, SW.; Yreka, Cal., 8th, 9th, 10th.

Earthquakes.—United States Naval Hospital, Yokohoma, June 22, 12 m., smart shock, lasting 35 seconds; 28th, 6:35 p. m., smart shock. July 5, 4:39 a. m., light shock, duration 20 seconds; 10th, 12:46 a. m., light shock; 3:45 p. m., smart shock. Salt Lake City, 21st, 5 a. m., slight shock. San José de Costa-Rica, Central America, July 27, 7.30 p. m., strong shock. August 13, 7.17 p. m., strong shock, 11.30 p. m., feeble shock; 14th, 3 a. m., feeble shock, 12:48 p. m., feeble shock; 22d, 10 p. m., strong shock. At Cartago, 12 miles east of San José, five shocks occurred from 7 p. m. of the 14th to 5 a. m. of the 15th, the first of which was very hard.

Sunsets.—The characteristics of the sky at sunset, as indicative of fair or foul weather for the succeeding twenty-four hours, have been obtained at all Signal Service stations. Reports from 124 stations show 3,829 observations to have been made, of which 35 were reported doubtful. Of the remainder, 3,090 or 81.2 per cent., were followed by the expected weather.

Sun-spots.—A record of observations made by Mr. D. P. Todd, on July 2, 4th, 21st, 28th, and 29th, has been forwarded by Rear Admiral John Rodgers, U. S. N., Superintendent United States Naval Observatory, Washington, D. C., and which reports no spots seen. Prof. Gustavus Hinrichs, Iowa City, Iowa, reports that the sun's disk was observed from *August* 1st to the 12th, on eight days, also on the 23d and 24, and not a spot seen. Observations were also made at Fort Whipple, Va., on the 2d, 6th, 7th, 8th, 10th, 18th, 19th, 20th, 23d, 24th, 26th, and 27th, and no spots seen.

The solar eclipse of July 29, 1878.—About three hundred and twenty letters and reports concerning this eclipse have been received from about two hundred and ninety-

five stations, of which, however, only twenty-eight were in the path of totality. The observations relative to temperature and weather, and about twenty-five sketches of the corona will be published with appropriate diagrams hereafter; those relating to "the duration of totality" are here given as being of immediate astronomical interest.

Locality.	Altitude.	Observer.	Duration of totality.
COLORADO.			*Seconds.*
Colorado Springs, Station 1	6,038	F. H. Loud	160
Colorado Springs, Station 2	6,038	J. H. Kerr	160
Colorado Springs, Station 3	6,038	A. H. Wright	161
Colorado Springs, Station 4	6,038	L. Kimball	162
Manitou	6,300	W. W. Nichols	165
Lake House, on Pike's Peak	10,230	P. Curtis	161.7
Four Mile	.....	M. Wiley	75
Monument, fifteen miles north of Colorado Springs	7,000	E. P. Bucher	161.4
Denver	5,260	J. A. Barwick?	179
Kit Carson	.....	O. Branham	3
Pike's Peak, summit	14,200	S. P. Langley	158
South Pueblo	4,600	E. S. Nettleton	153
INDIAN TERRITORY.			
Fort Sill	1,100	J. McCann	148
LOUISIANA.			
Lake Charles	.....	W. Meyer	150
MONTANA.			
Virginia City, Station 1	5,480	A. B. Knight	180
Virginia City, Station 2	5,480	D. W. Tilton	178
Virginia City, Station 3	5,480	R. B. Wassel	180
Virginia City, Station 4	5,480	H. Schmallhausen	176
Baldy Mountain, ten miles southeast of Virginia City	10,000	H. N. Blake	170
TEXAS.			
Belmont Farm, near Melissa	720	T. M. Scott	60
Corsicana	445	J. W. Smith	151
Decatur Court House	1,160	W. E. Garver	149
Graham	1,040	E. T. Hilliard	120
Henrietta, Station 1	915	J. I. Mullen	157
Henrietta, Station 2	915	Dr. Harrold	150
Pilot Point	800	E. F. Reeves	102
Terrell	550	F. P. Cline	134? 113?
WEST INDIES.			
Havana	25	C. Hasselbrink	114

NOTE.—The duration of totality is not stated at Navassa, West Indies, and Jacksboro, Texas.

Published by order of the Secretary of War.

ALBERT J. MYER,
Brigadier-General, (Brevet Assigned,) Chief Signal Officer, U. S. A.

PAPER 32.

MONTHLY WEATHER REVIEW, SEPTEMBER, 1878.

INTRODUCTION.

In compiling the present review the following data, received up to September 14, have been made use of, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at 118 Signal Service stations and 12 Canadian stations, as telegraphed to this office; monthly journals and means, 141 and 121 respectively, from the former, and monthly means from 14 of the latter; reports from 18 special sunset stations; 222 monthly registers from voluntary observers; 32 monthly registers from United States Army post surgeons; marine records; international simultaneous observations; monthly reports of the weather services of the States of Iowa and Missouri; reliable newspaper extracts; special reports.

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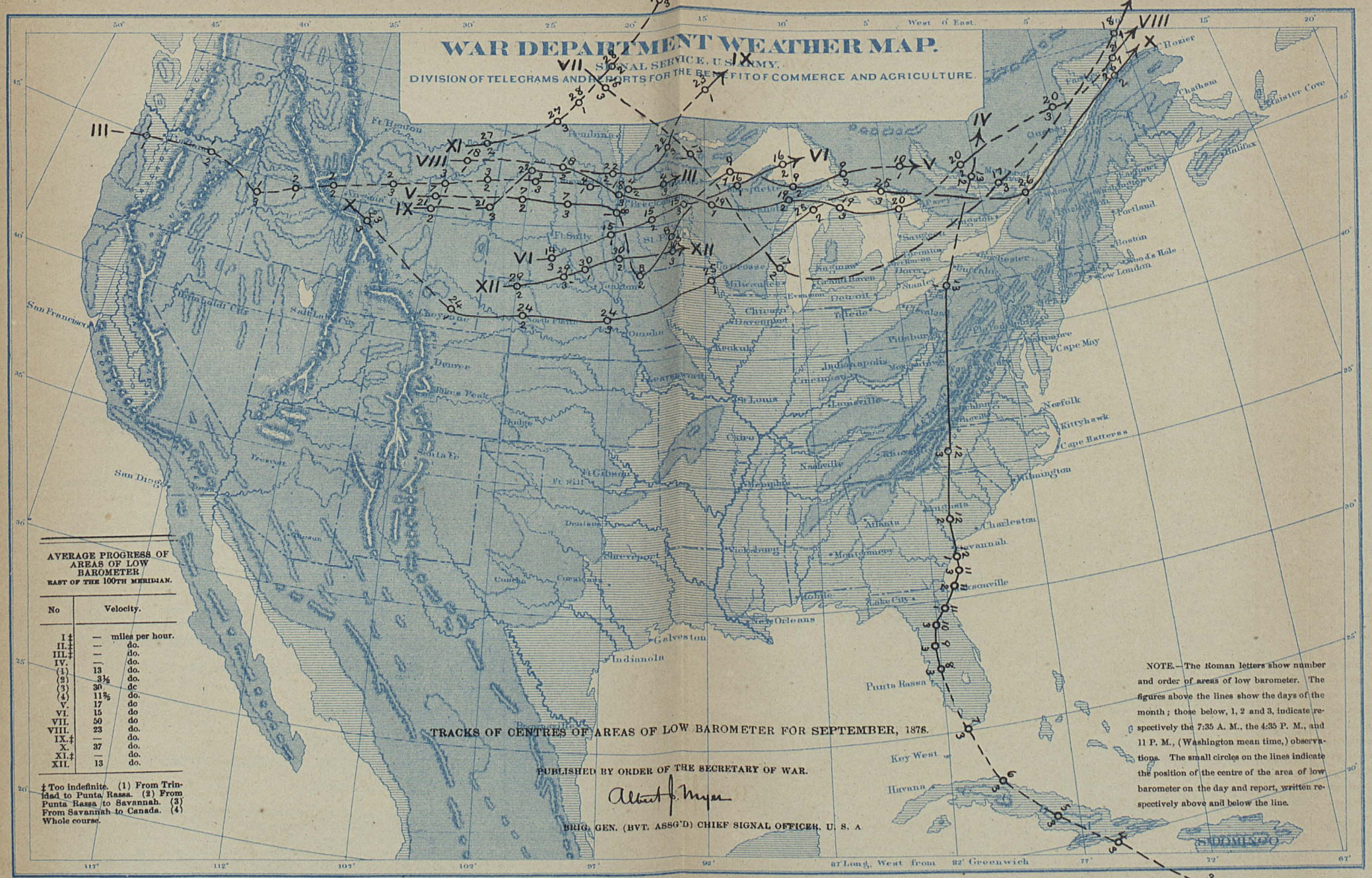
No. I.

WAR DEPARTMENT WEATHER MAP.

SIGNAL SERVICE, U.S. ARMY.

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.



TRACKS OF CENTRES OF AREAS OF LOW BAROMETER FOR SEPTEMBER, 1876.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

Albert J. Myer

BRIG. GEN. (BVT. ASSG'D) CHIEF SIGNAL OFFICER, U. S. A.

AVERAGE PROGRESS OF AREAS OF LOW BAROMETER EAST OF THE 100TH MERIDIAN.

No	Velocity.
I ‡	— miles per hour.
II. ‡	— do.
III. ‡	— do.
IV.	— do.
(1)	13 do.
(2)	3½ do.
(3)	30 do
(4)	11⅔ do.
V.	17 do
VI.	15 do
VII.	50 do
VIII.	23 do.
IX. ‡	— do.
X.	37 do.
XI. ‡	— do.
XII.	13 do.

‡ Too indefinite. (1) From Trinidad to Punta Rassa. (2) From Punta Rassa to Savannah. (3) From Savannah to Canada. (4) Whole course.

NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7:35 A. M., the 4:35 P. M., and 11 P. M., (Washington mean time,) observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.

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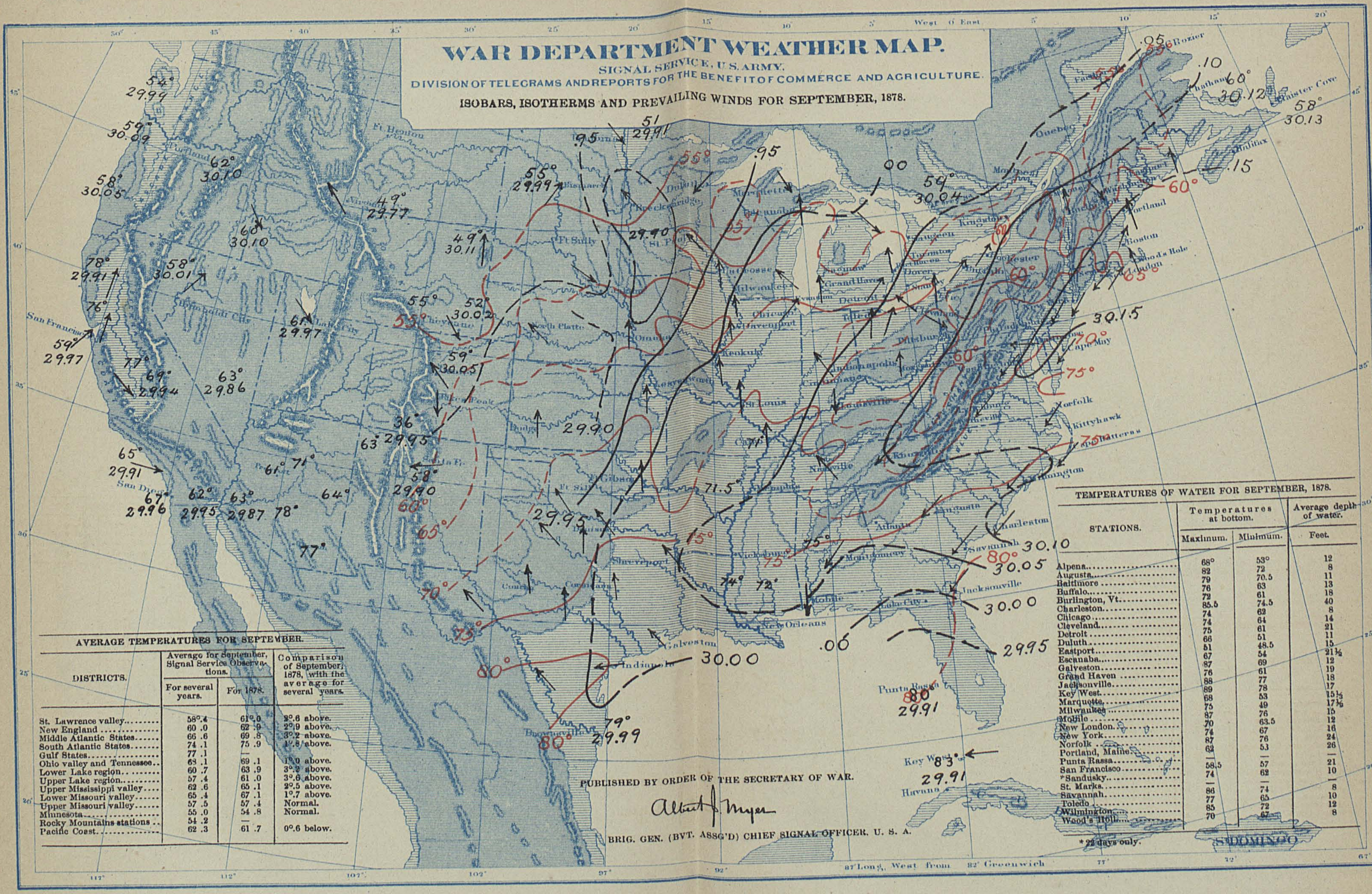
WAR DEPARTMENT WEATHER MAP.

SIGNAL SERVICE, U. S. ARMY.

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

ISOBARS, ISOTHERMS AND PREVAILING WINDS FOR SEPTEMBER, 1878.



AVERAGE TEMPERATURES FOR SEPTEMBER.

DISTRICTS.	Average for September, Signal Service Observations. For several years.	For 1878.	Comparison of September, 1878, with the average for several years.
St. Lawrence valley	58°.4	61°.0	2°.6 above.
New England	60 .0	62 .9	2°.9 above.
Middle Atlantic States	66 .6	69 .8	3°.2 above.
South Atlantic States	74 .1	75 .9	1°.8 above.
Gulf States	77 .1	—	
Ohio valley and Tennessee	68 .1	69 .1	1°.0 above.
Lower Lake region	60 .7	63 .9	3°.2 above.
Upper Lake region	57 .4	61 .0	3°.6 above.
Upper Mississippi valley	62 .6	65 .1	2°.5 above.
Lower Missouri valley	65 .4	67 .1	1°.7 above.
Upper Missouri valley	57 .5	57 .4	Normal.
Minnesota	55 .0	54 .8	Normal.
Rocky Mountains stations	54 .2	—	
Pacific Coast	62 .3	61 .7	0°.6 below.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

Albert J. Myer

BRIG. GEN. (BVT. ASSG'D) CHIEF SIGNAL OFFICER, U. S. A.

TEMPERATURES OF WATER FOR SEPTEMBER, 1878.

STATIONS.	Temperatures at bottom. Maximum.	Minimum.	Average depth of water. Feet.
Alpena	68°	53°	12
Augusta	82	72	8
Baltimore	79	70.5	11
Buffalo	76	63	13
Burlington, Vt.	72	61	18
Charleston	85.5	74.5	40
Chicago	74	62	8
Cleveland	74	64	14
Detroit	75	61	21
Duluth	66	51	11
Eastport	51	48.5	15
Escanaba	67	54	21½
Galveston	87	69	12
Grand Haven	76	61	19
Jacksonville	88	77	18
Key West	89	78	17
Marquette	68	53	15⅓
Milwaukee	75	49	17½
Mobile	87	76	15
New London	70	63.5	12
New York	74	67	16
Norfolk	87	76	24
Portland, Maine	62	53	26
Punta Rassa	—	—	—
San Francisco	58.5	57	21
*Sandusky	74	62	10
St. Marks	—	—	—
Savannah	86	74	8
Toledo	77	65	10
Wilmington	85	72	12
Wood's Holl	70	67	8

* 22 days only.

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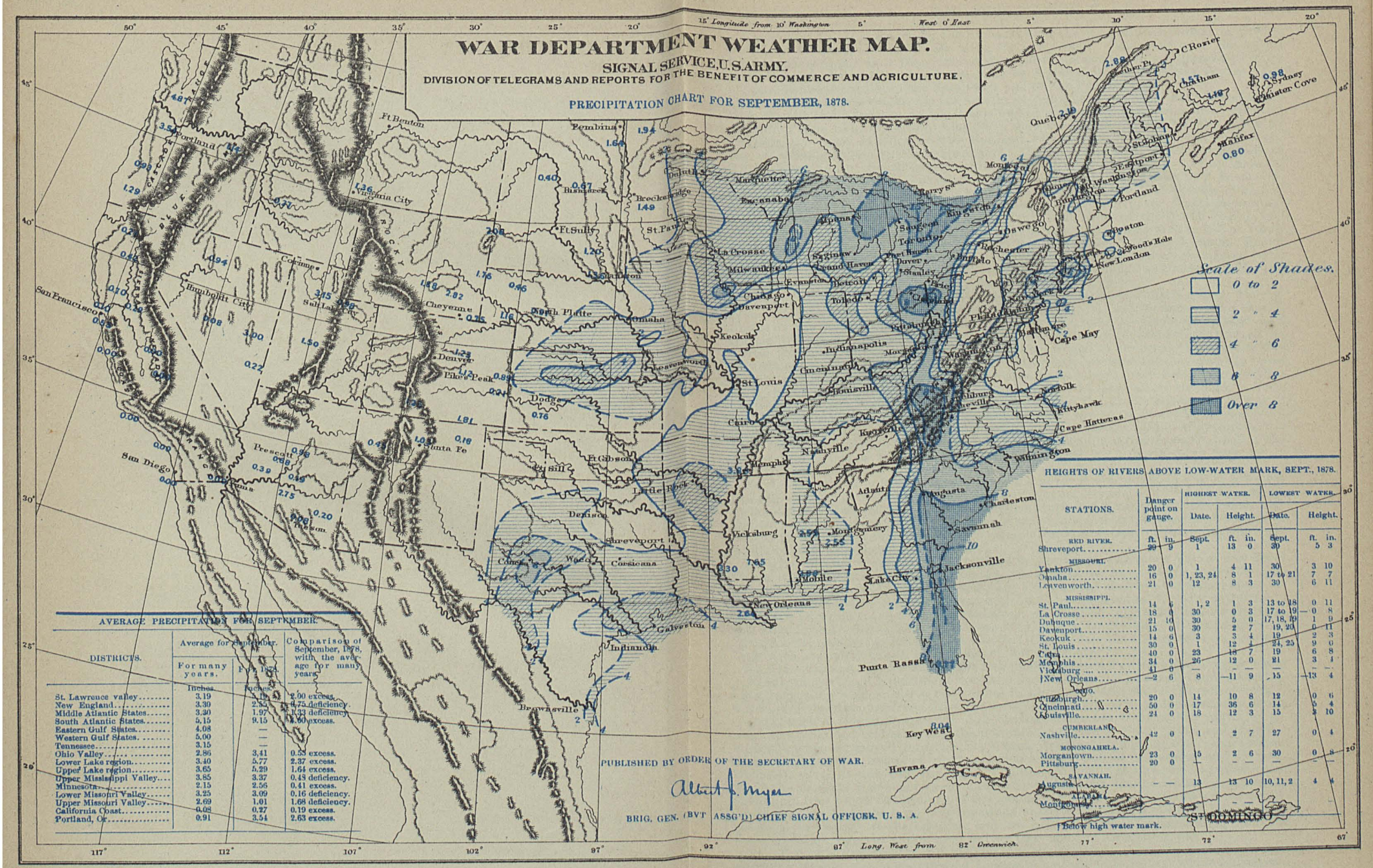
WAR DEPARTMENT WEATHER MAP.

SIGNAL SERVICE, U. S. ARMY.

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

PRECIPITATION CHART FOR SEPTEMBER, 1878.



AVERAGE PRECIPITATION FOR SEPTEMBER.

DISTRICTS.	Average for September. For many years.	Average for September. For 1878.	Comparison of September, 1878, with the average for many years.
	Inches.	Inches.	
St. Lawrence valley	3.19	5.19	2.00 excess.
New England	3.30	2.55	0.75 deficiency.
Middle Atlantic States	3.30	1.97	1.33 deficiency.
South Atlantic States	5.15	9.15	4.00 excess.
Eastern Gulf States	4.08	—	
Western Gulf States	5.00	—	
Tennessee	3.15	—	
Ohio Valley	2.86	3.41	0.55 excess.
Lower Lake region	3.40	5.77	2.37 excess.
Upper Lake region	3.65	5.29	1.64 excess.
Upper Mississippi Valley	3.85	3.37	0.48 deficiency.
Minnesota	2.15	2.56	0.41 excess.
Lower Missouri Valley	3.25	3.09	0.16 deficiency.
Upper Missouri Valley	2.69	1.01	1.68 deficiency.
California Coast	0.08	0.27	0.19 excess.
Portland, Or	0.91	3.54	2.63 excess.

HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, SEPT., 1878.

STATIONS.	Danger point on gauge.		Highest water. Date.	Highest water. Height.		Lowest water. Date.	Lowest water. Height.	
	ft.	in.	Sept.	ft.	in.	Sept.	ft.	in.
RED RIVER.								
Shreveport	20	9	1	13	0	30	5	3
MISSOURI.								
Yankton	20	0	1	4	11	30	3	10
Omaha	16	0	1, 23, 24	8	1	17 to 21	7	7
Leavenworth	21	0	12	8	3	30	6	11
MISSISSIPPI.								
St. Paul	14	6	1, 2	1	3	13 to 18	0	11
La Crosse	18	0	30	0	3	17 to 19	— 0	8
Dubuque	21	10	30	5	0	17, 18, 19	1	9
Davenport	15	0	30	2	7	19, 20	0	11
Keokuk	14	6	3	3	4	19	2	3
St. Louis	30	0	1	12	1	24, 25	9	6
Cairo	40	0	23	18	7	19	6	8
Memphis	34	0	26	12	0	21	3	4
Vicksburg	41	0	—	—	—	—	—	—
New Orleans	—2	6	8	—11	9	15	—13	4
OHIO.								
Pittsburgh	20	0	14	10	8	12	0	6
Cincinnati	50	0	17	36	6	14	5	4
Louisville	24	0	18	12	3	15	2	10
CUMBERLAND.								
Nashville	42	0	1	2	7	27	0	4
MONONGAHELA.								
Morgantown	23	0	5	2	6	30	0	8
Pittsburg	20	0	—	—	—	—	—	—
SAVANNAH.								
Augusta	—	—	13	13	10	10, 11, 2	4	4
ALABAMA.								
Montgomery				—	—		—	—

— Below high water mark.

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BAROMETRIC PRESSURE.

Upon chart No. II is shown by the isobaric lines the general distribution of the atmospheric pressure, reduced to sea-level, for the month. Compared with the means for September of previous years, the pressure for the present month is generally higher east of the Mississippi River, and especially so in the Middle and Eastern States. The pressure is about normal in the Northwest and on the Pacific Coast.

The local barometric ranges, for the month, as reduced to sea-level, have been largest from Kansas and Nebraska to the Lake region, and along a narrow belt of country, extending from Lake Ontario to Florida, in the course of storm area No. IV; taken by districts, they vary as follows: New England, 0.69 at Wood's Hole to 0.99 at Burlington, on summit of Mount Washington, 0.71; Middle Atlantic States, 0.42 at Norfolk to 0.94 at Washington; South Atlantic States, 0.50 at Cape Lookout to 1.02 at Jacksonville; Gulf States, 0.32 at Galveston to 0.47 at Mobile; Ohio Valley and Tennessee, 0.41 at Nashville to 1.03 at Morgantown; Lower Lake region, 0.87 at Cleveland to 1.19 at Rochester; Upper Lake region, 0.93 at Chicago to 1.26 at Alpena; Upper Mississippi Valley, 0.59 at Saint Louis to 1.17 at Saint Paul; Red River of the North Valley, 1.05 at Pembina to 1.23 at Breckenridge; Missouri Valley, 0.95 at Bismarck to 1.33 at Yankton; plains of Nebraska and Kansas, 1.28 at Dodge City to 1.51 at North Platte; Rocky Mountain stations, 0.52 at Santa Fé to 0.86 at Denver; Utah, 0.66 at Salt Lake City; Idaho, 0.71 at Boise City; Nevada, 0.54 at Winnemucca and 0.57 at Pioche; California, 0.22 at Los Angeles to 0.37 at Red Bluff.

Areas of high barometer.—Six have been sufficiently marked to merit a short description. They present some interesting features. Nos. I, III, and VI entered the United States on the Pacific coast, moved in an easterly path over the Rocky Mountains, and thence to the Lake region, in all instances accompanied by general rain as soon as the colder northerly winds, due to the high pressure, began to underrun the warm southerly winds that had previously prevailed. Prior to these rains the dew-point in these regions had been high, but the relative humidity had been quite low. The greatest daily ranges in temperature occurred in advance of the passage of these high areas. High areas IV and V appear to have been due to the rise of the barometer in rear of low areas III and VIII, respectively. Developing in the Southwest, they moved, with increasing pressure, in a northeasterly direction over Tennessee, Ohio Valley, and Lower Lake region, and thence to the New England and Middle Atlantic coast, and, at the approach of low areas from the west, were transferred, with diminishing pressure, to the southern coast.

No. I.—2d, the barometer rose rapidly on the north Pacific coast, in rear of low area No. III. 3d, the high pressure extended over Oregon, Nevada, and Utah, accompanied by northwest winds, considerable fall in temperature, and general but light rains. 4th and 5th, the highest barometer was transferred to the plateau lying north of the Platte River; in this region rain fell at every station after the shifting of the warm southerly winds to colder northerly.

No. II.—6th, the barometer rose rapidly in the Saint Lawrence Valley and Nova Scotia. 7th, this rising pressure, continuing highest in Nova Scotia, extended over New England and the Middle States, giving rise on that day to a northeast storm on the New Jersey coast. 8th, this storm, with light but general rain, was transferred to the North Carolina coast, while the barometer was highest but falling in New England and Nova Scotia. 9th and 10th, the high area, slowly diminishing, was transferred to Nova Scotia, where it gradually rose on the 11th, but rapidly disappeared on 12th and 13th, with southerly winds, in advance of low barometer No. IV.

No. III.—6th and 7th, the barometer rose in Washington Territory and Oregon, being generally more than 0.3 inch above normal. 8th, the pressure rose in Wyoming and Dakota, remaining highest above the normal in Idaho. On this day light rain generally fell west of the Missouri River, after the shifting of the winds to colder northerly due to the approach of this high pressure. 9th, the barometer rose most rapidly in the Northwest, but remained highest above the normal 0.33 inches in Utah. 10th and 11th, the highest barometer moved into the Northwest, Breckenridge being 0.41 inches above the normal, and the isobar of 30.40 included a great part of Minnesota and Dakota. 11th, 7:35 a. m., at this hour the highest barometer was in Minnesota and Wisconsin, while the pressure was everywhere unusually high in the United States, except near Savannah, Ga., where the cyclone of September (1st–13th) was entering the South Atlantic States. 12th, the high area remained nearly stationary in position, but situated between the cyclone of the 1st–13th, and low barometer No. IV approaching from the west; it disappeared as a high area during that and the succeeding day.

No. IV.—13th, the pressure was highest in the Southwest. 14th, the highest pressure slowly increasing, was transferred to Tennessee and the Ohio Valley, where light frosts were generally reported in the morning. 15th, the high area moved into the Eastern and Middle States. 16th, light frosts in New England, and the pressure was highest along the coast. 17th, the high area, slowly diminishing in pressure, was transferred to the South Atlantic States. 18th, remaining nearly stationary in position, it ceased

on that day to be a high pressure. In its march over the country, within the isobars of high barometer, cool, clear weather, with light winds, prevailed.

No. V.—20th, there was a rapid rise in pressure from the Upper Lakes to Texas in rear of depression No. VIII. 21st, greatest rise in the Lake region, but the barometer was highest in Tennessee and the Ohio Valley. 22d, the high area with increasing pressure moved into New England and the Middle States, the isobar of 30.40 including all New York. The pressure in this region was generally 0.4 inch above the normal. 23d, the isobar of 30.50 included nearly all New York and New England. That day the highest pressure, slowly diminishing with southeast winds, was transferred to the New England coast. 24th and 25th, slowly falling, the highest barometer extended along the coast from New York to Florida. 26th, still diminishing, it occupied the South Atlantic States. In the passage of this high area over the interior, clear weather prevailed, and frosts were generall reported in the Lower Lake region, New York, and New England, but as the high pressure was transferred in a southwesterly direction along the coast, cloudy weather and light rain prevailed under the regime of cold northeast winds.

No. VI.—24th, there was a marked and general rise in pressure in the North Pacific States. 25th, this rise was transferred with unusal rapidity to the Northwest, where light rain, followed by clearing weather, generally occurred after the shifting of the winds to colder northwest. 26th, the highest barometer, accompanied by clearing weather, moved into the Lake region. 27th, 7:35 a. m., the isobar 30.50 included most of the Lake region. Thence moving slowly to the eastward, the high area was (28th) in the Middle States and New England. 27th and 30th, diminising with southeast winds in advance of low barometer No. XII, it occupied the coast Sates from Nova Scotia to the Carolinas.

Areas of low barometer.—Twelve are described, while only ten have their tracks charted. With the exception of No. IV, the charted tracks all lie to the north of latitude 41° N. The most memorable storm of the month, perhaps of the year (No. IV), presents all the characteristics of a tropical cyclone. Originating a short distance north of the equator, it pursued a path north of west until it reached, in Florida, latitude 30 N, when it began to curve to the north and east. Its charted track is a parabola, and in its southern branch it manifested the greatest energy and caused the most damage. Fortunately the diameter of the storm area was quite limited, perhaps not much more than two hundred miles in extent, or greater disasters would have been recorded. In the storm centers moving over the northern portion of the chart the most abundant rain fell, as a rule, after the passage of the center of depression to the eastward.

Nos. I and II.—There were two depressions on the morning of the 1st, one in Eastern Minnesota, the other in the Lower Lake region. Slowly approaching each other, they became merged into a single depression by the morning of the 2d in the Upper Lake region, and during the day this low area was filled up by inflowing air. 1st, occasional light rain fell in the Upper Lake region. 1st, 2d, 3d, frequent and heavy rains were reported in the Lower Lake region, Middle States, and New England. The winds on the lakes were generally brisk, but not dangerous. During the night of the 3d and 4th a terrific thunder-storm occurred near Scranton, Pa., which flooded two mines, swept away bridges, and one person was drowned. The tracks of these depressions are too indefinite to be charted.

No. III entered Oregon and Washington Territory on the 1st; moving easterly, crossed the Rocky Mountains on the 2d. 3d, advanced into Dakota. 4th, was central in Minnesota. 5th and 6th, the barometer remained low in the northwest, but the center of depression appears to have remained nearly stationary. The weather in advance of the center was unusually clear and warm for the season. The maximum temperatures of the month for the region over which this depression moved occurred at this time in advance of the center, but cloudy weather with general rain prevailed in rear of the low after the winds had veered to colder northwesterly. Ship Airlie, at San Francisco, September 4, from Newcastle, New South Wales, reports strong NW. gale morning of September 3. This was probably in rear of this depression.

No. IV.—This is the most interesting storm of the month, with respect to its origin, duration, length of path within the observation of this office, and destruction of life and property caused by it. On the midnight of the 1st and 2d, it was central near the island of Trinidad. As it passed this island with considerable velocity for a tropical cyclone, it probably originated at a considerable distance to the eastward, perhaps south of the Cape Verde Islands and between 6° and 10° of N. latitude. At Trinidad the hurricane was the severest experienced for forty years, the barometer 29.05, being the lowest reading recorded on the island. The hurricane began about 7 p. m. the 1st and continued to 4 p. m. of 2d; it then abated for one hour, after which the winds returned with greater violence for fifteen minutes. All vessels in harbor were badly wrecked, dwelling-houses, warehouses, bridges, &c., completely demolished, whole plantations swept away, and much damage done to cocoa cultivation. During its passage over Trinidad the winds veered from northwest to southwest. Seven inches

of rain were measured by the gauge, and at various places in the island earthquake shocks were felt during the passage of the hurricane. 2d, the brig Typhoon, from Port Spain, Trinidad, to Boston, was dismasted by this hurricane on the 2d; position not given. The crew was rescued September 7 by the steamship Hadji, which crossed the path of the hurricane as charted. The log of the steamship Lotharingia from La Guayra, Venezuela, to Saint Thomas, shows it encountered the hurricane the night of the 2d and 3d, about latitude 15° N. and longitude 68½° W. 4th. The hurricane passed over Hayti and San Domingo, where it was very violent and destructive, doing most damage along the southern coast; at Port au Prince buildings were entirely destroyed: at Jacmel a high sea did great damage to shipping and to wharves, entire coffee and cocoa crops destroyed; at Aux Cayes, in less than three hours, 434 houses were destroyed by the violence of the wind, and a number of persons were killed and wounded; in the towns of Aquin and Cavaillon nearly every house destroyed and a large number of lives lost; at San Louis, La Grand Anse, Jeremie, and Cavail, the sea swept nearly everything away. The following shipping was wrecked: at Jacmel frigate Ozama, bark Helen, ship Serpent, and two others; at Cavail, ship Wardwell; at Jeremie, several vessels. Entering Cuba the midnight of the 4th and 5th, its track is thus traced over that island by Padre Benito Vines, director of the meteorological observatory of the Royal College of Bethlehem, at Havana: "The vortex of the hurricane entered the island near Guantanamo, moving towards Puerto Principe, which was a short distance to the right of its path; thence it moved between Jucaro and Villa Clara. The latter place was so near the center that it felt the calm of the vortex; finally it left the island at a point east of Cardenas and a short distance from it." The following notes are extracted from the observations of the Signal Service observer at Santiago de Cuba: 4th. 2 to 4:35 p. m., rain at intervals, wind generally N. and NNW. 11 p. m., clouds banked to E. and SE.; very threatening, lightning, showers, barometer steady until 9:30, squally. 5th. hurricane commenced about midnight, (4th–5th), from NW. 1 a. m., blowing very hard from NW. 2 a. m., WNW. 3 a. m., SW. 4 a. m., S. Barometer 3 a. m., 29.49, (lowest); 3:20 a. m., 29.49; 3:40 a. m., 29.52; 5 a. m., 29.51; 7:35 a. m., 29.70. Winds, 7:35 a. m., SE., high, heavy squalls; 4:35 p. m., SE., 19; 11 p. m., SE., high and squally, wind all day from ESE. to SSE, fresh with squalls; torrents of rain, incessant after 9 a. m. Although the center of the storm left Cuba the night of the 6th–7th, yet the barometer continued low, especially in the western portions of the island, until the 11th. The storm was here remarkable for the amount of rain that accompanied it. The inundations are reported greater and more destructive to property than ever before known. On the morning of the 6th, while the cyclone was yet central in Cuba, special warning was sent to all Atlantic ports of the situation of this storm, and from that time until it had passed beyond Canada notice was frequently given of its position. 7th, the center of the storm entered Florida, east of Key West. 8th, 9th, and 10th, it moved in a northerly track, very slowly, over the middle portions of this State. During the 9th and 10th, it was nearly stationary in latitude 30° N., preparatory to curving in its path to the east of north. Cautionary signals were displayed at Key West on the 6th, the gale beginning there the evening of that day, continued until the 11th. 7th, lowest barometer, 29.54, 3 p. m.; highest velocity 59 miles NW., 6:35 p. m. 8th, barometer steady from 29.61 to 29.64, highest wind, 47 miles W. 9th, highest wind, 48 miles SW., at 10:45 a. m. and 4:32 p. m.; barometer at end of day remaining steady at 29.51, or 29.52. 10th, barometer, 29:43 3 a. m.; 29.48 7 a. m.; 29.44 4 p. m., then continued rising to end of the storm; highest wind, 48 miles W., at 7:05 a. m., and SW., at 3 p. m. 11th, the gale ended in the morning. Total rainfall, 4.93 inches. The total movement of the air during the six days of the storm was over 4,000 miles. 7th, signals were displayed in advance of this storm at Saint Marks and Jacksonville, Fla., Tybee Island, and Savannah, Ga., Charleston, S. C. Jacksonville, 7th, at night, wind fresh NE., barometer steadily falling. 8th, wind brisk NE., barometer falling. 10th, barometer continued falling; at midnight, gale at its height, wind NE., velocity 40 to 48 miles. 11th, gale ceased; lowest barometer, 29.23 4 p. m., five hours after gale had ended. Total rain fall, 9.78 inches. The vortex of the hurricane probably moved over Tybee Island.

Tybee Island gale lasted from 7th to 12th. Highest wind, 52 E. on 11th. Lowest barometer, 29.33 7:45 a. m. on 12th. Total movement of air from 8th to 12th inclusive, 3,474 miles. Total rainfall, 5.61 inches. During the afternoon of September 10, the mate and four sailors of the German bark Tuiske were drowned in attempting to leave the island in a ship's "long" boat. Savannah.—The gale lasted from the 8th to the 12th. Lowest barometer, 29.35 on the 12th. Highest wind, 42 miles E. on the 11th. Total rainfall, 4.64 inches. Near Savannah, great damage by floods and high tides was reported. The damage to rice crop in that vicinity is estimated from $300,000 to $400,000. The loss to the planters would have been much greater but for the attention paid to the cautionary signal displayed in that city. The following notes give data and casualties accompanying the southern branch of the storm: bark Rebecca Caruana, from Mantanzas, Cuba, reports September 9, latitude 25° N., in Straits of Florida; took hurricane from SW. to S. and E., lasting three days, up to latitude 32° 30′ N; had

to keep heavy press of canvas to keep vessel from going ashore; decks completely flooded all the time. Bark L. T. Stocker arrived at Key West p. m. of the 6th; took pilot, but was compelled to anchor outside of bar on account of storm, and was blown to sea morning of the 7th; lost anchors, &c., and put into Savannah September 14. Bark Nueva Aurelia, from New Orleans to Rouen, put into Havana September 8 on account of heavy weather, with damage to mainmast. Brig Sabre, from Tampico to Havre, was driven ashore 60 miles S. of Cape Carnaveral in hurricane; total loss; one life lost. Schooner Jesse B. Smith, from Old Harbor, Ja., August 24, for New York, was driven to Jacksonville bar September 10, after five days' continued gales; let go both anchors, but was driven ashore 5 miles S. of Saint John's bar at daybreak of 11th in hurricane so fierce that it blew the light-house down. Schooner Chas. W. Lord, from Havana, September 7, to New Orleans, put back to Havana September 10 on account of heavy sea and head winds. Schooner Eulalia (fallen in with September 4 by ship Annie Goudey, from Cork to New Orleans, September 23) reported having been dismasted in hurricane September 3; September 4, heavy gale. Schooner Hattie Ross, driven ashore 12 miles S. of Cape Carnaveral. Brig Sallie Brown, abandoned September 11, 29.40 N., 80.40 W., dismasted and water-logged; crew landed at New York September 23. Steamer City of New York, at Havana September 13, from New York, reports hurricane lasting 40 hours between Cape Hatteras and Charleston. Steamer Santiago de Cuba, at Havana September 14, from New York, reports tremendous hurricane off Florida coast, lay to for four days off Cape Carnaveral. Schooner Ocean Pearl, from San Blas, Baltimore, was totally wrecked 30 miles north of Cape Carnaveral in hurricane. 12th, in the afternoon the center of the storm was in South Carolina. It should be stated here that a moderate northeast gale had set in on the 11th in the Lower Lake region after the passage of low barometer No. V, and which was probably due to the rising and high pressure north of the Saint Lawrence Valley. At 4:35 p. m. of the 12th the pressure in Nova Scotia was over 0.3 above the normal, and in the Lake Superior country about .25 above the normal, with a region of lower pressure between. 12th, 11 p. m., a belt of low pressure extended to Lake Erie from the Carolina coast. 13th, 7:35 a. m., the lowest pressure was near Buffalo, and on this day the center of the storm moved beyond the limits of the map; in addition to those already mentioned cautionary signals were ordered in advance of this cyclone, 11th, on the Atlantic coast, from Wilmington to Cape Henry; 12th, from Norfolk to Eastport. The following maximum velocities are reported: Charleston (signal ordered on the 7th), 44 miles E. on the 11th, and SE. on the 12th. The total movement of the air for the twenty-four hours ending noon, September 12, was 650 miles, the highest ever registered in that city. 12th, Smithville, 48 miles SE. Wilmington, 30 miles SE. Sloop Point, 65 miles (estimated). Cape Lookout, 75 miles SE. Cape Hatteras, 50 miles NE. 13th, Kittyhawk, 57 miles NW. Cape Henry, 33 miles NE. Cape May, 46 SE. Barnegat, 44 SE. Sandy Hook and New York, 40 miles SE. Mount Washington, 100 miles S., and on the 14th, 100 miles NW. Cautionary signals were generally justified on the New England coast on the 13th. Cautionary signals were ordered in advance of this storm in the Lake region from Oswego to Toledo on the 11th, and from Detroit to Alpena on the 12th. The following unusually high velocities are reported: 12th, Sandusky, 48 miles NE.; 13th, Cleveland, 48 miles, W.; Erie, 35 miles W.; Buffalo, 45 miles SW.; Rochester, 30 miles W. This storm is reported as being the severest known in the Lower Lake region for ten years; some say since 1844. Great disasters are reported from floods and the violence of the wind over the track of this storm from the South Atlantic coast to Lake Erie. These will be noted under the heading of floods and local storms.

No. V.—On the morning of the 7th a depression existed in Montana and Wyoming. Advancing eastward it was on the 8th in the Northwest; 9th, it moved over the Lake Superior region, and thence pursued its path to the northeast, beyond the limits of our stations. The rain accompanying the depression was most frequent in the southwest quadrant occurring after the shifting of warm southerly winds to colder northwesterly. The rain-belt beginning in the Lower Missouri Valley on the 9th, moved slowly to the east, reaching New England on the 11th. Cautionary signals were ordered for Lakes Superior and Michigan on the 9th, and were generally justified.

No. VI appeared on the evening of the 14th in Southern Dakota. 15th, it moved in a northeasterly path over Minnesota; clear weather, with warm southerly winds, prevailed that day in the States south of its track. 16th, it moved slowly over Lake Superior. On this day occasional rain fell after the shifting of the wind to colder northwest. The winds accompanying the depression were generally light.

No. VII.—At the midnight report of the 16th a depression was developed in Manitoba, moving in a southeasterly track, the center, at the 4:35 p. m. report of the 17th, was over Lake Michigan. At the midnight report the lowest pressure was between Rockliffe and Montreal, Canada. Thence moving in a northeasterly path, at the morning report of the 18th, the center of low barometer was near the mouth of the Saint Lawrence. The depression was only noticeable for the velocity of translation of its center. The rain that accompanied it was only occasional and light, and generally north of the track of its center. No high winds were reported.

No. VIII appeared at the morning report of the 18th in Dakota—moved eastward into Minnesota; 19th, its center passed over Northern Wisconsin to Lake Huron; 20th, continued its easterly track north of the Lower Lakes, and 21st disappeared beyond the Gulf of Saint Lawrence. Near the center of the depression the pressure was generally 0.3 below the normal. Cautionary signals were ordered in advance of this storm, on the 19th for Lakes Superior, Michigan, and Huron, and on the 20th for Lake Erie. The signals were justified on Lakes Michigan, Huron, and Erie. At Grand Haven, 60 miles NW., on the 19th, is the highest registered velocity occurring in the Lake region this season. The rain was frequent and abundant, but nearly all fell after the passage of the center of depression. September 20, Pentwater (on Lake Michigan), severe wind-storm—buildings damaged, one person killed. Sherman City, Isabella County, Michigan, "annihilated by terrible tornado, every building but one swept clean away," four persons injured. Coleman, Midland County, Michigan, considerable damage done to trees and fences, one person injured. Thursday, September 19, Tawas, 50,000 feet of lumber blown into lake; 1,500 trees fell across Tawas and Southwestern Railroad. Ogemaw Springs, tram-ways and smoke-stack blown down, mill, &c., damaged $1,500. Greenville, church blown down, one person killed. Sherman City, Isabella County, "sudden darkness, deathlike stillness, respiration difficult, and suddenly the tornado struck the place with indescribable force, lasting but a few seconds, sweeping every structure away, several persons injured—tornado seemed to be caused by meeting of two storms from NW. and SE., respectively."

No. IX appeared on the 21st in Dakota. 22d, 7:35 a. m., was central near and west of Bismarck. That day it moved over Minnesota and north of Lake Superior. The pressure near the center of the depression was about 0.5 inches below the normal. 22d, the winds on Lakes Superior and Michigan were high and southerly, with clear weather. All rain fell after the passage of center, beginning in the Northwest on the 23d; spread over the Lake region, Middle States, and New England on the 24th.

No. X.—23d, appeared at midnight report in Western Wyoming. 24th, the center moved along the Platte Valley to Omaha. 25th, thence moved rapidly, in a northeast track, over Lake Michigan to the Georgian Bay. 26th, 7:35 a. m., was central near Montreal; during the day moved up the Saint Lawrence Valley, and disappeared that night beyond our charts. The barometer at the center of depression was generally 0.3 inches below the normal. Abundant rain fell south of its track, and mostly during the prevalence of the southerly winds. Cautionary signals were ordered for this storm on the 24th for Lake Superior, and on the 25th for the other lakes. The signals were justified on all the lakes. *Indiana.*—September 25, Lebanon, 5 p. m., severe wind and rain storm; buildings badly damaged and unroofed; two persons injured. Crawfordsville, 5 p. m., severe wind and rain storm; buildings unroofed and flooded. Fort Wayne, 7 p. m., church struck by lightning and fired. Richmond, 7:30 p. m., heavy wind, followed by rain and lightning, damaging out-buildings and trees; railroad depot unroofed. *Illinois.*—Gilman, September 25, destructive wind-storm; church and buildings badly damaged. *Michigan.*—September 25, heavy storm washed away portion of C. and M. L. S. R. R. tracks near Coloma (fifteen miles northeast of Saint Joseph); barn struck by lightning and fired in Walker township during afternoon.

No. IX.—A low area appeared on the 27th, in Dakota. 28th, moved in a northeasterly track north of Pembina into Manitoba.

No. XII.—29th, moved over Northern Nebraska. 30th, advanced in Eastern Minnesota. The remainder of the track belongs to the October review. The barometer near the center of low area was frequently 0.6 inch below the normal. Frequent rain, seldom heavy, fell in advance of the storm center. Signals were ordered in advance of the storm for Lakes Superior and Michigan on the 29th, for the other lakes on the 30th. The storm was severe on Lake Michigan, and justified the signals displayed there, but appears to have diminished in energy as it passed to the east.

INTERNATIONAL METEOROLOGY.

May 11, 32° S., 22° W., severe cyclone.

June 2, 16° 56′ S., 76° 45′ E., sudden heavy gale. 15th, ship East Lothian, from Calcutta to New York, reports continuation of NW. to SW. gales from Mauritius to Cape of Good Hope, which was passed June 15. 17th, 55° 26′ S., 79° 26′ W., decks swept by heavy seas. 18th, bark Wakefield to the westward of Madagascar Island on June 18, encountered heavy westerly gales and high confused sea, continuing to July 19, when Cape of Good Hope was passed. Bark Wakefield, Singapore to New York, September 15, reported had strong E. winds up to June 22; in latitude 16° 56′ S., longitude 76° 45′ E., had very sudden and severe gale during evening. 22d, ship Ross Dhu, off Algoa Bay, South Africa, WNW. gale, lasting until July 13, vessel struck by heavy sea July 3, 36° S., 32° 20′ E.

July 4, ship Cosmopolis wrecked on Staten Island, off Cape Horn, during hard WSW. gale, with thick snow. 13th, 35° 30′ S., 19° 4′ E., violent gale from NNE., increasing

to hurricane and lasting six hours, with heavy cross seas. 14th, off Cape of Good Hope, strong westerly gales. 16th, Algoa Bay, Cape of Good Hope, SE. gale. 19th, 54° 33′ S., 53° 30′ W., during afternoon a heavy NE. gale set in, which continued with violence for eight days; 24th, 35° S., 24° 30′ E., heavy NW. gale, lasting 24 hours. 22d, bark Emma totally wrecked during strong NE. breeze on E. bar of Sable Island. 25th and 26th, 39° S., 140° E., severe gale. 27th, Cape of Good Hope, SE. gale.

August 4, bark Stover parted cables and went ashore near Back Beach, Port Natal. 5th, Port Natal, strong easterly wind and high seas nearly all day. 13th, 49° N., 37° W., heavy NNW. gale. 16th, 6:30 a. m., off Cape Farewell, Greenland, terrific NNW. gale, with high seas. The German Packet Padang left Tonila, Mexico, August 14, and experienced heavy weather until the 17th, when encountered fierce hurricane from SSW., lasting all night, with terrific sea and blinding rain; vessel was driven on Arena's Key, (latitude 22° N., longitude 91° 30′ W.) early in morning of the 18th; total wreck. Bark Unica left Santecomapa (Vera Cruz coast) and encountered storm August 16 to 19, in which sprung a leak, and was abandoned a. m. of the 20th, between New Bank and Triangles, off west coast of Yucatan. 18th, 47° 52′ N., 22° 35′ W., heavy SE. gale. 19th, 40° N., 58° 50′ W.; hurricane from SE. to NW.; 35° N., 61° W., hurricane; one of crew swept overboard; 43° 20′ N., 59° 40′ W., SW. hurricane; 45° N., 58° W., heavy gale; lost entire deck-load. Bark Calcutta (from London, August 1, to New York, August 26,) reports, latitude 42° 40′ N., longitude 55° W., heavy squall from southward, lasting four hours; August 21, latitude 44° N., longitude 58° 40′ W., spoke bark Aspatogan, who reported August 19, heavy squall, carrying away topsails, foresails, mainsail, and jib. 22d, 38° 10′ N., 45° 00′ W., noon, heavy W. sea; midnight, squally and tempestuous. 23d, 39° 10′ N., 46° 45′ W., cloudy and squally; Beak's Cay, Binimis, heavy squall from NE. 24th, 39° 11′ N., 47° 40′ W., during p. m., squally and threatening. 25th, 36° 20′ N., 49° 50′ W., night, squally and heavy rain; 26° N., 76° W., severe SE. to NW. gale, barometer 29.40. 26th, schooner Pedrito, at New York, September 15, from Gibara, Cuba, reported hurricane from S. to NW., lasting 12 hours (on the 28th, vessel was in latitude 28° 35′ N., longitude 71° 53′ W); schooner J. B. Atkinson, at Philadelphia, September 8, from Turk's Island, reported hurricane, lasting 8 hours; 28° 40′ N., 70° 30′ W., hurricane from S. to SE., veering to NE. and NW. 37° 28′ N., 51° 25′ W.; cloudy and squally, very heavy rains; 49° 40′ N., 17° 27′ W., rising WNW. wind and sea, squally. 27th, 48° 1′ N., 29° 41′ W., squally and rainy; 48° 45′ N., 26° 36′ W., wind N., heavy sea; 49° 30′ N., 23° 36′ W., wind WNW., stormy, high sea; 44° 58′ N., 56° 43′ W., SE., heavy thunder-squalls during the afternoon; 37° 38′ N., 53° 10′ W., a. m., W. squally and lightning; 26° N., 76′ W., gale; 31° 6′ N., 68° 5′ W., hurricane veering from SW. to NW., vessel lay on her beam ends for four hours; brig Brittania, from Barbadoes to New York, reports 27th, 30° 30′ N., 69° W., squally, wind S.—4 p. m., barometer 30.00—night, squally throughout, and on the 28th, 5 a. m., barometer 29.30, threatening, wind SE.; 9 a. m., 29.20, hurricane—noon, 28.70, perfect cyclone—2 p. m., moderated for a time—about 3 p. m., wind veered to NE., with increased violence and fearful sea—4 p. m., wind NW., sea more regular, barometer rising rapidly. Schooner Geo. B. Douglass, from New York, August 22, for Antigua, reports 27th, 10 p. m., barometer commenced falling, wind SW., backed to NE., with heavy seas; at 5:30 a. m., 28th, was in latitude 31° 50′ N., 66° 35′ W., while under bare poles was bove down and compelled to cut away foremast. Bark Marie B, 75 miles SW. of Bermuda encountered hurricane on the 27th and 28th; bark Hornet, 100 miles W. of Bermuda, had decks swept in gale commencing at SE. and working round easterly to NW. at 2 a. m., 28th. 28th, Prospect, Bermuda, 9 a. m., barometer 29.57; wind, SW., force, 6; rain-fall 2.43 inches during preceding 24 hours. Schooner Iris, from Boston, August 10, for coast of Africa, when NE. of Bermuda, August 28, encountered hurricane, commencing at SE. and working easterly to NW.; put into Saint George's, September 1. Ship Norton Stover, 80 miles NE. of Bermuda, hurricane; 23° 34′ N., 63° 32′ W., SW. gale; 47° 28′ N., 32° 9′ W., northerly wind, heavy sea; 49° 45′ N., 6° 14′ W., high sea. 29th, bark Joe. Rauers, 150 miles NE. of Bermuda, 4:45 a. m., lowest barometer, 28.80—violent hurricane and high seas; 38° 0′ N., 55° 50′ W.—a. m., storm from SSE., hauling to SE. and increasing—p. m., wind, WNW., heavy rain; 36° N., 55° 23′ W., terrific gale, SE. to E. and NE., vessel on beam-ends for five hours, decks swept, &c.; 49° 31′ N., 42° 40′ W., SE. to N., strong breeze, rainy; 51° 14′, 14° 55′ W. squally. 30th, bark Ocean Pearl, from Leghorn, at Philadelphia, September 11, reports, August 30, severe hurricane from WSW., veering S. to NNE., lasting fourteen hours, vessel had to scud before the gale—4 p. m., struck by heavy sea—midnight, fine weather, with heavy sea from all quarters; 50° 0′ N., 22° 47′ W., heavy sea from N. and NW.; bark Spanker, from Cienfuegos, August 22, along S. coast of Cuba to Cape San Antonia, August 30, reported heavy gales from SE. to WSW., with heavy thunder, lightning, and rain. 31st, 49° 52′ N., 5° 57′ W., heavy northwest sea.

September.—1st, 49° 20′ N., 39° 14′ W., wind S. SE., NE., N. stormy, rough sea from N.; 53° 50′ N., 26° 8′ W. strong SW. and SSW. gale and dirty weather. 2d, 40° 1′ N., 46° 17′ W. heavy sea; 50° 0′ N., 33° 9′ W., westerly, moderate gale and heavy sea; 52° 35′ N., 31° 49′ W., strong westerly gale and high sea; 49° 29′ N., 36° 53′ W., WSW.

squally, SW. sea; 50° 24′ N., 19° 13′ W., W. rainy, high westerly sea; 55° 12′ N., 17° 25′ W., WNW. to NW., strong gale and heavy sea; 50° 20′ N., 16° 29′ W., heavy sea; 51° 30′ N., 16° 4′ W., high sea and rain. 3d, 50° 24′ N., 25° 13′ W., WSW. squally, rain, very high sea; 50° 7′ N., 24° 1′ W., W., SW. strong wind, high sea; 51° 10′ N., 23° 14′ W., high sea. 5th, 45° 13′ N., 51° 39′ W., heavy sea-swell; 48° 50′ N., 37° 38′ W., very high westerly swell. Steamer Powhattan, Gibraltar, August 31, to New York, September 14, reported September 5, heavy NW. gale lasting three days. 6th, 21° 31′ N., 51° 41′ W., hurricane; 48° 26′ N., 44° 12′ W., WNW. strong winds to moderate gale, high to strong seas; 47° 18′ N., 41° 57′ W., high, rough sea; 50° 23′ N., 41° 43′ W., brisk WNW. and WSW. gale, squally, heavy sea; 51° 5′ N., 22° 55′ W., SW. to NW. squally. 7th, 30° 53′ N., 62° 52′ W., SSW. squally, barometer 30.10; Spanish frigate Pizarro left Bermuda September 7, and encountered strong SE. wind with heavy sea, increasing to hurricane, which lasted until 10th, vessel abandoned at 4 a. m. on the 11th, in 35° 30′ N., 57° 7′ W.; 45° 19′ N., 47° 21′ W., rain and fog, high westerly swell; 50° 50′ N., 32° 02′ W., a. m., high sea—p. m., WSW., stormy; 54° 43′ N., 16° 13′ W., heavy SW. swell; 49° 50′ N., 12° 27′ W., fresh NW. wind, heavy westerly sea; bark Lotus, from Hyeres, France, at Boston September 26, reported severe hurricane from E. to NNW. during September 7, 8, and 9. 8th, 30° 23′ N., 61° 51′ W., S. and SSE., squally and rain, barometer 30.10; 41° 57′ N., 59° 37′ W., heavy easterly sea; 39° 30′ N., 52° W., very high sea; 49° 13′ N., 37° 10′ W., SSW. to NNE. moderate gale, strong NW. sea; 51° 10′ N., 24° 6′ W., WSW. strong gale; 53° 53′ N., 22° 54′ W., strong SW. to NW. wind, very heavy sea; 50° 7′ N., 18° 55′ W., fresh SW. wind and heavy W. sea; 50° 44′ N., 14° 26′ W., fresh wind, high NW. sea, ship pitched heavily; steamer Alexandria, from Gibraltar August 30 to Sandy Hook September 14, reported, September 8 to 12, strong gales and heavy seas. 9th, 29° 27′ N., 62° 24′ W., SE. to SSE., heavy rains, barometer 30.10; 34° 59′ N., 48° W., NE. gale, high seas, heavy rains; 52° 19′ N., 29° 33′ W., strong W. and WSW. winds, heavy W. sea; 50° 7′ N., 25° 2′ W., a. m., heavy sea; 51° 10′ N., 20° 41′ W., NW.; NE., cloudy, much rain; 49° 9′ N., 17° 52′ W., WNW., squally. Bark Onward, from Barcelona July 20, for Miramichi, N. B., experienced severe gale from NE. on September 9; gale continued until daybreak of September 11, when ship was abandoned in sinking condition; crew taken off by bark Luchino, from Bristol, and landed at Philadelphia September 26. 10th, 29° 19′ N., 62° 13′, W., S. and SSW., squally and rain, barometer 30.10; 49° 39′ N., 33° 33′ W., noon, wind SW.—7 p. m., shifted to northward, with heavy squall; 49° 45′ N., 32° 15′ W., N., fresh, heavy rain, 48° 48′ N., 25° 49′ W., SSW., fresh, rainy, rough sea. 11th, 28° 34′ N., 62° 5′ W., ESE. to SE., squally and showers, barometer 30.10; 50° 38′ N., 36° 30′ W., NE., high swell; 49° 38′ N., 33° 33′ W., NE. moderate gale, clear weather, high, confused sea; 49° 3′ N., 30° 4′ W., SW. to NNE. fresh gale, confused sea. 12th, 27° 20′ N., 62° 15′ W., E. to SE., cloudy, barometer 30.10; 42° 15′ N., 43° 37 W., high sea; 47° 18′ N., 38° 1′ W., NE. moderate gale. 13th, 24° 58′ N., 62° 9′ W., ENE. and NE., heavy squalls, barometer, 30.00. 14th, 42° 6′ N., 65° 2′ W., p. m., strong SW. wind and heavy W. sea; 22° 1′ N., 62° 28′ W., NE. and NNE. gale and high sea, barometer 29.90; 50° 8′ N., 10° 46′ W., p. m., heavy sea swell. 15th, 41° 20′ N., 63° 30′ W., NW. rain squalls; 19° 43′ N., 63° 9′ W., NE. to NW., fresh gale, barometer 29.87; 18° 57′ N., 58° 56′ W., brig Adelaide lost sails, &c., in hurricane; 19° N., 56° 20′ W., SE. gale; 51° 9′ N., 22° 17′ W., westerly fresh gale; 50° 18′ N., 16° 5′ W., a. m., fresh NW. gale, squally—p. m., gale moderating, heavy seas; 55° 23′ N., 9° 23′ W.; SSW. to NNW. severe gale, very high sea, barometer 28.98; 49° 44′ N., 7° 41′ W., rough sea. 16th, 35° 50′ N., 64° 50′ W., strong NE. gale, high seas, hard rain-squalls; 18° 23′ N., 64° 36′ W., N. and NW. strong breeze, barometer 30.00; 50° 14′ N., 30° 15′ W., westerly moderate gale; 50° 16′ N., 19° 38′ W., a. m., NW. squally,—p. m., heavy sea; 49° 38′ N., 12° 1′ W., SW.—NW. strong gale, rains, rough sea; 55° 15′ N., 11° 45′ W., WNW. and SW. hard squalls; steamers Canadian and Devonia, from Montreal and New York, at Glasgow, September 17 and 18, respectively, reported fierce gale and heavy seas off Irish coast. 17th, brig Bergliot (from Caen, France, for Wilmington, N. C.), encountered hurricane September 17, and was abandoned September 20, in 26° 18′ N., 58° 27′ W.; 50° 8′ N., 24° 53′ W., a. m., WNW. squally—p. m., heavy sea; 49° 25′ N., 18° 30′ W., WSW. wind decreasing, rainy, heavy sea; 55° 03′ N., 15° 40′ W., WSW. to NW., hard squalls. 18th, 54° 28′ N., 19° 46′ W., NW. fierce squalls, with hail and rain; 50° 26′ N., 2° 22′ W., WSW. NNW. strong gale, high sea, squalls. 19th, 51° 20′ N., 13° 45′ W., NNW. strong wind and high sea; 49° 44′ N., 9° 02′ W., NW. WNW. strong gale, high sea. 20th, 49° 26′ N., 15° 54′ W., a. m., wind NNE., very high sea, moderating toward noon—p. m., wind E., S., SW. strong gale and high sea; 51° 26′ N., 13° 22′ W., heavy westerly sea. 21st, 51° 33′ N., 39° 05′ W., fresh W. gales and high seas; 52° 17′ N., 20° 20′ W., high cross seas. 22d, bark Emma wrecked during strong NE. breeze off east bar of Sable Island; 48° 21′ N., 30° 09′ W., fresh NW. gale, very high sea; 50° 54′ N., 26° 03′ W., heavy W. sea; 51° 11′ N., 23° 16′ W., fresh N. gale and heavy squalls; 54° 01′ N., 22° 10′ W., strong NW. breeze and heavy squalls. 23d, 41° 58′ N., 56° 40′ W., NE., N., W., increasing to gale, wild sea; 47° 18′ N., 51° 35′ W., SSW. to NNE. strong gales and rain; 50° 11′ N., 31° 26′ W., high westerly sea. 24th, 41° 25′ N., 62° 29′ W., NNW. decreasing

wind and sea; 44° 23′ N., 57° 23′ W., N. and NW. strong gales, with hard squalls; 45° 06′ N., 53° 03′ W., moderate westerly gale, squally, high west sea; 45° 20′ N., 42° 54′ W., W. heavy gale, high sea; 49° 09′ N., 38° 24′ W., fresh SW. gale, high westerly sea; 49° 59′ N., 37° 57′ W., SSW., W. hard gale, heavy W. sea. 25th, 43° 42′ N., 47° 58′ W., heavy WNW. gale and high sea; 47° 39′ N., 44° 34′ W., fresh WNW. to WSW. gale, high W. sea; 48° 31′ N., 42° 20′ W., fresh gale, heavy W. sea; 49° 19′ N., 41° 31′ W., strong W. breeze, with heavy rain-squalls; Jacmel, Hayti, "hurricane, two vessels and all lighters in harbor lost, many houses destroyed." 26th, 45° 47′ N., 51° 14′ W., fresh northwesterly gale.

TEMPERATURE OF THE AIR.

The isothermal lines on Chart No. II illustrate the general distribution of the temperature of the air during the month. By reference to the table on the left side of the chart it will be seen that the temperature for the month has been above the average for all sections east of a line drawn from Colorado to Minnesota; this is especially the case over the northern sections, namely, the Lake region, Middle and New England States, and Saint Lawrence Valley, where the general average is more than three degrees above the normal; the comparison for the Gulf States cannot be made on account of reports missing from the Lower Mississippi, but the means of the stations procured indicate that this section was from one to two degrees above normal. In the Northwest and on the Pacific coast the temperature has been about normal, but at the Rocky Mountain stations from 1°.3 at Denver to 5°.6 at Salt Lake City below.

Minimum and maximum temperatures respectively:—*Maine*—Orono, 29° and 79°; Cornish, 35°, 84°. *New Hampshire*—Mount Washington, 14°, 62°; Dunbarton, 24°, 87°; Auburn, 30°, 90°. *Vermont*—Woodstock, 27°, 86°; West Charlotte, 39°, 90°. *Massachusetts*—Rowe, 30°, 82°; Somerset, 36°, 93°; Westborough, 33°, 93°. *Rhode Island*—Newport, 43°, 83°; Fort Adams, 42°, 77°. *Connecticut*—Mystic, 35°, 86°; Colebrook, 38°, 84°. *New York*—Nile, 26°, 84°; Madison Barracks, 27°, 90°; West Point, 39°, 91°; New York City, 45°, 86°; Plattsburgh Barracks, 31°, 82°; Rochester, 34°, 87°. *New Jersey*—Somerville, 40°, 91°; Freehold, 42°, 85°; Jersey City, 48°, 92°. *Pennsylvania*—Blooming Grove, 28°, 88°; Philadelphia, 48°, 93°; Pittsburgh, 41°, 88°; Tioga, 32°, 88°. *Delaware*—Dover, 54°, 88°. *Maryland*—Cumberland, 38°, 86°; New Market, 40°, 90°; Baltimore, 49°, 87°. *District of Columbia*—Washington, 48°, 91°. *Virginia*—Wytheville, 41°, 81°; Norfolk, 57°, 93°; Snowville, 42°, 84°. *West Virginia*—Helvetia, 38°, 83°; Morgantown, 41°, 85°. *North Carolina*—Franklin, 43°, 81°; Highlands, 44°. 79°; Wilmington, 55°, 94°. *South Carolina*—Aiken, 58°, 91°; Charleston, 63°, 90. *Georgia*—Gainesville, 56°, 89°; McPherson Barracks, 52°, 98°. *Florida*—Fort Barrancas, 52°, 102°; Houston, 70°, 99°. *Alabama*—Green Springs, 55°, 89°; Mobile, 56°, 92°. *Mississippi*—Fayette, 48°, 87°; Brookhaven, 52°, 89°. *Louisiana*—Shreveport, 52°, 92°. *Texas*—Jacksboro', 44°, 95°: Decatur, 49°, 98°: Terrill, 62°; 100°. *Ohio*—Westerville, 37°, 85°; Cincinnati, 47°, 91°; Columbus, 43°, 85°. *Kentucky*—Danville, 47°, 85°; Louisville, 48°, 91°.

Ranges of temperature.—The *monthly ranges* will appear from examintion of the minima and maxima just given. Greatest *daily ranges* vary in New England from 18° at Eastport and Wood's Holl to 26° at Portland, Me.; Middle Atlantic States, 21° at Barnegat to 28° at Fort Whipple; South Atlantic States, 16° at Cape Lookout, Charleston, and Jacksonville to 27° at Smithville; East Gulf States, 14° at Key West to 25° at Saint Marks; West Gulf States, 16° at Indianola to 35° at Corsicana; Ohio Valley and Tennessee, 23° at Louisville to 34° at Knoxville; Lower Lake region, 24° at Toledo to 33° at Oswego; Upper Lake region, 24° at Milwaukee to 34° at Duluth; Upper Mississippi Valley, 25° at Davenport to 36° at Saint Paul; Missouri Valley, 29° at Omaha to 45° at Bismarck; plains of Nebraska and Kansas, 44° at Dodge City and North Platte; Rocky Mountain stations, 32° at Virginia Springs to 45° at Colorado City and Santa Fé; Western plateau, 32° at Pioche to 50° at Winnemucca; Pacific coast, 21° at San Francisco to 47° at Roseburg.

Frost occurred on nearly every day from the 9th to the 18th, and from the 20th to the 29th, in the Northwest and Northern portion of New England. Light frosts also occurred in Oregon on the 12th; northern Texas, 11th and 12th; Arkansas, 12th, 13th; Tennessee and North Carolina, 14th, 15th.

First frost reported at 7:35 a. m. in September.

Place.	Date.	Barometer.		Temperature.			Relative humidity.	Dew point.	Wind.		Condition of sky.		
		4:35 p. m.	7:35 a. m.	4:35 p. m.	Max.	Min.	4:35 p. m.	4:35 p. m.	4:35 p. m.	11 p. m.	4:35 p. m.	11 p. m.	7:35 a. m.
Eastport, Me	8	30.46	30.47	56	60	47	63	43	5 SE	3 NE	Fair.	Clear.	Clear.
Cheyenne, W. T	10	30.25	30.25	50	52	28	39	26	3 W	Calm.	Cloudy.	Fair.	Fair.
Denver, Colo	10	30.30	30.32	48	54	35	43	26	4 NW	2 SW	Cloudy.	Fair.	Clear.
North Platte, Nebr	10	29.92	30.15	59	60	33	28	26	16 N	8 W	Fair.	Clear.	Clear.
Bismarck, D. T	10	30.20	30.36	54	56	33	38	29	16 NW	10 W	Cloudy.	Clear.	Clear.
Breckenridge, Minn	10	30.02	30.24	57	59	33	47	37	20 NW	8 W	Fair.	Clear.	Cloudy.
St. Paul, Minn	10	29.94	30.12	64	70	42	48	44	14 NW	6 W	Fair.	Clear.	Clear.
Des Moines, Iowa	10	30.05	30.23	67	77	52	60	53	15 NW	9 NW	Cloudy.	Fair.	Clear.
Duluth, Minn	10	29.91	30.03	63	64	41	47	43	14 W	6 SW	Fair.	Clear.	Clear.
Leavenworth, Kans	11	30.21	30.29	66	67	43	36	38	14 N	7 N	Clear.	Clear.	Clear.
La Crosse, Wis	11	30.17	30.35	58	64	44	48	38	8 NW	5 W	Fair.	Clear.	Clear.
Davenport, Iowa	11	30.19	30.34	65	65	42	35	37	12 NW	6 NW	Fair.	Clear.	Clear.
Escanaba, Mich	11	30.00	30.28	64	66	49	34	35	14 W	6 W	Clear.	Clear.	Clear.
Omaha, Nebr	12	30.29	30.21	60	60	39	34	32	6 N	Calm.	Fair.	Clear.	Clear.
Marquette, Mich	12	30.33	30.31	51	55	39	65	40	8 W	10 N	Light rain.	Clear.	Clear.
Saint Louis, Mo	12	30.27	30.25	64	64	45	25	27	22 N	12 N	Clear.	Clear.	Clear.
Indianapolis, Ind	14	29.97	30.18	65	66	45	40	40	16 NW	3 NW	Fair.	Clear.	Clear.
Detroit, Mich	14	29.84	30.04	55	55	45	74	47	10 W	5 W	Clearing.	Clear.	Clear.
Louisville, Ky	14	29.97	30.20	70	70	52	28	35	16 NW	1 NW	Clear.	Clear.	Clear.
Knoxville, Tenn	14	29.97	30.22	70	71	47	32	38	8 N	Calm.	Clear.	Clear.	Clear.
Sandusky, Ohio	16	30.22	30.21	66	68	52	59	51	8 NE	7 S	Clear.	Clear.	Clear.
New London, Conn	16	30.12	30.32	67	68	49	55	50	4 N	4 NW	Clear.	Clear.	Clear.
Portland, Me	16	30.06	30.32	64	66	49	53	47	12 N	2 NW	Clear.	Clear.	Clear.
Dodge City, Kans	20	29.00	29.87	83	86	39	56	66	28 S	30 N	Fair.	Cloudy.	Clear.
Chicago, Ill	21	29.75	30.09	57	60	43	75	49	8 NW	5 W	Cloudy.	Clear	Clear.
Port Huron, Mich	22	29.99	30.00	62	63	37	32	32	16 W	8 NW	Fair.	Clear.	Clear.
Columbus, Ohio	22	30.08	30.31	61	63	44	52	43	8 NW	1 N	Fair.	Clear.	Clear.
Pittsburgh, Pa	23	30.25	30.35	65	67	43	35	37	6 E	1 NE	Clear.	Clear.	Clear.
Buffalo, N. Y	23	30.32	30.40	57	58½	40	47	37	6 SW	8 E	Clear.	Clear.	Clear.
Oswego, N. Y	23	30.35	30.50	60	61	41	44	34	6 NW	3 W	Clear.	Clear.	Clear.
Albany, N. Y	23	30.24	30.54	60	60	37	39	35	14 NW	8 NW	Clear.	Clear.	Clear.
Burlington, Vt	23	30.33	30.56	55	58	38	45	44	10 N	Calm.	Clear.	Clear.	Clear.

First frost reported at 7:35 a. m. in September—Continued.

Place.	Date.	Barometer.		Temperature.			Relative humidity.	Dew point.	Wind.		Condition of sky.		
		4:35 p. m.	7:35 a. m.	4:35 p. m.	Max.	Min.	4:35 p. m.	4:35 p. m.	4:35 p. m.	11 p. m.	4:35 p. m.	11 p. m.	7:35 a. m.
Grand Haven, Mich	27	30.38	30.53	54	57	37	61	41	16 N	4 NE	Fair.	Clear.	Clear.
Toledo, Ohio	28	30.40	30.27	56	57	45	51	38	10 NW	8 NE	Clear.	Clear.	Cloudy.
Baltimore, Md	28	30.35	30.49	65	65	47	40	40	11 NE	8 N	Clear.	Clear.	Fair.
Boston, Mass	29	30.39	30.37	59	59½	41	35	31	3 SW	8 SW	Clear.	Clear.	Fair.

NOTE.—The observations are taken at Washington time. The 4:35 p. m. and 11 p. m. reports belong to the preceding day. It will be observed that in all the instances given (36) first frost occurred with a high or a rising barometer. In three cases (Des Moines, Sandusky, and Louisville) frost is reported where the minimum temperature for the night did not fall below 52°, and twenty-five cases where it did not fall below 40°, and in no instance did the minimum temperature reach freezing. It is of interest to notice that in two instances the maximum temperature of the preceding day was 80° or more; in six cases 70° or more, and in twenty-four cases 60° or more. It will be observed in how few instances the minimum temperature of the night fell below the dew point of the 4:35 observation of the preceding day. It is regretted that, for want of space, this table cannot be extended to include all frosts reported for the month, but an examination of the data here exhibited gives the conditions existing at the 4.35 p. m. report favorable for the occurrence of frosts the coming night.

Ice is reported to have formed as follows: Camp Sheridan, Neb., 9th; Fort Fred Steele, Wyo., 11th, ¼ inch; Morristown, Dak., 12th, 26th; Vail, Iowa, 12th, 13th, ⅛ inch; Minneapolis, Minn., 12th; Big Creek, Mo., 12th, 21st; Genoa, Nebr., 26th; Contoocookville, N. H., 29th, ⅛ inch; Auburn, N. H., 28th; Waterburg, N. Y., 23d, 28th; Palermo, N. Y., 28th; Salt Lake City, Utah, 10th, ¼ inch; Boise City, Idaho, 25th, ⅛ inch; Winnemucca, Nev., 25th, $\frac{1}{10}$ inch; Denver, Colo., 11th; Virginia City, Mont., 9th, 25th, ¼ inch; *North Platte, Nebr., 10th*, ⅜ inch; Pembina, Dak., 26th, ⅛ inch.

PRECIPITATION.

On chart III is illustrated the general distribution of the rain-fall for the month. On the left side of the same chart is a table giving the average precipitation for September, by districts, which shows a decided excess over the region traversed by storm-area No. IV, namely from the South Atlantic States to Lower Lake region and Saint Lawrence Valley. A large excess is also observable in Oregon: elsewhere there is a general deficiency. The average for *Tennessee and the Gulf States* is not obtainable, owing to missing reports in the Lower Mississippi Valley, but individual reports show a decided deficiency, amounting to over two inches in *Tennessee, over three* in Arkansas, and seven and a half at Indianola, Texas; others from one to two inches.

Special heavy rains.—1st, Jacksonville, 2.32 inches (in 3 hours). 3d, *Blooming Grove*, Pa., 3 inches. 4th, Emory Grove, Md., 3.00 inches (in 4 hours); Egypt, Pa., 4.20 inches; 5th, Smithville, 2.35 inches (in about 1 hour); New Haven, 6.00 inches (in about 6 hours). 6th, *Thomasville, Ga.*, 3.04 inches. 9th, Jacksonville, 3.38 inches (in 6 hours). 10th, Saint Francis Barracks, Fla., 5.60 inches. 10th and 11th, Jacksonville, 4.29 inches. *11th and 12th, Charleston, 5.03 inches.* 11th, Savannah, 3.63 inches. 11th to 13th, Buffalo, 3.95 inches; Erie, 5.11 inches; Hudson, Ohio, 5.85 inches. 11th and 12th Augusta, 4.76 inches; Lenoir, N. C., *7.10 inches. 12th, Wytheville, Va.*, 7.02 inches; Wilmington, N. C., 4.00 inches. 12th and 13th, Cleveland, 4.41 inches; Pittsburgh, 4.17 inches; Morgantown, 2.54 inches; New Castle, Pa., *7.40* inches; *Oglethorpe Barracks*, Ga., 4.47 inches. 12th to 14th, Mount Forest, Can., 8.60 inches. 23d, Mobile, 2.36 inches (in 4 hours). 2d, Jacksonville, 2.43 inches.

Largest monthly rain-falls.—At Jacksonville, Fla., 21.12 inches; Daytona, Fla., 19.45 inches; Mount Forest, Can., 15.73 inches; Mayport, Fla., 13.28 inches; Saint Augustine, Fla., 11.96 inches; *Saint Mary's, Ga., 10.19 inches*; Newcastle, Pa., 10.00 inches; Cleveland, Ohio, 9.30 inches; Alpena, Mich., 9.06 inches; Oglethorpe Barracks, Ga., 8.88 inches; Punta Rassa, Fla., 8.77 inches; *Augusta, Ga., 8.83 inches*; Charleston, S. C., 8.28 inches; Key West, Fla., 8.04 inches; Smithville, N. C., 7.86 inches; New Haven, Conn., 7.67 inches; Mount Washington, N. H., 7.37 inches.

Smallest monthly rain falls.—At Los Angeles, San Diego, Fresno and Visalia, Cal., and Yuma, Ariz., none; Fort Warren, Mass., trace; Edinburg, Tex., 0.02 inches; Tucson, Ariz., and *Fort Craig, N. Mex., 0.08 inches*; Dover, Del., 0.10 inches; Austin, Tex., and Fort Union, N. Mex., 0.18 inches; Phœnix, Ariz., 0.19 inches; Camp Grant, Ariz., 0.20 inches; *La Messilla and Fort Lyon, Cal., 0.21 inches*; Boise City, Idaho, 0.27 inches; Sacramento, Cal., 0.29 inches; Saint Inigoes, Md., and Terrill, Tex., 0.31 inches; Decatur, Tex., 0.37 inches; Stockton and *Fredericksburg, Tex., 0.38 inches*; Wickenburg, Ariz., 0.39 inches; Red Bluff, Cal., 0.42 inches; San Francisco, Cal., 0.55 inches.

Floods and high tides.—The most serious floods and high tides during the month occurred during the passage of storm No. IV from Georgia to Canada. The following notes will serve to show the severity of these: Jacksonville, Fla., 11th, the river backed into streets, almost entirely suspending business. Savannah, Ga., 11th, rice-plantations along the Savannah, Ogechee, and Altamaha Rivers, completely inundated, damage to rice crop estimated at $400,000. *Fayetteville, N. C., 12th*, 13th, Cape Fear River flooded low lands, and destroyed about one-half the crops; 12th, all streams flooded in Southwes Virginia and Piedmont region, doing much damage—*bridges and trestles* swept away between Smythe and Roanoake Counties. Wytheville, Va., 12th, bridge over Red Creek carried away, also several dams, all the trees, houses, crops, corn, hay-stacks, &c., along the banks of New River and Red Creek, both streams several feet higher than ever before known, several persons drowned. 13th, above Lynchburg, all streams swollen; at 10 p. m., *James River* had risen 15 feet, and was rising 6 to 8 inches per hour; but little damage occurred. Dover Mines, Va., 13th, freshet in James River, highest water ever known here. *During the night of the* 12th, at Annapolis, the streets about the docks were flooded. At Baltimore, water overflowed docks and flooded streets; Light street submerged several feet deep. *Cannelton*, W. Va., 13th, heavy rains in mountain country which supplies Gawley, New, and Kanawha Rivers produced heavy freshets in these rivers; crops and lumber washed away; washouts on western division of Chesapeake and Ohio Railroad, between White Sulphur and Huntington, probably 50 miles of line submerged. 14th, the Kanawha River rose higher than during the *flood of* 1861, and Charleston, W. Va., was partly submerged; the Holston River rose 15 feet, doing much damage to crops. In Northwestern Pennsylvania and Eastern Ohio the floods were *specially severe*; in Erie County, Pennsylvania,

Connautte Lake rose 5 feet, bridges, &c., washed away; Elk Creek rose 6 to 8 feet; Oil City on the Allegheny River, partly flooded; Meadville, Pa., on French Creek, flooded by creek overflowing banks; three men killed by washout on Atlantic and Great Western Railroad, 3 miles to the SW.; at Newcastle, Pa., 11th to 13th, the Shenango, Mahoning, and Neshannock Rivers overflowed banks, all the bottom lands under water, fences, hay and sheep swept away, and a number of bridges on Mahoning River destroyed. At Warren, Ohio, 14th, 5 a. m., the Mahoning River reached the highest point ever known, flooding all lower portion of city, and doing immense damage—great damage also occurred at Campbellsport, Deerfield, Garrettsville, Windham and Mantua. Pittsburgh, Pa., 13th, city damaged by flood. Youngstown, Ohio, night of 12th, city flooded, principal streets, 8 feet deep; country between there and Hazleton a vast lake; railroad embankment swept away. Akron, Ohio, streams higher than for past 25 years. Chagrin Falls, river higher than ever known before, town flooded, dams and bridges washed away. Quaker City, Ohio, flooded. Ashtabula, Ohio, 13th, 9 a. m., water 13 feet above low water; mills at Sheffield and Kingsville carried away and numerous bridges and culverts swept into lake; rivers in this vicinity not as high since 1837. Alliance, Stark County, Ohio, creeks overflowed; lowlands deluged. At Minerva, Ohio, the water rose to a depth equal to the great flood of 1861. Cleveland, Ohio, 13th, houses flooded. Erie, Pa., 12th, 13th, Mill Creek overflowed; dams, culverts and bridges swept away. Oswego, N. Y., 14th, 100 feet of pier on east side of harbor washed away. In *Ontario*, September 13, at Oakville, considerable damage by floods and wash-outs. Saint Catharines, lower half of Welland Canal entirely submerged; navigation suspended until 23d. Markham, heaviest flood since 1851—bridges on river Rouge carried away—Toronto and Nipissing railroad badly washed. In Scarboro and Toronto Counties, nearly all bridges were swept away. At Brantford, September 15, large amount of property destroyed by flood. West Brantford, entirely submerged; iron bridge across Grand River gave way. At Galt, Grand River over-overflowed banks doing much damage.

Drought—Corsicana, Tex., 30th, recent rains have relieved the drought in some sections, while in others farmers are compelled to drive their stock many miles to water. Independence, Kans., 30th, corn crop severely injured by drought. Lebanon, Mo., 25th, tobacco crop almost a failure. Contoocookville, N. H., 30th, streams lower than ever before for many years, many wells have failed.

Hail.—Winnemucca, Nev., 16th; Pike's Peak, 1st, 2d, 8th, 19th, 30th; Stockton, Tex., 18th; Milwaukee, 25th; Chicago, 25th; Toledo, 2d; Logansport, Ind., 24th; Fort Hays, Kans., 19th; Camp Douglass, Utah, 18th; Fort Fred. Steele, Wyo., 8th; Summitt, Colo., 6th, 18th; Geneseo, Ill., 24th; Milford, Ind., 25th; Guttenburg, Iowa, 19th, 25th; Litchfield, Mich., 2d; Frankfort, Mo., 26th; Macon, Mo., 23d; Pierce City, Mo., 25th; Ashley, Mo., 25th., Plattsmouth, Neb., 19th; Genoa, Neb., 5th; Acto, N. J., 4th; Flushing, N. Y., 28th.

Raing days.—The number of days on which rain or snow has fallen, varies as follows: New England, 7 to 15; Middle States, 7 to 13; South Atlantic States, 7 to 20; Gulf States, 2 to 18; Ohio Valley, and Tennessee, 7 to 13; Lower Lake region, 9 to 15; Upper Lake region, 6 to 18; Upper Mississippi Valley, 6 to 13; Lower Missouri Valley, 5 to 8; Northwest, 8 to 12; Rocky Mountains, 6 to 11; Western Plateau, 0 to 8; Pacific coast, 0 to 8.

Cloudy days.—For New England, the number varies from 6 to 13; Middle States, 6 to 14; South Atlantic States, 4 to 15; Gulf States, 2 to 9; Ohio Valley and Tennessee, 4 to 6; Lower Lake region, 5 to 9; Upper Lake region, 6 to 13; Upper Mississippi Valley, 0 to 9; Lower Missouri Valley, 4 to 9; extreme Northwest, 8 to 14; Rocky Mountains, 1 to 11; Western Plateau, 0 to 5.

Snow is reported to have fallen as follows: At Fort Fred. Steele, Wyo., 9th; Summit, Colo., 7th, ground about station covered with snow; Boise City, Idaho, 27th, 30th, on Boise Mountains; Winnemucca, Nev., 30th, all the highest peaks in sight capped with snow; Pike's Peak, Colo., 1st, 4th, 5th, 6th, 7th, 30th; Marquette, Mich., 21st; Pembina, Dak., 20th; Lead City, Dak., 8th, 9th, 19th; Virginia City, Mont., 7th, on mountains, 8th, 24th, 30th; Coalville, Utah, 30th, first snow on mountains SW of station.

Rain from a cloudless sky.—Des Moines, Iowa, 17th.

RELATIVE HUMIDITY.

The average percentage of relative humidity for the month ranges as follows: New England, 70 to 85; Middle Atlantic States, 68 to 82; South Atlantic States, 75 to 81; East Gulf States, 66 to 78; West Gulf States, 64 to 76; Lower Lake region, 70 to 74; Upper Lake region, 67 to 78; Ohio Valley and Tennessee, 63 to 73; Upper Mississippi Valley, 60 to 73; Lower Missouri Valley, 61 to 57; Red River of the North Valley, 74 to 79; Eastern slope, from Dakota to interior of Texas, 45 to 67; Western Plateau, 23 to 49; California, 41 to 76. High stations report the following, not corrected for altitude: Mount Washington, 83; Cheyenne, 51; Denver, 44; Santa Fé, 37; Virginia City, 54; Colorado Springs, 46.

WINDS.

The prevailing winds at the Signal Service stations are shown by arrows on Chart No. II, by examination of which it will be seen that they have been northeasterly in the Atlantic States and generally southerly west of the Alleghanies.

Total movements of the air.—The following are the *largest* monthly movements recorded at the Signal Service stations, viz: Cape Lookout, 12,641 miles; Kittyhawk, 11,385; Portsmouth, N. C., 11,353; Sandy Hook, 10,278; Key West, 10,142; North Platte, 10,018, Cape Hatteras, 10,010; Cape Henry, 9,791; Dodge City, 9,703; Breckenridge, 9,463; Cape May, 9,377; Barnegat, 9,330; Atlantic City, 8,931. The *smallest* are: Knoxville, 1,380 miles; Visalia, Cal., 1,391; La Mesilla, N. Mex., 1,642; Nashville, 1,953; Uvalde, Tex., 1,987; Lynchburg, 2,045; Roseburg, Oreg., 2,069; Eagle Pass, Tex., 2,369; Shreveport, La., 2,797; Virginia City, Mont., 2,820; Fredericksburg, Tex., 2,822. The anemometer on the summit of Mount Washington was stopped by frost on the 15th, since when no continuous record has been obtainable.

Local storms.—5th, New York and vicinity, severe thunder-storm; 3 a. m., house struck by lightning; at Greenpoint, rain fell in torrents; Brooklyn, 4 a. m., oil works struck and fired; at East Marion, house struck by lightning; Jersey City, railroad washed and flag-pole struck by lightning. 6th, Ardenia, N. Y., afternoon, violent gale, uprooting trees, &c., path hundred yards wide. 12th, Goldsboro, Wayne County, North Carolina, "terrific and destructive tornado, passed three miles from city about 7 a. m., path hundred yards wide, every house demolished, and *débris* scattered around the country; negro killed and body blown considerable distance; four people injured, one afterwards died; hogs, cows, and horses killed." A tornado also probably originated near Stoney Creek and, moving WNW., passed about 1½ miles east of Ford's depot in Dinwiddie County; about 12 p. m. it swept across the Atlantic, Mississippi and Ohio Railroad in a northerly direction; track, 40 and 50 feet wide, soon spreading to about 300 feet; trees, barns, and small houses blown down, and timbers scattered broadcast; a little later a tornado is reported to have crossed the Richmond and Danville Railroad at two points, 1 or 2 miles west of Burkeville; trees twisted off, &c.; course NW. In Chesterfield County, between Summit and Clover Hill, "for a distance of 8 miles and width of 100 yards, destroyed everything, and houses completely demolished; eight persons injured." At Bosher's Dam a cyclone passed into Henrico County; "ravage fearful to contemplate; buildings demolished; one person killed, several injured." In Hanover County, at Short Pump, "tornado took a NW. direction; track 125 yards wide, cutting everything, cutting an avenue through the woods." 12th, "the 'northeaster' did considerable damage to shipping on Lake Erie." "Schooner Starling went ashore 2 miles east of Vermillion." "Schooner Everly, at Pigeon Bay, parted anchors." Schooner Provost parted anchor at Put In Bay and was driven on outside bar. At Baumbart Inlet, near North Amherst, Ont, schooners Sterling and Light were totally wrecked.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily weather indications with the telegraphic reports, for the succeeding twenty-four hours, shows a general percentage of omissions of 0.7 per cent., and of verifications of 84.9 per cent. The percentages of verifications for the four elements have been: weather, 89.3; wind, 81.6; temperature, 85.5; barometer, 83.4. The percentages of verifications by geographical districts have been: New England, 83.5; Middle States, 85.9; South Atlantic States, 89.2; East Gulf States, 83.4; West Gulf States, 89.5; Lower Lake region, 81.9; Upper Lake region, 83.3; Tennessee and Ohio Valley, 85.8; Upper Mississippi Valley, 84.2; Lower Missouri Valley, 82.8. Of the 3,573 predictions that have been made 124, or 3.5 per cent., are considered to have entirely failed; 147, or 4.1 per cent., were one-fourth verified; 436, or 12.2 per cent., were half verified; 342, or 9.6 per cent., were three-fourths verified; 2,524, or 70.6 per cent., were fully verified, so far as can be judged from the weather-maps.

Cautionary signals.—During the month 158 cautionary signals were displayed; 130, or 82 3 per cent., were justified by subsequent hourly velocities of 25 miles or over at or within 100 miles of the station.

Cautionary off-shore signals.—Of these 17 were displayed, of which 14, or 82.4 per cent., were justified, both as to velocity and direction, at or within 100 miles of station; of the remaining 3, 1 was justified as to direction, but not by velocity, and 2 were not justified by either. Forty-three cases were reported, generally from scattered stations, of winds of 25 miles or over when signals were not ordered.

NAVIGATION.

Stages of water in rivers.—In the table on the right-hand of Chart No. III are given the highest and lowest readings of the signal-service river-gauges during the month, with the dates of same.

During the latter portion of the month *navigation* on Upper Mississippi was at a standstill on account of low water; river only 1 foot above extreme low-water mark; no arrivals at Davenport since the 19th; no boats able to run above La Crosse; all large packets laid up. At Mobile, Ala., on the 11th, water in river fell 3 to 4 feet, retarding navigation. Following the heavy rains of the 12th and 13th a heavy rise occurred in the Ohio, and in this connection the following notes may be of interest: At Pittsburgh the river rose from 3 feet on the 13th to 10 feet 8 inches on the 14th. 16th, river falling; "business on river very active; six and a half million bushels of coal shipped down the river on the late rise." At Cincinnati, on the 15th, river rose 20 feet 8 inches in 24 hours, ending 3 p. m., and rising at the rate of 6 inches per hour; this was the most sudden rise on record; current strong and river filled with heavy drift; several barges drifted away, and one containing 5,000 bushels of coal sunk. 16th, river rose 9 feet; heavy drift passing all day, with fragments of houses, &c.; rising about 1 inch per hour since 3 p. m. 17th, river reached 36 feet 6 inches during a. m.; small drift-wood all day. 18th, river falling; very light drift. At Louisville, on the 16th, light drift-wood in river. 17th, heavy drift wood in river. At Cairo, on 21st, river rose 5 feet 7 inches; much drift-wood. 22d, river rose 4 feet 5 inches; drift-wood. 23d, river rose 1 foot 1 inch; drift-wood.

High tides.—Mount Desert, Me., 26th; Indianola, Tex., 26th, 29th, 30th; Savannah, Ga., 29th, unusually high tides; Charleston, S. C., 11th, tide unusually high; Smithville, N. C., 11th, 12th, highest tides known for years; Portsmouth, N. C., 12th, tides extremely high in sound, submerging beach and making roads almost impassable; 28th to 30th, tides high and beach submerged; Cape May, N. J., 26th to 28th; Baltimore, Md., 13th, wharves and streets overflowed.

ATMOSPHERIC ELECTRICITY.

Thunder-storms.—1st, New York, Virginia, Illinois, Iowa, Maine, Missouri, New Hampshire, New Jersey, Ohio, Pennsylvania, South Carolina, Vermont, Colorado, Florida, Alabama, Minnesota, Massachusetts. 2d, Massachusetts, Michigan, New York, Virginia, Illinois, Indiana, Maine, New Hampshire, North Carolina, Ohio, South Carolina, Vermont, Alabama. 3d, New York, Connecticut, Maine, Massachusetts, New Jersey, Ohio, Pennsylvania, Utah, Vermont, Virginia, Michigan, West Virginia, Georgia, North Carolina. 4th, Florida, New York, Virginia, Connecticut, New Jersey, Pennsylvania, Texas, Colorado, Georgia, North Carolina. 5th, New York, Virginia, Connecticut, Massachusetts, Nebraska, New Jersey, Pennsylvania, Wisconsin, Colorado, Dakota, Michigan, North Carolina, Connecticut. 6th, Colorado, Iowa, Kansas, Missouri, Nebraska, Wisconsin, Texas, North Carolina, Maine. 7th, Wyoming Territory, Iowa, Kansas, Texas, California, Dakota, Michigan. 8th, Illinois, Indiana, Iowa, Kansas, Nebraska, Texas, Wisconsin, Wyoming. 9th, Indiana, Kansas, Michigan, Nebraska, Texas, Wyoming, Missouri. 10th, Illinois, Michigan, Wyoming. 15th, Dakota, Iowa, Minnesota. 16th, Wyoming, Michigan, Utah, Nevada. 17th, New Mexico, Michigan, Nebraska. 18th, Nebraska, Colorado, Iowa, Utah, Texas, Minnesota. 19th, Nebraska, Dakota, Iowa, Kansas, Missouri, Wisconsin, Texas, Michigan. 20th, Arkansas, Illinois, Indiana, Iowa, Kansas, Michigan, Missouri, Texas, Wisconsin, Nebraska. 22d, Alabama, Dakota, Minnesota. 23d, Florida, Georgia, Illinois, Iowa, Missouri, Dakota, Alabama, Wisconsin. 24th, Dakota, Illinois, Iowa, Kansas, Wisconsin. 25th, Michigan, Illinois, Indiana, Iowa, Kansas, Ohio, Tennessee, Texas, Missouri, Wisconsin, Kentucky. 26th, New York, Connecticut, Illinois, Maine, Maryland, Massachusetts, Mississippi, Missouri, New Jersey, Ohio, Pennsylvania, Texas, Virginia, Alabama. 27th, Florida, Arkansas. 28th, Kansas, Missouri. 29th, Iowa, Kansas, Nebraska, Dakota, Wisconsin. 30th, Nebraska, Colorado, Minnesota.

Auroras.—Pembina, Dak., 25th; Bangor, Me., 28th, 29th; Thatcher's Island, Mass., 22d; Burlington, Vt., 22d, 29th; Eastport, Me., 27th, 29th, 30th; Newbury, Vt., 21st; Gainesville, Ga., 24th; Mount Sterling, Ill., 19th; Vevay and New Corydon, Ind., 26th; Nora Springs, Ia., 6th; Gardiner, Me., 22d; Orono, Me., 27th; Mechanics' Falls, Me., 30th; Waltham, Mass., 29th; North Lewisburgh, Ohio, 23d; Woodstock, Vt., 26th; West Charlotte, Vt., 23d.

Telegraphic communication interfered with by atmospheric electricity.—Umatilla, Oreg., 21st, during a high wind instruments became intensely electrified; sparks were drawn by the finger from the circuit wires and all metal parts of the instruments; some of the joints emitted a crackling sound; 26th, during gust of wind instruments electrified. Santa Fé, N. Mex., 1st, 4th, very great on wires. Pembina, Dak., 18th, very strong on wires; 29th, between 8 and 10 p. m., line unmanageable; 30th, on wires.

OPTICAL PHENOMENA.

Solar halos.—1st, Indiana, Mississippi. 2d, Texas. 3d, Texas, Connecticut, Rhode Island. 4th, Mississippi. 5th, Texas. 7th, Iowa. 8th, Ohio. 9th, Ohio. 11th, North Carolina, Massachusetts. 12th, Nevada. 13th, Ohio. 15th, Wisconsin, Ohio. 16th,

Ohio, Iowa. 17th, Connecticut, New York, Nebraska, Rhode Island, Vermont. 18th, Texas. 20th, Indiana, Ohio. 23d, Indiana, New York, Pennsylvania, West Virginia, Ohio. 24th, Iowa, Idaho, Connecticut. 25th, Rhode Island. 26th, Indiana, Kansas, Florida. 27th, Ohio, Kentucky. 28th, New Jersey, Ohio, Pennsylvania, North Carolina. 29th, Texas. 30th, Connecticut.

Lunar halos.—1st, Texas. 3d, Texas. 4th, Georgia, Wisconsin, North Carolina. 5th, New Jersey, Florida, Texas. 6th, Iowa, Nebraska, New Jersey, Texas, Indian Territory, Florida, Minnesota, Georgia, Connecticut, Massachusetts. 7th, Mississippi, Missouri, Texas, Virginia, Kansas, Minnesota, Georgia, South Carolina, Connecticut, Massachusetts. 9th, Indiana, New Jersey, Minnesota, Ohio, Michigan, Georgia, Virginia. 10th, New Jersey, Texas, Minnesota, Connecticut. 11th, Nevada, Texas, Minnesota, Illinois, West Virginia, Maine. 12th, Wisconsin, Dakota, Texas, Minnesota. 13th, Indiana, Maryland, New Jersey, Texas, Minnesota. 14th, New Jersey, Texas, Iowa, Illinois, Massachusetts. 15th, Dakota, Texas, Wisconsin. 16th, Iowa, Texas, Michigan, Illinois. 17th, Nevada, Texas, Illinois. 19th, Texas. 20th, Indiana, Texas. 23d, Indiana. 30th, Texas.

Mirage.—New Bedford, Mass., 28th to 30th; Fall River, Mass., 23d; New London, Conn., 8th, 14th, 22d, 23d, 27th, 28th; Burlington, Vt., 24th.

MISCELLANEOUS PHENOMENA.

BOTANICAL.—*Arkansas*—Helena, 3d; if town keeps healthy cotton will come in in a few days. *Colorado*—Summit, Rio Grande County: The following is a brief summary of an attempt to raise vegetables at the altitude of 11,300 feet (latitude 37° 28′ N., longitude 106° 30′ W.): June 14, radish and turnip seeds sown; 26th, maize, Mexican beans, peas, potatoes, beets, kohl-rabi, horse-radish, parsley, and spinach planted; 29th, lettuce sown; July 13, peas up; 20th, potatoes; 25th, corn, beets, and spinach; 31st, radishes ripe; August 1, horse-radish up. Radishes grew to be roots 5 inches long and ½ an inch thick; turnips, ¾ of an inch in diameter; Indian corn-stalks, 3 feet high; Mexican beans, 3 feet high; peas, 5 inches high and blossomed—no fruit; potatoes: stems, 6 inches high; tubers, ¾ of an inch long; beets, 4 inches long and ½ of an inch thick; khol-rabi and parsley did not come up; horse-radish, 1½ inches high; spinach and lettuce, 3 inches high. September 20, frost killed everything in garden except lettuce and spinach. *Connecticut*—New London, 30th, white dahlia in bloom. *Florida*—Milton, 30th, all crops harvested except sweet-potatoes. Sugar-cane in market since 1st of the month. *Indiana*—Milford, 22d, in bloom, strawberries, blackberries, plums, lilacs, currants, and dog-wood. *Iowa*—Fort Madison, 20th, potatoes very poor; fruit abundant and good; corn crop, very good. Guttenburg, 20th, potato crop very small. *Kansas*—Independence, 30th, corn crop severely injured by drought; acreage of winter wheat sown only one-third that of last year. *Louisiana*—Concordia Parish, 2d, cotton is opening very rapidly; all hands are picking; worms have appeared in portions of the field and are eating in spots; crops of this parish far below those of last year. *Massachusetts*—Waltham, ripe, 8th, Indian corn; 7th, wild grapes; fading of leaves, 4th, blackberry; 7th, wild grape; 20th, alder; 17th, hazel bush, white birch; 23d, red maple. Watertown, 9th, grapes ripe. *Mississippi*—Newton, 5th, farmers picking cotton, as it is opening very rapidly. Durant, 4th, cotton crop very poor. Torrence, 5th, cotton opening very rapidly. Summit, 4th, all crops very good. Brookhaven, 4th, forest leaves beginning to change color; ripe, 25th, persimmons, winter grapes; hops in full bloom twenty days later than usual. *Missouri*—Lebanon, 25th, tobacco crop almost a failure because of dry weather; harvesting corn, crop poor. Corning, 20th, the tenderest flowers are as green and blooming as in summer. Springfield, 30th, winter wheat sown; many cherry and apple trees still in full bloom; one apple tree of red June variety has fully ripened its second crop. *New Jersey*—Vineland, 30th, foliage of cherry, maple, cotton wood, and some others faded and mostly fallen. Freehold, 12th, second crop of strawberries gathered. *New Hampshire*—Auburn, 30th, apple crop good; potato crop a failure, rotting badly. Contoocookville, 7th, forest leaves falling; 9th, cutting corn; 21st, grapes ripe. *New York*—Waterburg, 30th, yield of wheat generally good; barley only fair; potatoes not a full crop; corn crop good. Wappinger's Falls, 7th, ripe, buckwheat, cutting and curing; cutting corn; 24th, egg-plant ripe. North Volney, 21st, second crop of strawberries gathered. Palermo, 7th, cutting corn; 20th, forest foliage beginning to change color. Vernon Centre, 15th, hops nearly all harvested, one-third of a crop, quality extra; 20th, potatoes nearly all gathered, crop very light, one-half rotten, will not average five bushels to the acre; 21st, corn harvest begun; 25th, pears a complete failure; apples, very heavy crop. *North Carolina*—Weldon, 1st, grapes ripening. *Ohio*—Bellefontaine, 30th, corn ripe. Ruggles, 30th, foliage of forest trees beginning to change color. *Texas*—Melissa, 30th, harvesting corn, crop very fine; cotton crop only fair, somewhat injured by ball worm; farmers sowing winter wheat. Gilmer, 30th, picking cotton, crop fair, army cotton-worm in a few isolated places; corn crop heavy; sweet potatoes, good crop. Corsicana, 30th, cotton in good condition. *Vermont*—West Charlotte, 18th, wild roses in bloom; Straf-

ford, 28th, raspberry and strawberry blossoms seen. *Virginia*—Broad Oak, Albemarle County, 15th, cutting tobacco, crop only fair, much worm-eaten; 20th, cutting corn, crop good; 30th, seeding wheat; Johnsontown, 9th, second crop of strawberries gathered; plum trees in bloom. *Wisconsin*—Wautoma, 30th, buckwheat and corn all harvested, fair crop of each.

INSECTS.—*Locusts:* Fort Madison, Iowa, 30th, injuring fall wheat lately sown. Creswell, Kans., 7th, flying south; 20th, North. Genoa, Nebr., 9th, flying south. Denver, Colo., 30th, no grasshoppers this season, in consequence of which farmers are harvesting very large crops. Bismarck, Dak., 1st, 2d, at great altitudes, flying southerly; 3d, on ground, few in air, numbers decreasing rapidly; 4th, very few on ground, none in air; 5th, 6th, 7th, rapidly decreasing, many dying; 9th, disappeared. Yankton, Dak., somewhat numerous until about the 12th, and disappeared almost entirely after the cold weather of the 26th. Fort Sill, Indian Territory, 23d, quite a number from the north; 24th, remaining; 25th, great numbers traveling south; 26th, swarms from north; great many alighting; 27th, few remaining; 28th, few flying north, great many on ground; 29th, few flying north; 30th, more numerous than at any time since their appearance, depositing eggs. Dodge City, Kans., 6th, swarm came to earth from the northeast with the wind; 7th, 10 a. m., immense swarms, disappearing at 3 p. m., height of swarms 50 to 1,000 feet, flying from northwest; 10th, 11 a. m., quite thick, swarms about 1,000 feet high flying west with the wind. *Chinch-bugs:* Creswell, Kans., 26th, eating young wheat. Reports from Sierra County, California, state that grasshoppers appeared there in May and June, since when they have become very numerous, destroying almost entire crops in the Sierra Valley. *Katydids:* Wappinger's Falls, N. Y., 29th, 30th.

BIRDS.—*Swallows:* Fall River, Mass., 13th, disappeared; Oregon, Mo., 23d, 25th, 29th; Genoa, Nebr., 10th, disappearing; Contoocookville, N. H., 3d, disappeared; Wappinger's Falls, N. Y., 30th; Bellefontaine, Ohio, 1st, disappearing. *Thrush:* Somerset, Mass., 10th, flying S. *Whippoorwills:* Fayette, Miss., 27th, disappeared; Wappinger's Falls, N. Y., 12th; Auburn, N. H., 20th, disappeared; Palermo, N. Y., 5th, last seen. *Ducks:* Monticello, Ia., 30th, S.; Contoocookville, N. H, 11th, NE. *Martins:* Melissa, Tex., 10th, disappeared. *Pigeons:* Monticello, Ia., 23d, S.; Palermo, N. Y., 10th, S.; Kensico, N. Y., 1st, W.; Broadoak, Va., 27th, S.; Chicago, Ill., 20th W.; Louisville, Ky., 20th, S. *Kingbirds:* West Charlotte, Vt., 7th, S. *Geese:* Monticello, Ia., 25th, S., Fort Madison, Ia., 11th, S.; Oregon, Mo., 23d; Genoa, Nebr., 14th, S.; Dover Mines, Va., 17th, S.; Sacramento, Cal., 5th, first of the season, returning from the N.; Bismarck, Dak., 25th, S.; Pembina, Dak., 19th, S.; Louisville, Ky., 21st, S. *Grouse:* Boise City, Idaho, 7th, preparing for winter quarters. *Blackbirds:* Milford, Ind., 22d, in large flocks; Contoocookville, N. H., 4th; Wappinger's Falls, N. Y., 1st; Palermo, N. Y., 6th, S.; Melissa, Tex., 19th. *Hummingbirds:* West Charlotte, 24, 19th, last seen. *Bluebirds:* Monticello, Iowa. 28th, S.; Oregon, Mo., 25th; Wappinger's Falls, N. Y., 29th. *Quails:* Oregon, Mo., 21st; New London, Conn., 27th, first seen. *Robins:* Monticello, Ia., 27th, S. *Bluejays:* Ringgold, Ohio, 18th. *Nighthawks:* Contoocookville, N. H., 1st, disappeared; Wappinger's Falls, N. Y., 8th, 15th. *Orioles:* Contoocookville, N. H., 4th, disappeared. *Cabbage worm and lice:* Broad Oak, Va., 30th, very destructive. *Catbirds:* Fayette, Miss., 22d; Oregon, Mo., 26th. *Cranes:* Fayette, Miss., 6th, S.; Genoa, Neb., 18th, S.

Meteors.—Boise City, Idaho, 20th; Yuma City, 12th; Fort Davis, Tex., 19th, 20th; Castroville, Tex., 1st, 2d, 4th, 22d; Pembina, Dak., 21st; Davenport, Iowa, 2d, 30th; Louisville, Ky., 8th, 11 p. m., meteor in NW. fell from an altitude of 45° to 35°, when it burst and emitted sparks, leaving a track about 1° in length; Indianapolis, Ind., 5th; Fort Adams, R. I., 28th; Gainesville, Ga., 15th; Vevay, Ind., 1st, 5th, 15th; New Corydon, Ind., 3d; Monticello, Iowa, 16th; Topeka, Kans., 28th, 29th, 30th; Gardiner, Me., 28th; Mount Desert, Me., 28th; Woodstock, Md., 5th, 16th, 17th, 24th, 26th, 27th, 28th; Fall River, Mass., 20th; Rowe, Mass., 23d, 25th, 28th, 29th; Fayette, Miss., 2d, 12th, 13th, 15th, 16th, 19th, 24th, 25th, 28th; Corning, Mo., 20th, 26th; Oregon, Mo., 23d, 24th; Atco, N. J., 19th; Waterburg, N. Y., 17th, 26th, 27th, 30th; Palermo, N. Y., 22d; North Volney, N. Y., 28th; Hector, N. Y., 30th; Wappinger's Falls, N. Y., 1st, 14th, 25th; Flushing, N. Y., 15th; Fayetteville, N. C., 25th; Westerville, Ohio, 18th, 30th; Melissa, Tex., 3d; Johnsontown, Va, 3d, 4th, 9th; Wautoma, Wis., 1st, 2d; Yuma, Ariz., 12th, six miles E. of station, about noon, meteor size of star of first magnitude, observed falling from NW. *August Meteors.*—The observer at Detroit, Mich., stated "that although a considerable number of falling stars were observed during the month of August, the number was much below the usual average during that month."

Polar bands: Guttenburg, Iowa, 6th; Gardiner, Me., 29th; Fayette, Miss., 24th; Brookhaven, Miss., 25th; Freehold, N. J., 28th; Woodstock, Vt., 25th; Wytheville, Va., 2d; Key West, Fla., 6th; Pembina, Dak., 21st.

Zodiacal light: New Corydon, Ind., 5th to 7th, 25th to 27th, 30th; Monticello, Iowa, 18th, 20th, 26th; Fall River, Mass., 24th, 25th; Cambridge, Mass., 16th to 20th, 22d, 23d, 25th, 27th, 30th; Waterburg, N. J., 30th; Savannah, Ga, 20th, 21st, 25th, 26th; Newberry, Vt., 23d.

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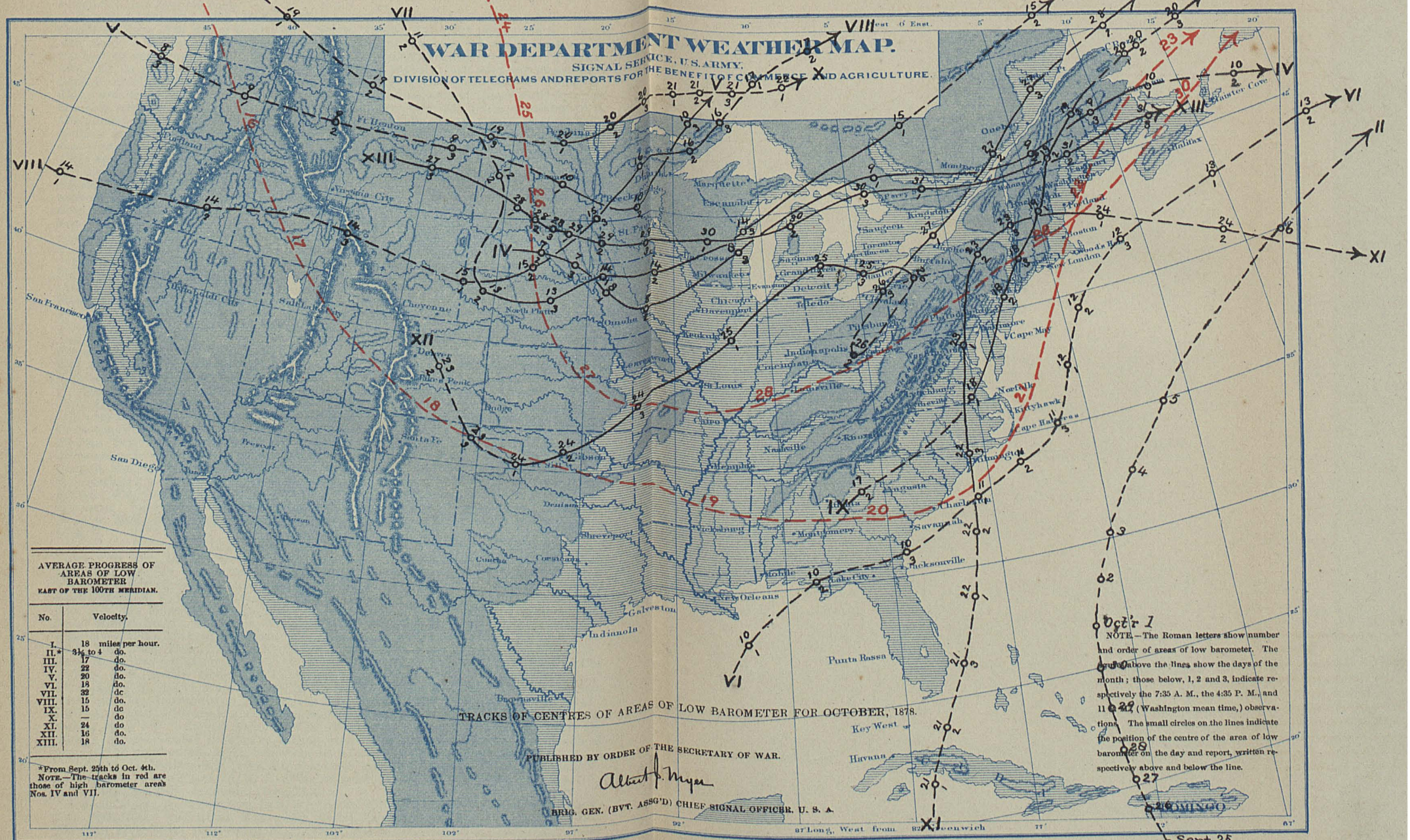
No. I.

WAR DEPARTMENT WEATHER MAP.

SIGNAL SERVICE, U. S. ARMY.

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.



TRACKS OF CENTRES OF AREAS OF LOW BAROMETER FOR OCTOBER, 1878.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

Albert J. Myer

BRIG. GEN. (BVT. ASSG'D) CHIEF SIGNAL OFFICER, U. S. A.

NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7:35 A. M., the 4:35 P. M., and 11 P. M. (Washington mean time,) observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.

AVERAGE PROGRESS OF AREAS OF LOW BAROMETER EAST OF THE 100TH MERIDIAN.

No.	Velocity.
I.	18 miles per hour.
II.*	3½ to 4 do.
III.	17 do.
IV.	22 do.
V.	20 do.
VI.	18 do.
VII.	32 do.
VIII.	15 do.
IX.	15 do.
X.	— do.
XI.	24 do.
XII.	16 do.
XIII.	18 do.

*From Sept. 25th to Oct. 4th.

NOTE.—The tracks in red are those of high barometer areas Nos. IV and VII.

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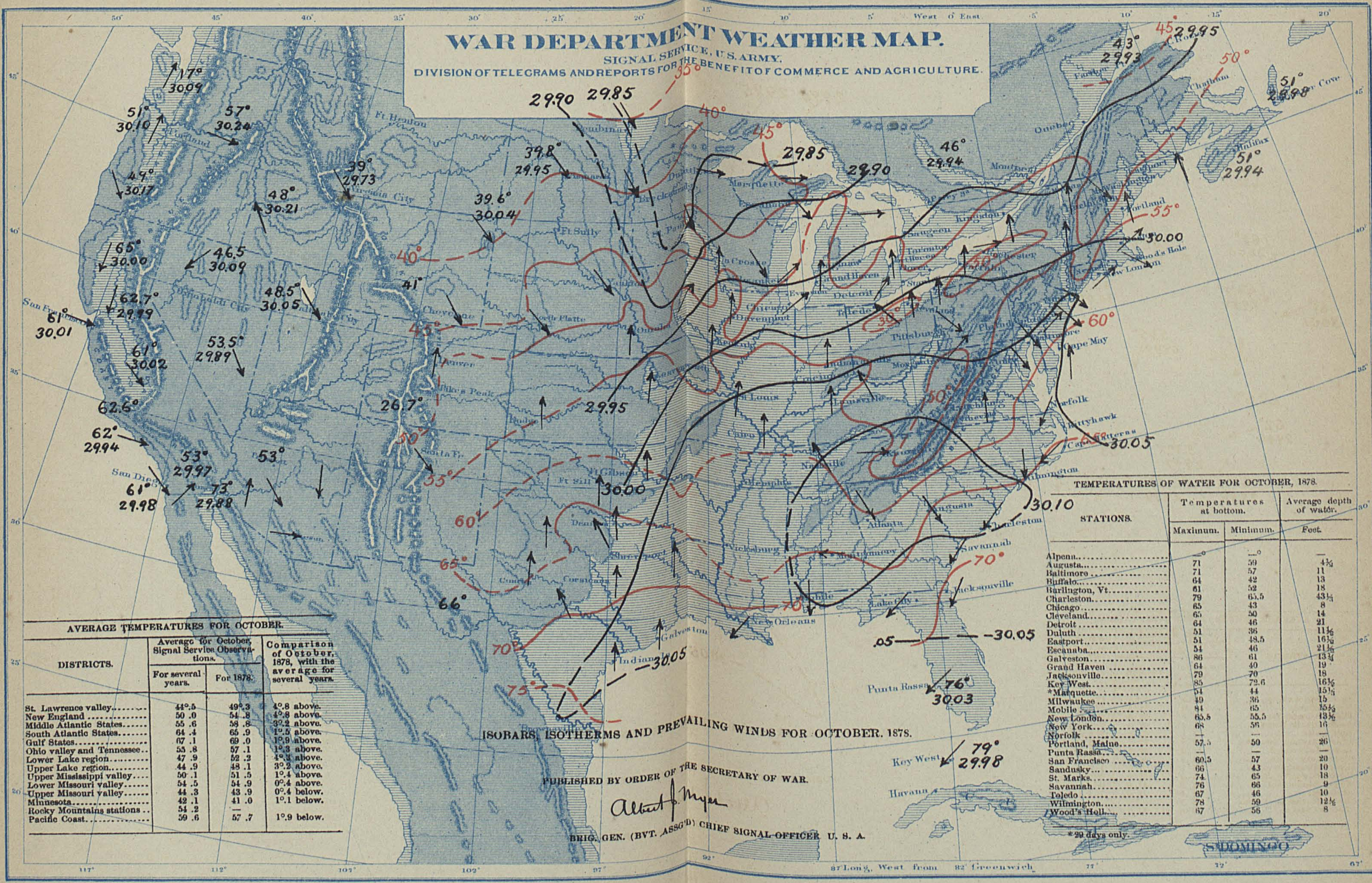
No. II.



AVERAGE TEMPERATURES FOR OCTOBER.

DISTRICTS.	Average for October, Signal Service Observations.		Comparison of October, 1878, with the average for several years.
	For several years.	For 1878.	
St. Lawrence valley	44°.5	49°.3	4°.8 above.
New England	50 .0	54 .8	4°.8 above.
Middle Atlantic States	55 .6	58 .8	3°.2 above.
South Atlantic States	64 .4	65 .9	1°.5 above.
Gulf States	67 .1	69 .0	1°.9 above.
Ohio valley and Tennessee	53 .8	57 .1	1°.3 above.
Lower Lake region	47 .9	52 .2	4°.3 above.
Upper Lake region	44 .9	48 .1	3°.2 above.
Upper Mississippi valley	50 .1	51 .5	1°.4 above.
Lower Missouri valley	54 .5	54 .9	0°.4 above.
Upper Missouri valley	44 .3	43 .9	0°.4 below.
Minnesota	42 .1	41 .0	1°.1 below.
Rocky Mountains stations	54 .2	—	
Pacific Coast	59 .6	57 .7	1°.9 below.

TEMPERATURES OF WATER FOR OCTOBER, 1878.

STATIONS.	Temperatures at bottom.		Average depth of water.
	Maximum.	Minimum.	Feet.
Alpena	—°	—°	—
Augusta	71	59	4½
Baltimore	71	57	11
Buffalo	64	42	13
Burlington, Vt.	61	52	18
Charleston	79	65.5	43⅓
Chicago	65	43	8
Cleveland	65	50	14
Detroit	64	46	21
Duluth	51	36	11½
Eastport	51	48.5	16½
Escanaba	54	46	21½
Galveston	86	61	13¾
Grand Haven	64	40	19
Jacksonville	79	70	18
Key West	85	72.6	16½
*Marquette	54	44	15⅓
Milwaukee	49	36	15
Mobile	84	65	15½
New London	65.5	55.5	13½
New York	68	56	16
Norfolk	—	—	—
Portland, Maine	57.5	50	26
Punta Rassa	—	—	—
San Francisco	60.5	57	20
Sandusky	66	43	10
St. Marks	74	65	18
Savannah	76	66	9
Toledo	67	46	10
Wilmington	78	59	12½
Wood's Holl	67	56	8

*20 days only.

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WAR DEPARTMENT WEATHER MAP.

SIGNAL SERVICE, U.S. ARMY.

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

PRECIPITATION CHART FOR OCTOBER, 1878.

AVERAGE PRECIPITATION FOR OCTOBER.

DISTRICTS	Average for October. For many years.	For 1878.	Comparison of October, 1878, with the average for many years.
	Inches.	Inches.	
St. Lawrence valley	3.62	4.10	0.48 excess.
New England	4.10	4.13	Normal.
Middle Atlantic States	3.15	3.86	0.71 excess.
South Atlantic States	2.60	4.05	1.45 excess.
Eastern Gulf States	3.72	4.06	0.34 excess.
Western Gulf States	3.00	3.10	0.10 excess.
Tennessee	2.74	3.91	1.17 excess.
Ohio Valley	2.90	3.39	0.49 excess.
Lower Lake region	2.90	4.92	2.02 excess.
Upper Lake region	3.20	4.50	1.30 excess.
Upper Mississippi Valley	2.70	2.90	0.20 excess.
Minnesota	1.45	3.80	2.35 excess.
Lower Missouri Valley	2.35	1.66	0.69 deficiency.
Upper Missouri Valley	1.10	0.81	0.29 deficiency
California Coast	0.46	1.12	0.66 excess.
Portland, Or	3.18	3.22	Normal.

HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, OCT., 1878.

STATIONS.	Danger point on gauge.		Highest water. Date.	Highest water. Height.		Lowest water. Date.	Lowest water. Height.	
	ft.	in.	Oct.	ft.	in.	Oct.	ft.	in.
RED RIVER.								
Shreveport	29	0	1	4	11	31	1	11
MISSOURI.								
Yankton	20	0	1	3	10	31	3	3
Omaha	16	0	1	7	6	31	5	11
Leavenworth	21	0	1	6	10	30	5	7
MISSISSIPPI.								
St. Paul	14	6	24 to 28	1	11	3	1	3
La Crosse	18	0	23, 24, 25	2	6	1 to 6	0	5
Dubuque	21	10	26, 27	6	0	10, 11	4	0
Davenport	15	0	30	4	6	10	3	1
Keokuk	14	6	19, 20	6	1	1	3	6
St. Louis	30	0	23	11	1	2	9	3
Cairo	40	0	1	10	5	18, 22	6	0
Memphis	34	0	1	8	9	25, 26	4	3
Vicksburg	41	0	—	—	—	—	—	—
*New Orleans	2	6	8	—11	6	27	—3	10
OHIO.								
Pittsburgh	20	0	26	6	6	20	—0	7
Cincinnati	50	0	31	11	5	22, 23, 24	4	4
Louisville	24	0	30, 31	6	0	25 to 27	3	0
CUMBERLAND.								
Nashville	42	0	31	1	2	9	0	4
MONONGAHELA.								
Morgantown	28	0	23	3	3	16	0	3
Pittsburg	20	0	26	6	6	20	—0	9
SAVANNAH.								
Augusta	—	—	30	5	6	14, 15	3	10
Montgomery								

* Below high water mark.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

Albert J. Myer

BRIG. GEN. (BVT. ASSG'D) CHIEF SIGNAL OFFICER U. S. A.

Prarie and forest fires: Morristown, Dak., 30th; Creswell, Kans., 2d, 5th, 12th, 13th, 18th, 22d, 24th, 25th, 30th; Independence, Kans., 4th, 5th, 6th, 10th, 11th; Wadena, Minn., 22d, very heavy forest fires, several farm houses burnt; Los Angeles, Cal., 10th, 11th, (12th, filling the air with smoke, falling cinders and ashes); 13th, much damage to ranches, &c.; San Diego, Cal., 11th, 12th, extensive on mountains; Bismarck, Dak., 26th to 29th; Fort Sill, Ind. Ter., 18th, 19th, 21st, 26th; Fort Gibson, Ind. Ter., 14th; Dodge City, Kans., 30th; Breckenridge, Minn., 27th; Pembina, Dak., 27th.

Earthquakes.—United States Naval Hospital, Yokohama, *June* 11, 0:15 p. m., smart shock. *July* 15, 3:45 p. m., smart shock, (this was erroneously reported the 10th, in August review). *August* 9, San Jose de Costa Rico, 4:15 a. m., feeble shock; 27th, 9:11 a. m., two violent shocks felt at Everfield, Cologne, Osnabruck, Barmen, Bonn, and Dusseldorff, Germany. *September* 7, San Francisco; about 9:35 a. m., three well-defined shocks, from W. to E., less than two seconds apart. 29th, San Francisco, about 6 p. m., shock reported from NE. to SW., followed in a few minutes by a milder one; at Oakland it is said to have been the most marked shock since 1875.

Sunsets.—The characteristics of the sky at sunset, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all signal-service stations. Reports from 117 stations show 3,501 observations to have been made, of which 47 were reported doubtful. Of the remainder 2,958 or 84.5 per cent. were followed by the expected weather.

Sun spots.—The following is a record of observations made by Mr. D. P. Todd, Nautical Almanac Office, Washington, D. C.:

September, 1878.	No. of New—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	
9—4 p. m	1	1	0	0	0	0	1	1	
13—4 p. m	0	0	0	0	0	0	1	1	Faculæ.
14—3 p. m	0	0	1	1	0	0	0	0	
16—4 p. m	0	0	0	0	0	0	0	0	
17—4 p. m	0	0	0	0	0	0	0	0	
18—3 p. m	0	0	0	0	0	0	0	0	
19—3 p. m	0	0	0	0	0	0	0	0	
20—4 p. m	0	0	0	0	0	0	0	0	
22—1 p. m	0	0	0	0	0	0	0	0	
23— 12 m	0	0	0	0	0	0	0	0	
27—3 p. m	0	0	0	0	0	0	0	0	
5 p. m	0	0	0	0	0	0	0	0	
28—4 p. m	0	0	0	0	0	0	0	0	
30—5 p. m	0	0	0	0	0	0	0	0	

NOTE.—The observations of sun spots are now made at the Nautical Almanac Office, and are not communicated by Admiral Rodgers, Superintendent Naval Observatory.

Prof. Gustavus Hinrichs, of Iowa City, Iowa, reports: "A very large sunspot was observed from the 4th until the 13th, when it disappeared by solar rotation; no spot seen since." Observations were also made at Fort Whipple, Va., on the 2d, 4th, 14th, 15th, 16th, 17th, 18th, 19th, 22d, and 27th, and no spots observed.

Published by order of the Secretary of War.

ALBERT J. MYER,
Brigadier-General (Brevet Assigned), Chief Signal Officer, U. S. A.

PAPER 33.

MONTHLY WEATHER REVIEW, OCTOBER, 1878.

INTRODUCTION.

In compiling the present review the following data, received up to November 14, have been made use of, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at 119 Signal Service stations and 11 Canadian stations, as telegraphed to this office; monthly journals and means, 127 and 143, respectively, from the former, and monthly means from 14 of the latter; reports from 20 special

sunset stations; 231 monthly registers from voluntary observers; 34 monthly registers from United States Army post-surgeons; marine records; international simultaneous observations; monthly reports of the weather services of the States of Iowa and Missouri; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

Upon Chart No. II is shown by the isobaric lines the general distribution of the atmospheric pressure, reduced to sea-level, for the month. Compared with the means for October of previous years, the pressure for the present month is slightly below the normal in all the districts, except Oregon, where it is about one-tenth of an inch above. The deficiency is greatest in Minnesota and the Upper Lake region.

The local barometric ranges for the month, as reduced to sea-level, have been largest in Oregon, from Indian Territory to Minnesota and Wisconsin, and along the path of low-pressure area No. XI. Taken by districts, they vary as follows: New England, 0.89 inch on summit of Mount Washington and 0.90 at Wood's Holl, to 0.98 at Springfield; Middle States, 1.00 at Kittyhawk to 1.61 at Fort Whipple; South Atlantic States, 0.64 at Jacksonville to 1 32 at Cape Lookout; East Gulf States, 0.54 at Mobile to 0.66 at Atlanta; West Gulf States, 0.56 at New Orleans to 0.81 at Corsicana; Ohio Valley and Tennessee, 0.62 at Knoxville to 0.90 at Morgantown; Lower Lakes, 0.63 at Cleveland to 1.14 at Oswego; Upper Lakes, 0.87 at Grand Haven to 1.28 at Duluth; Upper Mississippi Valley and Minnesota, 0.94 at Saint Louis to 1.64 at Breckenridge; Missouri Valley, 1.19 at Bismarck to 1.76 at Yankton; Western Plains, Fort Sill, 1.21, Dodge City, 1.88, and North Platte, 1.75; Rocky Mountain stations, 0.56 at Santa Fé to 0.90 at Denver; Nevada and Idaho, 0.76 at Pioche to 1.03 at Boise; California, 0.22 at San Diego to 0.70 at Red Bluff; Oregon, 1.39 at Roseburg.

Areas of high barometer.—Eight of these have been well-marked areas and a short description of each is given below. Two of them, Nos. IV and VII, were specially interesting from the fact of their influence on the progress of the yellow fever in the Southern States; their paths are given in red on Chart No. II.

No. I appeared on the Pacific coast on the 1st, the highest pressure passing eastward over Oregon and Washington Territory on the 2d; on these days frosts were reported at Yreka, Cal., and Winnemucca, Nev. It was preceded during the early morning of the 1st by a very heavy southwest gale and heavy rains in the Straits of Juan de Fuca; 3d and 4th, it extended to the Northwest, attended by clear, cool weather, but preceded, during latter part of 4th, by northerly winds, threatening and rainy weather in Nebraska and Kansas. 5th, it moved into the Ohio Valley, preceded by northerly winds, cloud, and rain from Tennessee to the Lower Lakes, and with frosts in Michigan on morning of the 6th. 7th and 8th, it was over the Atlantic States.

No. II appeared in the Northwest on the 9th, and followed low area No. IV across the Lake region to the Gulf of St. Lawrence, where it was central on the 11th. Frosts occurred in Northern Michigan on the morning of the 10th.

No. III appeared on the 11th, when it extended from Nevada and Arizona, where frost occurred, to the Lower Missouri Valley, and afterward moved in a more southerly track than the preceding areas; it produced lower temperatures over the Gulf States than either of the preceding, but did not produce any very beneficial effects in the "yellow fever districts." 12th, it was central over the Ohio Valley, and frosts were reported from Tennessee to Michigan. 13th, it moved slowly southeastward, and by night was central in the South Atlantic States, where it remained until the 16th, followed by southerly winds, and rising temperatures in the Gulf States.

No. IV apparently developed from Nevada northwards in rear of the extensive depression described as No. VIII. From the 15th to the 18th, frosts occurred in all the districts west of the Rocky Mountains, except along the immediate Pacific coast, and on the night of the 16th and morning of the 17th were quite general in New Mexico and Northwestern Texas, with light northerly winds or calms, and clear weather. Cautionary off-shore signals were ordered up at Indianola and Galveston on the afternoon of the 16th, and were justified on the 17th at Indianola by northerly winds of 44 and at Galveston of 38 miles. 17th, northerly winds, and clearing or clear weather, with a rapid fall in temperature, prevailed in the Gulf States. By morning of the 18th, the highest pressure was central over the Southwest, and the isotherm of 50° run almost parallel with, and about fifty miles north of, the immediate Gulf coast. On the morning of the 19th the highest pressure extended from the Gulf coast to the Lakes; heavy frosts occurred from Texas to Georgia, and the isotherm of 40° passed almost centrally through the States of Arkansas, Mississippi, Alabama, and Georgia. During the 20th, 21st, and 22d this moved northeastward over the Atlantic States, gradually giving way in advance of the severe storm described as area No. XI. As this storm, in conjunction with the following high-pressure area, perpetuated the northerly winds and cool weather over the Gulf States a great check was given to the progress of the "yellow fever," and the mortality resulting therefrom commenced to decrease rapidly.

No. V entered the Pacific States from the westward on the 20th; during the 21st it

was central from Oregon to Arizona, and rapidly extended its influence over the country west of the Mississippi. Cautionary off-shore signals were ordered up at Indianola and Galveston during the morning, and were justified as follows: Indianola, 11:45 p. m., N. 40; Galveston, N. 38. 22d and 23d, the pressure was high in the Southwest, with morning frosts in Texas; on the morning of the 23d the minimum temperatures of the month occurred at New Orleans, Mobile, and Montgomery, and were 49°, 42°, and 38° respectively.

No. VI.—In rear of the preceding area the pressure fell in Oregon and Washington Territory, but rose again on the 22d, and, on the morning of the 23d, very high pressures again covered this section, where the barometer remained high until the 29th, after which this area probably moved southeastward during the 30th over the Rocky Mountain region and extreme Northwest to the Southwest, where it was central on the 31st.

No. VII appeared north of Montana on the 24th and 25th, at which time it was probably a part of the preceding area. On the morning of the 26th it covered the Northwest, and on the morning of the 27th was central over Nebraska and Kansas; morning of the 28th over the Ohio Valley, and by the morning of the 29th over the Atlantic States, whence it disappeared eastward. This area was attended by the lowest temperatures of the month, of which the following are the lowest yet received: On the 26th, at Fort Fred Steele, Wyo., —8°; Santa Fé Creek, N. Mex., frozen over; 27th, Dodge City, Nebr., 10°; 28th, Indianapolis, Ind., 23°; 29th, Washington and Albany, 30°, and Mount Washington, 10°. Cautionary off-shore signals were ordered up at Indianola and Galveston on the 25th, which were justified on the 27th, as follows: Indianola, 4:45 a. m., N. 44 miles, gale lasting 34 hours; Galveston, noon, N. 37; and along the Atlantic coast from North Carolina to New York at midnight of the 27th, which were also generally justified.

No. VIII appeared during the 24th as the eastern portion of an immense area of high pressure, extending thence to the Pacific. During the 25th and 26th it moved southeastward to the Atlantic Ocean, with clear and frosty weather in the Atlantic States.

Areas of low barometer.—Fourteen areas of low barometer have appeared within the limits of observation during the month, and the tracks of eleven of them are shown on Chart No. I; the other three only appeared for a short time over the Northwest. Three of them, Nos. II, IX, and XI, originated in southern latitudes, and, as they progressed northward, developed into the severest storms of the season.

No. I.—This was a continuation of depression No. XII, partly described in the September review. On the morning of the 1st it was central in Minnesota, and moved during the day over Lake Superior into Canada; brisk southerly winds, veering to westerly, and light rains prevailed in the Upper Mississippi Valley and Upper Lake region, but were followed by clearing weather at night. Cautionary signals were ordered for the Lake region, and were justified in the Upper Lake region by the following wind velocities, in miles per hour: Escanaba, 33; Milwaukee, 48; Chicago, 28; Grand Haven, 36.

No. II.—This was a West Indies cyclone, and probably the same storm that passed over Hayti on the 25th and 26th of September. By a study of the reports relating to international meteorology, its track has been traced from this date to the 9th or 10th of October, and is found to have followed the general course of the Gulf Stream. Heavy gales were reported in the straits of Florida from the 2d to the 5th, but our stations were only affected along the coast of North Carolina, during the 3d and 4th, where northeast gales and a heavy northeast sea swell were reported. Cautionary signals were ordered up on the morning of the 4th, although somewhat late, and were justified by the following velocities: Cape Lookout, 48; Cape Hatteras, 40; Kittyhawk, 44. Special dispatches giving information of its progress were sent on the 27th and subsequently to the South Atlantic ports.

No. III passed eastward over Minnesota and Manitoba during the 6th. On this and the following day occasional light rains and southerly veering to westerly winds prevailed in the Lake region, but the center of the area passed to the northward. Cautionary signals were ordered up at midnight of the 6th, along the Lake shores from Escanaba to Alpena, and were justified by high winds on the 7th as follows: at Milwaukee, 11 a. m., W. 30; Alpena, 9.45 a. m., S. 28.

No. IV probably developed in the Northwest on the 7th; during the greater part of the 8th it was central in Iowa, preceded by brisk southerly winds, with a temperature of about 85° from Northern Texas to southeastern part of Iowa, and followed by northerly winds, with a temperature below 50°, from Northern Nebraska to Minnesota; at 5:30 p. m., a tornado passed over the southwestern portion of the city of Monticello, passing off in a northeasterly direction. "It totally destroyed 10 dwelling houses, 2 churches, 9 barns and stables, ice-houses, &c., and damaged 42 other buildings; the day opened with a temperature of 55° at 7 a. m., wind S., and a little sprinkling of rain; temperature increased at noon to 73°, with gentle breeze from E., wind came from E. until arrival of tornado when a stronger current from the SW. took its place. The storm was accompanied with a loud roaring noise like the approach of a thousand trains of cars. Width of path ¼ mile, length about 10 miles, and velocity about 40 miles per

hour. In the center of the path débris mostly lay in a northeasterly direction, but on either side from every point of the compass." During the evening the center of low pressure moved to Lake Michigan, where it rapidly increased in energy, and, during the night, developed into quite a severe storm; thunder-storms prevailed from Iowa to Lower Michigan. 9th, it moved rapidly to the Saint Lawrence Valley and by midnight of the 10th had passed to the east of Cape Breton. Light rains and brisk to high southerly veering to westerly winds prevailed in New England, and the following items will serve to show the severity of this storm in the Lake region. Cautionary signals were ordered up at midnight of the 8th at all Lake stations, except Rochester and Oswego, which were ordered on the morning of the 9th, and although somewhat late for Lake Michigan, were still several hours in advance of the most severe portions of the storm. The maximum velocity of the wind occurred on the 9th as follows: Milwaukee, 12:50 a. m., NW. 36 miles; Grand Haven, 7:10 a. m., N. 38; schooner Bates was capsized during preceding night, and was driven ashore in morning, 40 miles south of station; schooner Tempest went ashore at Muskegon, morning of the 9th; in both cases the vessels were totally wrecked. Alpena, 10 a. m., NW. 32, "lake very rough", schooner Minor ashore, morning of 9th, total wreck; Port Huron, NW. 38; Detroit, 8 a. m., SW. 34; Toledo, SE. 31; Cleveland, 9:30 a. m., S. 36; Erie, 33; Buffalo, SW. 60; schooner S. A. Wood ashore, "severest gale of season"; Rochester, 11:15 a. m., W. 40; Oswego, 3:30 p. m., 32; schooner Grant blown ashore on rocks at entrance of harbor. At Sackett's Harbor, the arsenal and many other buildings were badly damaged, some totally demolished; along the east end of Lake Ontario, and in the Saint Lawrence River shipping suffered severely; on the lake the waves were 30 feet high; at Boonville, church spire blown down; at Earlville, buildings blown down and several persons injured. Cautionary signals were ordered along the Atlantic coast, during the morning of the 9th, from Eastport to North Carolina, and were justified as far south as Cape May.

No. V appeared in Oregon and Washington Territory on the 8th, accompanied by brisk to high south and west winds and light rain. 9th, it probably moved into Montana, and during the 10th passed over Minnesota to north of Lake Superior; thundershowers prevailed in the Upper Mississippi Valley, and cautionary signals were ordered for Lakes Superior and Michigan, which were justified by the following velocities: Duluth, NE. 28; Marquette, SE. 28; Milwaukee, SE. 27, and Escanaba, S. 36.

No. VI probably developed over the Gulf of Mexico during the 9th, and passed eastward over Northern Florida on the 10th, accompanied by heavy rains. 11th, moved northeastward off the South Atlantic coast, along which it produced severe northeast gales and heavy rains. Cautionary signals were ordered up from Smithville to Cape Henry on the afternoon of the 10th, and were justified as follows: Smithville, NE. 25; Cape Lookout, NE. 72: Cape Hatteras and Kittyhawk, NE. 52, and Cape Henry, NE. 46. At midnight of the 12th, the storm was central off Cape Hatteras, where it was encountered by the following vessels: Brig Florence May, October 11, strong ENE. breeze, increasing to gale, with heavy rain,—at midnight the wind hauled to NW. by N. and blew a hurricane; schooner Sea Nymph encountered hurricane October 11, and was abandoned October 13, in latitude 34° 15′ N., 76° 50′ W.; schooner Yellow Pine, in 34° 50′ N., 74° 40′ W., terrific hurricane from ENE., suddenly shifting to NW., lasting 12 hours; schooner Victor, 80 miles southeast of Hatteras, gale from NW., lasting 12 hours, then calm for 20 minutes, after which it blew furiously for 12 hours. 12th, continued to move northeastward off the coast, and by midnight was probably central between Cape Cod and Nova Scotia. Cautionary signals ordered up on the morning of the 11th, from Lewes to Sandy Hook, and at midnight of same day from New York to Boston, were justified during the 12th, as follows: Lewes, 40; Cape May, 48; Atlantic City, NE, 38; Barnegat, severe NE. gale, followed by high NW. winds, high tides and heavy sea; Sandy Hook, E. on the 11th, and N. on the 12th, 40; New York, NW., 32; New Haven, NE., 28; New London, 26; Newport, 48; Wood's Holl, 32, and Boston, 36. During the day the disasters to shipping, along the southern coast of New England, were very numerous, as will be seen by the following summary: Whaling bark Sarah left New Bedford at 7 a. m., while signal was flying, capsized at 5:30 p. m., and 22 of crew perished; schooner Moss Glen was wrecked 45 miles southeast of Cape Cod, 3 lives lost; schooner R. H. Shannon wrecked at Vineyard Haven, 1 life lost; schooner Etta A. Stimpson capsized near Norton Shoal, Martha's Vineyard, only one of the crew saved; at Vineyard Haven, Nantucket, and along the Cape Cod peninsula, over fifty vessels were driven ashore, and nearly all others were more or less damaged; six vessels were also sunk in deep water. These disasters indicate the storm to have been much more severe than it would seem to be from the registered velocities, and it is probable that the storm-center passed somewhat nearer the land than shown on Chart No. I. The lowest barometer at Wood's Holl was 29.48 at 11 p. m. The extent of the storm seawards is indicated by the following shipping notes: Latitude 40° 39′ N., 69° 21′ W., SSE. to NW., heavy gale, and high cross seas; 40° 20′ N., 69° 30′ W., at midnight, wind SE., moderate, shifting suddenly to N. and NNW., barometer falling from 30.00 to 29.00, wind increasing to hurricane, with terrific sea,

and continuing until 3 p. m. of the 13th; 32° 30′ N., 72° 40′ W., hurricane from NE. round to NW., lasting 24 hours; 38° 45′ N., 71° 30′ W., severe hurricane, lasting 12 hours; Bermuda, wind S., barometer 29.87; and in the evening a severe thunder-storm occurred, lasting 2 hours, during which 2 62 inches of rain fell. 13th. Storm passed rapidly eastward during early part of day, followed by decreasing northerly winds on the coast of New England. Heavy northerly gales and terrific seas were reported off the Nova Scotia coast, and by a study of the shipping notes, its track may be followed still further eastward. Cautionary signals, ordered up at Portland and Eastport on the morning of the 12th, were justified on the 13th at Portland, 9:45 a. m., N., 36., and Eastport, 6 a. m., N., 48.

No. VII appeared to the north of Montana on the 11th. On the 10th, heavy SW. gales prevailed at New Westminster, B. C., and at Victoria, V. I., and ship Majestic lost sails in a SW. squall off Neah Bay, Washington Territory, which may possibly have been due to this depression. 12th, it was central in the extreme Northwest, where the pressure was quite low, but unattended, so far as reports show, by precipitation or high winds. 13th, the pressure fell decidedly in Wyoming and Colorado, and occasional light rains fell thence to Manitoba and on Lake Michigan, with southerly winds. Cautionary signals were ordered up, morning of the 13th, at Milwaukee and Grand Haven, but were not justified, the highest velocity at Milwaukee, SW. 45, occurring from 6:30 to 7 a. m., before signal was hoisted. 14th, center of depression moved to Lake Michigan, accompanied by rising temperature and clear or partly cloudy weather; at midnight threatening weather and light thunder-showers were reported from Iowa to Michigan, and cautionary signals were ordered up from Escanaba to Alpena, which were subsequently justified by winds attending the following storm-area. 15th, moved northeastward over Canada.

No. VIII. During the latter part of the 13th and morning of the 14th a severe storm entered the Pacific States, with heavy rains and occasional brisk to high winds north of the 36th parallel. 14th, it moved eastward, and by night the lowest pressure extended from Nevada to Colorado and Wyoming, over which region brisk southerly winds prevailed; rain, changing to sleet and snow in the mountains, prevailed from the Pacific coast to Nevada, but thence eastward rising temperatures, and clear or fair weather. 15th, it moved into the Northwest, preceded by brisk to high south to east winds, and cloudy weather, with rain, occasionally quite heavy, thence to Lakes Huron and Erie. 16th, it moved northward into British America, with heavy rains from Minnesota to Lake Michigan, the winds veering to west and north, with snow, in Minnesota. 17th, the lowest pressure continued north of the Lake region, but cloudy and rainy weather extended thence to the Gulf and South Atlantic States, clearing away by night with cooler westerly winds from the Upper Lakes to the Gulf States. 18th, was probably over Lower Canada during the morning, but as a secondary depression had formed in the Atlantic coast States, this day's weather will be considered with area No. IX. The cautionary signals ordered up at midnight of the 14th on Lake Michigan were continued; signals were ordered up at noon of the 15th on Lake Superior; on the morning of the 16th on Lakes Huron and Erie, and on the morning of the 17th on Lake Ontario, and were all justified except at Oswego, as follows: Duluth, NE. 44; on the 16th at Escanaba, 1:15 p. m., S. 29; Milwaukee, 2:55 p. m., S. 48; Grand Haven, 36, for several hours; Alpena, 12:18 p. m., W. 26; Detroit, 12:15 p. m., SW. 28; Toledo, SE. 33; Erie, 26; Cleveland, S. 32, and Buffalo, 30.

No. IX probably originated during the 17th over the South Atlantic States, in the southern extremity of area No. VIII. On the morning of the 18th it was central in North Carolina and Virginia, with southerly winds from Wilmington to Norfolk, but northerly winds and rain from interior of Virginia to New Jersey. 18th, moved northward to Massachusetts, preceded by southerly winds and light rain along the immediate coast, but followed by cold northwest winds, high along the coast, and rain in the Middle States, Lower Lake region and Vermont. Ship Davis reported "hurricane 35 miles south of Sandy Hook." 19th, moved to New Brunswick, preceded by northeast gales and high winds in the Lower Saint Lawrence Valley, and followed, during latter part of day, by clearing weather from the Lower Lakes to New England. 20th, was probably central over the Gulf of Saint Lawrence; light rains and westerly winds prevailed over Lower Canada and northern part of Maine, and a severe westerly gale at Sydney, C. B., during which several schooners were damaged and driven ashore. Cautionary signals were ordered up morning of the 17th at Lewes and along the New Jersey coast, and in the afternoon at New York, which were changed to cautionary off-shore at midnight, and were justified as follows: Cape May, 17th, S. 30; 19th, westerly, 42; New York, 17th, S. 25; Sandy Hook, 19th, NW. 39. On the 18th cautionary signals were ordered up along the coast of New England, and were generally justified: New London, 19th, SE. by S. 42; Newport, SW. 36; Portland, 19th, 10:45 a. m., S. 26.

No. X. On the 18th and 19th the pressure fell from British Columbia to Manitoba, and on the morning of the 19th the pressure at Olympia, Wash., was 29.66, or 0.33 below normal; fresh to brisk southerly winds, partly cloudy weather and light rains prevailed in Washington Territory, Oregon, Nevada, and Montana. 20th, lowest press-

ure was in the Northwest, preceded by warmer southerly winds and clear weather from the Lakes to the Gulf, and followed by cold northwest winds, during which the following high velocities were recorded: Virginia City, 40 miles; Cheyenne, 48; Denver, 96; North Platte, 60; and Bismarck, on the 21st, 48; 21st, was central north of the Upper Lakes, and cloudy and rainy weather prevailed thence southward to Illinois as the winds changed to colder northerly. Cautionary signals were ordered up on Lakes Superior and Michigan on the morning of the 20th, and were justified as follows: Duluth, NE. 28; Escanaba, S. 26; Milwaukee, 20th, 2:30 p. m., S. 30; at Grand Haven the velocity did not exceed 24, but incoming vessels reported storm severe on lakes, with very heavy seas.

No. XI—This storm probably originated in the tropics, and but little is yet known of its early history. Dispatches from Havana reported a hurricane there on the night of the 21st, with heavy rains, during which much damage was done to buildings, and three schooners sunk. The 4:35 p. m. reports of the 19th gave a rainfall of 1.40 inches at Kingston, Jamaica, and northeast winds, cloud, and rain at Havana and Key West. On the 20th, at 4:35 p. m, the barometer was falling at Havana, but the midnight report and the morning report of the 21st were missing; a heavy rainfall occurred at Key West. 21st, Havana, 4:35 p. m., barometer 29.67, NW. 24, light rain. At Key West the wind backed from NE. 46, at 7:35 a. m., to 44, at 2 p. m., and NW. 27 at 10:41 p. m., with heavy rains during first part; lowest barometer at 2 and 4:16 p. m., 29.53; highest wind, 54 miles, during the morning; high northeast to north winds at Punta Rassa. Steamer Nueva Barcelona reported lost rudder in gale eight miles south of Saint Augustine light-house, and a severe gale from ENE. was also reported off Saint John's Bar, backing to N. during the21st and 22d, although at Jacksonville the wind did not exceed 17 miles. Steamer Juniata, at Wilmington on the 22d, reported terrific NE. gale and chopping sea between Charleston and Tybee during night of the 21st. 22d. On this day the following general conditions existed, viz: the pressure was generally above the normal west of the Mississippi, being highest in the Southwest, while a second area of high barometer extended from the Canadian maritime provinces southward over the Atlantic Ocean, the pressure at Bermuda being 30.19, and falling, with easterly winds, veering to southeast on the 23d, with rain. Between these high areas an extensive barometric depression existed, in which were situated two centers, namely, the one over the Lake region, being the southern extremity of area No. X, just considered, and the other the present storm, which moved with such fearful destruction from North Carolina to New York during the following day. During the 22d, the vortex of present storm probably moved northward, as shown on chart No. I, from east of Florida to the coast of North Carolina, being at 11 p. m. situated between Wilmington and Cape Lookout. The storm commenced at Wilmington at 3 p. m., wind E.; at 10:20 p. m., wind suddenly shifted from NE. to NW.; at 10:40 p. m., maximum velocity, NW. 36, occurred, and at 11:56 p. m., the lowest pressure, viz, 29.12; rainfall during storm, 2.92 inches. Cape Lookout, 11:02 p. m, barometer 29.05; SE. 68; maximum velocity since 4.37 p. m., 100 miles; rainfall during storm, 4.06 inches. Portsmouth, N. C., 11:04 p. m., SE. 82; rainfall, 3.48 inches. During the day Smithville reported E. 32, and Charleston 12:10 to 12:30 p.m., NE. 30 miles. The following shipping disasters occurred in this section: Cape Lookout, 1:30 a. m., 23d, steamer Florence Witherbee went ashore. South of Cape Henry, ship A. S. Davis was driven ashore; gale began at 8 p. m., 22d, and ship went ashore at 2 a. m., 23d; a total wreck; 19 lives lost and 1 saved; "the life-saving crew did their whole duty, but the tempest was so violent that human effort could avail nothing." One mile south of Cape Hatteras schooner Altoona driven ashore at 11:45 p. m., 22d; total loss. Schooner Magnolia wrecked in Albemarle Sound October 22d. Schooner Mary A. Hood, spoken a. m. 24th off Hatteras, leaking badly; lost sails; first officer washed overboard; 3 men disabled. Schooner Wm. Collyer went ashore 6 miles south of Barnegat at 2:40 a. m., 23d. Schooner Wyoming, for Port-au-Prince, lost both masts, &c., and had captain and one passenger washed overboard in trying to enter Beaufort (no date); was towed into Beaufort 28th. Steamer Gen. Barnes foundered on the morning of the 23d off Cape Hatteras; total loss. Steamer City of Houston encountered the gale on the night of the 22d; was abandoned and went ashore on Frying-pan Shoals, N. C., morning of the 23d. 23d, storm began at Kittyhawk at 6:30 p. m. of the 22d, and reached its maximum registered velocity at 2:00 a. m., SE., 88, when the anemometer was carried away; lowest barometer, 29.06, wind shifting suddenly to SW. At Cape Henry and Norfolk the wind shifted from SE. to SW. during the night, with maximum velocities of 84 and 44, respectively; lowest barometer at Norfolk, 7:00 a. m., 29.36; at Lynchburg the wind backed from NE. to NW., with heavy rain. On Chesapeake Bay the storm was terrific, and appears to have been felt the worst in the narrow portion between the mouth of the Patuxent and Barren Island. Steamer Express foundered off Barren Island with the loss of several lives; four or five other steamers and a large number of schooners and smaller craft were driven ashore or otherwise damaged. The barometric vortex passed almost directly over Washington, probably a little to the east; at 4:40 a. m., the anemoscope was swung suddenly from E. to S., and then back again, twice round the compass to W.,

settling down to NE., where it remained, with little or no wind, until 7:00 a. m., when it backed to NW., with the abrupt beginning of the NW. wind; the lowest barometer, 28.80, occurred about 7:15 a. m. At Annapolis, 7:30 a. m., the barometer was 28.82; at 5:45 a. m. the wind shifted from NE. to SE., and blew with great violence; 7:30 a. m., SW., moderating; heavy sea in harbor. Baltimore, maximum velocity at 5:00 a. m., SE., 45; lowest barometer, 7:37 a. m., 28.83. On Delaware Bay the storm was one of the worst ever experienced; a large number of vessels of all kinds were driven ashore, and at least eight lives lost. At Cape May the wind veered from E. to SE. and SW.; maximum velocity occurred at 5:45 a. m., E., 84 miles. At Philadelphia half-hourly observations were taken from 5 a. m. to noon, which show the lowest barometer, 29 18, to have occurred at 7:30 a. m.; the wind attained its highest velocity at 7:40 a. m, SE. 72 miles, as it veered from NNE. to SW.; great damage occurred in this city, entailing a loss variously estimated at between one and three million dollars; over seven hundred substantially built buildings were either totally destroyed or seriously damaged, eight vessels were sunk and twenty-two badly damaged, all bridges damaged, seven lives lost, and several persons injured; League Island, at the junction of the Schuylkill and Delaware Rivers, was almost submerged—the highest water occurring about 10 a. m., while storm was abating. As the storm passed over Eastern Pennsylvania much damage to property occurred in the Schuylkill, Lehigh, Lackawanna, Lebanon, and Wyoming Valleys; at Wilkesbarre one life was lost and several persons injured, and at Reading two lives were lost. Along the New Jersey coast very high tides occurred; Cobb's and Smith's Islands were entirely submerged, the water being higher than for twenty years past; all live stock was swept away; schooner H. I. Patter was totally wrecked at Five-mile Beach, and two of crew drowned; schooner Sarah Clark totally wrecked near Peck's Beach, four of crew lost; numerous other vessels also went ashore; Barnegat, SE. 72, and Atlantic City, E. 56, were the maximum velocities registered. The storm-center passed into the State of New York about noon, and thence over New England during latter part of day and morning of 24th. Its severity somewhat modified as it moved eastward, but the following maximum velocities, occurring on the 23d, will be found interesting: New York, 7 a. m., 50, continuing for several hours; considerable damage in vicinity. New Haven, 11 a. m., E. 40; storm very severe; schooner Mary Tyce wrecked; two lives lost. New London, E. 60; severest storm in forty years. Newport, SE. 36. Boston, SE., 40. Portland, 9 p. m., anemometer cups blown away; estimated velocity afterward, 70 miles. Oswego, 29. Rochester, 2:30 p. m., N. 28. Erie, 32; schooner totally wrecked. Cleveland, NW. 35. Very high tides occurred along the New England coast, and much damage resulted thereby to wharves and shipping. On the summit of Mount Washington, at 4:57 p. m., of 23d, the wind reached a velocity of 120 miles from SE. Cautionary signals were ordered up at midnight of the 20th at Key West; at noon of the 21st from Jacksonville to Charleston; during the afternoon and at midnight of the 21st from Smithville to Kittyhawk; during the 22d from Cape Henry to Boston, and on the morning of the 23d at Portland and Eastport; as the storm-vortex moved northward these signals were changed to cautionary off shore signals northward to New York, and both sets of signals were fully justified. Cautionary signals were also ordered up on the Lakes, from Alpena to Sandusky, at midnight of the 21st, and thence to Oswego during the 22d, and were justified along the Lower Lakes, as already seen.

No. XII possibly developed during the afternoon of the 23d in Wyoming and Colorado—barometers at Cheyenne and Denver 29.78 and 29.80, respectively, or 0.30 below normal—and moved southward in advance of high-pressure area No. VII, to Indian Territory, where it was apparently central, with rising pressure, during the 24th. 25th, it moved northeastward to the Lower Lakes, but with pressure above the normal, and it would be more correct to consider it as merely a depression existing between the high areas, Nos. VII and VIII, than as a low-pressure area; northerly winds, cloudy weather, and light rains prevailed from Missouri to Michigan. 26th, the lowest pressure, still however above the normal, continued in the Ohio Valley and Lower Lake region, accompanied by cloudy and rainy, cool weather. 27th, it moved northeastward down the Saint Lawrence Valley, with pressure slightly below the normal, and cloudy and rainy, cool weather from Lake Ontario to the Middle and East Atlantic coast and Lower Canada.

No. XIII appeared in the Northwest on the 17th, accompanied by snow and sleet in Montana and Dakota. 28th, was central over the Northwest, preceded over the Lake region by cool southerly winds, cloudy weather, and light snow or sleet. 29th, remained central in the Northwest, but was preceded by falling barometer, southerly or easterly winds, cloudy and rainy, cool weather thence to the Lake region, Middle and South Atlantic and Gulf States. 30th, it moved eastward over the Lake region, and cool, cloudy, and rainy weather prevailed east of the Mississippi generally, clearing away south of the Ohio Valley by midnight; cool northwest winds and snow prevailed, during latter part of day, over the Upper Lakes. 31st, it moved eastward to the Gulf of Saint Lawrence; cloudy and rainy weather prevailed in the northern portion of the Middle States and in New England, and cold north to west

winds, with snow, in Lake region and Ohio Valley, clearing away over western portions by night.

No. XIV appeared in Manitoba on the 31st, but its subsequent history belongs to the November review.

INTERNATIONAL METEOROLOGY.

The following miscellaneous notes relative to storms at sea do not include the numerous reports that have been made use of in locating the path of storm on chart No. I:

May 25, 8° 49′ S., 30° 47′ W., heavy S. gale.

July 2, off Algoa Bay, heavy NW. gale, lasting until the 17th. 18th, 19th, and 20th, 35° 40′ S., 165° 10′ W., heavy cyclone. 24th, 35° S., 24° 30′ E., heavy NW. gale, lasting twenty-four hours.

August 12, off Cape of Good Hope, strong westerly gales; 18th, same position, heavy gales. 20th, 14° 14′ S., 74° 23′ E., very heavy weather from SE. 26th, 28° N., 72° W., severe hurricane from SW. to NW. 27th, 30° 30′ N., 69° W., hurricane increasing to cyclone and continuing to 4 a. m. of 28th; 30° 09′ N., 70° 30′ W., hurricane; 28th, 33° N., 65° W., hurricane from SE., veered round to NW.; 33° 40′ N., 64° W., hurricane; brig Echo, spoken August 31 in 32° N., 61′ W., from Baltimore, reported hurricane August 28. 29th, 32° 57′ N., 60° 37′ N., severe hurricane.

September 4, 40 miles south of Guantanamo, Cuba, hurricane. 7th, off Guantanamo, Cuba, terrific gale and heavy sea, lasting 24 hours. 8th, off Riding Rocks, Bahama Banks, hurricane; 43° N, 46° W., a. m., heavy cross-seas—3 p. m., E. to NW., perfect hurricane—midnight, almost calm, sea mountains high—9th, 1a. m., wind from N. with redoubled force—11th, noon, 40° N., 40° W., weather moderate, vessel abandoned; 53° 54′ N., 31° 46′ W., sails carried away in a fresh breeze. 11th, 29° 40′ N., 80° 40′ W., at 4 a. m., brig Sally Brown passed, dismasted and waterlogged, sea making a clean breast over her; 120 miles S. of Cape Hatteras, hurricane. 12th, 14° 43′ N., 58° 55′ W., heavy hurricane from NNW., veering round to SW. 13th, 19° 20′ N., 54° 40′ W., heavy gale; Santa Anna, Mexico, gale, in which two barks and two schooners were driven ashore and became total wrecks. Brig Mary Knowlton, from Pernambuco, August 24, to New York, October 7, reported, September 13, heavy SE. gale, lasting until the 16th, when took hurricane from NNW., with heavy seas, lasting until 18th. 15th, 60° 10′ N., 10° W., cyclone lasting 9 hours, barometer 27.70. 16th, 21° 19′ N., 58° 30′ W., severe hurricane lasting through 17th. 17th, 13° 32′ N., 111° 20′ W., hurricane from W. to SE., lasting 16 hours; 26° 18′ N., 58° 40′ W., hurricane from SW., lasting 9 hours; brig Bogota reported September 16 to 18 from 21° 17′ N. to 23° 38′ N., and 57° 14′ W. to 59° 05′, reported hurricane September 17; on the banks of Newfoundland, hurricane from NE., lasting 24 hours. 21st, 49° 57′ N., 11° 23′ W., strong, variable winds, rain, high westerly sea. 22d, off Sable Island, heavy NE. gale, lasting 48 hours; 50° 12′ N., 17° 36′ W., strong variable winds and squalls, high westerly seas; 49° 47′ N., 6° 23′ W., stiff SW. breeze, high westerly sea. 23d, 50° 04′ N., 23° 25′ W., fresh NW. breeze and rain; 51° 26′ N., 13° 53′ W., moderate northerly gale; 51° 36′ N., 13° 04′ W., fresh NW. gale, cloudy, heavy W. sea; 49° 47′ N., 12° 33′ W., stiff NW. breeze, high W. sea. 24th, 49° 27′ N., 19° 34′ W., stiff NNW. breeze, high W. sea; 51° 28′ N., 19° 21′ W., strong NW. gale, cloudy, high W. sea. 25th, 49° 39′ N., 29° 37′ W., high sea; 48° 57′ N., 26° 21′ W., stiff NNW. breeze, high W. sea; 51° 25′ N., 25° 32′ W., strong NW. gale, clear weather, very high W. sea. 26th, 48° 16′ N., 33° 32′ W., decreasing WSW. wind and sea; 49° 57′ N., 14° 03′ W., high westerly swell. 27th, 49° 57′ N., 22° 02′ W., high NW. swell; 49° 37′ N., 39° 25′ W., heavy W. sea; 47° 19′ N., 40° 12′ W., high W. sea; off Grand Bank, Newfoundland, heavy N. gale. 28th, 10° N., 116° W., hurricane from WNW., veering to ENE., lasting 36 hours; 44° 58′ N., 51° 53′ W., strong NW. winds and hard squalls; 48° 08′ N., 46° 37′ W., moderate W. to SW., winds, squally, heavy NE. swell; 49° 54′ N., 29° 54′ W., fresh WSW. to WNW. breezes, squally, rough sea. 29th, 49° 34′ N., 16° 09′ W., WNW., squally; 49° 59′ N., 20° 30′ W., strong SW. breeze, high W. sea; 50° 55′ N., 29° 56′ W, strong WSW. breeze, heavy W. sea; 49° 22′ N., 37° 16′ W., strong NW. to SW. gale, westerly sea; 43° 22′ N., 51° 31′ W., moderate northwesterly gale; 46° 20′ N., 52° 16′ W., strong NW. gale, squally, high W. sea; 44° 46′ N., 53° 20′ W., NNW., stormy, high sea; 42° 18′ N., 56° 15′ W., moderate NW. gale, hard squalls; 33° 44′ N., 50° 55′ W., gale; steamer Lepanto, at Hull, October 13, from New York, reported, September 29, heavy gale from NW., with tremendous northerly sea. October 1, longitude 53° 30′ W., high seas. 2d, took NW. gale, which continued until vessel arrived at Southampton. 30th, 49° 18′ N., 16° 22′ W., W. squally; 46° 09′ N., 21° 30′ W., SW., squally; 49° 50′ N., 26° 41′ W., strong SW. breeze, high W. sea; 49° 36′ N., 36° 51′ W., strong WSW. breeze, heavy W. sea; 18° 19′ N., 43° 15′ W., heavy WNW. gale, squally, increasing sea; 42° 52′ N., 55° 52′ W., moderate northwesterly gale; 44° 10′ N., 56° 20′ W., heavy NNW. gale, fierce squalls, very high W. sea.

October 1, Buenos Ayres, four vessels driven ashore and some thirty lives lost during violent storm; 48° 42′ N., 23° 49′ W., strong westerly breeze and heavy sea; 48° 40′ N., 27° 34′ W. SW., squally; 49° 09′ N., 33° 12′ W., strong WNW. breeze with heavy

squalls; 48° 12′ N., 42° 45′ W., fresh westerly gale, heavy W. sea; 46° 30′ N., 49° 31′ W., NW. stormy, heavy rain showers. *Another* cyclone visited the south coast of Hayti, during which an American brigantine was wrecked at Tiburon and all hands lost. 2d, 48° 18′ N., 31° 26′ W., strong SSW. breeze and heavy sea; 47° 59′ N., 33° 19′ W., strong W., unsteady wind, with squalls; 50° 32′ N., 36° 44′ W., strong S. breeze, squally, heavy cross sea; 48° 12′ N., 39° 20′ W., strong WNW. breeze, with heavy squalls; 47° 46′ N., 46° 25′ W., NW. gale in morning, with passing showers; 46° 20′ N., 48° 57′ W., strong northerly breeze and squally. 3d, 51° 29′ N., 14° 35′ W., S. by W., squally; 47° 10′ N., 38° 25′ W., stormy weather from WNW.; 46° 46′ N., 38° 25′ W., W. to NW. by N., strong wind, heavy squalls, increasing to strong gale, squalls and high sea; 47° 10′ N., 44° 52′ W., strong WNW. breeze with heavy squalls; 48° 52′ N., 45 26′ W., long, heavy swell from NE.; 42° 30′ N., 48° W., northerly gale and tremendous sea, lasting until the 4th. 4th, 51° 12′ N, 22° 16′ W. SW., *squally with rain*; 45° 52′ N., 42° 16′ W., strong NW. to N. gale and high sea; 45° 03′ N., 44° 26′ W., NW. continued storm, squally; 45° 52′ N., 47° 26′ W., strong NW. gale and confused sea; about 45° N. 50° W. heavy NE. gale and sea lasting 24 hours; 45° 52′ N., 52° 30′ W., strong WNW. breeze with heavy squalls. 5th, 51° 26′ N., 15° 05′ W., southerly squalls; 50° 24′ N., 30° 23′ W., S and NE. fresh breezes, squally and rain. 6th, 49° 47′ N., 6° 23′ W., WSW. squalls 50°. 19′ N., 29° 47′ W, moderate NNW. gale; 49° 0′ N., 37° 30′ W., fresh northerly breeze, squally; 59° N., 50° 50′ W., *hurricane from* E. to N., lasting 8 hours. 7th, 49° 58′ N., 13° 30′ W., strong SW. breeze, high westerly sea; 51° 25′ N., 14° 53′ W, SW. squally; 51° 13′ N., 15° 39′ W.. NW. to SW. gale, *heavy seas, rain*; 50° 03′ N., 21° 31′ W., moderate N. gale; about 47° 36′ N., 30° 14′ W., heavy gale and seas; 38° 02′ N., 35° W., terrific cyclone from SE. by W. to N., barometer 28.02—8th 4 a. m. sea terribly confused—6 a. m. terrific hurricane, ocean one sheet of foam—10 a. m. moderating—4 p. m. heavy gale; 48° 54′ N., 36° 07′ W., strong gale and high sea; 48° 00′ N., 36° 10′ W. SE. hurricane, very high sea, lasting 8 hours; 47° N., 36° W., heavy SW. gale; 49° 57′ N., 33° 41′ W., noon, barometer 29.80, SE., force 3—4 p. m., barometer 29.54 SE., 4—8 p. m., 29.01 ESE., 6—10. p. m., 28.65 E., 10—fierce gale, terrific squalls—midnight, 28.72, ENE., 11, very heavy gale, hurricane squalls—8th, 4 a. m., 29.25, NE., 10., heavy gale, fierce squalls—noon, 48° 16′ N., 42.27, W., 29.85, N., 8 *fresh gale, hard squalls, heavy* NE. sea; 44° N., 40° W., hurricane from SSE. to SW. lasting six hours; 44° N., 42° W., heavy SW. gale, barometer 28. 82; 44° 21′ N., 42° 13′ W., hurricane; 44° 21′ N., 42° 13′ W., hurricane; 44° N., 44° W., cyclone and heavy gale from SW. to NW. lasting twelve hours; 47° 24′ N., 44° 04′ W., strong ESE gale, rain and high sea; 44° N., 46° W., cyclone from SE. to NW. lasting nine hours——barometer at noon 27.70; 44° 20′ N., 48° W., very heavy gale, barometer, 28.20; 45° 30′ N., 49° 52′ W., heavy gale; 40° 30′ N, 50° 40′ W., hurricane from ESE. to SSE,, lasting five hours; 40° 31′ N., 50° 40′ W., hurricane from ESE. to WNW., with terrific sea; 41° 30′ N., 56° W., hurricane from ESE. to NNW., lasting sixteen hours; steamer Somerset, *Bristol, October 2 to New York* 15th, reported, October 7, heavy gale from SE. with heavy cross-sea, increasing to hurricane, lasting eight hours, and suddenly shifting to NW. and N.—October 13, was between Sable Island and George's Shoals; ship Lennie, Belfast, September 30, to New York, October 30, reported October 7, heavy SE. gale, veering to NW. and increasing to perfect hurricane, barometer 28.30. 8th, 49° 22′ N., 18° 55′ W., strong NW. wind and high sea; 50° 21′ N., 20° 40′ W., moderate NW. to SW. gale, heavy westerly sea; 50° 51′ N., 20° 40′ W., NW; *strong gale, high sea*; 51° 13′ N., 22° 17′ W., strong to hard N. and NW. gale, very heavy seas; 54° 07′ N., 22° 26′ W., N. squally, heavy sea; 49° 42′ N., 26° 30′ W., heavy SW. to NW. *gale and dangerous sea*; 47° N., 40° W., hurricane from SE., barometer, 28.35; 46° 10′ N., 23° W., hurricane from ESE. lasting twelve hours, then heavy gale from ENE., lasting eighteen hours, very high sea: 45° 30′ N., 39° W., NE. hurricane lasting twelve hours, very high sea; 49° 16′ N., 41° 08′ W., strong NE. gale, veering to NNW.; 47° 19′ N., 41° 18′ W., strong northerly gale, high sea; 48° 16′ N., 42° 27′ W., fierce NE to SE. gale and high sea; 45° 19′ N., 50° 49′ W., NE. whole gale, high sea; 44° 37′ N., 54° 32′ W., SE. and NE., stormy, heavy rains; British Isles, severe *storm, 7th to 9th, lowest barometer* 28.75 to north of Ireland on the 8th. 9th, 49° 41′ N., 5° 22′ W., WSW. gales, very rough sea, heavy rains; 49° 22′ N., 23° 06′ W., strong SW. to NW. gale, *with hurricane-like squalls*; 50° 10′ N., 24° 57′ W., strong SW. gales and high seas; 49° 03′ N., 25° 20′ W., heavy SW. to N. gale, high sea; 51° 26′ N., 28° 22′ W., increasing NW. gale, terrible sea; 52° 50′ N., 29° 10′ W., fresh NE. to NW gale, very high sea; 49° 16′ N., 28° 03′ W., a. m., heavy NNW. gale and dangerous sea; 49° N., 39° W., gale with terrific sea; 45° 56′ N., 47° 38′ W., rain; 44° 30′ N., 54° W., *midnight 8th to 9th*, thunder-storm; 46° 23′ N., 51° 02′ W., fresh gale and high sea; 50° N., 51° W., hurricane lasting twelve hours; bark Consul Platen was dismasted and water-logged *October 9 and abandoned* October 13 in 49° 04′ N., 16° 07′ W. 10th, 49° 45′ N., 10° 28′ W., westerly gales, heavy thunder-storms, with "immense" rains; 51° 15′ N., 11° 51′ W., fresh NW. *gale and high sea*; 48° 36′ N., 27° 53′ W., NW. and SW., wild, breaking sea; 49° 16′ N., 30° 46′ W., strong SW. gale and high sea; 48° 18′ N., 31° 55′ W., moderate SW. gale; 48° 22′ N., 32° 37′ W., heavy seas, SE. wind and rain; 48° N., 32° W., severe gale; 51° N., 36° 12′ W., fresh S. and SW.

gales; 44° 47′ N., 52° 50′ W., strong northerly gale; 42° 19′ N., 62° 49′ W., fresh westerly gale, heavy sea; 41° 06′ N., 66° 58′ W., SW. and NW., stormy, heavy W. sea; 200 miles E. of Sandy Hook, hurricane from N. E., lasting twenty-four hours; off George's Shoals, hurricane from NNE. to NW., lasting twenty-four hours.

TEMPERATURE OF THE AIR.

The isothermal lines on chart No. II illustrate the general distribution of the temperature of the air for the month. By reference to the table, on the left side of chart it will be seen that the temperature has been above the average in the Southwest and for all districts east of the Mississippi River. In the Northeast the excess is from four to five degrees, and gradually diminishes south and westward; in the Northwest, and thence to the Pacific, it is below the average, especially in the Rocky Mountain region. The comparison for last section is not obtainable, owing to the reports from Pike's Peak not having come to hand, but the deficiency varies from 0°.4 at Santa Fé, to 8°.0 at Salt Lake City.

Minimum and maximum temperatures, respectively: *Maine*—Orona 24° and 72°; Mechanics' Falls, 25°, 75°; Eastport, 29°, 68°. *New Hampshire*—Mount Washington, 10°, 54°; Dunbarton, 17°, 79°. *Vermont*—Newport, 27°, 76°; Burlington, 32°, 76°. *Massachusetts*—Westborough, 25°, 78°; Boston, 33°, 79°. *Rhode Island*—Fort Adams, 41°, 76°; Newport, 36° 76°. *Connecticut*—Colebrook, 24°, 78°; Mystic, 36°, 84°. *New York*—Waterburg, 23°, 79°, ; Schroon Lake, 32°, 84°; New York City, 39°, 78°. *New Jersey*—Somerville, 28°, 79°; Jersey City, 40°, 84°. *Pennsylvania*—Franklin, 20°, 74°; Philadelphia, 38°, 80°; Pittsburgh, 28°, 84°. *Delaware*—Dover, 36°, 78°. *Maryland*—Woodstock, 25°, 78°; Emory Grove, 48°, 89°; Baltimore, 35°, 80°. *District of Columbia*—Washington, 30°, 81°. *Virginia*—Wytheville, 22°, 77°; Johnsontown, 41°, 84°. *West Virginia*—Helvetia, 27°, 77°; Morgantown, 27°, 80°. *North Carolina*—Murphy, 22°, 79°; Wilmington, 40°, 86°. *South Carolina*—Aiken, 42°, 82°; Charleston, 44° 84°. *Georgia*—McPherson Barracks, 31°, 88°; Atlanta, 35°, 80°; Forsyth, 42°; 90°. *Florida*—Milton, 38°, 86°; Houston, 47°, 90°; Key West, 66°, 90°. *Alabama*—Montgomery, 38°, 86°; Mobile, 42°, 89°. *Mississippi*—Brookhaven, 44°, 86°; Fayette, 37°, 86°. *Louisiana*—Okalooska, 37°, 88°; Shreveport, 38°, 90°; New Orleans, 49°, 87°. *Texas*—Fort McKavett, 28°, 98°; Concho, 32°, 93°; Laredo, 44°, 97°; Uvalde, 32°, 102°; Galveston, 50°, 87°. *Ohio*—Bellefontaine, 20°, 80°; Cincinnati, 30°, 82°; Columbus 26°, 81°; Cleveland, 29°, 80°. *Kentucky*—Danville, 24°, 85°; Louisville, 27°, 83°. *Tennessee*—Clarksville, 25°, 84°; Nashville, 30°, 84°. *Arkansas*—Mount Ida, 24°, 84°; Judsonia, 36°, 84°. *Michigan*—Escanaba, 17°, 69°; Marquette, 18°, 78°; Detroit, 24°, 79°; Grand Haven, 30°, 77°. *Indiana*—Spiceland, 18°, 79°; Fort Wayne, 27°, 85°; Indianapolis, 23°, 81°. *Illinois*—Riley, 17°, 78°; Cairo, 28°, 81°; Louisville, 25°, 90°; Chicago, 27°, 79°. *Missouri*—Oregon, 12°, 88°; Saint Louis, 26°, 85°; Ashley, 20°, 84°. *Kansas*—Dodge City, 10° 88°; Topeka, 15°, 93°; Leavenworth, 20°, 86°. *Wisconsin*—Neillsville, 17°, 73°; La, Crosse, 22°, 73°: Madison, 20°, 76°. *Iowa*—Tabor, 10°, 72°; Logan, 15°, 85°; Davenport, 23°, 80°. *Nebraska*—Sidney Banks, 0°, 83°; Fort McPherson, 10°, 87°; Omaha, 15°, 81°. *Indian Territory*—Fort Sill, 19°, 92°; Fort Gibson, 25°, 86°. *Minnesota*—Saint Anthony, 11°, 72°; Breckenridge, 12°, 79°; Duluth, 8°, 64°. *Dakota*—Pembina, 6°, 74°; Fort Stevenson, 8°, 78°; Yankton, 12°, 83°; Bismarck, 6°, 70°. *Colorado*—Summit, 4°, 50°; Fort Lyon, 8°, 88°; Denver, 10°, 83°. *Wyoming*—Fort Fred. Steele, 8°, 70°; Cheyenne, 4°, 73°. *Utah*—Salt Lake City, 22°, 78°. *Nevada*—Pioche, 19°, 79°; Winnemucca, 10°, 77°. *California*—Visalia, 39°, 88°; Los Angeles, 43°, 91°; San Francisco, 51°, 78; Red Bluff, 48°, 91°. *New Mexico*—Fort Union, 7°, 79°; Sante Fe, 18°, 85°. *Idaho*—Boise City, 19°, 74°. *Montana*—Virginia City, 9°, 64°.

Ranges of temperature.—The *monthly ranges* will appear from an examination of the maxima and minima just given. Greatest *daily ranges* vary in New England from 17° at Eastport to 30° at Springfield and 31° on summit of Mount Washington; Middle Atlantic States, 21° at Sandy Hook to 35° at Fort Whipple; South Atlantic States, 23° at Cape Lookout and Charleston to 32° at Charlotte; East Gulf States, 14° at Key West to 36° at Saint Marks; West Gulf States, 19° at New Orleans to 33° degrees at Corsicana; Ohio Valley and Tennessee, 28° at Cincinnati to 36° at Nashville and Knoxville; Lower Lake region, 24° at Buffalo to 32° at Rochester; Upper Lake region, 23° at Milwaukee to 29° at Alpena; Upper Mississippi Valley, 25° at Davenport to 29° at Saint Paul; Missouri Valley, 32° at Leavenworth to 40° at Omaha and Yankton; plains of Nebraska and Kansas, 45° at Dodge City and 49° at North Platte; Rocky Mountain stations, 34° at Virginia City to 51° at Santa Fé; Western Plateau, 32° at Pioche to 47° at Winnemucca; Pacific Coast, 21° at San Francisco to 43° at Los Angeles.

Frost injuring vegetation is reported as follows: Knoxville, Tenn., 20th; Cincinnati, Ohio, 19th, 20th, 28th; Wilmington, N. C., 20th; Gainesville, Ga., 19th to 21st; Vevay, Ind., 23d, 28th; Spiceland, Ind., 12th; Arlington, Ind., 23d; Muscatine, Iowa, 19th; Fallston, Md., 20th; Sandy Springs, Md., 29th; Lebanon, Mo., 18th; Plattsmouth, Nebr., 18th; White Plains, N. Y., 29th; Kensico, N. Y., 29th; Murphy, N. C., 13th Egypt, Pa., 29th; Charlotte, N. C., 20th. *First frosts* of season; Brookhaven, Miss.;

and Green Springs, Ala., 19th; Gulf Hammock, Fla., 23d; Jersey City, N. J., 29th; Princeton, Cal., 17th; Lenoir and Weldon, N. C., 13th.

Ice is reported to have formed as follows: Fort Wallace, Kans., 10th, ¼ inch; Fort Union, N. Mex., 11th; Morristown, Dak., 24th; Hennepin, Ill., 19th, ⅛ inch; Riley, Ill., 19th, ¼ inch; Mount Sterling, Ill., 22d.; Laconia, Ind., 12th, 13th, 19th, ⅛ inch; Fort Wayne, Ind., 28th, ¼ inch; Afton, Iowa, 18th, Guttenburg, Iowa, 19th; Cresco, Iowa, 22d, ½ inch; Fort Madison, Iowa, 31st, 2 inches; Monticello, Iowa, 27th, ½ inch; Independence, Kans., 22d, ⅛ inch; Holton, Kans., 18th, 31st; Creswell, Kans., 27th, ¼ inch; Bowling Green, Ky., 19th, 21st; West Waterville, Me., 29th, 30th; Gardiner, Me., 7th; Mechanic's Falls, Me., 28th; Fallston, Md., 27th; Fall River, Mass., 29th; Oregon, Mo., 18th; Plattsmouth, Nebr., 18th, ¼ inch; Genoa, Nebr., 18th, ¼ inch, 25th to 31st; Auburn, N. H., 29th, ⅛ inch; Trenton, N. J., 29th; Somerville, N. J., 29th; Linden, N. J., 22d; Wappinger's Falls, N. Y., 29th, ⅛ inch; Flushing, N. Y., 29th, ½ inch; Schroon Lake, N. Y., 25th; Murphy, N. C., 13th; Westerville, Ohio, 28th, 29th, ¼ inch; Ruggles, Ohio, 28th; Cincinnati, Ohio, 28th; Ringgold, Ohio, 20th, 29th, ½ inch; North Lewisburgh, Ohio, 26th, ⅛ inch, 28th, ½ inch; Pittsburgh, Pa., 31st; Catawissa, Pa., 7th, 13th, 21st, 22d, 26th, 28th, 29th; Fallsington, Pa., 29th; McMinnville, Tenn., 28th, 31st; Mount Solon, Va., 29th; Snowville, Va., 20th; Wytheville, Va., 18th, 19th; Dover Mines, Va., 29th, $\frac{1}{10}$ inches; Broad Oak, Va., 21st; Bloomfield, Wis., 19th; Neillsville, Wis., 19th, ¼ inch; Leavenworth, Kans., 27th; North Platte, Nebr., 11th; Denison, Tex., 27th; Saint Louis, Mo., 19th; Madison, Wis., 19th, 22d, 26th; Chicago, Ill., 31st; Buffalo, N. Y., 28th; Cairo, Ill., 19th, 23d, 28th, 31st; Morgantown, W. Va., 29th; Philadelphia, Pa., 29th.

Ground was reported *frozen* as follows: Southington, Conn., 29th; Mount Sterling, Ill., 27th; Nora Springs, Iowa, 22d; Holton, Kans., 31st; Mount Desert, Me., 29th; Auburn, N. H., 29th, $\frac{1}{10}$ inch; Bethel, Ohio, 28th; Strafford, Vt., 29th, ⅛ inch; Waupaca, Wis., 25th, to 31st, over 1 inch.

PRECIPITATION.

On Chart No. III is illustrated the general distribution of the rainfall for the month. On the left side is a table giving the average precipitation for October, which shows an excess in most districts, which is largest from Minnesota to the Lower Lakes and in the Southern States. The rainfall was about normal in New England and Oregon, but deficient over the Western plains and in Florida, where prairie fires and droughts occurred.

Special heavy rains.—1st, Pembina, Dak., 2.56 inches. 3d, Creswell, Kans., 3.00 inches in two hours, between 8 and 10 a. m. 9th, New Orleans, 2.10 inches. 10th, Thomasville, Ga., 4.97 inches; Saint Mark's, Fla., 3.30 inches; Mobile, Ala., 2.40 inches; Camp Barrancas, Fla., 5.39 inches. 11th, Cape Lookout, N. C., 3.30 inches; Smithville, N. C., 2.67 inches; Portsmouth, N. C., 3.26 inches; Thatcher's Island, Mass., 3.78 inches. 12th, Mendon, Mass., 3.00 inches; Wood's Holl, Mass., 2.56 inches; Newport, R. I., 3.11 inches; Boston, 2.93 inches; Westborough, Mass., 2.43 inches. 12th and 13th, Fall River, Mass., 3.30 inches. 13th, Newport, R. I., 3.31 inches. 16th, Pembina, Dak. (15th and 16th), 2.79 inches. 22d, Sandy Springs, Md., 3.57 inches. Cape Lookout, N. C., 4.06 inches; Wilmington, N. C., 3.12 inches; Smithville, N. C., 4.39 inches; Portsmouth, N. C., 3.48 inches. 22d and 23d, Emory Grove, Md., 5.00 inches; Weldon, N. C., 3.25 inches. 23d, Baltimore, Md., 2.60 inches; Westborough, Mass., 3.05 inches; Mendon, Mass., 3.45 inches. 23d and 24th, West Waterville, Me., 6.30 inches; Mechanic Falls, Me., 4.25 inches; Gardiner, Me., 4.91 inches; Dunbarton, N. H., 3.45 inches. 26th, Sterling, Ill., 3.50 inches. 29th, Camp Barrancas, Fla., 2.75 inches.

Largest monthly rainfalls.—Camp Barrancas, Fla., 9.93 inches; Mount Forest, Can., 9.86 inches; Cape Lookout, N. C., 9.20 inches; West Waterville, Me., 8.49 inches; Smithville, N. C., 8.29 inches; Kittyhawk, N. C., 8.21 inches; Portsmouth, N. C., 8.03 inches; Gardiner, Me., 7.81 inches; Thatcher's Island, Mass., 7.57 inches; Oswego, N. Y., 7.55 inches; Buffalo, N. Y., 6.86 inches; Erie, Pa., 6.83 inches; Cape Henry, Va., 6.80 inches; Boston, Mass., 6.76 inches; Waltham, Mass., 6.66 inches; Pembina, Dak., 6.61 inches.

Smallest monthly rainfalls.—Fort Union, Fort Craig, and Santa Fé, N. Mex., none; Laredo, Tex., and Fort Lyon, Colo., trace; Cheyenne, Colo., 0.04 inch; Fort Garland, Col., 0.08 inch; Winnemucca, Nev., 0.07 inch; Dodge City, Kans., and Pilot, Tex., 0.09 inch; Austin, Tex., 0.12 inch; North Platte, Nebr., 0.13 inch; Fort McPherson, Nebr., and Los Angeles, Cal., 0.14 inch; Stockton, Tex., 0.17 inch; Yankton, Dak., 0.18 inch; Morriston, Dak., 0.20 inch; Castroville, Tex., 0.21 inch; Sydney Barracks, Nebr., 0.24 inch; Norfolk, Nebr., 0.26 inch; Fort Wallace, Kans., 0.28 inch; Boise City, Idaho, 0.30 inch; Campo, Cal., 0.31 inch; San Buenventura, Cal., 0.34 inch; Concho and Boerne, Tex., 0.40 inch.

Drought.—Milton, Fla., 31st, very dry month, ground too dry for seed to germinate. Forsyth, Ga., 22d, many wells have failed; water courses so low that mills are only partially able to do their work. Vail, Iowa, 31st, ground very dry. Clarksville, Tex.,

first half of month severe drought. Austin, Tex., 31st, most severe drought ever known here.

Hail.—Fort Porter, N. Y., 30th; Summit, Colo., 5th.; New Harmony, Ind., 5th, 6th; Vevay, Ind., 18th, 22d, 27th, 30th; Guttenburg, Iowa., 1st, 8th; Cresco, Iowa., 8th, 10th; Tabor, Iowa., 15th; Boonsboro, Iowa, 10th; Independence, 17th; Fort Madison, Iowa, 8th; Creswell, Kans., 3d, 16th, 26th; Bowling Green, Ky., 27th; Springfield, Mass., 9th; Grand Rapids, Mich., 5th, 8th; Northport, Mich., 17th; Oregon, Mo., 6th, 16th; South Hartford, N. Y., 9th; Cape Vincent, N. Y., 29th, 31st; Margarette, Ohio, 27th; West Charlotte, Vt., 31st; Leavenworth, Kans., 10th; Burlington, Iowa., 8th; near Cleveland, Ohio, 18th; Newport, R. I., 31st.

Rainy days.—The number of days on which snow or rain has fallen varies as follows: New England, 8 to 18; Middle States, 7 to 12; South Atlantic States, 5 to 10; Gulf States, 5 to 12; Ohio Valley and Tennessee, 9 to 15; Lower Lake region, 12 to 18; Upper Lake region, 15 to 22; Upper Mississippi Valley, 9 to 14; Lower Missouri Valley, 6 to 13; Northwest, 9 to 13; Rocky Mountains, 0 to 10; Western Plateau, 0 to 8; Pacific Coast, 1 to 3.

Cloudy days.—For New England the number varies from 8 to 14; Middle States, 5 to 10; South Atlantic States, 5 to 9; Gulf States, 4 to 20; Ohio Valley and Tennessee, 6 to 11; Lower Lake region, 6 to 14; Upper Lake region, 11 to 14; Upper Mississippi Valley, 3 to 12; Lower Missouri Valley, 5 to 9; extreme Northwest, 9 to 21; Rocky Mountains, 0 to 12; Western Plateau, 0 to 3; Pacific coast, 1 to 0.

Snow.—5th, Kansas. 6th, Maryland, New Hampshire. 8th, Dakota. 9th, Kansas, 10th, Kansas. 11th, New Mexico, Kansas. 13th, Wyoming Territory. 16th, Dakota, Nebraska, Wyoming Territory. 17th, Minnesota, Indiana, Iowa, Dakota. 18th, Michigan. 19th, New York, New Hampshire. 20th, Wyoming Territory, New York, Vermont, Kansas, New Hampshire. 21st, Nebraska, Dakota, Iowa. 22d, Kansas, Illinois. 23d, Nebraska, Wyoming Territory, Kansas, Dakota, Maine. 24th, Dakota, Nebraska. Wyoming Territory, Iowa, New York, Colorado, Michigan. 25th, Kansas, Nebraska, Colorado, Dakota, Michigan. 26th, Kansas, Nebraska, Illinois, Indiana, Iowa, Michigan, Missouri, Wisconsin, Colorado, Dakota. 27th, Dakota, Indiana, Iowa, Michigan, Minnesota, Ohio, Wisconsin, Illinois, Pennsylvania, New Hampshire. 28th, Dakota, Minnesota, Iowa, Michigan, New York, Ohio, Pennsylvania, Wisconsin, New Hampshire. 29th, Dakota, Minnesota, New York, Iowa, West Virginia, Wisconsin, Nebraska, Michigan, Ohio. 30th, Illinois, Indiana, New York, Ohio, Wisconsin, Iowa, Michigan, West Virginia. 31st, New York, Indiana, Maryland, Ohio, Pennsylvania, Virginia, West Virginia, Michigan, Tennessee, New Hampshire. At the end of the month the depth of snow on ground was reported as follows: Cincinnati, Ohio, trace; Ringgold, Ohio, 1 inch; Pembina, Dak., 1 inch; Saint Paul and Duluth, Minn., 1 inch; Marquette, Mich., 4½ inches; Escanaba, Mich., trace; Madison, Wis., ½ inch; Chicago, Ill., ½ inch; Grand Haven, Mich., ½ inch; Alpena, Mich., 1 inch; Cleveland, Ohio, trace; Rochester, ½ inch; Oswego, ½ inch; Columbus, Ohio, ½ inch; Mount Washington, N. H., 2 inches. On the 12th, the observer at New Westminster, B. C., reported the snow on mountains almost to winter-line, one month earlier than the mean for the last five years. Heavy snow fell at the base of Pike's Peak October 26 and 27, while but little fell on the summit, where the weather has been remarkably mild and pleasant. At Summit, Central Pacific Railroad, 12.13 inches of snow fell during the month.

RELATIVE HUMIDITY.

The average percentage of relative humidity for the month ranges as follows: New England, 65 to 80; Middle Atlantic States, 62 to 77; South Atlantic States, 69 to 79; East Gulf States, 67 to 76; West Gulf States, 65 to 71; Lower Lake region, 63 to 73; Upper Lake region, 67 to 73; Ohio Valley and Tennessee, 59 to 71; Upper Mississippi Valley, 60 to 65; Lower Missouri Valley, 54 to 61; Red River of the North Valley, 69 to 78; Eastern Slope, from Dakota to interior of Texas, 52 to 70; Western Plateau, 24 to 54; California, 41 to 73. *High stations* report the following not corrected for altitude: Mount Washington, 88; Virginia City, 60; Cheyenne, 47; Denver, 28; Santa Fé, 23.

WINDS.

The prevailing winds at the Signal Corps stations are shown by arrows on chart No. II, by an examination of which it will be seen that they have been northerly along the Middle and South Atlantic States; southerly in New England and from the Lower Lakes to the Southwest, and northwesterly in the Upper Lake region, the Northwest, and thence westward.

Total movements of the air.—The following are the *largest* monthly movements recorded at the Signal Corps stations, viz: Cape May, 13,478 miles; Portsmouth, N. C., 12,292; Cape Lookout, 12,162; Kittyhawk, 11,841; Sandy Hook, 11,776; Thatchers' Island, 10,813; Dodge City, Kans., 10,558; Sandusky, 10,430; Cape Henry, 10,289; Barnegat,

10,152; Milwaukee, 10,150; Breckenridge, 10,115; Key West, 10,101; Grand Haven 9,957; Fort Sill, Ind. T., 9,836. *The smallest* are: Visalia, Cal., 1,574 miles; Knoxville 1,666; Lynchburg, 2,208; Augusta, 2,509; Uvalde, Tex., 2,625; Nashville, 2,764; Los Angeles, 2,869; Boise City, Idaho, 3,398; Davis, Tex., 3,463; Eagle Pass, Tex., 3,508; Montgomery, 3,636; Shreveport, 3,667; Springfield, 3,923; Fort Craig, N. Mex., 3,703; San Diego, Cal., 3,872.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily weather indications with the telegraphic reports for the succeeding twenty-four hours show the greatest percentage of omissions to be 0.4 per cent., and of verifications to be 87.5 per cent. The percentages of verifications for the four elements have been: weather, 90.7; wind, 83.7; temperature, 88.7; barometer, 87.0. The percentages of verifications by geographical districts have been: New England, 87.6; Middle States, 88.4; South Atlantic States, 87.3; East Gulf States, 87.2; West Gulf States, 89.1; Lower Lake region, 85.3; Upper Lake region, 87.4; Tennessee and Ohio Valley, 86.8; Upper Mississippi Valley, 89 4; Lower Mississippi Valley, 86.8. Of the 3,704 predictions that have been made, 63, or 1.7 per cent., are considered to have entirely failed; 16, or 4.4 per cent., were one-fourth verified; 409, or 11.1 per cent., were one-half verified; 295, or 8.0 per cent., were three-fourths verified; 2,776, or 75.0 per cent., were fully verified, so far as can be judged from the tri-daily weather maps.

Cautionary signals.—During the month 234 cautionary signals were displayed; 207, or 88.4 per cent., were justified by subsequent hourly velocities of 25 miles or over at or within 100 miles of the station.

Cautionary off-shore signals.—Thirty-two signals not included in the preceding were ordered up as cautionary off-shore signals; 25, or 78.1 per cent. of these were justified both as to velocity and direction. Sixty-two cautionary signals were changed to off-shore signals, and, as to velocity, are considered with the cautionary,—as to direction, 58, or 84 per cent., were justified. Fifty-nine cases were reported, generally from scattered stations, of winds of 25 miles or over when signals were not ordered.

NAVIGATION.

In the table on the right-hand of chart No. III are given the highest and lowest readings on the Signal Service river gauges during the month, with dates of same, from an examination of which it will be seen that the rivers have continued quite low throughout.

Ice in rivers.—Floating and shore ice was reported in the Missouri and Red River of the North, from the 26th to the 29th, at Fort Rice, Bismarck, and Pembina; at Morriston, Dak., the James River was frozen over on the 27th, but on the 31st all the ice had disappeared.

High tides.—Portsmouth, N. C., 3d, 4th; Tybee Island, S. C., 27th, 29th; Cape May, N. J., 23d, highest tide since 1821, all small objects swept before it; Dover, Del., 23d, highest tide known for years; Mount Desert, Me., 24th, 28th; Flushing, N. Y., 23d, in Flushing Bay, three feet higher than usual.

ATMOSPHERIC ELECTRICITY.

Thunder-storms.—1st, Minnesota, Illinois, Indiana, Iowa, Missouri, Nebraska, Wisconsin, Arizona, Michigan; 3d, Kansas; 4th, Illinois, Kansas, Missouri, Vermont; 5th, Colorado, Kansas, Missouri; 6th, Iowa, Missouri; 7th, North Carolina, Virginia; 8th, Texas, Illinois, Iowa, Michigan, Wisconsin, Kansas; 9th, New York, Connecticut, Illinois, Indiana, Kentucky, Maine, Massachusetts, Missouri, New Hampshire, New Jersey, Ohio, Vermont, Pennsylvania; 10th, Illinois, Iowa, Kansas, Missouri, Nebraska, Wisconsin; 11th, Indiana, Kentucky; 12th, Iowa, Wisconsin; 13th, Illinois, Iowa, Missouri, Ohio; 14th, Iowa, Michigan, Ohio, Wisconsin; 15th, Dakota, Maine, Michigan, Minnesota, Illinois, Iowa, Kansas, Missouri, Nebraska, New York, Wisconsin; 16th, Illinois, Iowa, Kansas, Michigan, Missouri, New York, Wisconsin; 18th, Iowa, Virginia; 22d, Virginia; 23d, Virginia; 25th, Indiana; 26th, Illinois; 27th, New Jersey; 30th, Tennessee, Virginia.

Auroras.—Bismarck, Dak., 21st; Madison, Wis., 25th; Escanaba, Mich., 19th; Eastport, Me., 21st; Fort Wayne, Ind., 12th, 31st; Nora Springs, Iowa, 16th; Cape Vincent, N. Y., 22d; Garrettsville, Ohio, 11th; Woodstock, Vt., 28th; Manitowoc, Wis., 19th.

Telegraphic communication interfered with by atmospheric electricity.—Boerne and McKavitt, Tex., 8th.

OPTICAL PHENOMENA.

Solar halos.—1st, Illinois; 2d, New York, Maryland, Ohio; 3d, California, Iowa; 4th, Ohio, Rhode Island, Connecticut; 5th, Rhode Island; 6th, Iowa; 7th, Connecticut, Illi-

nois, Indiana, Iowa, Maryland, New Jersey, New York, Ohio, Vermont, Maryland, Dakota, Georgia, Rhode Island; 8th, Connecticut, Indiana, Maine, New York, Ohio, Maryland, Dakota, Georgia, Rhode Island; 9th, Kentucky, Massachusetts, Maryland, Florida, South Carolina, Georgia; 10th, Indiana, Ohio, Maryland, North Carolina; 11th, Connecticut, Maine, Mississippi, New Jersey, New York, Ohio, Rhode Island; 12th, Indiana, Iowa; 13th, Indiana, New York, Ohio, Maryland; 16th, New York, Vermont, Maryland, North Carolina, South Carolina, Rhode Island; 17th, Connecticut, New Jersey, New York, Rhode Island; 20th, Maryland; 22d, New Hampshire, New Jersey; 25th, New York, Ohio; 26th, New Jersey, New York, Pennsylvania; 27th, New York, Pennsylvania; 29th, Indiana, New York, Ohio; 30th, Maryland.

Lunar halos.—1st, New York; 2d, Dakota; 3d, Illinois; 4th, Iowa, Massachusetts, Vermont, Rhode Island; 5th, Georgia, Illinois, Kentucky, Mississippi, Vermont, Nebraska; 6th, Illinois, Kentucky, Michigan, Mississippi, New York, Vermont, Nebraska, Missouri, Ohio; 7th, Florida, Indiana, Maine, Massachusetts, Ohio, Nebraska, Illinois, Connecticut; 8th, Connecticut, Florida, Maine, Massachusetts, Ohio, Vermont, Texas, Florida, Illinois, South Carolina, Georgia, New Jersey, Rhode Island; 9th, Connecticut, North Carolina, Vermont, Maryland, Nebraska, Florida, Michigan New York, Ohio, South Carolina, Georgia, Pennsylvania, Massachusetts; 10th, Illinois, Indiana, Iowa, Maryland, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Vermont, Maryland, New Hampshire, Connecticut, Maine; 11th, Maine, Ohio, New York; 12th, Illinois, Iowa, Wisconsin, Nebraska, Missouri, Pennsylvania; 13th, Connecticut, Indiana, Iowa, Massachusetts, New York, Ohio, Vermont, Rhode Island; 14th, Connecticut, Maine; 15th, Iowa, New York, Maine; 16th, Indiana, Iowa, Maine; 17th, New York, Illinois; 21st, New York; 22d, Maryland, Maine; 24th, New York; 28th, Indiana; 29th, Maine; 30th, Nebraska; 31st, New Jersey, Wisconsin.

Mirage.—Burlington, Vt., 20th; New London, Conn., 2d, 3d, 5th, 6th, 7th, 25th, 28th, 29th.

MISCELLANEOUS PHENOMENA.

BOTANICAL.—*Maine*—Cornish, 14th, forest foliage changed color; 10th, field strawberries and dandelions in bloom since the middle of last month, and some ripe fruit. *Massachusetts*—Somerset, 1st to 10th, harvesting corn. Fall River, in bloom, 21st. pear and some forest trees; 26th, trailing arbutus in full bud. Westboro, 1st to 29th, flowers blooming in field and garden. Waltham, 7th to 25th, forest leaves falling rapidly, 26th, almost stripped of leaves. *Michigan*—Northport, 31st, fall crops, corn, potatoes, and buckwheat very light. *Missouri*—Corning, 31st corn crop large, winter wheat in fine condition. *Mississippi*—Fayette, in bloom, 10th, peach, 24th, roses, crysanthemums, japonicas, &c.; 28th, second crop of mulberries. *New Hampshire*—Dunbarton, 31st, potato crop very poor, apples very abundant, largest crop ever known in this section. *New York*—Flushing, in bloom, 24th, pear. Wappinger's Falls, 1st to 14th, pears; 15th, currants; 21st, grapes and dandelions; 29th, marigolds and dahlias up to this date; 17th, hickory nuts and chestnuts ripening, green currant on bushes, grass still green; 19th, second crop of strawberries; 21st, spring trees in bud. Palermo, 1st, second crop of strawberries; 10th, second crop of raspberries; 6th, second crop of blackberries. Cape Vincent, 15th, second crop of apples, large as walnuts, second crop of barley harvested. *Ohio*—Ruggles, 31st, forest foliage falling, crops all good, except potatoes, which are nearly a failure; wheat looking well, but somewhat late. Cleveland, 1st, foliage fading. Ringgold, 31st, wheat medium size, corn crop excellent, grass large growth. *Texas*—Clarksville, 31st, cotton crop very good in some sections, but in others injured by boll-worm; harvesting progressing favorably. Melissa, cotton crop mostly gathered, weather favorable, harvesting corn progressing rapidly; most delicate vegetation still unharmed by frost; roses in bloom. *Virginia*—Keswick, 31st, foliage generally killed, leaves falling fast; heavy crop of persimmons; wheat very backward; winter oats looking well; sweet and Irish potatoes good crop; turnips good and cabbage poor. Dover Mines, 5th, harvesting corn; 10th to 31st, sowing wheat; 18th, wheat coming up. *Vermont*—West Charlotte, 4th, 21st, second crop of raspberries; in bloom, 31st, dandelions; 24th, forest leaves falling. Stratford, 12th, second crop of raspberries; in bloom, 23d, strawberries.

INSECTS—*Kaytdids.*—Fayette, Miss., 25th, last heard; Wappinger's Falls, N. Y., 8th, 9th. *Cotton-worm.*—Brookhaven, Miss., 8th, appearing; 11th, cotton fields stripped of leaves. *Locusts.*—Denver, Colo., no locusts seen during the entire month; Genoa, Nebr., 1st, 2d, flying SE; Fort Sill, Ind. Ter., 1st to 4th, very numerous and depositing eggs; 6th, 7th, going N. in great numbers; 11th, few going S; continued numerous until 14th; 15th to 26th, diminishing; 29th, disappearing; 30th, going S. in great numbers; 31st, "locusts have remained in this vicinity during the whole month, but diminished in numbers gradually; toward the latter part of the month they were about one-third as numerous as at the beginning. They have been depositing their eggs during the entire month, and with favorable circumstances for hatching this section with young locusts next spring." Decatur, Tex., 18th, locusts passing over station, but none alighting. *Beetles.*—Pembina, Dak., 11th, millions flying over station and swimming in Red River. *Butterflies,*—Daytona, Fla., 2d, 14th, flying S.

BIRDS.—*Owls.*—Oregon, Mo., 13th; Wappinger's Falls, N. Y., 9th. *Meadow-larks.*—Oregon, Mo., 14th, 15th. *Geese.*—North Platte, Nebr., 20th, 24th, 28th, flying S.; Chicago, Ill., 28th, S.; Cairo, Ill., 9th, 17th, 23d, S.; Morgantown, W. Va., 31st, S.; Camp Sheridan, Nebr., 23d, 24th, 25th, S.; Madison Banks, N. Y., 24th, S.; Princeton, Cal., 13th, numerous; Mystic, Conn., 2d, S.; Laconia, Ind., 18th, S.; New Corydon, Ind., 30th, S.; Monticello, Iowa, 21st, 28th, S.; Afton, Iowa, 14th, 30th, S.; Nora Springs, Iowa, 4th, S.; Tabor, Iowa, 31st; Boonesboro, Iowa, flying daily; Holton, Kans., 2d, 16th, 23d, S.; Creswell, Kans., 4th, 13th, 17th, 18th, 26th, S.; Independence, Kans., 2d, 21st, S.; Morse, Kans., 1st, S.; Empire City, Kans., 17th, S.; Mount Desert, Me., 23d, S.; Oregon, Mo. 12th, 21st, 31st, S.; Lebanon, Mo., 3d, S.; Plattsmouth, Nebr., 3d, S; Palermo, N. Y., 29th, S.; North Volney, N. Y., 22d, S.; Hulmeville, Pa., 17th, Catawissa, Pa., 19th, S.; Melissa, Tex., 18th, S.; Keswick, Va., 31st, S.; Dover Mines, Va., 17th, 19th, 20th, S.; Wytheville, Va., 6th, 10th, S.; Waupaca, Wis., 17th, 24th to 26th, S.; San Diego, 12th, SE.; Red Bluff, Cal., 11th, 12th, S.; Fort Gibson, Ind. T., 27th, S.; Corsicana, Tex., 20th, 25th, S.; Keokuk, Iowa, 9th, S.; Davenport, Iowa, 26th, S.; Cape Henry, Va., 11th, 17th, S. *Ducks.*—Pembina, Dak., 23d, flying S.; Dubuque, Iowa, 18th, S.; Madison, Wis., 1st, S.; Portsmouth, N. C., 26th, in great numbers; Tybee Island, Ga., 20th, S.; Camp Sheridan, Nebr., 23d, S.; Daytona, Fla., 20th, S.; Monticello, Iowa, 21st, 28th, S.; Boonsboro', Iowa, flying daily; Creswell, Kans., 20th, S.; Empire City, Kans., 17th, S.; Oregon, Mo., 31st, S.; Brookhaven, Miss, 8th, from N.; Fort Gibson, Ind. T., 27th, S.; Castroville, Tex., 11th, S.; Keokuk, Iowa, 9th, S.; Cape Henry, Va., 11th, 17th, S.; *Crows.*—Mount Desert, Me., 25th, S; Palermo, New York, 12th, S.; Ringgold, Ohio, 25th, 29th 30th, S.; North Lewisburg, Ohio, 24th, S.; Norwalk, Ohio, 18th, 31st, S. *Sparrows.*—Waltham, Mass., 18th, S. *Swallows.*—Tybee Island, Ga., 17th, in great numbers; Somerset, Mass., 25th, S.; Oregon, Mo., 13th, S.; Wappinger's Falls, N. Y. 9th, disappeared. *Cranes.*—Monticello, Iowa, 29th, flying S.; Boonsboro, Iowa, flying daily; Holton, Kans, 25th, S. *Quails.*—Oregon, Mo., 14th. *Snow Birds.*—Pembina, Dak., 30th.; Fayette, Miss., 28th, first seen; Lebanon, Mo., 10th, appearing; Flushing, N. Y., 2d, first appearance. *Pigeons.*—Dover Mines, Va., 9th, appeared. *Black Birds.*—Rochester, N. Y., 14th, flying S. E.; Anna, Ill., 7th, S.; Monticello, Iowa, 24th, S.; Cornish, Me., 9th, S.; Waltham, Mass., 20th, S.; Oregon, Mo., 13th; West Charlotte, Vt., 19th, immense flock flying S.; *Brants.*—Boonsboro, Iowa, flying daily; Holton, Kans., 16th, 23d, S.; Independence, Kans., 30th, S.; *Robins.*—Monticello, Iowa, 13th, flying S.; Oregon, Mo., 17th, 31st, S.; Keswick, Va., 31st, S.; Dover Mines, Va., 10th, 15th, S. *Blue Birds.*—Oregon, Mo., 31st, flying S.; Wappinger's Falls, N. Y. 6th; Palermo, N. Y., 19th. *Phebes.*—West Charlotte, Vt., 16th, disappeared.

Meteors.—Boise City, Idaho, 30th; Milwaukee, Wis., 4th; Gainesville, Ga., 10th; Vevay, Ind, 25th; New Corydon, Ind, 23d, 28th, 29th; Arlington, Ind., 22d, 24th to 31st; Topeka, Kans., 20th; Woodstock, Md., 1st, 2d, 6th, 8th, 14th, 16th 18th, 19th, 20th, 21st, 24th to 27th; Sandy Springs, Md., 6th; Fayette, Miss., 1st, 3d, 13th, 21st, 23d, 24th, 31st; Freehold, N. J., 24th, 26th; Vineland, N. J., 1st; Waterburg, N. Y., 6th, 16th, 24th; Palermo, N. Y., 1st; Hector, N. Y., 21st; North Volney, N. Y., 25th; Wappinger's Falls, N. Y., 6th, 13th, 16th, 26th, 29th; South Hartford, N. Y., 29th; Vernon Centre, N. Y., 24th; Westiville, Ohio, 14th; North Lewisburg, Ohio, 20th. At Navassa, W. I., on the 8th, about 9 p. m., a brilliant meteor was observed, moving from E. to W.

Polar bands.—New Corydon, Ind., 8th, 10th, 29th; Laconia, Ind., 13th; Guttenburg, Iowa, 31st; Gardiner, Me., 9th; Westboro, Mass., 15th; Oregon, Mo., 31st; Plattsmouth, Nebr., 31st; Auburn, N. H., 11th, 23d; Freehold, N. J., 10th; Woodstock, Vt., 7th, 9th, 11th, 13th, 15th; Wytheville, Va., 3d, 6th, 13th, 14th, 23d, 24th; Washington, D. C., 2d, 6th, 15th, 19th, 31st.

Zodiacal light.—Daytona, Fla., 1st, 9th, 25th, 30th; New Corydon, Ind., 1st, 2d, 3d, 6th, 7th, 8th, 24th, 25th, 28th; Monticello, Iowa, 2d, 11th, 18th; Waterburg, N. Y., 8th in the morning; Cape Vincent, N. Y., 17th.

Prairie and forest fires.—Neah Bay, Wash., 3d, recent rains had extinguished the forest fires in that section; Hat Creek, Wyo., 8th; Los Angeles, Cal., 21st, 24th, raging in mountains south of Anaheim; San Diego, Cal., 17th, on hills southeast of station; 20 to 40 miles east of Pike's Peak, Colo., 8th, 12th, 13th, 23d; North Platte, Nebr., 8th, 13th, 19th, 20th; Pembina, Dak., 3d, 4th, 5th, 6th, 8th, 9th, (10th, telegraph poles burned down,) 24th, 27th; Lead City, Dak., 14th; Fort Gibson, Ind, T., 1st, 11th, 17th, 18th, 19th, 21st, 22d, 23d, 24th, 25th, 31st; Dodge City, Kans., 2d, 13th, 20th, 21st 22d, 29th, 30th, 31st; Yankton, Dak., 3d, 11th, 12th, 20th, 22d; Bismarck, Dak., 5th, 6th, 7th, 8th, 18th, 19th, 20th; Corsicana, Tex., 25th; Breckenridge, Minn., 6th, (9th, office and part of village threatened;) Camp Sheridan, Nebr., 8th, 9th, 10th, 12th; Summit, Col., 26th, large forest fires; Creswell, Kans., 1st, 6th, 10th, 19th to 25th, 28th; De Soto, Nebr., numerous throughout month; Genoa, Nebr., 10th, 12th, 13th, 15th.

Earthquakes.—San José de Costa Rica, *August* 30, 0:23 a. m., feeble shock. *September*, night of 8th and 9th, "reverberations;" 24th, 5 a. m., and 6:55 p. m., feeble shocks; 29th, 7:45 a. m., feeble shock, 7:15 p. m., feeble shock. *October* 11, 5 p. m., feeble shock. A letter dated Alton Island, Alaska, September 1, states "that frequent shocks occurred

during the summer in conjunction with renewed activity of the numerous volcanoes of the Aleutian Islands; Amukhta and Ichegula were emitting smoke and occasionally fire and lava; on the 29th ultimo, the village of Makuslin, on Unalaska Island, was destroyed by earthquake shocks and tidal waves." *September* 30, United States naval hospital, Yokohoma, Japan, 5:32 a. m., slight shock. *October* 2, Santiago de Cuba, slight shock. 4th, 2:30 a. m., along both sides of the Hudson, from Marlboro to Peekskill; at West Point people were aroused from sleep; at Garrison's, persons aroused, house jarred, furniture moved and crockery rattled; at Highlands, people aroused; at Peekskill, 2:30 a. m., shock seemed to come from north and pass south, the earth seemed to rock for several seconds, houses were shaken and crockery rattled; at Marlboro farmers report hearing rumbling, resembling blasting of rocks, for two days previous, main shock felt at 2:30 a. m.; at Newburg, 2:40 a. m., rumbling noise followed by sharp shock and another rumbling, the whole lasting about half a minute, windows rattled and people were aroused from sleep; at Cold Spring shock lasted several minutes and buildings were shaken; at Ardenia, 2 to 3 a. m., distinct shock; the shock was also specially felt in the hilly region (the "Highlands") to the west of the river. 21st, Sacramento, Cal., 5.40 p. m., two distinct shocks from north to south, lasting a few seconds.

Sunsets.—The characteristics of the sky at sunset, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Corps stations. Reports from 125 stations show 3,844 observations to have been made, of which 42 were reported doubtful, of the remainder 3,328 or 88.6 per cent. were followed by the expected weather.

Sun-spots.—Monthly record of observations by Mr. D. P. Todd, Nautical Almanac office, Washington, D. C.:

October, 1878.	No. of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	
1—4 p. m	0	0	0	0	0	0	0	0	
2—5 p. m	0	0	0	0	0	0	0	0	
3—5 p. m	0	0	0	0	0	0	0	0	
4—4 p. m	0	0	0	0	0	0	0	0	
5 p. m	0	0	0	0	0	0	0	0	
6—1 p. m	0	0	0	0	0	0	0	0	
8—4 p. m	0	0	0	0	0	0	0	0	
9—4 p. m	0	0	0	0	0	0	0	0	
10—2 p. m	0	0	0	0	0	0	0	0	
12—5 p. m	0	0	0	0	0	0	0	0	Faculæ.
13—1 p. m	0	0	0	0	0	0	0	0	Faculæ.
14—4 p. m	0	0	0	0	0	0	0	0	
15—3 p. m	0	0	0	0	0	0	0	0	
16—4 p. m	0	0	0	0	0	0	0	0	
18—4 p. m	0	0	0	0	0	0	0	0	
19—4 p. m	0	0	0	0	0	0	0	0	
28	1	1	0	0	1	1	1	1	
29	1	2	0	0	0	0	2	3	
31	0	0	0	0	0	0	1	1	

Prof. Gustavus Hinrichs, at Iowa City, Iowa, reports: "No sun-spots were seen until the last day of the month, when a very large round spot was seen so far from the sun's rim that it would have been visible to us on the 29th had the weather permitted the examination of the sun's disk." Mr. J. Harcourt, at Wappinger's Falls, N. Y., examined the sun's disk on the 6th, 13th and 20th, but saw no spots. Mr. H. D. Gowey, at North Lewisburg, Ohio, observed one spot on the 29th. At Waterburg, N. Y., Mr. David Trowbridge, observing with a refractor and power of 55 diameters, reports no spots on October 3d, 5th, 6th, 7th, 8th, 11th, 13th, 17th, 20th, 21st, 22d, 24th, 25th, 26th, 28th, 29th, observations generally made in the morning. November 1, 1 p. m., saw one spot one-third the way across the solar disk; 2d, same spot still visible.

NOTES AND EXTRACTS.

Lightning conductors.—A very useful paper on lightning conductors was read at the British Association for the Advancement of Science, by R. Anderson. He asserts that the terrible losses that are caused by lightning is to be attributed to the grosest negligence in neglecting to provide lightning conductors, in placing them in the wrong positions, and in omitting to have them properly tested and protected so as to secure

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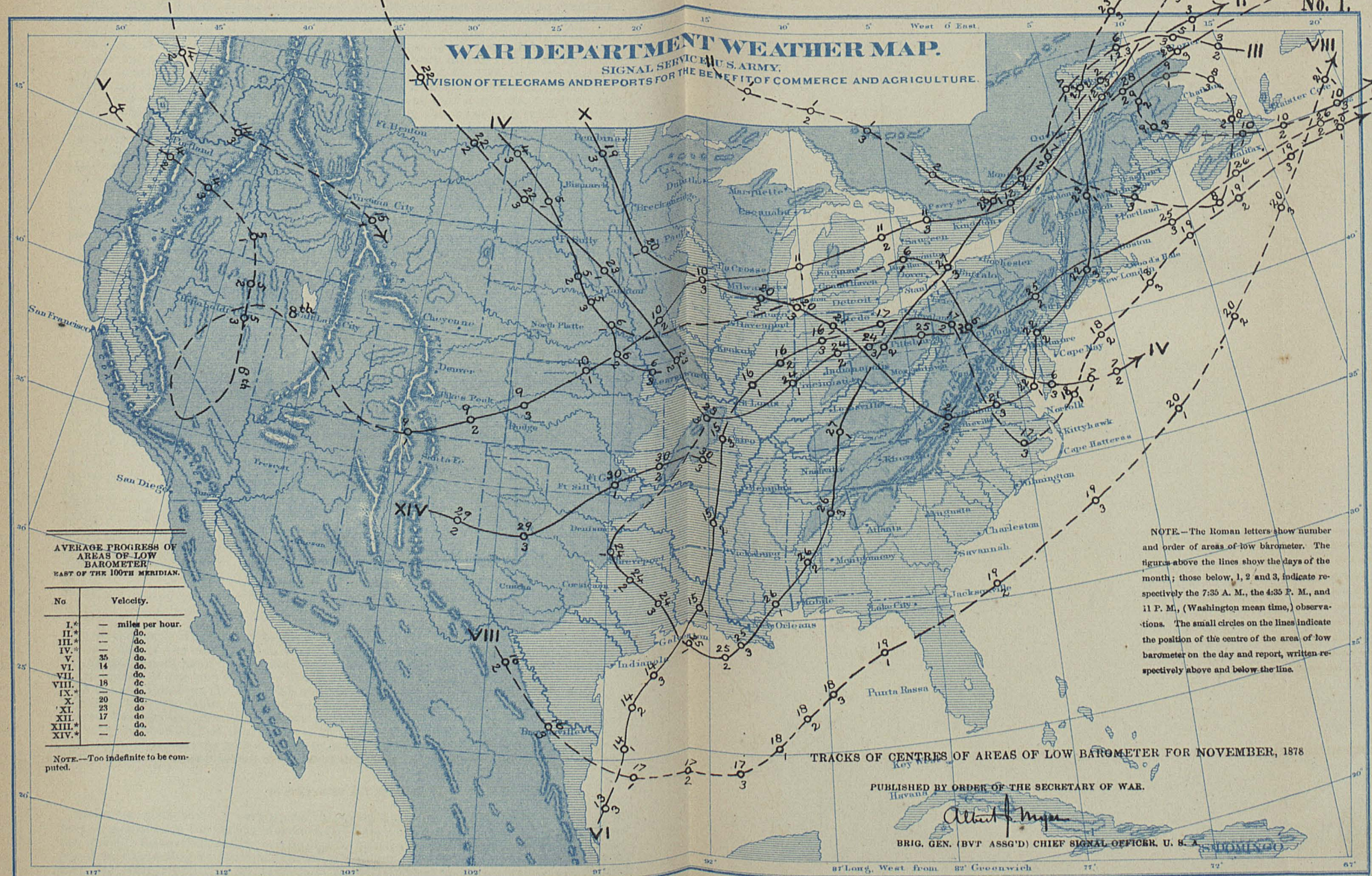
No. 1.

WAR DEPARTMENT WEATHER MAP.

SIGNAL SERVICE U. S. ARMY.

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.



AVERAGE PROGRESS OF AREAS OF LOW BAROMETER EAST OF THE 100TH MERIDIAN.

No	Velocity.
I.*	— miles per hour.
II.*	— do.
III.*	— do.
IV.*	— do.
V.	35 do.
VI.	14 do.
VII.	— do.
VIII.	18 do.
IX.*	— do.
X.	20 do.
XI.	23 do.
XII.	17 do.
XIII.*	— do.
XIV.*	— do.

NOTE.—Too indefinite to be computed.

NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7:35 A. M., the 4:35 P. M., and 11 P. M., (Washington mean time,) observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.

TRACKS OF CENTRES OF AREAS OF LOW BAROMETER FOR NOVEMBER, 1878

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

Albert J. Myer

BRIG. GEN. (BVT ASSG'D) CHIEF SIGNAL OFFICER, U. S. A.

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AVERAGE TEMPERATURES FOR NOVEMBER.

DISTRICTS.	Average for November, Signal Service Observations. For several years.	For 1878.	Comparison of November, 1878, with the average for several years.
St. Lawrence valley	31°.6	32°.6	1°.0 above.
New England	37 .2	40 .3	3°.1 above.
Middle Atlantic States	43 .6	47 .0	3°.4 above.
South Atlantic States	56 .4	57 .0	0°.6 above.
Gulf States	59 .4	60 .2	0°.8 above.
Ohio valley and Tennessee	43 .6	48 .0	4°.4 above.
Lower Lake region	36 .1	39 .1	3°.0 above.
Upper Lake region	32 .0	38 .0	6°.0 above.
Upper Mississippi valley	34 .3	42 .1	7°.8 above.
Lower Missouri valley	28 .7	45 .7	7°.0 above.
Upper Missouri valley	23 .8	37 .5	13°.7 above.
Minnesota	22 .2	34 .6	12°.4 above.
Rocky Mountains stations	31 .3	34 .7	3°.4 above.
Pacific Coast	53 .5	53 .6	Normal.

TEMPERATURES OF WATER FOR NOVEMBER, 1878.

STATIONS.	Temperatures at bottom. Maximum.	Minimum.	Average depth of water. Feet.
	—°	—°	—
Alpena	66	56	6
Augusta	56	47	11
Baltimore	47	37	13
Buffalo	51.5	45	18
Burlington, Vt.	63	54	42½
Charleston	44	39	8
Chicago	48	39	14
*Cleveland	43.5	39	21
Detroit	42.5	36	14
Duluth	48.5	44	17
Eastport	45	38	21½
Escanaba	72	52	12⅔
Galveston	44	37	19
Grand Haven	68	61	18
Jacksonville	78	69	16½
Key West	42	38	15½
†Marquette	39	35	15
Milwaukee	67	59	14
Mobile	57.5	47	11⅔
New London	55	46	15½
New York	53.5	49	24
Norfolk	50	41.5	26
Portland, Maine	—	—	—
Punta Rassa	—	—	—
San Francisco	44.5	38.5	10
Sandusky	53	40.5	17 1-6
St. Marks	61	55	9
Savannah	45	39	9¾
Toledo	64	49	12½
Wilmington	57	45	8

*23 days only.
†24 days only.

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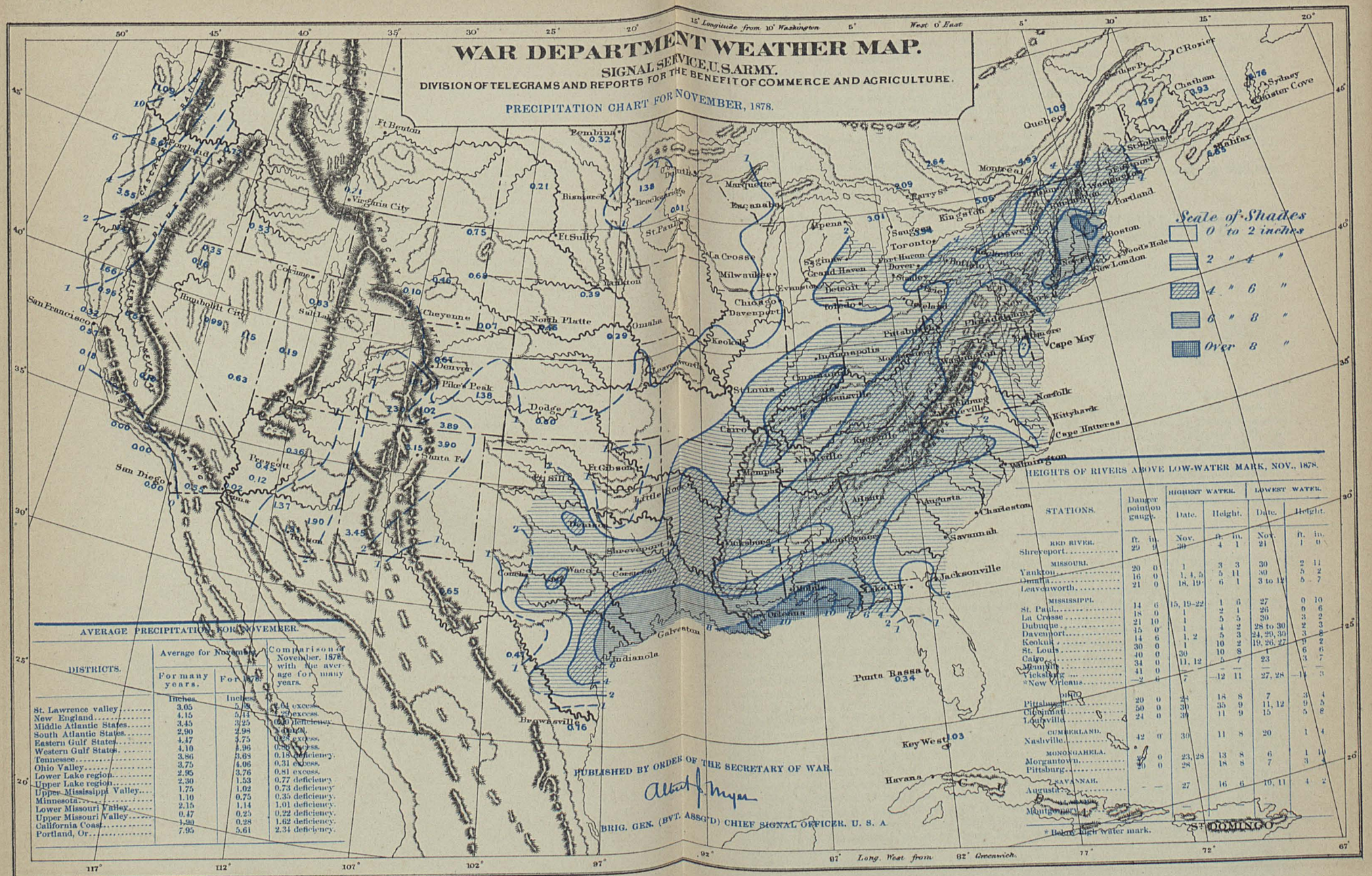
WAR DEPARTMENT WEATHER MAP.

SIGNAL SERVICE, U.S. ARMY.

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

PRECIPITATION CHART FOR NOVEMBER, 1878.



AVERAGE PRECIPITATION FOR NOVEMBER.

DISTRICTS.	Average for November. For many years.	Average for November. For 1878.	Comparison of November, 1878, with the average for many years.
	Inches.	Inches.	
St. Lawrence valley	3.05	5.08	2.03 excess.
New England	4.15	5.11	0.96 excess.
Middle Atlantic States	3.45	3.25	0.20 deficiency.
South Atlantic States	2.90	2.98	0.08 excess.
Eastern Gulf States	4.47	5.75	0.28 excess.
Western Gulf States	4.10	4.96	0.86 excess.
Tennessee	3.86	3.68	0.18 deficiency.
Ohio Valley	3.75	4.06	0.31 excess.
Lower Lake region	2.95	3.76	0.81 excess.
Upper Lake region	2.30	1.53	0.77 deficiency.
Upper Mississippi Valley	1.75	1.02	0.73 deficiency.
Minnesota	1.10	0.75	0.35 deficiency.
Lower Missouri Valley	2.15	1.14	1.01 deficiency.
Upper Missouri Valley	0.47	0.25	0.22 deficiency.
California Coast	1.90	0.28	1.62 deficiency.
Portland, Or.	7.95	5.61	2.34 deficiency.

HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, NOV., 1878.

STATIONS.	Danger point on gauge.		Highest water. Date.	Highest water. Height.		Lowest water. Date.	Lowest water. Height.	
	ft.	in.		ft.	in.		ft.	in.
RED RIVER.								
Shreveport	29	9	30	4	1	21	1	0
MISSOURI.								
Yankton	20	0	1	3	3	30	2	11
Omaha	16	0	1, 4, 5	5	11	30	5	2
Leavenworth	21	0	18, 19	6	1	3 to 12	5	7
MISSISSIPPI.								
St. Paul	14	6	15, 19–22	1	6	27	0	10
La Crosse	18	0	1	2	1	26	0	6
Dubuque	21	10	1	5	5	30	3	2
Davenport	15	0	1	4	2	28 to 30	2	3
Keokuk	14	6	1, 2	5	3	24, 29, 30	3	8
St. Louis	30	0	1	10	2	19, 26, 27	0	2
Cairo	40	0	30	10	8	1	6	6
Memphis	34	0	11, 12	5	7	23	3	7
Vicksburg	41	0	—	—	—	—	—	—
*New Orleans	2	6	7	12	11	27, 28	1	3
OHIO.								
Pittsburgh	20	0	28	18	8	7	3	4
Cincinnati	50	0	30	35	9	11, 12	0	5
Louisville	24	0	30	11	9	15	5	8
CUMBERLAND.								
Nashville	42	0	30	11	8	20	1	4
MONONGAHELA.								
Morgantown	10	0	23, 28	13	8	6	1	10
Pittsburg	20	0	28	18	8	7	3	4
SAVANNAH.								
Augusta	—	—	27	16	6	10, 11	4	2
ALABAMA.								
Montgomery	—	—	—	—	—	—	—	—

* Below high water mark.

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Albert J. Myer

BRIG. GEN. (BVT. ASS'T) CHIEF SIGNAL OFFICER, U. S. A.

their constant efficiency. These matters are attended to very systematically in France, but much neglected in England and America.

Sun-spots and rainfall.—A paper by C. Meldrum of some interest upon this subject is published in a recent number of "Nature." He therein compares Wolf's sun-spot numbers with the rainfall at Madras, 1816–'77; Edinburgh, 1824–'72; Paris, 1824–'72, and concludes that there is an intimate connection between sun-spots and rainfall. This paper is followed by one by Mr. F. Chambers, who compares the Bombay barometric observations with the sun-spot record, and thinks that they lead to the conclusion that the sun is hottest about the time of maximum spots, and coldest at time of minimum spots.

Auroras.—In the report of C. Weyprecht on the aurora observations of the Austro-Hungarian Arctic Expedition, 1872–'74, he states that after careful study he finds no connection between the aurora and the subsequent wind or weather.

Balloons.—An important work on the application of the balloon to science and meteorology has just been published by Tissander, of Paris.

Published by order of the Secretary of War.

ALBERT J. MYER.
Brigadier-General (Brevet Assigned) Chief Signal Officer, U. S. A.

PAPER 34.

MONTHLY WEATHER REVIEW, NOVEMBER, 1878.

INTRODUCTION.

In compiling the present review the following data, received up to December 14, have been made use of, viz: the regular tri daily weather charts, containing the data of simultaneous observations taken at 119 Signal Service stations and 11 Canadian stations, as telegraphed to this office; monthly journals and means, 117 and 141 respectively from the former, and monthly means from 13 of the latter; reports from 22 special sunset stations; 228 monthly registers from voluntary observers; 40 monthly registers from United States Army post-surgeons; marine records; international simultaneous observations; monthly reports from voluntary observers and local weather services of the States of Iowa and Missouri; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

Upon Chart No. II is shown by the isobaric lines the general distribution of the atmospheric pressure, reduced to sea-level, for the month. Compared with the means for October of previous years, the pressure for the present month is slightly above normal west of the Rocky Mountains, and slightly below east of that region, the greatest deficiency is over the New England States.

The local barometric ranges for the month, as reduced to seal-level, have been largest over New England and the Middle States, from which region they have gradually decreased south and westward to the Gulf and Pacific coasts. Taken by districts, they vary as follows: New England, 1.60 inches at Boston and Springfield to 1.40 at Burlington and 1.18 on the summit of Mount Washington; Middle States, 1.60 at Sandy Hook to 1.36 at Lynchburg; South Atlantic States, 1.08 at Cape Lookout to 0.69 at Jacksonville and 0.67 at Tybee Island; Gulf States, 0.75 at Montgomery to 0.61 at Indianola, and 0.39 at Key West; Ohio Valley and Tennessee, 1.20 at Pittsburgh to 0.87 at Cairo; Lake region, 1.41 at Oswego to 0.84 at Duluth; Upper Mississippi Valley and Minnesota, 0.97 at Des Moines to 0.83 at Saint Paul, and 0.90 at Pembina; Missouri Valley, 1.06 at Yankton to 0.80 at Bismarck; eastern slope of Rocky Mountains and interior of Texas, 0.96 at North Platte to 0.63 at Deadwood, Dak., and 0.47 at Fort Davis, Tex.; Rocky Mountain stations, 0.63 at Virginia City, Mont., to 0.45 at Cheyenne; 0.58 on summit of Pike's Peak; Western Plateau, 0.84 at Boise City to 0.70 at Pioche; California, 0.75 at Red Bluff to 0.57 at San Diego.

Areas of high barometer.—Nine of these have been well marked areas, and a brief description of each is given below. Three of them, Nos. II, III, and V, first appeared over the Northwest; four, Nos. IV, VII, VIII, and IX, over Oregon and Washington Territory, and one, No. VI, over California. Their paths were similar, those appearing in the Northwest moving eastward over the Lake region, Ohio Valley and Atlantic States, while those first appearing on the Pacific coast moved southeastward over the Rocky Mountains and Southwest, and thence spread over the Gulf States.

No. I is a continuation of high area No. VI of the October review, and was central

over the Southern States during the 1st and 2d, where it was accompanied by clear, frosty weather; on the morning of the 1st the minimum temperatures of the month were experienced at stations from Illinois and Ohio to the South Atlantic coast, and ranged from 24° at Columbus, Ohio, to 41° at Jacksonville, Fla.

No. II advanced southward over Montana and Wyoming on the 1st in rear of low area No. II, then central north of the Lake region. 2d, a general rise in pressure occurred over the entire country, and during the 3d the pressure was everywhere above the normal, except on the immediate Pacific coast, in advance of low area No. V. Rising temperature prevailed, except from the Lower Lakes to the Atlantic coast. 4th, pressure above normal east of the Mississippi, with maximum pressure ove Lake region; barometer falling in the Northwest, in advance of low area No. IV, which was subsidiary to area No. V on the Pacific coast. 5th, passed southeastward off the South Atlantic coast.

No. III advanced southward over Manitoba and the Northwest on the 6th, separating low areas Nos. IV and V, the former being transferred to the Atlantic coast, the latter remaining central in Nevada. 7th, moved southward into the Missouri Valley; lower temperatures, fog, rain, and snow prevailed in Colorada and New Mexico, and low area No. V was apparently pushed back toward the California coast. 8th, moved eastward over the Mississippi Valley, followed by heavy snow and rain in Colorado and New Mexico, as low area No. V advanced eastward. 9th, was east of the Mississippi, with falling pressure. 10th, was probably dissipated by the joint influence of low areas Nos. V (over the Upper Mississippi Valley) and III (over Nova Scotia).

No. IV appeared over Oregon on the 9th, and extended eastward on the 10th to the northwest and west of low area No. V. 11th, moved southeastward over the Rocky Mountains, preceded by northerly winds west of the Mississippi, increasing to high, with light rains, on the coast of Texas; Indianola, 7:12 a. m., N. 32, and Galveston, 10:30 p. m., NW. 27. 12th, central over the Southwest, with falling barometer and frosty weather, and, on the 13th, was probably dissipated in advance of low area No. VI.

No. V appeared over the Northwest on the 12th in rear of, and filling up the extensive trough left by, low area No. V. 13th, it followed in the track of the low area just mentioned, and by morning of the 14th was central over the Lake region. 15th and 16th, moved east and northeast over the North Atlantic States and Lower Canada, producing the lowest temperatures of the month at some stations ranging from 24° at New Haven to 33° at Erie and Baltimore. 17th and 18th, was central over or north of the Gulf of Saint Lawrence, the area extending southward over the Atlantic (barometer at Bermuda 30.21, probably highest reading of month occurring on morning of this day). 19th, disappeared in advance of low area No. VI.

No. VI spread over California, the Western Plateau and Rocky Mountain region on the 16th. 17th, highest pressure over the Western Plateau or Rocky Mountain region, where it remained until the 20th, while an extensive depression, including within its area low pressures Nos. VI, VIII, IX and X, covered the eastern section of the country. 21st, moved southeastward over the Southwest.

No. VII appeared over Washington Territory on the 22d to the westward of low area No. XI, and during the 23d extended over Montana. 24th, the highest pressure was transferred to the extreme Northwest; light snow prevailed from Montana to Minnesota and New Mexico, and on the morning of the 24th and 25th, the lowest temperatures of the month occurred over this region, ranging from 12° at Santa Fé to zero at Fort Garland Colo., and —15° at Summit, Rio Grande County, and on summit of Pike's Peak. 25th and 26th, moved eastward over the Lake region to New England, separating low areas Nos. XI and XII. 27th, disappeared eastward over the Atlantic.

No. VIII appeared in Washington Territory and Oregon on the 26th, and moved rapidly southeastward to Utah and Colorado. 27th, it extended over the Southwest, where the lowest temperatures of the month occurred, ranging from 20° at Fredericksburg to 37° at Indianola and Galveston; frosts were reported from Indianola to the Rio Grande Valley. 28th and 29th, it moved eastward over the Southern States, producing the lowest temperatures of the month, on morning of the 29th, along the Gulf coast: New Orleans, 41°; Fort Barrancas, 31°; Milton, Fla., 30°; and Key West, 63°.

No. IX appeared over Washington Territory and Oregon during latter part of the 28th, at which time the pressure was also rising in the Northwest in rear of area No. VIII. 29th, an extensive area of high pressure stretched from the Pacific coast to the Lake region, while low area No. XIV was developing over New Mexico and Northwestern Texas. 30th, low area No. XIV moved northeastward into the Mississippi Valley, thus dividing the present area of high pressure, the eastern portion of which passed eastward over the Atlantic States, while the original center remained over the Western Plateau. From the 28th to the 30th the minimum temperatures of the month occurred at most stations from California to Utah, and ranged from 47° at San Francisco and 37° at Los Angeles to 9° at Winnemucca.

Areas of low barometer.—Of these, fourteen are described below, and the tracks of twelve

of them are shown on Chart No. I, from a study of which it will seen that they agree in general with those of the same month of preceding years. While over the eastern section of the country their paths were southeastward, but, after reaching the Mississippi valley, changed toward the northeast, four of them, Nos. VI, VIII, XII and XIV, either originated or commenced their northward trend south of the 35th parallel.

No. I.—The low pressure area No. XIII of the October review continued during the 1st of the present month off the coast of Nova Scotia and Cape Breton.

No. II is a continuation of area No. XIV, noticed in the October review. On the 1st it was probably central some distance north of the Upper Lake region. High winds prevailed on the Lakes, and a severe storm, with heavy sea, on Lakes Michigan and Huron, which resulted in the loss of several vessels and lives along the eastern shore of former and north portion of latter. Cautionary signals ordered up on the Lower Lakes morning of October 30 were continued, and were ordered up on the Upper Lakes morning of November 1. The following maximum winds were recorded: Grand Haven, 1 p. m., SW. 36 miles; Port Huron, 12:30 p. m., SW. 30; Cleveland, 1:25 p. m., SW. 30, and Buffalo, 9:26 a. m., SW. 36. The signals at Marquette and Escanaba were ordered late, and not considered justified, the highest velocity at Marquette occurred at 3 a. m., NE. 34. During the day the barometer gradient was quite steep from the Lake region to the Ohio Valley, but the storm was unattended by precipitation within the limits of our stations. On the 2d it passed down the Saint Lawrence Valley, followed by north to west winds and light rain or snow.

No. III.—During the 4th the pressure fell over the Canadian maritime provinces, with light rain or snow and generally northerly winds; at night heavy snow falls occurred at St. John and Chatham, N. B., and at the Magdalen Islands, and on the 5th the center of depression appeared to move northward over the Gulf of Saint Lawrence. 6th, lowest pressure north of the New Brunswick, with westerly gales and light snow at the mouth of the Saint Lawrence. 7th, it appeared to move up the Saint Lawrence Valley and to spread southward over New England, attended by cloudy weather and snow. 8th and 9th, it remained over the Canadian provinces, accompanied by cloudy weather and light rain, sleet or snow, and on the 10th moved off to the eastward.

No. IV.—While area No. V, described below, was probably central over Oregon, a subsidiary center of depression apparently formed in Montana. 5th, it moved southeastward to the Lower Missouri Valley, preceded by diminishing pressure, increasing cloudiness, and, during latter part of day, light rain or snow, over the Lake region. 6th. On the morning of this day an extensive barometric trough extended from the Lower Missouri Valley to New England, and by night the center of depression was apparently transferred to the Atlantic coast, where it joined area No. III just described. In anticipation of dangerous winds attending the preceding two areas cautionary signals were ordered up on the Upper Lakes morning of the 5th; on the Lower Lakes during latter part of day and morning of the 6th; and on the Atlantic coast from North Carolina to Maine on morning of the 6th. The Atlantic coast signals were changed to cautionary off-shore signals at midnight of the 7th and morning of the 8th, and all signals were justified, except at Port Huron and Eastport. The following maximum velocities were recorded: On the 6th, Duluth, 6.50 a. m., NE. 40; Marquette and Escanaba, 28; Milwaukee, 26; Sandusky, 8 p. m., NE., 32; on the 7th, Alpena, 25; Sandusky, 10 p. m., NW. 32; Cleveland, 8 p. m., NW. 35; Erie, 10 p. m., NW. 32; Buffa'o, 1 and 3 p. m., SW. 36; on the 8th, Rochester, 3:45 a. m., and Oswego, 4:15 a. m., NW. 26, storm severe on lake and two schooners driven ashore; Cape May, 11:30 a. m., NW. 46; Barnegat, 1:45 p. m., NW. 36; Sandy Hook, 11:45 a. m., NW. 48; New York, 11:30 a. m., NW. 37; Boston, 3 p. m., NW. 32. These show the highest velocities to have occurred in rear of the storm-center and in advance of high area No. IV. Vessels arriving at the North Atlantic ports generally reported westerly gales, high seas, and rain-squalls from the 5th to the 11th west of the sixty-second meridian and north of fortieth parallel.

No. V appeared on the Pacific coast on the 4th, and cloudy and rainy weather (snow on the mountains) prevailed from San Francisco northward to British Columbia. 5th and 6th, lowest pressure moved southward over the Western Plateau from interior of Oregon and Idaho to Nevada and Utah, accompanied by rain and snow, occasionally quite heavy, and which extended by night of the 6th to Arizona and New Mexico. During these days the pressure was generally below the normal west of the Mississippi, but commenced rising over the Northwest and Upper Lake region during latter part of the 6th, in advance of high area No. IV. 7th and 8th, the lowest pressure (0.10 to 0.20 inch below normal) remained over the Western Plateau, and the highest pressure moved southward into the Mississippi Valley; the pressure rising during the 7th, but falling on the 8th at the Rocky Mountain stations. Heavy rain and snow storms prevailed in Arizona, New Mexico, and Colorado. 9th and 10, storm-center moved northeastward from Colorado to the Upper Mississippi Valley, accompanied by cloudy and rainy weather. Heavy rains of short duration fell in Texas. At Summit, Rio Grande County, Colorado, 11,300 feet above sea-level, 17 inches of snow fell from

the 6th to the 10th, the heaviest fall, 8 inches, occurring on the 7th. 11th, was over the Lake region, where high winds, cloudy and rainy weather prevailed, and with partly cloudy weather and light rains thence to the East Gulf and Atlantic States, 12th and 13th, was over the Saint Lawrence Valley and Canadian maritime provinces, followed by brisk to high northwest winds. Cautionary signals were ordered up morning of the 10th on the Upper Lakes; morning of the 11th on the Lower Lakes, and on the afternoon of same day along the Atlantic coast from North Carolina to New York (changed to cautionary off-shore morning of 12th), and morning of the 12th along the New England coast (changed to cautionary off-shore afternoon of 13th). They were all justified, except on Lake Superior and at Easport, Me. Maximum velocity, on the 11th, Milwaukee, 3:50 p. m., NW. 27; 12th, Grand Haven, 10:30 p. m., NW. 45; Buffalo, 11:50 p. m. SW. 37; Cape May, 12:45 p. m., S. 32; Cape Lookout, 2 a. m., SW. 36; 13th, Sandusky, 5:30 a. m., NW. 44; Oswego, 10:15 p. m., NW. 28; Cape May, 3 p. m., NW. 35; Sandy Hook, 11 a. m., W. 46; New York, 12:45 p. m., NW. 36; Newport, 2:44 p. m., SW. 33; Thatcher's Island, 3:45 p. m., W. 37.

No. VI.—On the 13th, the pressure being above the normal throughout the Mississippi Valley, Northwest and Lake region, increasing cloudiness prevailed from Texas to New Mexico, with easterly winds and light rains in former, and northerly winds and light snow in latter. 14th, the lowest pressure was off the coast of Texas; easterly winds and increasing cloudiness prevailed from the Gulf coast to the Lake region to the west of high area No. V, and rainy weather, with winds backing to north and west, in Texas. 15th, storm-center moved northward to Missouri; severe thunderstorms and heavy rains occurred from Eastern Texas to Mississippi and easterly winds, increasing cloudiness and rain, thence to the South Atlantic States and Ohio Valley. Cautionary signals were ordered up morning of the 14th at Indianola and Galveston, and although somewhat late, were justified by easterly winds of 27 and 26 miles, respectively; morning of the 15th, at Port Eads, New Orleans and Mobile, the first two of which were justified by a registered velocity of 25 miles, SE., at Port Eads. 16th and 17th, lowest pressure over the Ohio Valley and Lower Lakes, and cloudy and rainy weather extended thence to the Atlantic States. Cautionary signals were hoisted in the Lake region night of the 15th and morning of the 16th, but were not justified. During latter part of the 17th the minimum pressure was probably transferred to North Carolina and Virginia. 18th and 19th, center moved northeastward off the Middle Atlantic, New England, and Nova Scotia coasts, rapidly increasing in energy and producing brisk to high northerly and easterly winds and heavy rains from Connecticut to Cape Breton. Cautionary signals were ordered up, morning of the 16th, from Cape May to Sandy Hook; midnight of the 17th, from New York to Portland, and on the afternoon of the 18th at Eastport were justified as follows: on the 18th, Cape May, 3:30 p. m., N. 27; Sandy Hook, 8 p. m., N. 30; New York, 5 p. m., NE. 31; Boston, 5:50 p. m., NE. 31; on the 19th, Thatcher's Island, 2:30 a. m., N. 44, and Eastport, 2:45 a. m., NE. 36.

No. VII was probably central near Vancouver's Island, on the morning of the 14th, where stormy weather prevailed throughout the day, preceded by a southeast wind of 40 miles (estimated) at Victoria; southeast gales and heavy rains continued over this region until the 18th, in consequence of the high-pressure area No. VI to the southward. During the day the lowest pressure moved southeastward to interior of Oregon, preceded by high southerly winds at places, and heavy coast rains, extending to northern half of California. On the 15th, the pressure rose rapidly at the Pacific coast stations and over the western plateau, and fell at the Rocky Mountain stations and in the Northwest, and this area probably either joined the depression then existing in the Mississippi Valley and described as No. VI, or by moving southward over Colorado helped to form area No. VII. On this day light rains and snow fell in Idaho, Nevada, and Utah, but no precipitation was reported at the Rocky Mountain stations. At 11 p. m., the pressure at Santa Fé was 29.66 or 0.16 below normal.

No. VIII appeared in the Rio Grande Valley during the 16th, and may possibly be a continuation of area No. VII; at midnight, rising barometer, north to east winds, cloud and rain prevailed over Texas. 17th, storm-center moved eastward over the Gulf of Mexico, followed by increasing pressure and rains in Texas. Cautionary signals ordered up at Indianola and Galveston, morning of the 16th, were justified by a severe NE. gale accompanied by very heavy rains during early morning of the 17th; maximum velocity at Indianola, 2:30 a. m. NE., 46; Galveston, 5:40 a. m., NE. 40, and at Port Eads, morning of the 17th, justified at 11 p. m., by a northeast wind of 35 miles (estimated.) 18th, center moved northeastward, preceded by southeast to north winds, and rain from Florida to Louisiana; the Carrie Nelson reported a heavy blow in 25° 12′ N. and 88° 05′ W. 19th, moved eastward over Northern Florida, and thence northeastward, producing heavy rains along the South Atlantic coast and severe NE. gales along the coast of North Carolina. 20th and 21st, passed northeastward, south of Nova Scotia and Cape Breton, followed by northerly winds and rain along the coast; on these days heavy rains and southwest to northwest winds prevailed at the Bermudas. Cautionary signals were ordered up at midnight of the 18th, and morning of

the 19th, from Jacksonville to Kittyhawk; midnight of the 19th from Cape Henry to Sandy Hook, and morning of the 20th from New York to Eastport, and were justified, except at Jacksonville, and along the New England coast. Maximum velocities on the 19th, at Tybee Island, 5:20 p. m., NW. 37; Cape Lookout, 9:30 p. m., NE. 52; Hatteras, 10:30 p. m. NE. 44; Kittyhawk, 11:30 p. m., NE. 49. On the 20th, Barnegat, 8:15 a. m., NE. 26, and Sandy Hook, 5. a. m., E. 30. On the 20th, SE. gales were experienced in 31° 52′ N., 77° 12′ W.; 41° 51′ W., 63° 35′ W., and 43° 06′ N., 58° 43′ W.

No. IX was probably central in Manitoba on the 17th. 18th, was north of Lake Superior. 19th and 20th, north of Lake Huron, with light rains extending to Lake Erie. Its track is not charted.

No. X appeared in the Missouri Valley on the 19th, and moved rapidly southeastward during the 20th, almost without precipitation. During latter part of 20th, and and early morning of the 21st, its center remained almost stationary over Illinois and Indiana, with increasing cloudiness and a general light rain from the Upper Lakes to the Lower Mississippi Valley; during latter part of day its center was transferred to Virginia and North Carolina, with diminishing pressure and heavier precipitation from Georgia to New York. Heavy rain, turning into snow, fell in the Monongahela Valley, causing a sudden rise in the rivers of this region. 22d, the 7:35 a. m. reports showed the lowest pressure, (about 29.20, or 0.90 below normal,) to be central over Chesapeake Bay, preceded by easterly gales and heavy rains along the New Jersey coast. At noon the center was over Delaware Bay—Cape May barometer, 28.95, or about 1.10 inch below normal—and at 4:35 p. m. was central between Baltimore and Philadelphia, the barometers at these stations reading 28.98, or 1.08 and 1.05 inch, respectively, below normal. During the day the winds decreased over the Middle States as the center of pressure enlarged in area, but increasing easterly gales, with high tides, prevailed along the New England coast and valley of the Saint Lawrence; during the night the gale was specially severe in latter section and much damage was done to shipping. On the summit of Mount Washington the wind continued from the east all day, with light snow, the highest registered velocity of the month; 129 miles per hour, occurring at 4:30 p. m. Heavy snows fell in the Alleghany Mountains, the observer at Helvetia, Randolph County, West Virginia, reporting from 21 to 36 inches at altitudes of 1,300 and 1,800 feet. High westerly winds, increasing to gales at places on the North Carolina coast. 23d, the lowest pressure moved northward over New England, accompanied by light winds and calms, and followed by brisk westerly winds and clearing weather. Cautionary signals were ordered up along the Atlantic coast from Smithville to New York, on the 21st, (changed to cautionary off-shore on the 22d,) and from New Haven to Eastport on the morning of the 22d, (changed to cautionary off-shore morning of the 23d,) and were all justified. Maximum velocities on the 21st: at Smithville, 10 a. m., W. 26; Wilmington, 2:30 p. m., W. 35; on the 22d, Cape Lookout, 1:30 p. m., W. 52; Kittyhawk, 6:50 p. m., W. 40; Philadelphia, 9:30 a. m., NE. 38; Barnegat, 1 a. m., E. 38; Sandy Hook, 6:50 a. m., E. 56; New London, 12:40 p. m., E. 48; Wood's Holl, 1:55 p. m., E. 40; Boston, 3:30 p. m., E. 48; Thatcher's Island, 3:15 p. m., ESE. 50; Portland, 1:45 p. m., NE. 36; and, on the 23d, Eastport, 12:20 a. m., NE. 60, with very high tides; Baltimore, 9:18 a. m., NW. 30; Cape May, 7:45 a. m., W. 52. Cautionary signals were also ordered up in the Lake region, but were only justified on the Lower Lakes. Maximum velocities on the 22d: Oswego and Rochester, 5:15 p. m., NE. 32 and 30; Cleveland, 5:15 p. m., NW. 42; Sandusky, 6:45 p. m., NW. 42; and, on the 23d, at Erie, 10:15 a. m., NW. 34, lake very rough.

No. XI was probably northeast of British Columbia at midnight of the 21st, extending southwestward over Oregon, where the pressure was 0.30 below normal, followed, on the morning of the 22d, by rising pressure, westerly winds and light rains. 22d, moved southeastward to the Missouri Valley, preceded by southeast winds in the Northwest. 23d, moved down the Missouri Valley, unattended by precipitation, except light snow in rear of the center as the winds changed to colder northerly; during the day the lowest pressures of the month occurred over the Southwest and thence to Colorado and New Mexico, in which region a secondary center of depression formed, which will be considered as area No. XII. 24th, the present area moved eastward over the central Mississippi and Ohio Valleys, followed by northerly winds and light rains. 25th, moved from the Lower Lake region over New England, with light, but increasing, precipitation. 26th, passed south of Nova Scotia, and heavy rain prevailed for a short time at Halifax and Sydney.

No. XII.—Formed during the 23d over the high lands in Northwestern Texas and New Mexico, where high temperature prevailed during the afternoon. 24th, moved southeastward over Texas, followed by cold northerly winds, with snow in New Mexico and rain in Western Texas. 25th, was off the coast of Texas and Louisiana, followed by brisk to high northerly winds, rain or snow in former, and preceded by easterly winds and heavy rain at New Orleans. 26th, moved northward, with southerly winds and heavy rains on the East Gulf coast, and generally rainy weather thence to Tennessee and Virginia. 27th, moved northward to the Lower Lakes, with heavy

rains, thence to the Atlantic coast, and heavy snows from Arkansas to Michigan. 28th, passed down the Saint Lawrence Valley, with heavy rains, thence to the coast of New England and Nova Scotia. Cautionary signals ordered up at Indianola and Galveston were justified on the 25th: Indianola, 10 a. m., N. 43, and Galveston, 7:45 p. m., NW. 32; on the Atlantic coast from Smithville to Sandy Hook on the 26th (changed to cautionary off-shore on the 27th); from New York to Eastport on the 27th (changed to cautionary off-shore on the 28th); and in the Lake region on the afternoon of the 27th were justified, except at the stations in Northern Michigan. Maximum velocities: on the 27th, at Wilmington, 1:45 p. m., SW. 31; Cape Hatteras, 4 p. m., S. 40; Kittyhawk, 4:35 p. m., S. and SW. 44; Barnegat, 8:40 p. m., SE. 40; Sandy Hook, 5:35 p. m., E. 47; New London, 10:20 p. m., SE. 45; Thatcher's Island, 11 p. m., SE. 34; Duluth, 11 p. m., NW. 34. On the 28th, Cape Lookout, 4:30 a. m., W. 40; Cape May, 3:45 p. m., W. 46; Newport, 10:40 p. m., NW. 32; Wood's Holl, 2:05 a. m., SE. 34; Thatcher's Island, 1 a. m., NW. 35; Eastport, 8:25 a. m., SE. 38; Erie, 6:30 a. m., W. 32; Cleveland, 4:10 a. m., NW. 36; Sandusky, 2:35 a. m., W. 37.

No. XIII was probably north of Montana on the 25th, and passed eastward, over Manitoba, on the 26th, followed by high north winds and light snows in Dakota and Minnesota.

No. XIV.—During the 28th the pressure fell below the normal over the Western Plateau, and on the 29th in New Mexico, while high-pressure area No. IX was over Montana; light snows fell during these days from Idaho to Colorado and New Mexico; five inches of snow was reported at Summit, Rio Grande County, Colorado. During latter part of the 29th the lowest pressure was central over the high lands of Western Texas. 30th, moved eastward to Arkansas, preceded by a heavy NE. snow-storm in the Lower Missouri Valley, and followed by brisk to high northerly winds in Texas. Cautionary off-shore signals were ordered at Indianola and Galveston. Maximum velocity at Indianola, NW. 32. This area afterward developed into quite a severe storm, and will be considered in the December review.

INTERNATIONAL METEOROLOGY.

On chart No. IV are shown the partial tracks of hurricanes occurring over the oceans as follows: *Atlantic.*—No. I. as given in the September review; No. II, September 14 to 17; No. III, September 21 to October 3, and No. IV, September 29 to October 8, that were treated of in the October review as one storm, but Mr. Jahncke, of Saint Thomas, considered them as two, whose paths crossed each other. No. V, October 9 to 20, probably reached the British Isles. No. VI, October 14 to 19, the track of which is nearly identical with that of No. V, but about five days later. No. VII, October 21 to 29, was treated of in the October review. *Pacific.*—No. I, September 12; No. II, September 15 to 19; No. III, September 19; No. IV, October 7 to 9; No. VI, October 17 to 19. Additional reports of storms are to hand. *South Atlantic Ocean.*—September 8, 31° 19′ S., 31° 00′ E; September 25 to October 1, storm lasting six days off the coast of Brazil; October 3, heavy at Caracas, Venezuela.

TEMPERATURE OF THE AIR.

The isothermal lines on chart No. II illustrate the general distribution of the temperature of the air for the month. The mean temperature for Punta Rassa should be 69°.6 instead of 74°, as given on the chart. By reference to the table on the left side of the chart, it will be seen that the temperature has been considerably above the normal over the interior of the continent, the largest deviation from the normal (+13°.7) occurring in the Upper Missouri Valley. Along the Pacific, Gulf, and South Atlantic coasts, it has ranged about, or slightly above, normal, and in the Middle States and New England about 3° above.

Minimum and maximum temperatures, respectively:—*Maine*—Mechanic Falls, 15° and 50°; Portland, 22°, 56°; Eastport, 17°, 54°. *New Hampshire*—Dunbarton, 13°, 52°; Mount Washington, 10°, 37°. *Vermont*—Woodstock, 12°, 54°; Burlington, 21°, 52°. *Massachusetts*—Westborough, 17°, 60°; Boston, 22°, 61°; Springfield, 22°, 66°. *Rhode Island*—Newport, 26°, 57°. *Connecticut*—Colebrook, 17°, 56°; New Haven, 24°, 61°. *New York*—Schroon Lake, 10°, 56°; Nile, 13°, 54°; Plattsburg Barracks, 18°, 48°; New York City, 28°, 59°; Buffalo, 24°, 54°. *New Jersey*—Linden, 18°, 54°; Atco, 26°, 64°; Trenton, 28°, 60°. *Pennsylvania*—Franklin, 16°, 52°; Brownsville, 26°, 68°; Philadelphia, 36°, 64°; Pittsburgh, 21°, 58°. *Delaware*—Dover, 31°, 61°. *Maryland*—Woodstock, 21°, 69°; Saint Inigoes, 40°, 75°; Baltimore, 33°, 69°. *District of Columbia*—Washington, 27°, 56°. *Virginia*—Snowville, 22°, 68°; Johnsontown, 35°, 72°; Lynchburg, 30°, 68°. *West Virginia*—Morgantown, 25°, 59°. *North Carolina*—Franklin, 20°, 68°; Weldon, 30°, 76°. *South Carolina*—Aiken, 33°, 74°; Charleston, 37°, 75°. *Georgia*—Gainesville, 30°, 73°; McPherson Barracks, 29°, 74°; Augusta, 33°, 77°. *Florida*—Camp Barrancas, 31°, 86°; Key West, 63°, 85°; Milton, 30°, 76°. *Alabama*—Mobile, 36°, 81°;

Montgomery, 33°, 77°. *Mississippi*—Fayette, 31°, 78°. *Louisiana*—Point Pleasant, 36°, 79°; New Orleans, 41°, 76°; Shreveport, 34°, 81°. *Texas*—Fort Davis, 17°, 76°; Fredericksburg, 20°, 78°; Uvalde, 28°, 86°. *Ohio*—Bellefontaine, 19°, 63°; Columbus, 24°, 63°; Toledo, 26°, 60°. *Kentucky*—Danville, 21°, 69°; Louisville, 30°, 72°; Bowling Green, 26°, 74°. *Tennessee*—Clarksville, 23°, 71°; Nashville, 28°, 71°; Knoxville, 54°, 69°. *Arkansas*—Mount Ida, 21°, 80°; Judsonia, 33°, 74°. *Michigan*—Litchfield, 17°, 54°; Marquette, 18°, 59°; Detroit, 14°, 53°. *Indiana*—Spiceland, 19°, 64°; Saint Meinrad, 32°, 72°; Indianapolis, 25°, 65°. *Illinois*—Mount Sterling, 13°, 69°; Anna, 30°, 75°; Cairo, 30°, 71°; Chicago, 31°, 57°. *Missouri*—Wet Glaze, 16°, 85°; Pierce City, 19°, 81°. *Kansas*—Fort Hays, 6°, 76°; Dodge City, 13°, 74°; Leavenworth, 25°, 71°; Independence, 22°, 83°. *Wisconsin*—Neillsville, 8°, 60°; Embarrass, 16°, 56°; Madison, 24°, 55°. *Iowa*—Vail, 12°, 70°; Logan, 14°, 72°; Des Moines, 21°, 69°. *Nebraska*—Sidney Barracks, 7°, 81°; North Platte, 17°, 75°; Omaha, 18°, 71°. *Indian Territory*—Fort Sill, 17°, 81°; Fort Gibson, 22°, 78°. *Minnesota*—Breckenridge, 3°, 59°; Saint Anthony, 10°, 63°; Duluth, 13°, 58°. *Dakota*—Pembina, 2°, 51°; Yankton, 15°, 73°; Bismarck, 19°, 58°. *Colorado*—Fort Garland, 0, 60°; Pike's Peak, 15°, 33°; Denver, 11°, 73°; Colorado Springs, 5°, 66°. *Wyoming*—Fort Fetterman, 1°, 72°; Cheyenne, 2°, 67°; Fort Fred. Steele, 3°, 67°. *Utah*—Salt Lake City, 22°, 68°. *Nevada*—Winnemucca, 9°, 66°; Pioche, 17°, 67°. *California*—Visalia, 29°, 76°; Sacramento, 34°, 72°; San Francisco, 47°, 68°; Los Angeles, 37°, 81°; Red Bluff, 34°, 77°. *New Mexico*—Santa Fé, 12°, 77°; Fort Union, 2°, 72°. *Idaho*—Boise City, 18°, 70°. *Montana*—Virginia City, 11°, 59°.

Ranges of temperatures.—The *monthly ranges* will appear from an examination of the maxima and minima just given. Greatest *daily ranges* vary in New England, from 19° at Portland to 29° at New Haven; Mount Washington, 23°; Middle Atlantic States, 20° at Albany to 31° at Lynchburg; South Atlantic States, 20° at Cape Lookout and Charleston to 32° at Wilmington; Gulf States, 12° at Key West to 34° at Corsicana and 35° at Saint Marks; Ohio Valley and Tennessee, 22° at Louisville to 35° at Knoxville; Lower Lakes, 16° at Erie to 27° at Toledo; Upper Lakes, 20° at Port Huron to 30° at Marquette; Upper Mississippi Valley, 22° at La Crosse to 33° at Saint Louis; Missouri Valley, 30° at Omaha to 44° at Yankton; eastern slope of Rocky Mountains, 35° at Deadwood, Dak., and 31° at Dennison, Tex., to 49° at North Platte and Fort Stockton; Rocky Mountain stations, 26° at Virginia City to 48° at Fort Craig; 22° on summit of Pike's Peak; Western Plateau, 28° at Pioche to 43° at Winnemucca; California, 15° at San Francisco to 56° at Campo.

Frost has been quite general over the northern sections of the country, and the following items will show its occurrence in some of the Southern States: Houston, Fla., injuring vegetation, 1st; Quitman, Ga., first frost, 1st; in Southern Texas and Lower Rio Grande Valley the first frost of season occurred on the 27th; at Milton, Fla., first frost, 28th.

Ice.—Santa Fé, N. Mex., 17th, ½ inch; 25th, creeks frozen; Albuquerque, N. Mex., 18th, 24th (25th and 26th ½ inch), 27th to 30th; Denison, Tex., 27th; Mobile, Ala., 1st, 2d; Dubuque, Iowa, 26th; Cleveland, Ohio, 24th; Cincinnati, 1st, 29th; Louisville, Ky., 1st, 29th; Nashville, 29th; Smithville and Wilmington, N. C., 1st; Atlanta, Ga., 1st; Lynchburg, 1st; Atlantic City, N. J., 5th; Baltimore, 4th; Philadelphia, 5th, 9th; Fort Whipple, Va., 30th; Newport, R. I., 4th, 5th; New London, 4th, 15th, 16th, 27th; Boston, 4th; Forsyth, Ga., 1st; Thomasville, Ga., 29th; Creswell, Kans., 1st to 3d; Independence, Kans., 3d, 12th, 13th, 25th to 29th; Point Pleasant, La., 28th; Gardiner, Me., 7th; Somerset, Mass., 4th; Springfield, Mass., 2d, 3d, $\frac{1}{16}$, 4th, ¼ inch, 5th, ¾ inch; Rowe, Mass., 28th; Oregon, Mo., 8th, 13th, 25th to 29th; Auburn, N. H., 4th, 5th; Freehold, N. J., 9th, ¼ inch, 14th, 15th, ¼ inch; Sacramento, Cal., 28th to 30th; Boise City, Idaho, 7th, 10th to 13th, 23d to 29th; Princeton, Cal., 1st; Catawissa, Pa., 1st, 2d, 5th, 6th, 8th, 9th, 14th to 16th, 26th, 29th, 30th; West Charlotte, Vt., 4th, 5th; Dover Mines, Va., 4th, 5th, 8th, 10th, 15th, 29th, 30th; Wytheville, Va., 14th, ice on pond, 24th, thin ice all over pond.

Ground frozen as follows: North Volney, N. Y., 5th; Starkey, N. Y., 9th; Fayetteville, N. C., 1st; Catawissa, Pa., 2d, 5th, 9th, 15th, 30th; Fallsington, Pa., 2d, 4th, 5th, 9th; Ringtown, Pa., 4th, 1 inch; Woodstock, Vt., 4th to 9th, 3 inches; West Charlotte, Vt. 4th, 5th, 14th to 16th; Broad Oak, Va., 4th, 30th; Wautoma, Wis., 30th, 2 inches.

PRECIPITATION.

On Chart No. III is illustrated the general distribution of the precipitation of rain and snow for the month. On the left side is a table giving the average precipitation for November, which shows a decided excess on the East Gulf coast over New England and in the Saint Lawrence Valley. The greatest deficiencies occur in the Pacific Coast States, and from the Lower Missouri Valley to the Upper Lakes.

Special heavy rains.—15th, Fort Barrancas, Fla., 3.29 inches; 17th, Auburn, N. H., 3.25 inches; Indianola, Tex., 3.16 inches; 17th and 18th, Contoocookville, N. H., 2.75 inches; New Orleans, 2.38 inches; New Bedford, Mass, 3.74 inches; 18th, Boston, 3.09 inches;

Newport, R. I., 2.97 inches; Auburn, N. H., 2.49 inches; 18th and 19th, Thatcher's Island, Mass., 5.75 inches; 17th to 19th, Westborough, Mass., 3.22 inches; Amherst, Mass., 2.44 inches; Dunbarton, N. H., 3.54 inches; 19th, Lawrence, Mass., 2.16 inches; Fort Barrancas, Fla., 2.15 inches; 18th to 21st, Milton, Mass., 3.75 inches; 18th to 22d, Mendon, Mass., 5.00 inches; 22d, Boston, 2.18 inches; Antrim, N. H., 2.40 inches; Sandy Hook, N. J., 2.75 inches; Auburn, N. H., 4.00 inches; 25th, New Orleans, 2 13 inches; 25th and 26th, Knoxville, 2.98 inches; 26th, Mobile, Ala., 3.32 inches; Saint Marks, 2.70 inches; Highlands, N. C., 4.00 inches; Fort Barrancas, Fla., 10.39 inches; 27th, Fayetteville, N. C., 4.25 inches; Sandy Hook, N. J., 2.00 inches; White Plains, N. Y., 3.90 inches.

Largest monthly rainfalls.—Fort Barrancas, Fla., 17.79 inches; Olympia, Wash., 11.09 inches; Auburn, N. H., 9.82 inches; White Plains, N. Y., 9.80 inches; Boston, 8.94 inches; Thatcher's Island, Mass., 9.30 inches; Dunbarton, N. H., 8.63 inches; Newport, R. I., 7.99 inches; New Orleans, La., 7.78 inches; Antrim, N. H., 7.55 inches; Galveston, Tex., 7.31 inches; Highland, N. C., 7.00 inches; Sandy Hook, 6.96 inches; Saint Mark's, Fla., 6.89 inches; New Ulm, Tex., 6.68 inches; Clinton, Mass., 6.75 inches.

Smallest monthly rainfalls.—Los Angeles and San Diego, Cal., none; Cheyenne, Wyo., Fort Lincoln, Dak., and Fort Hartsuff, Nebr., trace; Yuma, Ariz., 0.02 inch; Sidney Banks, Nebr., 0.07 inch; Visalia, Cal., Fort Fred. Steele, Wyo., Hennepin, Ill., and Vail, Iowa, 0.10 inch; Wickenburg, Ariz., 0.12 inch; Winnemucca, Nev., 0.16 inch; Fort Craig, N. Mex., 0.18 inch; Fort Gibson, Ind. T., 0.21 inch; Camp Stockton, Tex., 0.22 inch; Salinas City, Cal., 0.20 inch; Fort Pembina, Dak., 0.24 inch; Pilot, Tex., 0.25 inch; Phœnix, Ariz., and Afton, Iowa., 0.30 inch; Virginia City, Mont., 0.31 inch; Point San José, Cal., 0.32 inch; Camp McDermit, Nev., 0.35 inch; Camp Verde, Ariz., 0.36 inch.

Drought.—Independence, Kans., during the entire month drought very severe, wheat dying; many wells and springs exhausted, and farmers obliged to transport water a considerable distance for domestic purposes. Lebanon, Mo., 28th, very dry, causing forest fires; creeks and ponds nearly dried up; water very scarce for stock; fall wheat injured to some extent. Melissa, Tex., 30th, water for stock very scarce, but little rain has fallen since September.

Hail.—Willett's Point, N. Y., 8th; Gainesville, Ga., 10th and 11th; Anna, Ill., 27th; New Harmony, Ind., 27th; West Waterville, Me., 18th and 30th; Gardiner, Me., 25th; Mechanic Falls, Me., 18th; New Market, Md., 6th; Springfield, Mass., 22d; Wappinger's Falls, N. Y., 13th; Flushing, N. Y., 6th; Cape Vincent, N. Y., 30th; Clarksville, Tenn., 15th; Woodstock, Vt., 18th, 22d, 25th and 27th; Manitowoc; Wis., 6th; Albuquerque, N. Mex., 7th and 13th; Pembina, Dak., 21st; Denison, Tex., 25th: Burlington, Vt., 20th; Escanaba, Mich., 5th; Grand Haven, Mich., 23d; Fort Whipple, Va., 26th; Laredo, Tex, 17th and 25th.

Rainy days.—The number of days on which rain or snow has fallen varies as follows: New England, 10 to 22; Middle States, 6 to 16; South Atlantic States, 5 to 10; Gulf States, 6 to 10; Ohio Valley and Tennessee, 8 to 14; Lower Lake region, 10 to 22; Upper Lake region 19 to 16; Upper Mississippi Valley, 4 to 11; Lower Missouri Valley, 3 to 7; Eastern Slope, 1 to 7; Rocky Mountains, 5 to 13; Western Plateau, 1 to 8; Pacific coast, 1 to 4.

Cloudy days.—For New England, the number varies from 9 to 23; Middle States, 5 to 15; South Atlantic States, 4 to 9; Gulf States, 4 to 9; Ohio Valley and Tennessee, 8 to 17; Lower Lake region, 10 to 24; Upper Lake region, 7 to 19; Upper Mississippi Valley, 4 to 14; Lower Missouri Valley, 3 to 8; Eastern Slope, 2 to 14; Rocky Mountains, 2 to 10; Western Plateau, 3 to 6; Pacific coast, 1 to 4.

Snow.—On the 1st, New York, Connecticut, Iowa, Vermont. 2d, Michigan, New York. 3d, New Hampshire, New York. 4th, New Hampshire, Maine, Massachusetts, New York, Vermont. 5th, New York, New Hampshire, Maine, Vermont, Nevada. 6th, Wisconsin, Minnesota, New York, Michigan, Rhode Island, New Hampshire, Massachusetts, Connecticut, New Jersey, Nevada. 7th, Colorado, New York, New Jersey, New Hampshire, Maine, Massachusetts, Michigan, Vermont, New Mexico, California. 8th, New Mexico, New York, New Hampshire, Connecticut, Maine, Massachusetts, New Jersey, Vermont. 9th, New Mexico, Colorado, Maine, New York, Vermont, Montana. 10th, Colorado, Nebraska, Maine, New Hampshire, New York, Utah. 11th, Vermont, New Mexico. 12th, Michigan, New Hampshire, New York, Wisconsin. 13th, North Carolina, Michigan, New Hampshire, New York, Vermont. 14th, Colorado, Massachusetts, New York. 15th, Colorado, New Hampshire, New York, Wyoming, Nevada, Montana. 16th, Colorado, Texas, Utah. 17th, New Hampshire. 18th, New Hampshire, Wyoming. 19th, New Hampshire, Massachusetts. 20th, Colorado, New Hampshire, Virginia, Nebraska. 21st, Michigan, Minnesota, Iowa, Tennessee, Virginia, Wisconsin. 22d, Minnesota, New Hampshire, Michigan, Virginia, Wisconsin, Montana. 23d, Colorado, Dakota, New York, West Virginia, New Hampshire, Wisconsin, Montana, Minnesota, Utah, Wyoming. 24th, New Mexico, Colorado, Dakota, Iowa, Minnesota, Wisconsin, Michigan, New Hampshire, Nebraska, Wyoming. 25th, New Mexico, Colorado, Iowa, Wisconsin, Michigan, Minnesota, New York, New Hampshire, Maine, Texas, Vermont. 26th, Dakota, Iowa, Minnesota, Virginia, New Hampshire, New York, Vermont, Texas, Louisiana. 27th, Dakota,

Wisconsin, Michigan, Ohio, Kentucky, Illinois, Indiana, Tennessee. 28th, Michigan, Ohio, New Hampshire, Indiana, New York, Nebraska, Montana. 29th, New Mexico, Utah, Colorado, Michigan, New Hampshire, Indiana, New York, Idaho. 30th, Colorado, Dakota, Iowa, New Hampshire, New York, Kansas, Missouri, Vermont. At the end of the month the depth of snow on ground was reported as follows: Summit, Colo., 18 inches; Milford, Ind., 2 inches; Holton, Kans., 2½ inches; Arkansas City, Kans., 1 inch; Creswell, Kans., 7 inches; Topeka, Kans., 7½ inches; Litchfield, Michigan, 4 inches; Oregon, Mo., 5 inches; Kansas City 2¾ inches; Salt Lake City ¼ to ½ inch in sheltered places; Virginia City, Mont., 2 inches; Denver, Colo., 1 inch; Santa Fé, N. Mex., trace; Pike's Peak, 2 inches; Deadwood, Dak., trace; Leavenworth, Kans., 4 inches; Breckenridge, ½ inch; Pembina, Dak., ¼ inch; La Crosse, trace; Keokuk, 1½ inches; Duluth, ½ inch; Madison 1 inch; Indianapolis, trace; Boise City, Idaho, trace; Mount Washington, 12 inches.

RELATIVE HUMIDITY.

The average percentage of relative humidity for the month ranges as follows: New England, 68 to 77; Middle Atlantic States, 60 to 76; South Atlantic States, 64 to 77; East Gulf States, 68 to 79; West Gulf States, 61 to 77; Lower Lakes, 68 to 80; Upper Lakes, 70 to 78; Ohio Valley and Tennessee, 62 to 74; Upper Mississippi Valley, 63 to 75; Lower Missouri Valley, 60 to 76; Red River of the North Valley, 79 to 83; Eastern Slope, 59 to 69; Western Plateau, 43 to 62; California, 58 to 75. *High stations* report the following, not correct for altitude: Mount Washington, 93; Virginia City, 54; Cheyenne, 55; Denver, 42; Santa Fé, 53; Colorado Springs, 52.

WINDS.

The prevailing winds at the Signal Service stations are shown by arrows on Chart No. II, by an examination of which it will be seen that they have been very generally north or westerly. In Southern Texas, Minnesota, Montana, Nevada, Idaho, Oregon, and Washington Territory they have been southeasterly.

Total movements of the air.—The following are the *largest* monthly movements recorded at the Signal Service stations, viz: Sandy Hook, 13,949 miles; Cape May, 13,509; Pike's Peak, 12,439; Cape Lookout, 12,134; Thatcher's Island, 11,954; Kittyhawk, 11,004; Portsmouth, N. C., 10,165; Indianola, 9,809; Sandusky, 9,704; Barnegat, 9,659; New York, 9,049; Wood's Holl, 8,982; Newport, 8,724; Boston, 8,619. The *smallest* are: Visalia, Cal., 1,491 miles; Deadwood, Dak., 1,754; Nashville, 1,918; Virginia City, 2,178; Shreveport, 2,235; Lynchburg, 2,583; Uvalde, Tex., 2,630; Knoxville, 2,674; Indianapolis, 2,869; Dubuque, 2,876; Boise City, Idaho, 3,041; Augusta, Ga., 3,122; Sacramento, Cal., 3,140; Salt Lake City, 3,148; Los Angeles, Cal., 3,293.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily weather indications with the telegraphic reports for the succeeding twenty-four hours show the general percentage of omissions to be 0.5 per cent., and of verifications to be 90.7 per cent. The percentage of verifications for the four elements have been: weather, 95.1; wind, 88.1; temperature, 91.7; barometer, 87.8. The percentages of verifications by geographical districts have been: New England, 89.1; Middle States, 90.8; South Atlantic States, 91.3; East Gulf States, 88.2; West Gulf States, 90.4 Lower Lake region, 91.0; Upper Lake region, 89.7; Tennessee and Ohio Valley, 92.4; Upper Mississippi Valley, 92.4; Lower Missouri Valley, 91.5. Of the 3,588 predictions that have been made, 82, or 2.3 per cent., are considered to have entirely failed; 90, or 2.5 per cent., were one-fourth verified; 326, or 9.1 per cent., were one-half verified; 85, or 2.4 per cent., were three-fourths verified; 2,999, or 83.8 per cent., were fully verified, so far as can be judged from the tri-daily weather maps.

Cautionary signals.—During the month 260 cautionary signals were displayed; 202, or 77.7 per cent., were justified by subsequent hourly velocities of 25 miles or over at or within 100 miles of the station.

Cautionary off-shore signals.—Twenty-nine signals, not included in the above, were ordered up as cautionary off-shore signals; 26, or 89.7 per cent., of these were justified, both as to velocity and direction. Seventy-six cautionary signals were changed to cautionary off-shore signals, and as to direction were all justified; as to velocity they are considered with the cautionary. Thirty-nine cases were reported, generally from scattered stations, of winds of 25 miles or over, when signals were not ordered.

NAVIGATION.

In the table on the right hand of Chart No. III are given the highest and lowest readings on the Signal Service river gauges during the month, with dates of same,

from which it will be seen that the Mississippi and its western tributaries have continued low throughout the month. In consequence of the heavy rains during the latter portion of month (mostly due to the storm areas Nos. X and XII), rapid rises occurred in the headwaters of the Ohio and tributaries, and in the Savannah River.

Ice in rivers.—*Missouri*—Lower Brule Agency, Dak., 8th, last boat of season passed down, 30th, river covered with floating ice. Plattsmouth, 26th to 30th, soft ice floating in river. *Mississippi*—La Crosse, 29th and 30th, ice running from Black River in small pieces.

High tides.—Tybee Island, Ga., 19th; Flushing, N. Y., 22d (3½ feet above ordinary high tide-mark); on the 23d, Eastport, Me., running over some of the wharves; Portland, Me., highest known for years, even with the wharves.

Low tides.—Indianola, Tex., 22d to 30th; Tybee Island, Ga., 22d and 23d, long-continued off-shore winds have caused very low water in the Savannah River, affecting navigation somewhat, and causing the lowest tide known for many years.

ATMOSPHERIC ELECTRICITY.

Thunder storms.—3d Texas. 4th, New Mexico. 5th, New Mexico, Wisconsin, Michigan. 6th, Iowa, Illinois, Kansas, Missouri. 7th, New Mexico, Tennessee, Illinois, Indiana, Kentucky, Texas. 9th, Indian Territory. 10th, Texas. 11th, North Carolina, Illinois, Kentucky, Texas. 12th, North Carolina, Virginia. 14th, Illinois, Texas. 15th, Alabama, Texas, Mississippi. 16th, Texas. 17th, Texas. 18th, Alabama, Mississippi. 19th, Florida, North Carolina. 20th, Louisiana, Virginia. 21st, North Carolina, Virginia. 22d, New Jersey, Virginia. 23d, Massachusetts, Minnesota. 24th, Texas. 25th, Louisiana, Texas. 26th, Florida.

Auroras.—Pembina, Dak., 18th; Dubuque, Iowa, 16th; Escanaba, Mich., 30th; Boston, 30th; Cresco, and Nova Springs, Iowa, 30th; Cornish and Mechanics' Falls, Me., 14th; Gardiner, Me., 6th, 20th, 30th; Waltham, Mass., 14th, 30th; Cambridge, Mass., 14th; Saint Anthony, Minn., 29th; Oregon, Mo., 14th; Contoocookville, N. H., 14th; Starkey, N. Y., 7th; Cape Vincent, N. Y., 14th; Franklin, Pa., 12th; Woodstock, Vt., 30th; Beloit, Wis., 21st.

Telegraphic communication interfered with by atmospheric electricity.—Santa Fé, N. Mex., 7th, 8th, 9th; Albuquerque, N. Mex., 13th; Fort Sill, Ind. T., 9th, line ceased working.

OPTICAL PHENOMENA.

Solar Halos.—1st, Connecticut, California; 2d, California; 4th, Florida, Texas; 5th, Iowa, Missouri, Ohio, Louisiana, Mississippi; 7th, Texas, Florida, Connecticut, Texas; 8th, Dakota, Massachusetts, Texas; 9th, Dakota, Connecticut, Mississippi, Ohio, Louisiana. 10th, Ohio, Indiana. 11th, Dakota, Connecticut, Illinois, Mississippi. 12th, New Mexico, Connecticut, California. 13th, New Jersey, Texas. 14th, Iowa, Missouri, Ohio, Illinois, Indiana, Maine, New Jersey. 15th, Iowa, Ohio, Rhode Island, Connecticut, Illinois, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Vermont. 16th, Connecticut, New York. 17th, Wisconsin. 18th, Iowa, Minnesota. 19th, Indiana. 20th, Ohio. 21st, New York. 24th, North Carolina, Kansas, Ohio. 25th, Connecticut. 26th, Connecticut, Michigan, New York. 27th, Connecticut, Illinois, Maine, New Hampshire. 28th, Iowa Texas. 29th, Iowa, Ohio, Illinois, Louisiana, Missouri. 30th, North Carolina, Connecticut, Illinois, Louisiana, Michigan, Mississippi, New Jersey, Ohio, Tennessee, Texas.

Lunar halos.—1st, New Mexico, Nebraska, Iowa, Minnesota. 2d, Iowa, Wisconsin, Minnesota, Illinois, Connecticut, Missouri, California, Nebraska, Texas, Louisiana. 3d., New Nexico, Utah, Nebraska, Dakota, Texas, Florida, Iowa, Wisconsin, Minnesota, Ohio, Rhode Island, Connecticut, Maine, Massachusetts, New Jersey, New York, California, Nevada, Idaho, Louisiana. 4th, Utah, Nebraska, Indian Territory, Wisconsin, Mississippi, Missouri, Nevada, Minnesota. 5th, Iowa, Minnesota, Illinois, Georgia, Connecticut, New York, Alabama, Massachusetts, Missouri, New Jersey, Pennsylvania, Idaho, Texas, Louisiana. 6th, Kansas, Alabama, Illinois, New Hampshire, Missouri, Nebraska, New York, Texas. 7th, Texas, Florida, Wisconsin, Illinois, Tennessee, Massachusetts, New Jersey, Louisiana, Minnesota. 8th, Dakota, Texas, Wisconsin, Minnesota, Illinois, Rhode Island, Maine, Massachusetts, New Hampshire, New Jersey, Michigan, Louisiana. 9th, Texas, Alabama, Iowa, Minnesota, Wisconsin, Ohio, Illinois, Rhode Island, Connecticut, Massachusetts, Maine, Louisiana, Mississippi, Missouri, New Jersey, Pennsylvania. 10th, Texas, New York, North Carolina, New Jersey, Maryland, Pennsylvania, Virginia, Connecticut, Massachusetts, Michigan, Missouri, Ohio, Louisiana. 11th, Dakota, Texas, Minnesota, Wisconsin, New York, South Carolina, Illinois, Mississippi. 12th, New Mexico, Texas, Ohio, Connecticut, Massachusetts, Missouri, New Jersey, New York, Pennsylvania, California, Minnesota. 13th, Indian Territory, Nebraska, Iowa, Wisconsin, Missouri, New Jersey, Kansas, Texas, Louisiana. 14th, Dakota, Iowa, Michigan, Ohio, Virginia, New Jersey, Connecticut, Illinois, Kansas, Texas. 15th, Virginia, Maine, Ohio, Wisconsin, California, Texas. 17th,

Dakota, Texas. 18th, Nebraska, Texas. 19th, Indiana, Texas, Louisiana. 20th, Wisconsin. 21st, Maine. 28th, Wisconsin, Texas, Louisiana, Minnesota. 29th, Dakota, Texas, Iowa, Wisconsin, Illinois, Connecticut, Nebraska, Ohio, Tennessee, California, Nevada, Minnesota. 30th, Iowa, Michigan, Ohio, West Virginia, Indiana, North Carolina, Pennsylvania, Virginia, Illinois, Kentucky, Maryland, Mississippi, New Jersey, Wisconsin, California, Idaho, Texas, Louisiana.

Mirage.—Pembina, Dak., 3d; New London, 4th, 7th, 8th, 15th, 19th, 27th, 29th; New Bedford, Mass., 10th; Olivet, Dak., 26th.

MISCELLANEOUS PHENOMENA.

BOTANICAL.—*Florida*—Houston, 30th, month has been very pleasant and favorable to vegetation, most vines are still growing; sugar cane not yet injured, the manufacture of sugar has continued throughout the month. Milton, since the 15th all winter gardens are doing well. *Iowa*—Tabor, 30th, weather remarkably favorable during the month for harvesting fall crops; corn two-thirds of a crop, but of very good quality and mostly harvested in fine condition. Vail, 30th, farmers still plowing. *Maryland*—Sandy Spring, 30th, clover in bloom second time. *Massachusetts*—Mendon, 30th, grass still green. Somerset, 30th, dandelions and arnica in bloom second time. *Missouri*—Oregon, 25th, farmers still plowing. *Mississippi*—Fayette, 30th, month very favorable for cotton-picking; crop all gathered but very light; corn, potatoes, and sugar cane very good; hardly a killing frost, some tender plants still alive; sage and morning glories in bloom second time. Brookhaven, 5th, forest leaves falling; witch-hazel, chinese pinks, roses, and snap-dragons in bloom second time. *Texas*—Melissa, 14th, early-sown fall wheat looking very green, some farmers still sowing; 30th, harvesting of corn and cotton about finished, average yield per acre of corn, about 50 bushels, of cotton about 500 pounds. Clarksville, 30th, very little wheat sown, ground too dry to work, cotton crop nearly all gathered, quality very good but quantity much below expectations. *Pennsylvania*—Chambersburg, 30th, pansies in bloom in the open air. *Virginia*—Broad Oak, 30th, forest leaves all fallen, fall wheat looks well. *Nebraska*—Genoa, farmers plowing during entire month. *New York*—Wappinger's Falls, 21st, farmers still plowing. Palermo, 17th, leaves falling from fruit trees; 10th, grass still green. Flushing, 24th, dandelions in bloom second time. *North Carolina*—Fayetteville, 14th, cherry trees in bloom second time; 30th, fall roses, chrysanthemums, and violets in bloom second time, corn crop good, cotton fair, potatoes excellent, fruit average, wheat acreage larger than usual and looks fine. Weldon, 30th, corn crop good, cotton crop small. *Ohio*—Jacksonburg, 26th, wheat and barley luxuriant; 1st to 18th, foliage falling. Ringgold, 30th, wheat and grass still growing.

INSECTS.—*Bees*—Monticello, Iowa, 12th, out in open air. *Moths*—Oregon, Mo., 5th. *Locusts*—Denver, no locusts seen during month, and none this year up to date. Fort Sill, Ind. Ter., 1st, diminishing in numbers; 2d, a few observed going S.; 3d, gradually decreasing; 12th, almost entirely disappeared. *Crickets*—Melissa, Tex., 10th. *Native grasshoppers*—Melissa, Tex., 29th. *Worms*—Flushing, N. Y., 28th, appeared on surface of ground. *Small insects*—Palermo, N. Y., 16th, myriads flying in the air. *Butterflies*—Oregon, Mo., 5th. *Katydids*—Brookhaven, Miss., 7th.

BIRDS.—*Geese*—Princeton, Cal., 3d; Mount Sterling, Ill., 13th; Creswell, Kans., 6th, 10th, flying S.; Fort Madison, Iowa, 3d, 4th, 10th, 14th; Independence, Kans., 26th, S.; Somerset, Mass., 28th, S.; New Bedford, Mass., 19th, S.; Springfield, Mass, 6th, S.; Waltham, Mass., 19th, S.; Oregon, Mo., 2d, 5th, 16th, 17th; Corning, Mo., abundant during month; no movement yet to the south. Ashley, Mo., 30th; Starkey, N. Y., 28th, S.; Flushing, N, Y., 3d, S.; Bellefontaine, Ohio, 24th; Tioga, Pa., 5th, S.; Cleveland, Ohio, 29th, S.; Cairo, Ill., 7th, 28th, S.; Tybee Island, Ga., 8th, S.; New River, N. C., 11th. *Ducks*—Daytona, Fla., 1st, flying S. in large flocks; Monticello, Iowa, 13th, 26th, S.; Corning, Mo., abundant during month; no movement yet to the South; Starkey, N. Y., 11th; Fayetteville, N. C., 2d, 3d; Jacksonburg, Ohio, 24th, S.; Melissa, Tex., 2d, plenty; Fort Gibson, Ind. Ter., 24th. *Blackbirds*—Elmira, Ill., 27th, numerous; Creswell, Kans., 15th, flying S.; Oregon, Mo., 1st to 3d, 7th to 11th, 13th to 15th, 26th; Wappinger's Falls, N. Y., 2d, flying S. *Wild pigeons*—Fayetteville, N. C., 2d, 3d. *Snowbirds*—Creswell, Kans., 25th. *Yellowbirds*—Ringgold, Ohio, during month. *Jaybirds*—Oregon, Mo., 10th; Palermo, N. Y., 11th. *Owl*—Oregon, Mo., 2d, 12th, 22d, 23d. *Meadow larks*—Creswell, Kans., 27th. *Prairie chickens*—Creswell, Kans., 28th, plenty. *Buffalo birds*—Creswell, Kans., 4th, leaving. *Quails*—Oregon, Mo., 1st. *Crows*—Creswell, Kans., 24th, 26th; Oregon, Mo., 22d; Bellefontaine, Ohio, 3d, flying S. *Cranes*—Oregon, Mo., 27th; Fayette, Miss., 1st, 4th, 21st, 27th, flying S.; Melissa, Tex., 1st, S. *Bluebirds*—Waltham, Mass., 4th, disappeared; Oregon, Mo., 1st, 17th; Starkey, N. Y., 13th, flying S.; Ringgold, Ohio, during month. *Robins*—Daytona, Fla., 26th, first seen this season; Fayette, Miss., 9th, first heard; Brookhaven, Miss., 6th; Starkey, N. Y., 3d, flying S.; Melissa, Tex., 8th, first appearance. *Eagles*—Wappinger's Falls, N. Y., 23d.

Meteors.—Vevay, Ind., 12th to 14th. New Corydon, Ind., 2d, 14th, 23d, 26th, 28th to 30th. Fort Dodge, 16th, 8:15 p. m., very brilliant meteor of intense yellow color, ex-

ploded with a dazzling flash, but no noise; size twice or thrice that of Jupiter; after explosion a streak of greenish light remained visible for a second or two. Topeka, Kans., 17th, 7 p. m., brilliant meteor moved from near the zenith towards the southwest, through a path of about 20°; size about twice that of Jupiter; color, orange red; 27th. Afton, Iowa, 1st, 7th, 27th. Vail, Iowa, 14th. Holton, Kans., 18th. Woodstock, Md., 15th, 8:35 p. m., meteor appeared in the west at a height of about 45° and traveled very slowly over an arc of about 30°; it was brighter than Jupiter; color, orange tinged with red on lower side; exploded into three parts, the largest the size of Jupiter; 1st to 4th, 12th, 13th, 23d, 24th, 29th, 30 h. Owing's Mills, Md., 2d. Fall River, Mass., 6th. 26th. Rowe, Mass., 24th, 26th, 29th. Fayette, Miss., 3d, 4th, 6th, 19th, 21st, 23d. Oregon, Mo., 1st, 18th, 22d, 23d. Kansas City, Mo., 12th, 13th. Norfolk, Nebr., 14th. Freehold, N. J., 14th. Atco, N. J., 5th, 15th. Linden, N. J., 29th, Jersey City, N. J., 24th. Waterburg, N. Y., 24th, 27th, 30th. Starkey, N. Y., 23d. Wappinger's Falls, N. Y., 1st, 13th, 24th, 26th, 29th. Flushing, N. Y., 24th. Jacksonburg, Ohio, 18th. Cleveland, Ohio, 23d. Strafford, Vt., 15th. Broad Oak, Va., 29th. Davenport, Iowa, 18th. Indianapolis, Ind., 2d. New Haven, Conn., 13th. Sacramento, Cal., 22d. Pioche, Nev., 29th, 30th. Boise City, Idaho, 23d, 26th, 27th. Breckenridge, 14th. Princeton, Cal., 10th, 8:30 p. m., meteor equal in size to Jupiter; appeared in the west at a height of 45°; 22d, 8 p. m., meteor, size, one-eighth of full moon; appeared in the north northwest of a height of about 35° and moved to the west 60°, where it exploded; trail visible for three minutes, nearly as bright as day. South Hartford, N. Y., 1st, 5th. Cambridge, Mass., 14th, a brilliant meteor was observed to fall to the ground during broad sunshine, apparently at a distance of about ten rods from position of observer; the ground was examined, but nothing found resembling a meteoric stone. Brilliant meteors were also observed in Iowa; at Albion, on the 14th: Anita and Albion, 15th; Waverly, 16th; Decorah, 20th; and at Council Bluffs and Charles City on the 28th. Mr. E. F. Sawyer, of Boston, reports none on 23d, 24th, 26th, 29th; cloudy on 25th, 27th, 28th, 30th; Bielas comet or meteor shower was expected on the 27th.

Polar bands.—Bismarck, Dak., 16th; Savannah, 11th, 24th; New Corydon, Ind., 3d, 10th, 14th, 15th, 19th, 29th; Tabor, Iowa, 13th, 20th, 28th, 29th; Gardiner, Me., 3d, 7th, 16th; Danville, Ky., 30th; Fayette, Miss., 2d; Plattsmouth, Nebr., 2d, 20th; Auburn, N. H., 30th; Freehold, N. J., 9th; Vineland, N. J., 20th; Woodstock, Vt., 2d, 16th; Wytheville, Va., 5th, 10th, 14th.

Zodiacal light.—Savannah, 13th, 14th, 22d; Southington, Conn., 14th; New Corydon, Ind., 1st, 2d to 5th, 23d, 24th, 29th, 30th; Monticello, Iowa, 25th; Somerset, Mass., 14th; Oregon, Mo., 1st, 20th, 23d; Contoocookville, N. H., 30th; Waterburg, N. Y., 2d, 27th, in the morning; Cambridge, Mass., regularly looked for at 8 p. m., suspected on the 14th and 23d, seen distinctly on the 24th and 26th; these four were the only evenings when the observation was not hindered by clouds or moonlight.

Prairie fires.—Fort Gibson, Ind. T., 1st to 9th, 11th to 13th, 14th (many buildings and miles of fences burning), 15th, 17th (nearly all fences burned in vicinity of national cemetery), 23d to 25th, 28th, 29th; Dodge City, Kans., 1st, 2d, 20th, 29th, 30th; Pembina, Dak., 14th; Creswell, Kans., 1st to 7th, 12th, 16th to 25th, 29th; Independence, Kans., 3d, 22d to 24th, 28th; Topeka, Kans., nearly every night during month; Monticello, Iowa, 30th; De Soto, Nebr., nearly every day; Oregon, Mo., 13th, 18th, 22d, 23d.

Earthquakes.—Medellin, United States of Columbia, S. A., *September* 9, 7 p. m., "single shock; no damage at this place, but at Manizales, 80 miles south of Medellin, several houses were destroyed;" 10th, 12:30 p. m., slight shock. Manizales, Antioquia, United States of Columbia, S. A., *October* 9, (probably *September* 9,) severe earthquake, 110 houses destroyed, including church, hospital, and principal city buildings; no lives lost, as shock was long sustained, with principal force at its termination. *October* 8, Yokohama, Japan, 10:48 p. m., slight shock; 9th, 1:20 p. m., smart shock, duration 45 seconds. San José Cal., 11th, 7:30 p. m., severe shock, accompanied by a rumbling noise; vibrations from N. and S., lasting 30 seconds. *November*—San Francisco, 11th, 9:45 a. m., slight shock, with undulations, from east to west, and lasting about two seconds. Cairo, Ill., 18th, at 11h 51′ 50″, "a trembling motion was felt, lasting 40 seconds, followed by a rocking motion from WNW. to ESE., lasting 20 seconds, and a second trembling lasting 10 seconds"—houses distinctly felt to totter, and loose bricks were shaken from chimneys. Leavenworth, 18th, 11:15 p. m., slight shock, movement hardly sufficient to determine the direction, but it seemed to be from north to south. Saint Louis, 18th, 11:57 p. m., slight shock, movement north to south, lasting but a few minutes and was felt only by persons occupying quiet positions in old buildings and in a few brick buildings; persons in the street did not perceive the shock. Lebanon, Mo., 18th, a few minutes after midnight a severe shock, large brick houses trembling, awakening persons sleeping on second floor; vibration north to south, continuing for eight or ten seconds, and followed by two lesser shocks, with six or eight seconds intervening; noise a low rumbling like distant thunder. Cairo, Ill., 19th, 5:10 a. m., slight trembling, lasting 20 seconds, houses tottered from WNW. to ESE. Murphy, N. C.,

2d, 10 a. m., slight shock from west to east, lasting one minute, not much jar, but a rumbling noise like distant thunder. Panama, November 7, advices from San Salvador, C. A., report the volcanoes Izalco and Santa Ana in a state of great activity, and confirm the previous report of a severe earthquake in southern portion of the republic, resulting in great loss of life and property.

Sea fog wave.—The observer at Westminster, B. C., reports the annual sea fog wave (which he considers as the beginning of winter) to have made its first appearance this year on October 31, at 4 p. m., barometer 30.04, temperature 49°; its first appearance occurred as follows, during the preceding five years:

Year.	Month.	Hour.	Bar.	Temp.
				°
1873	October 27	4:00 p. m.	30.23	46
1874	October 31	5:00 p. m.	30.14	49
1875	October 9	9:30 p. m.	29.93	49
1876	October 9	4:30 p. m.	30.00	65
1877	October 19	8:00 p. m.	29.86	47

Sunsets.—The characteristics of the sky at sunset, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from 123 stations show 3,682 observations to have been made, of which 37 were reported doubtful; of the remainder 3,140 or 85.3 per cent. were followed by the expected weather.

Sun spots.—Monthly record of observations by Mr. D. P. Todd, Nautical Almanac Office, Washington, D. C., communicated by Prof. S. Newcomb, United States Navy, in charge of that office:

November, 1878.	No. of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	
1—4 p. m.	0	0	0	0	0	0	1	1	
2—4 p. m.	0	1	0	0	0	0	1	2	
4—3 p. m.	0	0	0	0	0	0	1	1	
5—3 p. m.	0	0	0	0	0	0	1	1	
7—4 p. m.	0	0	0	0	0	0	1	1	
8—4 p. m.	0	0	0	0	0	0	1	1	
9—4 p. m.	0	0	0	0	0	0	0	0	
12—4 p. m.	0	0	0	0	0	0	0	0	
13—4 p. m.	0	0	0	0	0	0	0	0	
14—3 p. m.	0	0	0	0	0	0	0	0	
15—3 p. m.	0	0	0	0	0	0	0	0	
16—2 p. m.	0	0	0	0	0	0	0	0	
20—1 p. m.	1	2	0	0	1	2	1	2	Faculæ.
23—4 p. m.	0	0	0	0	0	0	0	0	
25—2 p. m.	0	0	0	0	0	0	0	0	
29—3 p. m.	0	0	0	0	0	0	0	0	
30—2 p. m.	0	0	0	0	0	0	0	0	

Mr. John W. James, of Riley, Ill., reports that up to the 28th the sun spot, observed on the 3d, had not reappeared. Prof. Gustavus Hinrichs, at Iowa City, Iowa, one very large spot observed from the 1st to the 8th. Mr. Jay Harcourt, at Wappinger's Falls, N. Y., observed one spot, on the 3d, near the sun's center, slightly below equator, very round and sharply defined; 4th, same spot, slowly rotating, changing its form to the shape of a kidney; 5th, slowly rotating towards the sun's circumference, 21st, 24th, 26th, sun examined, but no spots. Mr. David Trowbridge, at Waterburg, N. Y., examined the sun on the 1st, 2d, 3d, 4th, 5th, 9th, 10th, 12th, 14th, 15th, 16th, 24th, 29th, and 30th; spots observed from the 1st to 5th, disappearing on the 9th. Mr. H. D. Gowey, of North Lewisburg, Ohio, observed spots on the 2d, 4th, and 6th, disappearing on the 12th by solar rotation; 26th, observed spot which might have appeared by solar rotation.

NOTES AND EXTRACTS.

Altitude of meteors.—In the *Wochenschrift*, page 304, Torvald Köhl gives the altitude of twelve meteors simultaneously observed at two neighboring stations. Four hundred and eighteen meteors were observed in all, but only for these twelve could altitudes be computed; the results are obtained by Brandes' graphic method, and are as follows:

Altitude in geographical miles.

Number.	At the beginning.	At the end.	Number.	At the beginning.	At the end.
1	10	11.6	7	.....	14.0
2	15	12.3	8	.....	5.0
3	.....	9.3	9	·16	.....
4	.....	10.9	10	11	7.0
5	.....	13.0	11	11.5	10.0
6	.....	13.6	12	15.25	13.5

Photographing the clouds.—In a letter to the European Meteorological Congress (*Wochenschrift*, p. 327), Dr. Hildebrandsson urges universal attention to the motions of the upper and lower clouds, and adds: "The various forms of the clouds are, without doubt, of great interest, and their earnest study will certainly lead to important discoveries. But we must photograph the various forms of the clouds on a large scale, at different points in Europe, and note the different atmospheric conditions under which they occur. The studies executed in Upsala, with the assistance of an experienced photographer, have convinced us that these pictures can be taken in the majority of cases, even when the apparent motion of the clouds is very considerable. But it is, then, imperative to use extraordinarily sensitive plates, so that the time of exposure may last only a portion of a second. This is also the case when one would obtain good pictures of the small transparent cirrus clouds, whose photographic effect is but little different from that of the blue light of the sky. In this way we have, at Upsala, obtained an interesting series of photographs, which show how one form of cloud gradually passes over into another form." The observers of the Signal Service have, since November 1, 1870, made three daily simultaneous observations and reports of the direction of the winds and of the directions of movement of upper clouds at the different stations throughout the United States for purposes of study. In 1871 photographs of clouds were taken by the photographer employed at this office in connection with the meteorological instruments. In May, 1872, Assistant Cleveland Abbe, A. M., of this office, reported the results of an especial examination and comparison of the direction of movement of the wind and the direction of upper-cloud movement, as reported from the stations and appearing on the manuscript charts of the office, thrice daily, for the period from January 1, 1872, to May 1, 1872, and later, in 1875, a further report on the subject was made by him, by direction of the Chief Signal Officer; the facts so ascertained and reported being, in effect, coincident with the facts announced, as to the different directions of movement of upper and lower air currents, by Buchan, Ley, Hildebrandsson and others. The field of study in the United States is large and affords unusual advantages for studies of this description.

Increase of temperature with altitude.—M. Alluard communicates to the Paris Academy some of his experiences on the summit of the Puy de Dome (4,850 feet). He finds a great hinderance in the frost, which forms as readily as on Mount Washington or Pike's Peak. He is planning to secure a large number of temporary stations at different altitudes in the neighborhood of Puy de Dome, and thus study horizontal sections of the earth's atmosphere. He finds not only occasional instances in which the temperature at the summit is higher than at the base, as has already been found to be the case at very many other stations, but so frequently does this occur that even the monthly means exhibit similar anomalies. The minimum night temperatures at the base are frequently 12¼° Fahrenheit lower than at the summit; the maximum day temperatures show no such anomalies. He concludes that the rate of diminution of the temperature with altitude is very different during the day from the rate during the night, and hopes that future observations will give some clue as to the reason therefor.

A new thermometer.—Joubert has determined very carefully the effect of heat in altering the rotatory power of quartz for polarized light. His experiments were made at temperatures of from —20° C. [—4° F.] to +1500° C. [2732° F.], through which enormous range quartz proves to be exceedingly sensitive, and he proposes to reverse the problem and use the rotatory power of quartz as the best thermometer, convenient and comparable at all temperatures, that has yet been discovered. (Paris C. R., p. 499.)

Sun spots and terrestrial meteorology.—Mr. J. A. Broun communicates to *Nature* (vol. 19, p. 6) an investigation of the question, does the barometric pressure vary in a decennial period? He examined particularly the observations made in India since 1841, and presents the following conclusions: (1) The years of greatest and lowest mean annual barometric pressure are probably the same for all India. (2) Therefore the ap-

parent relation to the decennial (sun spots) period found by Mr. Chambers for Bombay holds for all India. (3) The annual oscillations of monthly mean pressure and monthly mean temperature (the amplitude of the annual variations) have nearly a constant ratio in India. (4) These oscillations depend on local conditions in the same latitude at places quite near each other, which are independent of the heat emitted by the sun. (5) The yearly mean isobars run parallel to the equator in India and are independent of local conditions. (6) The yearly mean isotherms vary in their direction with local conditions. (7) There is no relation between the variations of yearly mean temperature and yearly mean pressure.

Solar radiation.—W. Stanley Jevons communicates to *Nature* (vol. 19, p. 35) a memoir, enumerating a very full list of commercial crises compared with the solar-spot periodicity, and adds: "I should point to the necessity of at once undertaking direct observations of the varying power and character of the sun's rays. There are hundreds of meteorological observations registering at every hour of the day and night the most minute facts about the atmosphere; but that very influence upon which all atmospheric changes ultimately depends, the *solar radiation*, is not, I believe, measured in any one of them, at least not in the proper manner." The various methods proposed by Pouillet, Herschel, Crova, Violle, Govi, Weber, Erman, Ericsson, Draper, Marie Davy, and many others, offer to physicists a wide range of investigation into this important subject, which has certainly been neglected in the increasing demands upon meteorologists for weather predictions and practical results.

Edison's tasimeter and carbon telephone as a barometer or hygrometer.—At the London Physical Society, November 9, Prof. W. F. Barrett stated that on replacing the hard-rubber cylinder of the Edison tasimeter by a strip of gelatine varnished on one side it was found that a very slight change in the hygrometric state of the atmosphere can be detected by the absorption of moisture, causing expansion of the gelatine. By connecting the carbon button with an aneroid box the tasimeter becomes an aneroid baroscope; before any accurate measurements can be made, however, we must investigate more carefully the resistances of the button.

The origin of atmospheric electricity.—Professor Edlund, of Stockholm, communicates to the Swedish Academy the result of his researches upon "Unipolar induction," in which he has apparently made great progress toward the discovery of the origin and laws of terrestrial magnetism, earth currents, and terrestrial and atmospheric electricity. Although Edlund treats this subject by developing it in connection with his well-known theory of the physical nature of that what we call electricity and magnetism, yet apart from this theory we may obtain some idea of his views in the following synopsis. The magnetic condition of the earth, as shown by observations upon its surface, may be approximately represented by assuming the existence of a great magnet somewhere in its interior and whose axis is inclined to the earth's axis. Now the laws according to which a magnet acts upon magnetic bodies and magnetic or galvanic currents in its neighborhood can be clearly expressed in mathematical formulæ agreeably to the known laws of magnetism and electricity, and Edlund finds that if we assume, as we know is the case, that the magnetic earth is a good conductor of electricity, then its action upon the moving atmosphere of oxygen, nitrogen, and aqueous vapor (which is also slightly magnetic and of which the vapor is a better electric conductor than the gas) leads to the following rather rigorous deductions: (1) The earth will be negatively electrified. (2) Its potential will be everywhere the same. (3) The atmosphere will be positively electrified. (4) The general equilibrium between atmosphere and earth takes place either by continuous currents or by discharge, but is hindered by the poor conductibility of the air and can take place only when favoring circumstances combine. (5) The atmospheric positive electricity will be strongest toward the equator and feeblest toward the poles. (6) Near the poles the negative electricity of the earth may even be, by dissipation, so distributed throughout the lower atmosphere as to feebly negatively electrize the air, as observed by Wijkander. (7) Owing to the feeble electrization of the air in arctic regions, and to the absence of any opposition due to unipolar induction, there can be little or no lightning there, while thunder-storms will be most frequent in the equatorial region, where the resistances and potential are greatest. (8) The discharge by continuous current or aurora takes place in directions parallel to the free hanging magnetic needle. (9) At and near the magnetic pole itself the resistances to discharge are so slight and the discharges are so favored by induction that not even auroral light is produced. (10) The disruptive discharge between two bodies cannot take place except they be good conductors and be separated by a poor conductor; the dry air is the latter, while water or the mass of particles of fog and large drops of rain form good conductors. (11) By induction a negative cloud may exist in any locality, although the average condition of the atmosphere is positive. (12) The region of most numerous auroras must occupy a circle about the pole at such distance that the positively electrized particles of air flying northward are just able to overcome the atmospheric resistances and those arising from unipolar induction, which latter diminish with increasing latitude; this is also a zone in which the inclination of the magnetic needle is everywhere the same.

(13) The direction of auroral coronæ should coincide only approximately with the magnetic needle, because the earth's axis of rotation does not agree precisely with the magnetic axis. (14) The aurora should be most frequent where thunder-storms are least frequent. (15) The perpetual interchange of currents of electricity going to the poles through the atmosphere and returning to the equator through the earth produces a slight disturbance of the magnetic needle fully accounting for annual, daily, and irregular variations. (16) Similar irregularities are produced by the varying conductibility of the atmosphere due to the variable quantity of its moisture. (17) The secular changes in the magnetic needle and atmospheric electricity appear to be due to causes outside of the earth.

Apparatus for recording atmospheric electricity.—An apparatus for maintaining an almost continuous record of the atmospheric electricity has been invented by Mascart, the Director of the French Bureau Central de Meteorologie, and has performed satisfactorily during several months at the Paris Exposition. Mascart's apparatus is described by Angot (*Le Nature*, p. 371.) It is contemplated to establish these instruments in several different portions of France, and to study the laws of atmospheric electricity.

Monsoons and hurricanes of the Indian Ocean.—W. Wagner, chief of the first sub-section of the *Deutsche Seewarte*, communicates to the *Annalen des Hydrographie* a comprehensive review of our knowledge on this subject as contained in the works of Blanford, Meldrum, Wilson, Elliott, &c. From Wagner's memoir we extract the data given in the following table, showing the average characteristics of the hurricanes, cyclones, or typhoons of Asia and India:

Locality.	Hurricanes most frequent.	Duration of progress.	Duration.	Rotation of wind.	Diameter.
Sea of China	September and October	Toward W. and NW. when north of 20° N. lat. Toward S. and SW. when south of 20° N. lat.; but exceedingly irregular and especially so between China and Japan and north of Formosa.	Eight to twelve hours; usually less.	Opposed to motion of hands of watch.	60 to 240 knots.
Bay of Bengal	April, May, June, October, November, December.	Toward W. and N.	Several days	Opposed	100 to 300 knots; inner calm space 20 knots.
Arabian Sea	Very seldom	(*)	(*)	(*)	(*)
Southern Indian Ocean or Mauritius.	February and March	Toward WSW.; then S. and SSE., and finally SE.		Same as watch hands.	9-10 knots per hour for the fastest; 7-12 knots per hour for the slowest.

*Probably similar to those in the Bay of Bengal.

Barometric pressure in Asia.—Dr. W. Köppen, of the *Deutsche Seewarte*, communicates to the *Annalen* an indorsement of Woeikof's statement, based on the preliminary result of the leveling across Siberia, according to which the altitudes of meteorological stations are greater by from 60 to 72 meters than has been hitherto accepted; therefore the mean barometric pressure, reduced to sea-level, is increased even more than was formerly assumed by Woeikof and Buchan.

Published by order of the Secretary of War.

ALBERT J. MYER,
Brigadier-General (Brevet Assigned), Chief Signal Officer, U. S. A.

PAPER 35.

MONTHLY WEATHER REVIEW DECEMBER, 1878.

INTRODUCTION.

In compiling the present review the following data, received up to January 14, have been made use of, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at 119 Signal Service stations and 11 Canadian stations, as telegraphed to this office; monthly journals and means, 109 and 143 respectively, from the former, and monthly means from 13 of the latter; reports from 26 special sunset stations; 237 monthly registers from voluntary observers; 34 monthly registers from United States Army post-surgeons; marine records; international simultaneous observations; monthly reports from voluntary observers and the local weather services of the States of Iowa and Missouri; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

Upon Chart No. II is exhibited by the isobaric lines the general distribution of the atmospheric pressure, as reduced to sea-level, for the month. Compared with the means for December of previous years, the pressure has generally been below the normal, east of the Mississippi; the greatest deficiency (0.05 to 0.11 inches) occurring over the Lower Lake region, Middle States, and New England. West of the Mississippi the pressure has generally been above the normal, the greatest excess (about 0.17 inches) occurring in Oregon.

The local barometric ranges for the month, as reduced to sea-level, have been largest over the Middle States and New England and least from the Rocky Mountains to California. Taken by districts, they vary as follows: New England 1.25 inches on summit of Mount Washington and 1.43 at Eastport to 1.70 at Burlington; Middle Atlantic States, 1.65 at Atlantic City and Norfolk to 1.90 at Fort Whipple; South Atlantic States, 0.96 at Jacksonville to 1.44 at Charlotte, N. C.; Lake region, 1.78 at Rochester to 0.97 at Marquette; Ohio Valley and Tennessee, 1.53 at Pittsburgh to 0.94 at Memphis; Gulf States, 0.99 at Mobile to 0.76 at Vicksburg and Laredo, Tex., and 0.52 at Key West; the Northwest and eastern slope of Rocky Mountains, 1.00 at Saint Louis to 1.40 at Pembina, 1.47 at Dodge City, and 1.19 at Fort Sill; Rocky Mountains, 0.47 at Santa Fé to 0.64 at Denver; Western Plateau, 0.64 at Salt Lake City to 0.70 at Winnemucca; California, 0.70 at Red Bluff to 0.81 at Visalia.

Areas of high barometer.—As usual, for this month, the areas of high pressure have been well marked, and have exhibited a decided influence on the climate of the country. Nine areas merit a brief description. Two (Nos. V and VI) have been remarkable for the persistence shown in remaining on the Pacific coast. Special attention is also called to Nos. II, V, VII, and IX, which, after entering the Gulf States, were accompanied, or rather followed, by storms which probably developed in that vicinity after the cold winds of the high area had begun to blow over the warm and moist surface of the Gulf of Mexico.

No. I is a continuation of high area No. IX, described in the November review. 1st, 7:35 a. m., it extended over New England and the Saint Lawrence Valley; that day it moved beyond Nova Scotia, with winds veering to southeast in advance of low area No. I, then entering the Lake region.

No. II.—4th, the pressure rose slowly in Texas, while clear weather, with light northerly winds, prevailed in the Gulf States. 5th, the rise extended over the East Gulf and South Atlantic States, but the barometer fell slowly in the Southwest, where the winds veered to warmer southeast in advance of the development in Texas of a storm-center, charted as low area No. III. 6th, slowly diminishing, the high area was transferred to the Florida region.

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No. I.

WAR DEPARTMENT WEATHER MAP.

SIGNAL SERVICE, U. S. ARMY,

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

TRACKS OF CENTRES OF AREAS OF LOW BAROMETER FOR DECEMBER, 1878.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

Albert J. Myer

BRIG. GEN. (BVT ASSG'D) CHIEF SIGNAL OFFICER, U. S. A.

NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7:35 A. M., the 4:35 P. M., and 11 P. M., (Washington mean time,) observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.

AVERAGE PROGRESS OF AREAS OF LOW BAROMETER EAST OF THE 100TH MERIDIAN.

No.	Velocity.
I.	21 miles per hour.
II.	33 do.
III.	20 do.
IV.	30 do.
V.	50 do.
VI.	— do.
VII.	— do.
VIII.	50 do.

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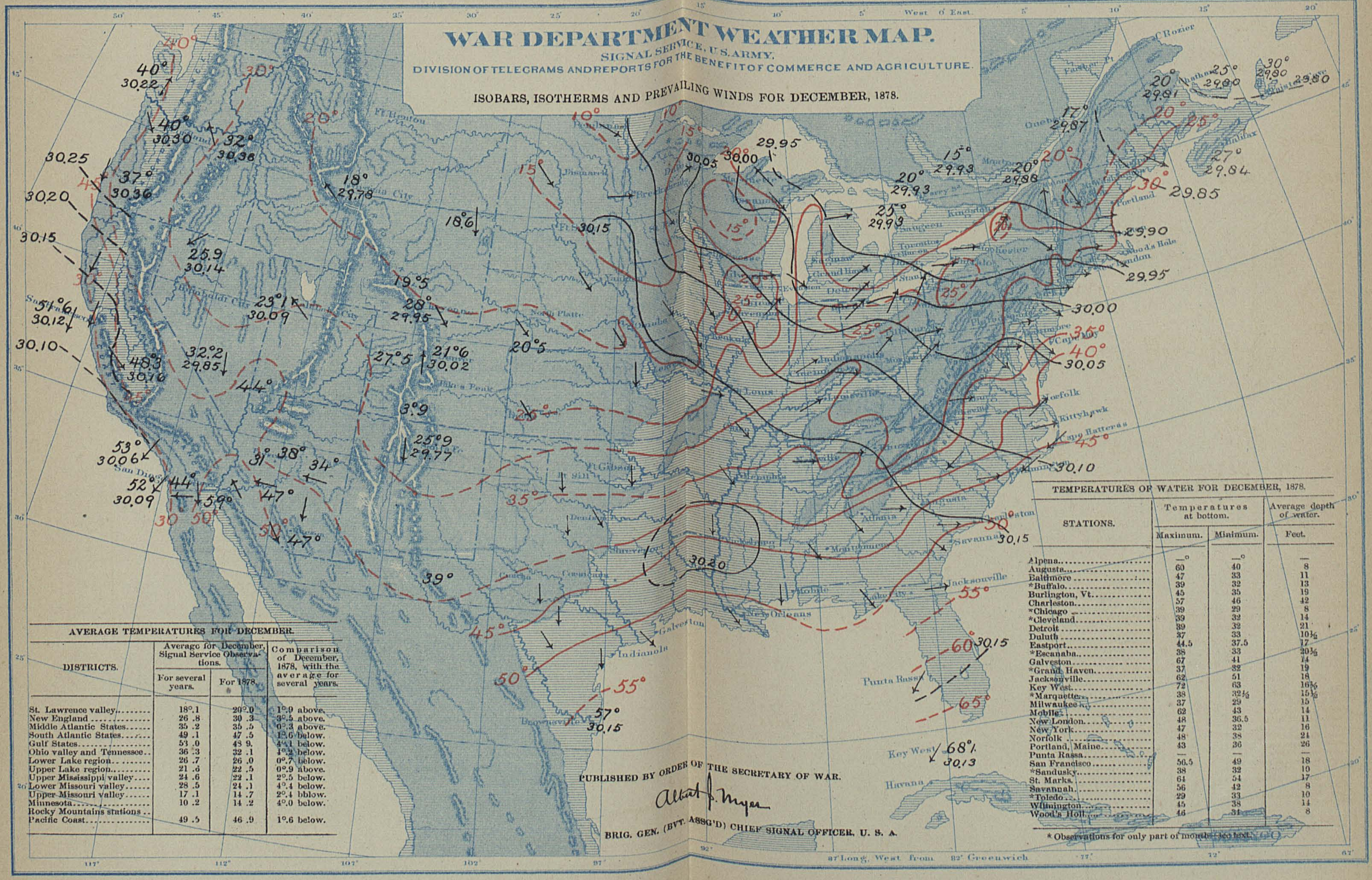

AVERAGE TEMPERATURES FOR DECEMBER.

DISTRICTS.	Average for December, Signal Service Observations. For several years.	For 1878.	Comparison of December, 1878, with the average for several years.
St. Lawrence valley	18°.1	20°.0	1°.9 above.
New England	26 .8	30 .3	3°.5 above.
Middle Atlantic States	35 .2	35 .5	0°.3 above.
South Atlantic States	49 .1	47 .5	1°.6 below.
Gulf States	53 .0	48 9.	4°.1 below.
Ohio valley and Tennessee	36 .3	32 .1	4°.2 below.
Lower Lake region	26 .7	26 .0	0°.7 below.
Upper Lake region	21 .6	22 .5	0°.9 above.
Upper Mississippi valley	24 .6	22 .1	2°.5 below.
Lower Missouri valley	28 .5	24 .1	4°.4 below.
Upper Missouri valley	17 .1	14 .7	2°.4 bblow.
Minnesota	10 .2	14 .2	4°.0 below.
Rocky Mountains stations			
Pacific Coast	49 .5	46 .9	1°.6 below.

TEMPERATURES OF WATER FOR DECEMBER, 1878.

STATIONS.	Temperatures at bottom. Maximum.	Minimum.	Average depth of water. Feet.
Alpena	—°	—°	—
Augusta	60	40	8
Baltimore	47	33	11
*Buffalo	39	32	13
Burlington, Vt.	45	35	19
Charleston	57	46	42
*Chicago	39	29	8
*Cleveland	39	32	14
Detroit	39	32	21
Duluth	37	33	10½
Eastport	44.5	37.5	17
*Escanaba	38	33	20⅓
Galveston	67	41	14
*Grand Haven	37	32	19
Jacksonville	62	51	18
Key West	72	63	16⅙
*Marquette	38	32½	15½
Milwaukee	37	29	15
Mobile	62	43	14
New London	48	36.5	11
New York	47	32	16
Norfolk	48	38	24
Portland, Maine	43	36	26
Punta Rassa	—	—	—
San Francisco	56.5	49	18
*Sandusky	38	32	10
St. Marks	64	54	17
Savannah	56	42	8
*Toledo	29	33	10
Wilmington	45	38	14
Wood's Holl	46	34	8

* Observations for only part of month—see text.

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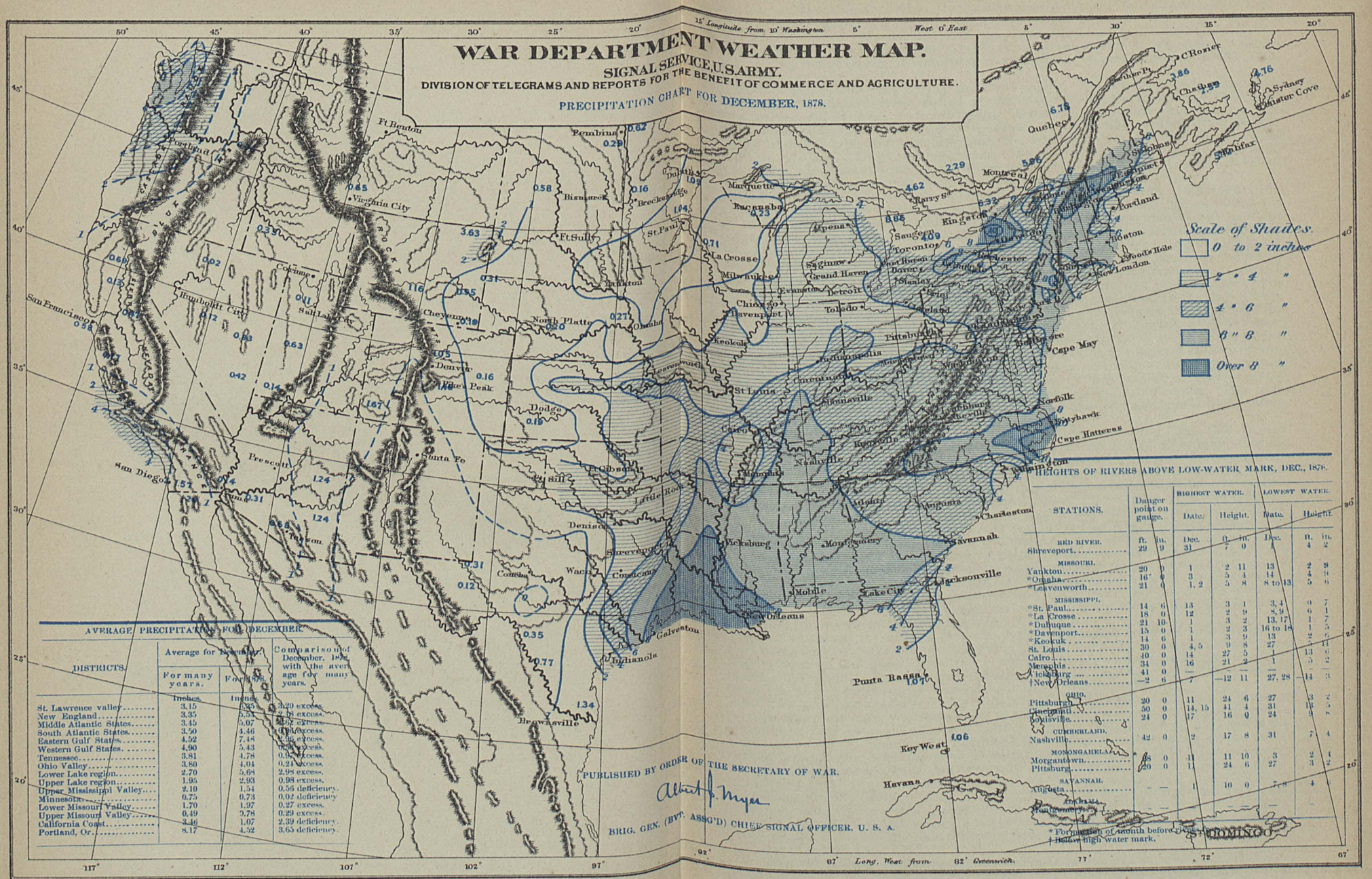
WAR DEPARTMENT WEATHER MAP.

SIGNAL SERVICE, U. S. ARMY.

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

PRECIPITATION CHART FOR DECEMBER, 1878.



AVERAGE PRECIPITATION FOR DECEMBER.

DISTRICTS.	Average for December. For many years.	Average for December. For 1878.	Comparison of December, 1878, with the average for many years.
	Inches.	Inches.	
St. Lawrence valley	3.15	6.35	3.20 excess.
New England	3.35	5.57	2.22 excess.
Middle Atlantic States	3.45	5.07	1.62 excess.
South Atlantic States	3.50	4.46	0.96 excess.
Eastern Gulf States	4.52	7.18	2.66 excess.
Western Gulf States	4.90	5.43	0.53 excess.
Tennessee	3.81	4.78	0.97 excess.
Ohio Valley	3.80	4.04	0.24 excess.
Lower Lake region	2.70	5.68	2.98 excess.
Upper Lake region	1.95	2.93	0.98 excess.
Upper Mississippi Valley	2.10	1.54	0.55 deficiency.
Minnesota	0.75	0.73	0.02 deficiency
Lower Missouri Valley	1.70	1.97	0.27 excess.
Upper Missouri Valley	0.49	0.78	0.29 excess.
California Coast	3.46	1.07	2.39 deficiency.
Portland, Or.	8.17	4.52	3.65 deficiency.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

Albert J. Myer

BRIG. GEN. (BVT. ASSG'D) CHIEF SIGNAL OFFICER, U. S. A.

HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, DEC., 1878.

STATIONS.	Danger point on gauge.		Highest water.			Lowest water.		
			Date.	Height.		Date.	Height.	
	ft.	in.	Dec.	ft.	in.	Dec.	ft.	in.
RED RIVER.								
Shreveport	29	9	31	7	0	1	4	2
MISSOURI.								
Yankton	20	0	1	2	11	13	2	9
*Omaha	16	0	3	5	4	14	4	9
*Leavenworth	21	0	1, 2	5	8	8 to 13	5	6
MISSISSIPPI.								
*St. Paul	14	6	13	3	1	3, 4	0	7
*La Crosse	18	0	12	2	9	8, 9	0	1
*Dubuque	21	10	1	3	2	13, 17	1	7
*Davenport	15	0	1	2	3	16 to 18	1	5
*Keokuk	14	6	1	3	9	13	2	6
St. Louis	30	0	4, 5	9	8	27	7	11
Cairo	40	0	14	27	5	1	13	6
Memphis	34	0	16	21	2	1	5	2
Vicksburg	41	0	—	—	—	—	—	—
†New Orleans	—2	6	7	—12	11	27, 28	—14	3
OHIO.								
Pittsburgh	20	0	11	24	6	27	3	2
Cincinnati	50	0	14, 15	41	4	31	13	5
Louisville	24	0	17	16	0	24	9	8
CUMBERLAND.								
Nashville	42	0	2	17	8	31	7	4
MONONGAHELA.								
Morgantown	18	0	11	11	10	3	2	4
Pittsburg	20	0	11	24	6	27	3	2
SAVANNAH.								
Augusta	—	—	1	10	0	7, 8	4	8
COLORADO.								
Grand Junction	—	—	—	—	—	—	—	—

* For portion of month before post was established.
† Below high water mark.

No. III.—5th, the barometer rose rapidly in Manitoba. 6th, the rise extended over the Northwest, where it was accompanied by light snows, followed by colder, clearing weather and northwest winds. 7th, the high area moved to the southeast, with maximum pressure central in Virginia. 8th, it was transferred to the Middle Atlantic and New England coast. 9th and 10th, the high barometer, slightly increasing in pressure, moved slowly to Nova Scotia and thence to the Cape Breton region, where it disappeared, with winds veering to southeast in advance of the great storm of the 9th, 10th, and 11th (low area No. III).

No. IV.—6th, the mercury rose on the Pacific slope. 7th and 8th, an examination of the charts of departures from normal pressures shows that the high area spread over New Mexico and Arizona. It is interesting to note in connection with this area that it was situated to the northwest of storm-center (low area No. III) then developing in Texas, while the high area just described (No. III) was situated in the Middle States and New England. These two high areas, 1,500 to 2,000 miles apart, gave rise to a circulation of winds around the center of depression in Texas favorable to the development of the great energy that storm afterward displayed.

No. V.—10th, the pressure rose rapidly on the North Pacific coast. 11th, continuing highest in Washington Territory, the barometer rose over all the United States, the greatest rise occurring in the Middle States. 12th, the pressure increased all over the chart, while the highest area extended from Washington Territory to Manitoba and Minnesota. 13th, 14th, and 15th, the pressure was above the mean west of the Mississippi, remaining highest on the Pacific coast, but rising only from Southern California to Louisiana. 16th, the area of highest barometer was this day transferred to Manitoba and Minnesota, but over the entire map the pressure was generally above the mean. 17th and 18th, the high area extended from the Northwest to the Gulf States, Tennessee, and the Ohio Valley. 19th, the isobar of high barometer 30.50 included the country from the Lower Mississippi Valley to the Middle and South Atlantic coast. This day a storm of considerable energy was developing in the Southwest, one of less intensity in the Northwest. 20th, diminishing in pressure, the highest area was transferred to the Middle States and New England. 21st, it moved in a northeasterly track beyond Nova Scotia, accompanied by cold northwest winds veering to warmer southeast in advance of storm-center (No. VI) then entering the Lake region. This high area is remarkable for the large extent of country covered by its isobars of high barometer in its passage from the Pacific to the Atlantic.

No. VI.—This is a continuation on the Pacific coast of the high area (No. V) just described, which on the 16th was transferred east of the Rocky Mountains; but although the maximum pressure had moved to the eastward, still the barometer had remained above the mean in Washington Territory and Oregon, and the mercury began on the 17th to rise again. 18th, 19th, and 20th, the high area remained nearly stationary, generally occupying the regions west of the Rocky Mountains. 21st, the pressure remaining highest in Idaho, the barometer generally rose west of the Mississippi River. 22d, the high area slowly diminishing was transferred to Washington Territory and Oregon. 23d, 24th, 25th, 26th, and 27th it remained nearly stationary in position. 28th and 29th, it disappeared in advance of a great depression entering the Pacific States from the southwest. This high barometer was remarkable for the persistence it exhibited in remaining over Washington Territory and Oregon. Its great influence on the climate of that region is shown by a comparison of the means for this month with the same month of previous years. Temperature 1°.5 below the mean. Rain-fall 3¼ inches deficiency; barometer 0.17 above the mean.

No. VII.—20th, at the midnight report a region of low barometer extended from the Gulf to the north of Lake Superior (low area Nos. VI and VII). 21st, the mercury rose rapidly west of the Mississippi River. 22d, the highest area moved into the Gulf States. 23d, rapidly diminishing in pressure, it moved eastward beyond the Atlantic coast, in advance of the storm-center developing in the Gulf (No. VIII).

No. VIII.—23d, barometer rose very rapidly in the Northwest. 24th, highest pressure 0.5 inch above the mean was transferred to the Indian Territory. 25th, the high area spread over Tennessee and the Ohio Valley. 26th, it disappeared in advance of the storm-center No. VII, then moving over the East Gulf and South Atlantic States. Considered in connection with the snow areas that preceded (Nos. VI, VII) it was accompanied by high westerly gales and extraordinary snow-storms over the Lakes and adjoining country. The following maximum velocities are reported: Duluth, 30, NW.; Milwaukee, 45, W.; Grand Haven, 50, NW.; Alpena, 26, W. In the Lower Lakes the maximum velocities reported generally exceed 30 miles, but at Buffalo a maximum velocity of 72, W., occurred during a heavy snow-storm. The minimum temperatures of the month, except in the East Gulf and South Atlantic States, occurred during the *régime* of this high area.

No. IX.—26th, the mercury rose rapidly in Texas, in rear of low area No. VIII. 27th, it extended over the South and Southwest. 28th, moving to the east, the isobar of high barometer circumscribed the Southern States. 29th. The high area occupied

the South Atlantic coast. 30th, it disappeared in front of a low area, then developing in Texas.

Areas of low barometer.—Eight are described, and all their tracks are charted. The number of storm-areas have been less than the average of December in previous years. Of these, three storms were quite severe; low areas No. I, III (VI and VII). Low area No. V appears to have been a secondary development of low area No. IV. Several of the low areas seem to belong to depressions that entered the Pacific coast from the west, but in no case has it been possible to give a reliable charted track of a depression across the continent. This is in marked contrast with December of 1877, when eight low areas had paths charted over the country, from the Pacific to the Mississippi.

No. I is the storm-center described as No. XIV in the November review. At the a. m. report of 1st, it was central in Western Tennessee. This day, rapidly increasing in energy, the center moved slowly to the northeast, the pressure at Louisville, Ky., 29.49, being 0.62 below the normal. 2d, this day the storm-center moved into the Lower Lake region, and thence into New England. During the forenoon of this day, a special warning was telegraphed to all Middle Atlantic and New England ports. 3d, pursuing a northeast track, it passed beyond the Gulf of Saint Lawrence. It was accompanied in its east and south quadrants on the Atlantic coast by high easterly gales, veering to southerly and thence to westerly, and by heavy precipitation. Cautionary signals were ordered on the 1st from Jacksonville, Fla., to Eastport, Me., and these were changed on the 2d to cautionary off-shore signals from Macon, N. C., to Cape Henry. The signals were generally justified. The following maximum velocities (measured) are reported: Smithville, 40 SE.; Cape Lookout, 50 SE.; Cape Hatteras, 48 SE.; Kittyhawk, 42 SW.; Cape May, 36 SE.; Atlantic City, 36, SE.; Barnegat, 56 E.; Sandy Hook, 50 SE.; New York, 38 SE.; New Haven, 35 SE.; New London, 69 SE.; Newport, 36 SE.; Wood's Holl, 64 SE.; Boston, 47 SE.; Thatcher's Island, 38 SE.; Portland, 60 SE.; Eastport, 47 SE.

No. II.—2d, appeared first in Manitoba, where the pressure fell 0.7 below the normal. 3d, the center of the depression moved in a southeast track in Southern Michigan. 4th, with diminishing energy it marched in an easterly path to Nova Scotia. This storm in the east portions of its track covered much of the country traversed by low area No. I, and rapidly followed it. The precipitation accompanying this depression was light. Rain fell in the advanced quadrants, which changed into snow after the winds veered to colder northwest. Only brisk winds were reported.

No. III.—5th, a great depression entered the North Pacific States. An examination of the map of the departures from the normal pressures shows it crossed the Rocky Mountains on the 6th, but with no well defined center. 7th, the barometer fell generally from Manitoba to the Gulf, with one center of depression in Texas, and a second center in Dakota, both included in the same region of low barometer. 8th, the low area moved slowly to the east, extending from Lake Michigan to the Gulf, the pressure being in this region more than 0.3 below the normal. As this was to prove the severest storm of the month, it is interesting to note the meteorological conditions that existed at the end of this day. A high barometer covered the Rocky Mountain region and its eastern slope, where cold northerly winds prevailed with clear weather; and a second high barometer occupied the Atlantic coast, where the winds had generally shifted to easterly. The precipitation had in general been heavy, but confined to the region of low pressure. 9th, rapidly increasing in energy, the storm-area moved slowly east, the lowest pressure being from Lake Erie to Georgia. From midnight to the morning of the 10th the storm developed a great increase of energy. The barometer fell in the Middle States, an average of 0.4 inches, and at Norfolk the pressure was 1.02 inches below the normal. At 7:35 a. m., the vortex of the storm was of great extent, nearly covering the States of Pennsylvania, Virginia, and North Carolina; in these States the winds were calm, or light and variable, while a fierce southeast gale prevailed on the Middle Atlantic and New England coast. 4.35 p. m., the storm still increasing in energy, the center occupied the Middle States, where the pressure was generally below 29.00 inches; the following exceedingly low barometers are reported at that hour: Washington, 28.72, 1.40 inches below normal; Baltimore, 28.73, 1.39 below normal; Philadelphia, 28.83, 1.29 below normal; New York, 28.82, 1.23 below normal, while the pressure had rapidly fallen at the center of the storm in its progress to the east, it had continued to rise slowly at Cape Breton and over the Gulf of Saint Lawrence. The rise in that region was as significant as the fall at the center of the depression in producing the steep barometric gradient existing from New York to Nova Scotia, as shown by the crowded isobars in the weather map of that day. The gradient indicated the fierce gales that accompanied this storm. 11 p. m., the center of low barometer moved into New York, where the region of pressure of one inch below the mean was of greater extent than at any previous time during this storm, but the rapid fall of mercury in Nova Scotia greatly diminished the barometric gradient on the New England coast and moderated the existing gales. 11th, pursuing a northeasterly track, the storm-center moved over the mouth of the Saint Lawrence River. In the progress of this storm over the country great damage was caused by wind and flood, which

will be noted under special appropriate headings. Reports of frequent marine disasters show this storm extended far out to sea on the Atlantic coast. Cautionary off-shore signals were ordered on the 8th at Indianola and Galveston, and justified respectively by 42 N. and 40 N. Cautionary signals were ordered on the morning of the 8th from Cape Lookout to Sandy Hook, and at the morning report of the 9th from Macon, N. C., to Key West, also at the midnight report of the 9th from New York to Portland, Me., and a. m. of the 10th at Eastport, Me. These signals were changed to cautionary off-shore from Smithville, N. C., to New York on the 10th and from New Haven to Portland on the 11th. The cautionary displays were justified by the following maximum velocities, (measured:) Key West, 40, NW.; Savannah, 36, W.; Charleston, 34, SE., 35 W.; Smithville, 48 S., 38 W.; Cape Lookout, 51 S., 64 W.; Cape Hatteras, 64 S., 64 SW.; Kittyhawk, 48 S., 44 SW.; Cape Henry, 36 S., 36 SW.; Cape May, 40 SE., 64 W.; Barnegat, 44 S, 43 W.; Sandy Hook, 52 S., 47 W.; New York, 48 SE., 32 NW.; New London, 67 SE.; Newport, 38 SE., 36 W.; Wood's Holl, 48 SE., 50 W.; Thatcher's Island, 44 SE., 41 SW.; Boston, 52 SE., 34 W.; Portland, 60 SE.; Eastport, 44 SE.

Nos. IV. and V.—12th, southeast winds, falling barometer, increasing cloudiness followed by rain on the West Gulf coast, gave indication of the approach or formation of a storm-center in Texas. 13th, 7:35 a. m., the veering of winds to northeast in Western Texas indicated the center shown in the chart. This day the depression moved in a northeast track to Western Tennessee, and the winds in Texas shifted to high and cold northerly. 14th, the storm-center moved into the Lake Ontario country. 15th, it disappeared beyond the Gulf of Saint Lawrence with ill-defined track. The movement of depression No. IV was quite rapid and the precipitation had been confined in an undesirable degree to the center of the low area. The barometer continued to fall to the usual degree to the center of the low area. The barometer continued to fall to the east of its charted track, and the rain belt also moved to the east, and there was developed a secondary depression, No. V, whose center is first charted on the morning of the 15th, near Augusta, Ga., though at that time a region of low barometer extended from New England to Florida. This depression rapidly pursued a northeasterly track, leaving the coast near Cape Henry, moved nearly parallel to the Gulf Stream, and is located on the morning of the 16th near Halifax, N. S. The precipitation was general, but not abundant. The high winds reported were of short duration and confined to the Middle Atlantic and North Carolina coast. These storms, taken together, are interesting, since the development of the second depression may have been mainly due to the rapidity of the march of the center of the first low area.

Nos. VI and VII.—These two low areas are described together, although they developed in portions of the country far distant, but, as will be seen from their charted tracks the depressions approaching each other were united on the morning of the 21st in the Ohio Valley. 17th, there was a general fall in pressure in the Rocky Mountain region, the barometer being most below the normal at Salt Lake. 18th, the low area occupied nearly same position with a slight fall of pressure in Texas. 19th, a decided fall in Texas, where the precipitation and circulation of the winds showed the formation of a storm-center. There was a more decided fall of the barometer in the Northwest, but a great deficiency in precipitation. 20th, this day the centers of depression marched slowly to the eastward, No. VI moving along the West Gulf coast, and No. VII remaining in Minnesota, while there was a marked decline in pressure from the Upper Lakes to the East Gulf. The precipitation in the Gulf States was very abundant, but in the Upper Lakes and the Northwest, although general, it was light. 21st, 7:35 a. m., after midnight there was a fall in pressure in the Ohio Valley averaging 0.4 inch, and the two low areas became united in a single depression central near Cincinnati, Ohio. 4:35 p. m., the storm-center was over Lake Erie, but southerly gales prevailed on the North Carolina coast, and high southeasterly gales on the Middle Atlantic coast. 11 p. m., New York State was the region of lowest barometer, easterly gales had extended along the New England coast, but on the Middle Atlantic and Carolina coast the wind had shifted to high westerly. 22d, the storm-center moved along the Saint Lawrence Valley, and into the Gulf beyond. Cautionary signals were ordered for this storm, 18th, at Indianola and Galveston, 20th, from Savannah to Kittyhawk, N. C., 21st, from Cape Henry to Eastport; these were changed to cautionary off-shore signals, 21st, from Smithville to Kittyhawk, N. C., and from Baltimore to Wood's Holl, 22d, from Boston to Eastport. The following maximum velocities (measured) are reported: Indianola, 40 N.; Galveston, 30 NW.; Smithville, 36 W.; Wilmington, 43 SW.; Cape Lookout, 44 S.; Cape Hatteras, 48 SW.; Kittyhawk, 40 S.; Cape May, 38 SE., 48 W.; Atlantic City, 36 SE.; Barnegat, 40 SE.; Sandy Hook, 47 SE, 48 W.; New York, 28 SE.; New London, 35 SE.; Wood's Holl, 48 SE., 58 W.; Thatcher's Island, 36 SE., 36 W.; Boston, 40 E., 35 W.; Portland, 44 E., 32 W.; Eastport, 40 SE.

No. VIII.—24th, the barometer was high and rising in the southwest, and a severe "norther" with cold rain or sleet prevailed on the West Gulf coast. 25th, the pressure slowly diminished in the Gulf States, and the circulation of the winds in the Gulf marked the development of a storm-center. 26th, 7:35 a. m., the center of depression was situated southwest of New Orleans. This day the storm-center moved, with great rapidity, to the northeast as charted. 27th, 7:35 a. m., it passed beyond the limits of

the map. It was accompanied by general but light precipitation in the Gulf and South Atlantic States. The winds were high and from the north on the Texas coast, elsewhere were only brisk.

INTERNATIONAL METEOROLOGY.

On chart No. IV are shown the probable tracks of the storm-centers over the oceans as follows: *Atlantic*—No. I, as previously given; No. II is the extended track of area No. IV given under International Meteorology in the November review. No. III is the extended track of area No. IV of the October review; No. IV is the extended track of area No. VI, given under International Meteorology in the November review, and which probably joined the following area; No. V is the extended track of area No. IX, October review; No. VI is the extended track of No. VII, given under International Meteorology in the November review; No. VII is the extended track of area No. III of the November review. *Caribbean Sea*—November 24 and 28, a violent hurricane reported south of Saint Thomas, W. I.; at midnight of December 1, the schooner Thos. Pickering was reported driven ashore by hurricane on reef 35 miles NNE. of Saona Island, near Saint Domingo. December 1 and 2 heavy E. and SE. squalls at Navassa. At Colon, Panama, a severe "norther" commenced on morning of the 4th and continued until the 10th, accompanied by heavy rains and floods; at 7 p. m. of the 10th, a second "norther" commenced, lasting until the 14th; much damage resulted from these storms. *Pacific*—No. I, W. to NW. "typhoon;" No. II, November 15 to 19; No. III, November 22 and 23, hurricane, barometer 28.18; No. IV, November 28 and 29; No. V, December 3 to 6. *Indian Ocean*—Mauritius, "during a barometric depression which passed over this island, between September 28 and October 8, severe gales occurred in 36° to 44° S. and 20° to 42° E.; the wind at Mauritius veered from SE. to E., NE., &c., round the compass."

Reports from Saint Michael's, Alaska, received at this office for the year ending June 30, 1878, contain the following items: *July*—16th, SW gale all day, ending abruptly about noon of the 17th; 29th and 30th, high winds from SW. and W. *August*—28th, N. gale commenced, reaching 60 miles per hour on the 29th; high winds occurred on the 2d, 12th, 13th, 15th, 17th, 22d and 28th; faint aurora on the 10th. *September*—23d, a northerly gale commenced, lasting until 26th, and reaching 52 miles per hour on the 25th; high winds on the 1st, 2d, 14th and 22d; snow on the 11th, first of season, observed on hills about ten miles distant, a few flakes falling at station 12th, 13th, 18th and 19th; 14th, thin ice on pools; frost on 13 days. *October*—Gales on the 12th and 13th, NE., 16th, easterly 19th and 20th, southerly 21st, N., 24th, N., and 26th E.; snow on 12 days, 6 inches on ground at end of month; ice on pools, 7th; skating 14th; forming on bay 15th; 22d, large part of bay covered, temperature of water 30°; 28th, several inches thick near the shore, natives crossing inner part of bay; 31st, ice breaking up and snow disappearing; aurora observed on the 11th, 12th and 13th; on the 7th most of the fresh-water fowl had left, and on the 15th, "the only birds remaining, except the winter residents, were a few sandpipers, gulls, and cormorants." *November*—Gales, on the 1st, easterly 40; 4th and 5th, N., 60; 9th, S. 63; 11th and 12, E. to NE. 67, barometer 28.89; 21st, N. 40; 24th, NE. 43; 27th, NE. 47; snow on five days, 8 inches on ground at end of month; freezing every day; aurora, 7th and 26th. *December*—Gales on 2d,—57; 21st, S., 46; 28th and 29th, N., 41; snow on eight days, 12 inches on ground at end of month; "winter set in, bay frozen across;" aurora, 5th and 31st. *January*—Gales, on the 1st, E., 40; 11th and 12th, NE., 48; 22d, northerly 53; snow on five days, 15 inches on ground at end of month; mirage, 30th. *February*—Gales on the 8th, 9th, and 10th, NE.. 43; snow on three days, 23 inches on ground at end of month; auroras, 5th, 26th and 27th; mirage observed on five days. *March*—Gale on the 29th, 30th, and 31st, NE., 40; snow on four days, 15 inches on ground at end of month; 23d to 25th, first thaw of the season; 25th, showers on distant mountains; mirage observed on five days. *April*—Gales, on the 5th and 6th, S. to E., 43; 25th, S. to E., 54; snow on sixteen days, 18 inches on ground at end of month; 17th and 18th, thawing rapidly; 19th, freezing; 26th, first wild goose seen *May*—3d, severe S. gale, with heavy snow, S., 73 miles; snow on two days; only scattered patches on ground at end of month; rain on ten days; 12th, snow rapidly disappearing; 14th, lake opening rapidly; 16th, lake all open and many birds arriving; 18th, much water on ice in bay; 30th and 31st, high tides in morning; ice cracking; 31st vegetation springing up rapidly and nearly all migratory birds returned; 19th, first swallow; freezing nearly every night; 13th severe frost; 9th, mirage all day, elevating into view capes 60 or 70 miles away, and showing open water 15 to 20 miles southward, also on 10th, 11th and 30th. *June*—No gales; twelve rainy days; 7th and 8th, ice moving out of bay; 10th, all out of inner bay; first trader from Yukon; 11th, natives arrived in boat from northern end of Sound; 15th, ice all gone; 25th, much large floating ice from seaward; 30th, but little ice; one or two snow-drifts still on mountains; month very cold, and vegetation backward.

Summary.

Date.	Barometer.			Temperature.				Relative humidity.	Prevailing wind.	Total monthly movement, in miles.	Rain-fall and melted snow.	Days.			Depth of snow.§
	Mean.	Max.	Min.	Mean.	Max.	Min.	Range.†					On which rain fell.	On which snow fell.	Cloudy.	
1877—July*	29.85	30.18	29.52	56°.4	75°	41°	23°	83	SW	1,312‡	0.67	8	0	12	0
August	29.74	30.09	29.36	53°.4	67°	42°	16°	90	S	7,381	2.48	19	0	24	0
September	29.80	30.46	29.19	40°.8	61°	21°	23°	87	N	8,339	2.23	11	5	20	0
October	29.77	30.26	29.14	28°.6	45°	4°	17°	90	S	10,134	0.27	1	12	22	6
November	29.47	30.25	28.89	15°.7	41°	—18°	21°	85	N	9,428	0.52	1	5	14	8
December	29.46	30.17	28.95	1°.9	32°	—30°	62°	98	S	10,377	0.11	0	5	10	12
1878—January	29.45	30.04	28.87	1°.4	30°	—47°	36°	99.6	NE	7,266	0.11	0	5	11	15
February	29.46	29.99	28.87	—6°.2	28°	—52°	42°	98	NE	5,784	0.12	0	2	8	23
March	29.61	30.01	29.05	3°.6	41°	—39°	42°	95	NE	6,385	0.12	0	4	7	15
April	29.61	30.21	28.95	21°.6	42°	—17°	35°	90	E	8,218	0.44	0	16	25	18
May	29.84	30.34	28.98	34°.1	55°	5°	32°	89	NE	6,119	2.59	10	2	20	—
June	29.74	30.11	29.26	46°.3	64°	32°	25°	86	N	6,642	1.40	12	0	17	0

* From the 15th to the 31st only. † Greatest daily range. ‡ From 25th to 31st only. § Depth of snow on ground at end of month, in inches.

York Factory, Hudson Bay Territory.—The observer (Mr. J. Fortescue), in submitting reports for June, July and August, states: "all our ships speak of heavy ice in Hudson's Bay, as high as the foreyards," and thinks that "an ice stream has been liberated from Sir Thos. Roe's Welcome, and through the various channels intersecting what was formerly supposed to be Southampton Island, by the two previous mild winters; and that the prevalence of easterly winds all summer has kept it in the bay, where icebergs are rarely seen."

Advices from Point Barrow, dated August 19, state that nearly all the whaling fleet had arrived there, some as early as the latter part of July, having worked northeastward as fast as the ice opened away from the land; some found much hinderance from ice, and two vessels were lost a few miles south of Point Barrow. August 8 to 11, there was much drifting ice between Point Barrow and Return Reef; at time of writing the ice which previously had been close to the land from Point Barrow to Point Belcher, 60 miles south, was fast disappearing to the westward, with a continued ENE. wind.

TEMPERATURE OF THE AIR.

The isothermal lines of chart No. II illustrate the general distribution of the temperature of the air for the month. By reference to the table on the left side of the chart it will be seen that the temperature of the month has been considerably above the mean in New England, and below the mean from the South Atlantic States to the Lower Lakes and westward. The greatest deviation occurs in Colorado and Wyoming, where the temperature is about seven degrees below the mean.

Maximum and minimum temperatures, respectively:—*Maine*—Mechanics' Falls, —4° and 46°; Gardiner, 5°, 53°; Eastport, 8°, 52°. *New Hampshire*—Mount Washington, —15°, 34°; Auburn, —2°, 54°. *Vermont*—Newport, —14°, 49°; Burlington, 6°, 56°. *Massachusetts*—Billerica, —1°, 40°; Springfield, 8°, 60°; Boston, 10°, 59°. *Rhode Island*—Newport, 14°, 56°. *Connecticut*—Mystic, 0°, 53°; New London, 12°, 57°. *New York*—Brookhaven, —5°, 58°; Plattsburg Barracks, —1°, 45°; New York City, 12°, 58°; Rochester, 8°, 52°; Buffalo, 6°, 49°; Wappinger's Falls, 12°, 60°. *New Jersey*—Somerville, 7°, 59°; Acto, 13°, 64°. *Pennsylvania*—Tarentum, —12°, 46°; Hulmeville, 9°, 64°; Philadelphia, 13°, 62°; Pittsburgh, 4°, 52°. *Delaware*—Dover 12°, 60°; Wilmington, 13°, 67°. *Maryland*—Cumberland, 4°, 48°; New Market, 7°, 60°; Baltimore, 15°, 61°. *District of Columbia*—Washington, 13°, 60°. *Virginia*—Wytheville, 5°, 52°; Capeville, 26°, 64°; Lynchburg, 17°, 52°. *West Virginia*—Helvetia, —2°, 52°; Morgantown, 7°, 54°. *North Carolina*—Franklin, 0°, 56°; Weldon, 21°, 70°. *South Carolina*—Aiken, 17°, 67°; Charleston, 25°, 67°. *Georgia*—Gainesville, 13°, 68°; Savannah, 24°, 73°; Saint Mary's, 23°, 74°. *Florida*—Mayport, 26°, 75°; Key West, 55°, 79°; Saint Mark's, 25°, 71°. *Alabama*—Green Springs, 17°, 68°; Montgomery, 22°, 70°. *Mississippi*—Vicksburg, 20°, 72°. *Louisiana*—New Orleans, 26°, 70°; Point Pleasant, 23°, 73°. *Texas*—Fredericksburg, 9°, 81°; Jacksboro, 10°, 72°; Corsicana, 18°, 73°; Galveston, 29°, 71°. *Ohio*—Bellefontaine, —13°, 44°; Columbus, —7°, 48°; Cincinnati, —1°, 52°. *Kentucky*—Danville, —3°, 50°; Louisville, 4°, 53°; Bowling Green, —2°, 57. *Tennessee*—Austin, —2°, 50°; Memphis, 11°, 63°; Knoxville, 6°, 57°. *Arkansas*—Judsonia, 9°, 71°. *Michigan*—Detroit, —4°, 42°; Alpena, 9°, 38°; Grand Haven, 12°, 42°; Marquette, 2°, 40°. *Indiana*—Spiceland, —14°, 39°; Indianapolis, —12°, 48°; Saint Meinrad, 10°, 56°. *Illinois*—Elmira, —23°, 44°; Anna, —4°, 60°; Chicago, —9°, 46°; Cairo, 4°, 60°. *Missouri*—Ashley, —17°, 55°; Corning, —13°, 62°; Saint Louis, —3°, 56°. *Kansas*—Fort Hays, —13°, 68°; Independence, —4°, 60°; Dodge City, —3°, 65°. *Wisconsin*—Neillsville, —18°, 41°; Milwaukee, —8°, 44°; Madison, —8°, 39°. *Iowa*—Byron, —17°, 46°; Des Moines, —10°, 52°; Keokuk, —13°, 52°; Ames, —15°, 35°. *Nebraska*—Plattsmouth, —11°, 56°; Omaha, —8°, 59°; Fort McPherson, —20°, 70°. *Indian Territory*—Fort Gibson, 3°, 63°; Fort Sill, 10°, 67°. *Minnesota*—Fort Snelling, —12°, 38°; Duluth, —14°, 38°; Breckenridge, —17°, 40°. *Dakota*—Morriston, —12°, 45°; Bismarck, —20°, 48°; Pembina, —22°, 41°; Yankton, —11°, 55°; Deadwood, —25°, 54°. *Colorado*—Colorado Springs, —15°, 59°; Denver, —12°, 62°; Fort Garland, —23°, 51°. *Wyoming*—Cheyenne, —12°, 56°; Fort Fred. Steele, —28°, 54°. *Utah*—Salt Lake City, 8°, 56°. *Nevada*—Winnemucca, —6°, 65°. *California*—San Francisco, 40°, 68°; Sacramento, 23°, 66°; Red Bluffs, 25°, 71°; Campo, 7°, 80°. *New Mexico*—Santa Fé, 0°, 65°; Fort Union, —11°, 61°. *Idaho*—Boise City, 7°, 53°. *Montana*—Virginia City, —15°, 46°.

Range of temperatures.—The *monthly ranges* will appear from an examination of the minima and maxima just given. Greatest *daily ranges* vary in New England from 18° at Wood's Holl to 33° at Burlington; Middle Atlantic States, 19° at Lynchburg to 29° at Cape Henry; South Atlantic States, 23° at Savannah and Charleston to 30° at Jacksonville; Gulf States, 14° at Key West, to 33° at Montgomery and 35° at Corsicana; Ohio Valley and Tennessee, 20° at Louisville to 29° at Nashville; Lake region, 15° at Grand Haven and Buffalo to 29° at Milwaukee; the Northwest, 20° at Dubuque and Davenport to 43° at North Platte; Rocky Mountains, 39° at Colorado Springs to 47° at Santa Fé; Western Plateau, 24° at Salt Lake to 43° at Winnemucca; California, 16° at San Francisco to 23° at Visalia and 54° at Campo.

Frost has been quite general over the northern sections of the country and interior of the Southern States; at stations along the Gulf and South Atlantic coasts frosts have occurred from five to fifteen days.

Ice formed in the Gulf and South Atlantic States and on the Pacific coast as follows: Denison, Tex., 14th; Laredo, Tex., 16th (first), 25th, 26th, 27th; Montgomery, 19th, 28th; Saint Mark's, 19th, 28th; Atlanta, Ga., 20th, 26th; Tybee Island, Ga., 23d (1 inch, first), 28th (1¼ inch); Savannah, 23d (¼ inch), 24th, 27th, 28th, 29th; Princeton, Cal., 14th, 16th to 25th (¼ inch), 26th (⅜ inch), 27th (⅜ inch), 29th (¼ inch); Green Springs, Ala., 16th to 18th; Mayport, Fla., 6th (⅛ inch); Okahumka, Fla., 28th (3/16 inch); Melissa, Tex., 10th (⅜ inch), 23d (1 inch), 24th (creeks frozen over), 31st (3 inches); Sacramento, Cal., 8th, 14th to 20th, 22d, 26th, 27th (2½ inches), 29th (3¾ inches); Eagle Pass, Tex., 15th, 16th, 18th, 21st, 25th, 26th; Point Pleasant, La., 16th to 18th, 22d to 28th; Brookhaven, Miss., 3rd, 4th, 5th, 15th to 18th, 22d, 23d, 26th to 28th; Los Angeles, Cal., 12th, 13th, 14th, 18th, 25th; Visalia, Cal., 27th (½ inch).

Ground frozen.—The following items will serve to show the occurrence of frost in ground in the same districts: Denison, Tex., 16th; Savannah, 28th, 29th; Green Springs, Ala., 16th to 18th, 22d to 25th, 27th, 28th; Thomasville, Ga., 28th; Melissa, Tex., 15th; Brookhaven, Miss., 15th to 18th, 24th (2 inches).

PRECIPITATION.

On chart No. III is illustrated the general distribution of the precipitation for the month. On the left side is a table giving the average precipitation for December, which shows a decided excess in the northeast districts and the East Gulf States, and a large deficiency on the Pacific coast.

Special heavy rains.—1st, Clarksville, Tenn., 2.50 inches; Point Pleasant, La., 3.01 inches. 2d and 3d, Dunbarton, N. H., 3.08 inches. 8th and 9th, Clarksville, Tenn., 3 inches; Point Pleasant, La., 7.02 inches. 9th, Tybee Island, Ga., 3.41 inches. 9th and 10th, White Plains, N. Y., 4.10 inches; Fayetteville, N. C., 6 inches; Tioga, Pa., 3.75 inches; Fallston, Md., 4.05 inches; Newark, N. J., 3.99 inches; Auburn, N. H., 4 inches; Contoocookville, N. H., 3 inches. 10th, Mystic, Conn., 40 inches; Gardiner, Me., 3.84 inches; Rowe, Mass., 3 inches; Ardenia, N. Y., 4.51 inches; Weldon, N. C., 2.44 inches; Tarentum, Pa., 3 inches; Cape Henry, Va., 3.07 inches. 10th and 11th, Mechanics' Falls, Me., 4.73 inches; Dunbarton, N. H., 4.28 inches; Cape Lookout, 3.66 inches; Oswego, 3.69 inches; 11th, Atco, N. J., 2.52 inches; Boyd's Corners, N. Y., 5.02 inches; North Volney, N. Y., 3.75 inches. 19th and 20th, Galveston, 4.79 inches; New Orleans, 2.77 inches; 19th to 21st, Point Pleasant, La., 4.81 inches. 20th and 21st, Thomasville, Ga., 3.38 inches; Fayetteville, N. C., 6 inches; Saint Mark's, 3.78 inches; 21st, Cape Lookout, 4.77 inches; White Plains, N. Y., 2.40 inches; Sandy Hook, 2.72 inches. 24th, Point Pleasant, La., 2.81 inches. 30th, Point Pleasant, La., 3.01 inches. 31st, Los Angeles, Cal., 3.58 inches.

Largest monthly rainfalls.—Mount Pleasant, La., 17.69 inches; Fayetteville, N. C., 14.50 inches; Cape Lookout, 11.25 inches; Dunbarton, N. H., 10.63 inches; Oswego, 10.49 inches; Cape Hatteras, 10.20 inches; Mechanics' Falls, Me., 9.64 inches; White Plains, N. Y., 9.40 inches; Clarksville, Tenn, 9.25 inches; Galveston, 9.07 inches; Saugeen, 8.86 inches; Mount Washington, 8.77 inches; Boyd's Corner, N. Y., 8.74 inches; Buffalo, 8.55 inches; Ashland, N. H., 8.25 inches; North Volney, N. Y., 8.35 inches; Palermo, N. Y., 8.12 inches; Cape Henry, 8.06 inches.

Smallest monthly rainfalls.—Deep Creek, Utah, and Fort McKavett, Tex., none; Fort Concho, Tex., and Camp McDermit, Nev., trace; Winnemucca, Nev., 0.02 inch; Fort Lyon, Col., 0.10 inch; Salt Lake City, 0.11 inch; Fort Davis, Tex., 0.12 inch; Princeton, Cal., 0.13 inch; Yuma, Ariz., 0.14 inch; Castroville, Tex., 0.17 inch; Dodge City, Kans., and Cheyenne, Wyo., 0.19 inch; Visalia, Cal., and North Platte, Nebr., 0.20 inch; Brackettsville, Tex., and De Soto, Nebr., 0.24 inch; Omaha, 0.27 inch; Logan, Iowa, and Clear Creek, Nebr., 0.30 inch; Stockton, Tex., and Burkes, Ariz., 0.31 inch; Sacramento, Cal., 0.47 inch.

Floods.—Tioga, Pa., 9th, river overflowed, doing considerable damage to roads and bridges. Catawissa, Pa., 12th, river 22½ feet above low water. Lockhaven, Pa., 11th, Bald Eagle Creek overflowed, flooding low part of town. 10th, at Kingston, N. Y., storm most severe in this part of State since 1802. Country flooded; at Eddyville much damage to canal-boats and property. Paterson, N. J., at midnight of Tuesday "the flood reached within a few inches of that of 1854, the greatest since 1810, and still rising." Dec. 11, a. m., higher than ever known before; streets inundated from 4 to 5 feet deep; factories, bridges, and dams much damaged. Delaware River—at Bordentown, all railroads under water; Trenton, N. J., higher than before known. Susquehanna River—severe floods for 50 miles; Lehigh Valley Railroad flooded for miles, 1 mile swept away. Albany, N. Y., 11th and 12th, Hudson River overflowed its banks, flooding lower part of city; Mechanic's Falls, 9th to 11th, severe freshets, bridges, &c., carried away; 40 feet of railroad track washed away south of Garrison's; tide higher than for years. Springfield, Mass., 11th, Connecticut River rose to 18 feet

6 inches above low-water mark, or highest water since 1854; at Hartford it rose 24 feet above low-water mark, submerging city front.. Contoocookville, N. H., 12th, river very high, mills stopped, railroads badly washed, &c. The Merrimac, at Concord, N. H., within 1 inch of highest water (1869) ever known; railroad tracks submerged and badly washed. West Deerfield, Mass., 50 feet wash-out on Troy and Greenfield Railroad. Brattleboro, Vt., heavy flood in low part of village. Northampton, Mass., 50 houses flooded; Mill River higher than ever known before. Rapid rises were reported in Cape Fear River, at Fayetteville, on the 9th, 42 feet; on the 21st, 45 feet; and 28th, 42 feet.

Hail.—Fort Sill, Ind. T., 30th; Camp McDermit, Nev., 6th; Mount Sterling, Illinois, 8th; Creswell, Kans., 13th; Owing's Mills, Md., 21st; New Bedford, Mass., 2d; Linden, N. J., 14th; Somerville, N. J., 4th; White Plains, N. Y., 14th; Flushing, N. Y., 10th; Weldon, N. C., 4th, 20th, 26th; College Hill, Ohio, 4th; North Lewisburgh, Ohio, 8th; Pittsburgh, Pa., 15th; Ringtown, Pa., 4th; Accotink, Va., 2d; Red Bluff, Cal., 9th; Cheyenne, Wyo., 3d; Smithville, N. C., 26th; Fort Whipple, Va., 26th; Atlantic City, N. J., 4th.

Rainy days.—The number of days on which rain or snow has fallen varies as follows: New England, 10 to 18; Middle States, 8 to 17; South Atlantic States, 8 to 14; Gulf States, 6 to 17; Ohio Valley and Tennessee, 11 to 26; Lower Lake region, 20 to 28; Upper Lake region, 8 to 23; Upper Mississippi Valley, 6 to 21; Lower Missouri Valley, 4 to 14; Eastern slope, 3 to 14; Rocky Mountains, 6 to 10; Western Plateau, 2 to 4; Pacific coast, 1 to 15.

Cloudy days.—For New England the number varies from 7 to 24; Middle States, 6 to 19; South Atlantic States, 9 to 15; Gulf States, 5 to 14; Ohio Valley and Tennessee, 12 to 23; Lower Lake region, 18 to 31; Upper Lake region, 12 to 29; Upper Mississippi Valley, 11 to 22; Lower Missouri Valley, 8 to 17; Eastern slope, 8 to 14; Rocky Mountains, 2 to 9; Western Plateau, 3 to 9; Pacific coast, 3 to 6.

Snow.—West of the Appalachian Range the precipitation occurred generally in snow. On the Pacific, Gulf and South Atlantic Coast, it occurred as follows: In *British Columbia*, on the 3d, 17th and 18th. *Oregon*—on the coast mountains, 9th. *California*—on the coast mountains, 25th and 29th. *Texas*—interior, 13th, 16th, 17th, 20th, 21st, 25th, 26th, 28th. *Louisiana*, 26th. *Alabama*—interior, 10th, 26th, 27th. *Georgia*—interior, 9th, 10th. *North Carolina*, 4th, 5th, 6th, 17th, 18th, 20th, 21st, 26th, and 27th.

Depth of snow on ground at end of month.—At the end of the month the country north of a line almost identical with the isotherm of 35°, given on Chart No. II, remained covered with snow. It varied in depth in the different sections as follows: *In New England*, from none or a trace along the coast to 9 inches in Vermont and 24 inches in the White Mountains. *Middle States*, trace to 1 inch along coast to 4 inches in interior. *Western North Carolina and Northern Georgia*, ½ inch. *Tennessee*, none to 2 inches. *Ohio Valley*, 2 to 24 inches. *Lower Lakes*, 4 inches to 2 or 3 feet at eastern ends of Lakes Erie and Ontario. *Upper Lakes*, 1 to 2 inches near Lake Superior to 2 or 3½ feet along eastern shore of Lake Michigan. *Northwest*, generally from 1 to 6 inches, except from Arkansas to Illinois, where it was much deeper, some observers reporting 2 and 3 feet. *Rocky Mountain stations*, 1½ inches at Santa Fé to 7½ at Denver and 4 at Virginia City. *Black Hills*, Deadwood, 18 inches.

RELATIVE HUMIDITY.

The average percentage of relative humidity for the month ranges as follows: New England, 65 to 79; Middle Atlantic States, 62 to 78; South Atlantic States, 65 to 72; East Gulf States, 72 to 79; West Gulf States, 61 to 81; Lower Lakes, 71 to 84; Upper Lakes, 66 to 83; Ohio Valley and Tennessee, 65 to 76; Upper Mississippi Valley, 70 to 76; Lower Missouri Valley, 70 to 85; Red River of the North Valley, 84 to 94; Eastern slope, 61 to 77; Western Plateau, 46 to 59; California, 44 to 59. *High stations* report the following, not corrected for altitude: Cheyenne, 66; Denver, 51; Colorado Springs, 63; Santa Fé, 49.

WINDS.

The prevailing winds at the Signal Corps stations are shown by arrows on Chart No. II, from an examination of which it will be seen that they have been, almost without exception, from the north or northwest; except in the Lake region, Ohio Valley, and Atlantic States, where they have been more westerly, and in some instances southwest.

Total movements of the air.—The following are the *largest* monthly movements recorded at the Signal Corps stations, viz: Cape May, 16,567 miles; Wood's Holl, 15,969; Sandy Hook, 15,426; Cape Lookout, 14,227; Thatcher's Island, 13,584; Indianola, 12,428; Barnegat, 11,046; Cape Henry, 10,564; Sandusky, 10,426; Newport, 10,396; Key West, 9,917; Milwaukee, 9,858. The *smallest* are: Visalia, Cal., 1,443 miles; Deadwood, Dak., 1,658; Nashville, 2,853; Salt Lake City, 2,895; Santa Fé, 2,941; Lynchburg, 2,969; Indianapolis, 3,246; Augusta, 3,526; Knoxville, 3,730; Dubuque, 3,565; Eagle Pass, Tex., 3,620; Los Angeles, 3,906.

VERIFICATIONS.

Indications.—The detailed comparison of the tri daily weather indications with the telegraphic reports for the succeeding twenty-four hours, show the general percentage of omissions to be 1.4 per cent., and of verifications to be 87.1 per cent. The percentage of verifications for the four elements has been: weather, 93.6; wind, 84.4; temperature, 86.5; barometer, 83.8. The percentage of verifications by geographical districts has been: New England, 88.6; Middle States, 87.0; South Atlantic States, 85.5; East Gulf States, 90.1; West Gulf States, 88.6; Lower Lake region, 87.1; Upper Lake region, 88.4; Tennessee and the Ohio Valley, 85.5; Upper Mississippi Valley, 85.2; Lower Missouri Valley, 84.6. Of the 3,667 predictions that have been made, 118 or 3.2 per cent. are considered to have entirely failed; 141 or 3.8 per cent. were one-fourth verified; 361 or 9.8 per cent. were one-half verified; 281 or 7.7 per cent. were three-fourths verified; 2,766 or 75.5 per cent. were fully verified, so far as can be judged from the tri-daily weather maps.

Cautionary signals.—During the month 187 cautionary signals were displayed; 155 or 82.9 per cent. were justified by subsequent hourly velocities of 25 miles or over at or within 100 miles of the station.

Cautionary off-shore signals.—Fifty signals, not included in the above, were ordered up as cautionary off-shore signals; 36 or 72.0 per cent. of these were justified, both as to velocity and direction. Seventy-eight cautionary signals were changed to cautionary off-shore signals, and, as to direction, 67 or 85.9 per cent. were justified; as to velocity they are considered with the cautionary. Sixty-eight cases were reported, generally from scattered stations, of winds of 25 miles or over where signals were not used.

NAVIGATION.

In the table on the right side of Chart No. III are given the highest and lowest readings on the Signal Corps river-gauges during the month, with dates of same.

Ice on rivers and lakes.—*Missouri*—Fort Randall, Dak., 24th, river closed by ice; Yankton, 13th, closed by ice; Omaha, 18th, closed by ice; Croning, 18th, closed by ice; Leavenworth, 11th to 14th, much floating ice; 17th, gorge formed one mile below; 18th, frozen over. Lexington, 23d, closed. Booneville, 27th, closed. *Mississippi*—Saint Paul, 14th, frozen over. La Crosse, 7th, first floating ice; 11th, ice gorged; 12th, river closed. Dubuque, 2d, last boat of season left, latest closing of navigation since 1857; 7th, full of floating ice; 17th, ice-gorge; 18th, frozen over; 23d, teams crossing. Fulton, 9th, ice stopped running. Le Claire, 14th, frozen over, people crossing. Davenport, 7th, first floating ice; 14th, shore ice; 18th, navigation closed; 20th, frozen over; 26th, teams crossing. Muscatine, 8th, floating ice; 19th, closed; 23d, teams crossing. Burlington, 9th, first ice in river; 10th to 13th, floating; 13th, navigation entirely suspended; 16th, frozen over. Fort Madison, 18th, river closed. Keokuk, 7th, much floating and shore ice; 10th, canal closed; 20th, ice 8 to 10 inches thick; 27th to 31st, floating and shore ice. Saint Louis, 15th to 23d, floating ice; 17th, navigation suspended; 24th, gorged and frozen over, people crossing. Cairo, 23d to 31st, river frozen. *Maquoketa*—Monticello, Iowa, 20th, frozen over. *Des Moines*—Boonsboro', 19th, frozen over. *Spring River*—Empire City, Kans., 18th, closed with ice; 31st, ice 14 inches thick, "hardest frozen ever known." *Rock River*—Rockford, Ill., 7th, 8th, and 18th, frozen over; 13th and 15th, partly frozen. Sterling, 6th and 7th, frozen over. *Ohio*—Pittsburgh, 25th, both rivers frozen over. Cincinnati, 19th, canal frozen over; 20th, ice 4 inches thick; 24th, river full of floating ice, impeding navigation 25th to 31st, all southern packets laid up, ferries stopped. Louisville, 25th, canal frozen; 26th, navigation closed; 30th, river full of floating ice. Cairo, 25th to 31st, floating ice. *Licking River*—Cincinnati, 23d, frozen over; 30th, ice 8 inches thick. *Monongahela*—Morgantown, 23th, river frozen ½ inch thick; 27th, ice 2 inches thick; 28th to 31st, ice 3 inches thick. Pittsburgh, 23d, floating ice; 25th, frozen over. *Allegheny*—Pittsburgh, 19th and 21st, floating ice; 25th, frozen over. *New River*—Wytheville, Va., 25th, river and Barret's mill-dam frozen over. *James River*—Dover Mines, Va., 27th and 28th, frozen over; 29th, ice moving; 26th to 31st, canal frozen and navigation suspended. *Potomac*—Washington, 26th and 28th, river frozen. *Susquehanna*—*North Branch*—Catawissa, 25th, frozen over; navigation closed on the 11th owing to damages caused by high water. *Delaware*—Trenton, 8th, canal frozen over, first time this season; 14th, river frozen over. Philadelphia, 19th, ice forming; 20th to 25th, floating ice. *Hudson*—Albany, 11th, floating ice, 23d, frozen over, navigation closed. Ardenia, 27th, navigation closed. West Point, 25th, frozen over. Wappinger's Falls, 24th, floating ice, 28th, navigation closed, 31st, ice 9 inches thick. New York, 25th, much floating ice in rivers. *Long Island Sound*—Flushing Creek, 23d, navigation closed, 27th, ice 6 inches thick. *Thames River*—New London, 27th, frozen over. *Penobscot River*—Bangor, Me., 7th, ice forming, 8th, frozen over. *Lake Superior*—Duluth, 23d, ice in inner harbor ½ inch thick, lake free during rest of month. Ashland, 15th, Long Island Bay closed by ice. Marquette, 20th and

29th, ice in harbor. *Lake Michigan*—Escanaba, 16th, ice around docks, 29th, bay frozen over. Embarras, Wis., 1st, rivers closed. Manitowoc, 7th, rivers closed. Chicago, 16th, navigation closed; 24th, river frozen over, people crossing. *Monono Lake, Wis.*—7th, bay frozen over; 16th, lake frozen over. *Mendota Lake, Wis.*—22d, frozen over; 31st, ice 16 to 25 inches thick. *Geneva Lake, Wis.*—26th, frozen over, horses and ice-boats on ice. *Lake Huron*—Port Huron, 15th, navigation closed; 24th, ice-floes in Saint Clair River. *Lake Erie*—Toledo, 20th, river frozen over. Sandusky, 14th, ice along docks; 18th, bay entirely frozen over. Cleveland, 15th, navigation closed; 16th, first ice in river; 17th, first ice on lake; 18th, canal frozen over; 20th, river frozen over. Buffalo, 7th, navigation closed; 28th, lake frozen as far as visible with glass. *Niagara River*—Fort Niagara, 24th to 31st, river half to nearly full of floating ice. *Lake Ontario*—Rochester, 1st, lake navigation closed; 7th, navigation closed on Erie Canal. Oswego, 1st, navigation closed. Madison Barracks, 27th, bay frozen over. *Otsego Lake, N. Y.*—31st, partially frozen over. *Lake Massabesic, N. H.*—17th, frozen over. *Lake Winnepiseoge, N. H.*—27th, closed by ice. *Cape Lookout, N. C.*—28th, sound frozen nearly half a mile out. *Cape May*—24th, ice in Egg Harbor.

High tides.—Coney Island, 10th, bathing-houses, &c., washed away. Eastport, Me., 23d, tides very high, overflowing wharves. Newport, R. I., 23d, unusually high, overflowing wharves in some parts of the city. Wappinger's Falls, N. Y., 2d, 10th to 12th.

Low tide.—Cape Lookout, N. C., 26th, lowest known tide in sound for fourteen years.

TEMPERATURE OF WATER.

The temperatures of water, as observed in rivers and harbors, with average depth of observations, is given on Chart No. III. At the following stations observations were discontinued, on account of ice, on the dates named: *December* 15, at Buffalo; 16th, Escanaba; 18th, Chicago and Cleveland; 19th, Marquette; 20th, Toledo; 22d, Grand Haven and Detroit; 24th, Sandusky. Observations were resumed at Marquette on the 25th and continued until the 28th; they were interrupted at Cleveland on the 2d, 4th, 5th, 7th, and 10th to 12th, by rough water.

ATMOSPHERIC ELECTRICITY.

Thunder-storms.—Gulf Hammock, Fla., 24th; Independence, Kans., 7th; Brookhaven, Miss., 9th; Weldon, N. C., 10th; Aiken, S. C., 26th; Melissa, Tex., 7th; Red Bluff, Cal., 6th; Smithville, N. C., 26th; Cape Lookout, N. C., 2d.

Auroras.—Bangor, Me., 1st; Boston, 1st; Eastport, Me., 1st, 26th; Pembina, Dak., 23d, 24th; Cornish, Me., 24th; Gardiner, Me., 16th; Orono, Me., 15th, 16th; Cambridge, Mass., 16th, 19th, 23d; Fall River, Mass., 16th; Dunbarton, N. H., 19th; Contoocookville, N. H., 16th; Freehold, N. J., 24th; Atco, N. J., 25th; Jacksonburg, Ohio, 27th; Cincinnati, 3d; North Lewisburg, Ohio, 13th; Brownsville, Pa., 11th to 14th; Woodstock, Vt., 16th; Embarrass, Wis., 1st; Yankton, Dak., 1st; Starkey, N. Y., 16th.

OPTICAL PHENOMENA.

Solar halos.—1st, Maryland, New Jersey, New York, Pennsylvania. 2d, Nevada. 4th, Texas. 6th, California, Nebraska, Kansas. 7th, Illinois, Iowa, Ohio, Tennessee. 8th, California, Texas, Connecticut, New Jersey, New York. 9th, Maine, California. 11th, Texas, Ohio, Nevada. 12th, Iowa, Nebraska. 13th, Indiana, Ohio. 14th, Iowa, Georgia, South Carolina. 16th, Florida, Kansas, Ohio, Vermont, Nevada. 17th, Minnesota, Florida, Colorado, Massachusetts, Missouri, Nebraska. 18th, Dakota, Kansas, Missouri, New Hampshire. 19th, Iowa, New York, Ohio. 20th, Iowa, Kansas. 21st, Iowa, Ohio, Dakota. 22d, Iowa, Dakota. 23d, Iowa, Florida, Dakota, Kansas, Maine, Nebraska, West Virginia, Nevada. 24th, Iowa, Vermont, Dakota, Kansas, Nebraska. 25th, Illinois, Iowa, Dakota, Kansas, Ohio. 26th, Iowa, New York. 27th, Iowa, Ohio. 28th, Illinois, Iowa, Wisconsin. 29th, Rhode Island, Massachusetts, New Hampshire, New York. 30th, Dakota, Virginia. 31st, Iowa.

Lunar halos.—1st, Iowa, California, Nebraska, Maryland, Massachusetts, Rhode Island, New York, Pennsylvania, Wisconsin, Dakota. 2d, Illinois, Indiana, California, Nevada, New Mexico, California, Kansas, Iowa, Ohio, Kentucky, Nevada, Nebraska, New Jersey, Wisconsin. 3d, California, Colorado, Texas, Dakota, Illinois, Tennessee, New Jersey, Rhode Island, Connecticut, Missouri, Nebraska, New York, Virginia, Wisconsin. 4th, California, Nevada, Texas, Minnesota, Illinois, Massachusetts, Rhode Island, Dakota, Missouri, New Jersey, New York, Ohio, Virginia. 5th, Indiana, California, New Mexico, Iowa, Minnesota, Tennessee, New Jersey, Connecticut, Nebraska. 6th, California, Nebraska, Kansas, Mississippi, Illinois, Massachusetts, Connecticut, Missouri, Texas, Virginia. 7th, Illinois, Indiana, Iowa, Dakota, Wisconsin, Michigan, Ohio, West Vir-

ginia, Massachusetts, Maine, Missouri, Virginia. 8th, Iowa, California, Nevada, Minnesota, Michigan, New York, Massachusetts, Connecticut, Vermont, Dakota, Missouri, Nebraska. 9th, Colorado, Nebraska, Kansas, Maine, Utah. 10th, California, Colorado, Iowa, New Jersey, Louisiana. 11th, Iowa, Texas, Minnesota, Ohio. 12th, Iowa, Minnesota, Ohio, Connecticut, Wisconsin. 13th, Indiana. 14th, California, South Carolina. 16th, California. 17th, Nevada, Missouri. 18th, New Mexico. 19th, New Mexico. 20th, Virginia. 21st, Nebraska. 26th, Iowa. 28th, Illinois, Iowa. 29th, Illinois, California, Wisconsin. 30th, Illinois, California, Nevada, Texas, Dakota, Wisconsin, Minnesota, Tennessee, North Carolina. 31st, Illinois, Iowa, Nebraska, Wisconsin, Minnesota, Indiana, Connecticut, New Jersey, New York, Pennsylvania, Virginia.

Mirage.—Burlington, Vt., 15th, 26th; New London, Conn., 8th, 12th, 17th; McPherson Barracks, Ga., 12th; Princeton, Cal., 15th; New Bedford, Mass., 1st, 13th; Genoa, Nebr., 29th to 31st.

Rainbow.—Washington, D. C., 26th, 10:20 a. m., rainbow observed in zenith.

MISCELLANEOUS PHENOMENA.

BOTANICAL.—*Massachusetts*—Somerset, ground open and farmers plowing until the 15th. *Kansas*—Independence, 11th, farmers plowing. *North Carolina*—Fayetteville, 31st, japonicas budding, violets in bloom; Wilmington, 31st, roses in full bud, one in bloom, geraniums in garden still green. *Utah*—Camp Douglass, grass and clover remained fresh and green until the 7th.

BIRDS.—*Geese*—Winnemucca, Nev., 5th, flying SW.; Des Moines, Iowa, Saint Louis, 16th, S.; Newport, R. I., 11th, NW.; Somerset, Mass., 23d, S.; Fall River, Mass, 23d, S. in large numbers; Corning, Mo., 24th, 26th; Oregon, Mo., 5th, 8th; Clear Creek, Nebr., during month; Howard, Nebr., 27th, S.; Flushing, N. Y., 8th, N.; Melissa, Tex., 5th, 9th; Riley, Ill., 9th, SE. *Snow-birds*—Monticello, Iowa, 19th, 29th; Oregon, Mo., 4th, 8th, 13th, 15th; Contoocookville, N. H., 4th. *Blackbirds*—Oregon, Mo., 8th. *Woodpeckers*—Monticello, Iowa, 10th. *Blue-jays*—Monticello, Iowa, 8th. *Ducks*—Daytona, Fla., 1st, flying S.; Monticello, Iowa, 4th, S.; Creswell, Kans., 2d, 5th, 30th; Oregon, Mo., 4th, 5th; Palermo, N. Y., 5th, S. *Tree-sparrows*—Somerset, Mass., numerous during month. *Owls*—Norfolk, Ohio, hooting 27th.

Meteors.—Cheyenne, Wyo., 16th, 9 p. m., large meteor moving south to north, elevation 45°. North Platte, Nebr., 26th, 9:50 p. m., small but very brilliant meteor moving from zenith to about 15° above NE. horizon, where it exploded, trail of light smoke vanished almost instantly. Davenport, Iowa, 27th. Toledo, 30th. Morgantown, 30th, 7:10 p. m., remarkably brilliant meteor fell from a point a little west of south, at an altitude of about 60°; color deep blue, changing to white, then golden, then crimson; path nearly perpendicular to the horizon; exploded within 20° of the horizon, remained visible 15 seconds; 7:20 p. m., small meteor in same path, leaving blue trail. Indianapolis, 28th. Savannah, 12th. Fort Whipple, Va., 30th, 7:10 p. m., very brilliant meteor, altitude about 40° above NW. horizon, following a vertical downward course until its disappearance at about 20° above the horizon there spread out from it a tail resembling that of a comet, of a rich vermillion color; its motion was comparatively slow, remaining visible for about two seconds. Bangor, Me., 1st. Princeton, Cal., 12th, very large meteor, moving from east to west, light equal to half daylight, train visible several seconds. Monticello, Iowa, 12th. Cresco, Iowa, 12th. Woodstock, Md., 5th, 6th, 11th, 12th, 16th, 25th. Rowe, Mass., 22d. Oregon, Mo., 5th, 17th. Freehold, N. J., 2d, 19th. Atco, N. J., 22d. Linden, N. J., 6th. Waterburg, N. Y., 20th. Wappinger's Falls, N. Y., 20th, 25th, 30th. Flushing, N. Y., 29th, 30th. Fayetteville, N. C., 8th, 27th. Westerville, Ohio, 12th, 15th. Jacksonburg, Ohio, 30th. Tioga, Pa., 30th. Fallsington, Pa., 15th. Wytheville, Va., 12th. Yankton, 4th. Castroville, Tex., 6th.

Zodiacal light.—Savannah, 22d, 23d, 25th; Newburg, Vt., 19th; New Corydon, Ind., 6th, 7th, 23d, 26th, morning, 25th, morning and evening; Monticello, Iowa, 28th, evening; Somerset, Mass., 13th, 14th, 16th, 18th to 20th, 22d, 23d, 24th, evening; Cambridge, Mass., 14th, 16th, 19th, 23d, 24th, 25th, evening; suspected 18th, 22d; Fall River, Mass., 18th, evening; Oregon, Mo., 23d, 24th, evening; Atco, N. J., 16th to 18th, 20th, 22d to 24th, evening, 24th, 28th, morning; Waterburg, N. Y., 20th, evening; Bellefontaine, Ohio, 12th; Wytheville, Va., 24th, 25th, 27th; Southington, Conn., 16th, 23d to 25th; Washington, D. C., 17th, 6 p. m., 18th, 6:30 p. m., 19th, 6 p. m., faint, 20th, 6:15 p. m., extending 90° from the sun, 21st, cloudy, 22d, 6 p. m., 22d, suspected, 7:30 p. m., certain, but faint, long and narrow, 23d, 5:30 a. m., bright, 23d, 6 p. m, bright, extending 90° from sun, 24th, 6 p. m., bright, sharply defined, extending 80° from sun, 25th, 6:15 p. m., bright, broad, ill defined, axis passes south of Venus by several degrees, 26th, cloudy, 27th, 6 p. m., moonlight, dark disk, remarkably bright, 28th, clear, moonlight, dark disk, not very bright, 29th, cloudy, haze, 30th, moonlight.

Polar bands.—Leavenworth, Kans., 16th; Dubuque, Iowa, 29th; Milwaukee, 7th; Savannah, 8th, 19th; Wilmington, N. C., 2d, New Corydon, Ind., 7th; Taber, Iowa, 29th;

Guttenburg, Iowa, 7th, 31st; Danville, Ky., 12th, 13th; Gardiner, Me., 19th, 27th; Plattsmouth, Nebr., 6th; Clear Creek, Nebr., 1st, 2d, 3d, 6th, 7th, 9th, 20th; Auburn, N. H., 1st, 8th; Wytheville, Va., 7th, 8th, 12th, 13th, 19th, 29th.

Prairie fires.—Keokuk, Iowa, 5th; New Orleans, La., 18th; Eagle Pass, Tex., 3d, 17th.

Earthquakes.—San José de Costa Rica, *October* 31, 9:30 a. m., very feeble shock. *November* 3, 5:30 p. m., feeble shock; 8th, 8:15 p. m., feeble shock; 23d, quite strong shock. United States naval hospital, Yokohama, Japan, *November* 5, 0h. 57′ light shock; 10th, 1:47 a. m., light shock. Alajuela, Costa Rica, *November* 26, 1:40 a. m., earthquake of short duration. Red Bluff, Cal., *December* 9, 3:20 p. m., severe shock, lasting 15 to 20 seconds, motion upward and downward. Flushing, N. Y., 24th, 9 p. m., slight shock from N. to S., lasting 5 minutes, and accompanied by a low, rumbling noise.

Sunsets.—The characteristics of the sky at sunset, as indications of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Corps stations. Reports from 103 stations show 3,173 observations to have been made of which 36 were reported doubtful; of the remainder, 2,630 or 82.9 per cent. were followed by the expected weather.

Sun spots.—Monthly record of observations by Mr. D. P. Todd, Nautical Almanac office, Washington, D. C., communicated by Prof. S. Newcomb, U. S. N., in charge of that office:

December, 1878.	No. of new.—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	
6—4 p. m	0	0	0	0	0	0	0	0	
11—2 p. m	0	0	0	0	0	0	0	0	
12—2 p. m	0	0	0	0	0	0	0	0	
13—3 p. m	0	0	0	0	0	0	0	0	
16—2 p. m	0	0	0	0	0	0	0	0	
18—4 p. m	1	1	0	0	0	0	1	1	Faculæ; spot small.
19—2 p. m	0	0	0	0	0	0	1	1	Faculæ.
24—3 p. m	0	0	1	1	0	0	0	0	
28—2 p. m	0	0	0	0	0	0	0	0	
30—2 p. m	0	0	0	0	0	0	0	0	

Mr. Jay Harcourt, at Wappinger's Falls, N. Y., examined the sun on the following days, but observed no spots: 1st, 4th, 8th, 14th, 16th, 19th, 21st, 25th, 30th, 31st. Mr. David Trowbridge, at Waterburg, N. Y., examined the sun on the following days, but observed no spots: 1st, 2d, 3d, 5th, 6th, 8th, 12th, 13th, 18th, 22d to 24th, 29th to 31st. Observations were also made at Fort Whipple, Va., from the 20th to the 31st, and no spots observed.

NOTES AND EXTRACTS.

In the American Journal of Science and Arts for January, 1879, Professor Loomis publishes his tenth paper of "Contributions to Meteorology." With respect to storms of the Atlantic Ocean, he has examined seventy-seven cases of low areas near the coast of the United States, and was able to follow thirty-six of them, with considerable confidence entirely across the Atlantic Ocean, but eight of the storms became merged with other storms before reaching the European coast, leaving only twenty-eight low areas which reached the coast of Europe, Professor Loomis examines the seventy-seven depressions, with respect to their first appearance, lowest isobars, respectively, in longitudes 60°, 30°, and 0° West of Greenwich; average velocities between those longitudes respectively, and the highest wind with the direction, on the English coast, at the approach of each low area. From his examination, he concludes:

"We see from this table that in one year there are on an average only eighteen different storms which can be traced by means of Hoffmeyer's charts from the coast of the United States across the Atlantic. If for each day we had two good charts, instead of only one, it is probable that a few more storms might be identified in their progress across the ocean, but it is doubtful whether the number would be greatly increased. Nearly all of these storms pursued a course north of east, and passed considerably to the north of Scotland. In only four of the cases did the low center cross the meridian of Paris in a latitude as low as the northern boundary of England. The average track of the thirty-six low centers which are traced across the ocean, is shown by the means at the bottom of the table, where it is seen that the meridians of 60°, 30°, and 0° were crossed in the latitudes 49°.6, 58°.0, and 63°.3. Since the storm-centers generally passed

600 miles north of London, most of them did not exhibit much violence on the English coast. In half of the cases, the highest velocity reported was 3, denoting a very fresh breeze, and in only six of the cases was the velocity at any station on the English coast as high as 5, denoting a gale.

"We may hence conclude that when a center of low pressure (below 29.5 inches) leaves the coast of the United States, the probability that it will pass over any part of England is only one in nine; the probability that it will give rise to a gale any where near the English coast is only one in six; and the probability that it will give rise to a very fresh breeze is one in two.

"One of the most noticeable circumstances connected with Atlantic storms is their slow rate of progress. This is due partly to the erratic course of the center of the low area, and partly to the frequent blending of two low areas into one, whence it generally results that the most eastern center appears to be pushed backward toward the west. In my eighth paper I have described a remarkable example of this kind of movement. In like manner the storms numbered 35, 39, 41, 51, 53, 70, and 72 of the preceding table appeared to be pushed westward by blending with storms of subsequent date. Aside from this cause of detention, there seems in the Atlantic Ocean to be a special cause which frequently holds storms nearly stationary in position from day to day, and this cause is probably the abundance of warm vapor arising from the Gulf Stream, in close proximity to the cold dry air from the neighboring coast of North America. Hence we see that when American storms are predicted to appear upon the European coast, and it is assumed that they will cross the ocean at the same rate as they have crossed the United States, such predictions will seldom be verified.

"It will also be noticed that the storms which cross the Atlantic generally increase in intensity after leaving the American coast; the average depression of barometer shown in the preceding table being 6 millimeters (0.24 inch) greater in longitude 30° than in longitude 60°."

Professor Loomis also makes an examination of the barometer and winds at the base and summit of Mount Washington, and also compares the results with data obtained from adjoining stations and draws the following conclusion:

"1. High winds on Mount Washington circulate about a low center as they do near the level of the sea. 2. The motion of the wind is nearly at right angles to the direction of the low center. 3. The low center at the height of Mount Washington sometimes lags behind the low center at the surface of the earth apparently as much as two hundred miles."

In the last edition of the Encyclopædia Britannica, William B. Carpenter, F. R. S., on the temperature of the Atlantic, holds that the deep-sea temperature sounding has justified the doctrine of a *vertical* oceanic circulation, sustained by opposition of temperature only, quite independent and distinct from the *horizontal* circulation produced by the winds. His views are expressed as follows:

"1. That instead of the local depressions of bottom-temperature imputed by previous writers to polar currents, the temperature of every part of the deep-sea bed in communication with either of the polar areas would be not many degrees above that of the polar areas themselves.

"2. That this general depression of bottom-temperature would be found to depend, not upon such a shallow glacial stream as might be maintained to be a return from the polar areas of water propelled toward them by wind currents, but upon a creeping flow of the whole under-stratum, having a thickness of from 1,000 to 2,000 fathoms.

"3. That as the depression of bottom temperature in any part of the general oceanic basin would be proportional to the freedom of communication between its deeper portion and that of one or other of the polar areas, the bottom-temperature of the South Atlantic would probably range downward to 32°, while that of the North Atlantic would not be below 35°, except where it first receives the Arctic flow, or comes under the influence of the Antarctic underflow, which would very probably extend itself to the north of the equator.

"4. That as the Arctic and Antarctic underflows must meet at or near the equator, whilst the surface stratum is there continually being drafted off thence toward either pole, there would be a continual ascent of glacial water under the line, showing itself by a nearer approach of cold water to the surface in the *inter*-tropical than in the *extra*-tropical zone."

Published by order of the Secretary of War.

ALBERT J. MYER,
Brigadier-General (Breret Assigned) Chief Signal Officer, U. S. A.

PAPER 36.

MONTHLY WEATHER REVIEW, JANUARY, 1879.

INTRODUCTION.

In compiling the present review the following data, received up to February 14, have been made use of, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at 119 Signal Service stations and 11 Canadian stations, as telegraphed to this office; monthly journals and means, 121 and 144 respectively, from the former, and monthly means from 12 of the latter; reports from 21 special sunset stations; 243 monthly registers from voluntary observers; 52 monthly registers from United States Army post-surgeons; marine records; international simultaneous observations; monthly reports from voluntary observers and the local weather services of the States of Iowa and Missouri; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

Upon chart No. II is exhibited by the isobaric lines the general distribution of the atmospheric pressure, as reduced to sea-level, for the month. Compared with the means for January of previous years, the pressure is above the normal on the Pacific coast and from Wyoming and New Mexico to the Lower Ohio Valley, and thence to the Gulf of Mexico and southern portion of the South Atlantic States. Over Lake Superior and from the Lower Lakes to North Carolina and thence northeastward it has been below the normal, especially over New England, the deficiency gradually increasing to Maine, where, at Portland, the mean pressure is 0.16 inch below the normal.

The local barometric ranges for the month, as reduced to sea-level, have been largest over New England, and from Dakota and Minnesota to Kansas. Taken by districts they vary as follows: New England, from 1.83 at Eastport, to 1.19 at New Haven; summit of Mount Washington, 1.26; Middle Atlantic States, 1.25 at Philadelphia to 1.02 at Lynchburg; South Atlantic States, 1.00 at Charlotte to 0.64 at Jacksonville; Lake region, 0.87 at Chicago to 1.16 at Oswego and 1.35 at Duluth; Ohio Valley and Tennessee, 1.09 at Morgantown, and 1.13 at Knoxville to 0.76 at Nashville; Gulf States, 0.37 at Key West to 1.00 at Corsicana and 1.14 Brackettsville; the Northwest and eastern slope of the Rocky Mountains, 0.98 at Saint Louis to 1.10 at Fort Sill, 1.48 at North Platte, 1.57 at Yankton and 1.71 at Pembina; Rocky Mountain stations, 0.71 at Santa Fé to 0.83 at Denver; summit of Pike's Peak, 0.63; Western Plateau, 0.81 at Pioche to 1.01 at Boise City; Pacific coast, 0.41 at Campo, and 0.52 at San Diego to 1.13 at Portland, Oreg.

Areas of high barometer.—Eleven are described below. Four of them, namely: Nos. I, II, V, and VI. deserve special notice as they produced the minimum temperatures of the month over the regions traversed by them.

No. I. This area, which was over the northwest territory of British America during the 1st and 2d of January, moved slowly south and east over the United States from the 3d to the 7th, and over the Bermudas on the 8th. A telegraphic dispatch received at Saint Paul, Minn., January 3, reported the following low temperatures in British America: —60° at Battlefield, the capital of the Northwest Territory; —35° at Fort Pelly, and —29° at Winnipeg. The lowest temperatures recorded over the United States (Signal Service observations), were: over the Northwest, —32° at Pembina on the 1st and at Breckenridge on the 2d; in the Mississippi Valley, —26.°2 at Saint Paul and La Crosse on the 2d, to 20° at New Orleans on the 6th; in the Atlantic States, —5° at Fort Whipple, Va., on the 3d, to 25° at Jacksonville, Fla., on the 7th; and at Prospect, Bermudas, 45.°5 on the 8th. On the 1st the pressure rose west of the Mississippi, and on the morning of this day the isotherm of zero curved through Wisconsin, Nebraska, Colorado, and Idaho. 2d, the pressure continued highest over the Northwest, and rising thence to the Gulf, South and Middle Atlantic coasts and Lower Lake region; the morning isotherm of zero curved through Michigan, Indiana, Missouri, Colorado, Wyoming, and Western Montana. 3d, the highest pressure extended from Minnesota to Missouri, and the morning isotherm of zero curved through Michigan, New York, Connecticut, Virginia, Tennessee, Indian Territory, Colorado, and Montana; the lowest temperature (—29°) was reported at Bismarck. 4th, the region of highest pressure remained almost stationary and the temperature generally rose slightly. The morning isotherm of zero curved south over Lake Michigan, thence east to Pennsylvania and westward through Tennessee, Arkansas, Colorado, and Western Dakota. The lowest temperature (—30°) occurred at Yankton. 5th, the region of highest pressure continued almost stationary until evening, when the pressure fell rapidly over the Northwest and the maximum was transferred to the Southwest. The lowest morning temperature (—29°) occurred at Bismarck, but a rapid rise occurred over this region dur-

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No. I.

WAR DEPARTMENT WEATHER MAP.
SIGNAL SERVICE, U. S. ARMY.
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.
AVERAGE PROGRESS OF AREAS OF LOW BAROMETER EAST OF THE 100TH MERIDIAN.
No. Velocity.
I. — miles per hour.
II. 20 do.
III. — do.
IV. 38 do.
V. 35 do.
VI. — do.
VII. — do.
VIII. 55 do.
IX. — do.
X. — do.
XI. 40 do.
XII. 33 do.
XIII. 35 do.
XIV. 28 do.
XV. — do.
NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7:35 A. M., the 4:35 P. M., and 11 P. M., (Washington mean time,) observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.
TRACKS OF CENTRES OF AREAS OF LOW BAROMETER FOR JANUARY 1879.
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
BRIG. GEN. (BVT. ASSG'D) CHIEF SIGNAL OFFICER, U. S. A.
97° Long. West from 82° Greenwich
San Francisco
San Diego
Denver
Cheyenne
Salt Lake City
Santa Fe
St Louis
Chicago
Detroit
Pittsburg
Cincinnati
Louisville
Nashville
Memphis
Atlanta
Savannah
Charleston
Jacksonville
Key West
Havana
Punta Rassa
Norfolk
Cape Hatteras
Wilmington
Cape May
Boston
Quebec
Montreal
Toronto
Buffalo
Rochester
Milwaukee
Duluth
Bismarck
Pembina
St Paul
Ft Sully
Ft Smith
Shreveport
Galveston
New Orleans
Mobile
Vicksburg
Montgomery
Indianola
Brownsville
Ft Bliss
Pike's Peak
Bridge
Chatham
Nantucket
New London
Block Island
Cape Sable
Grand Haven
Saugeen
Port Huron
Cleveland
Erie
Evanston
Dubuque
Keokuk
Leavenworth
Omaha
North Platte
Lake City
Jacksonville
SDOMINGO

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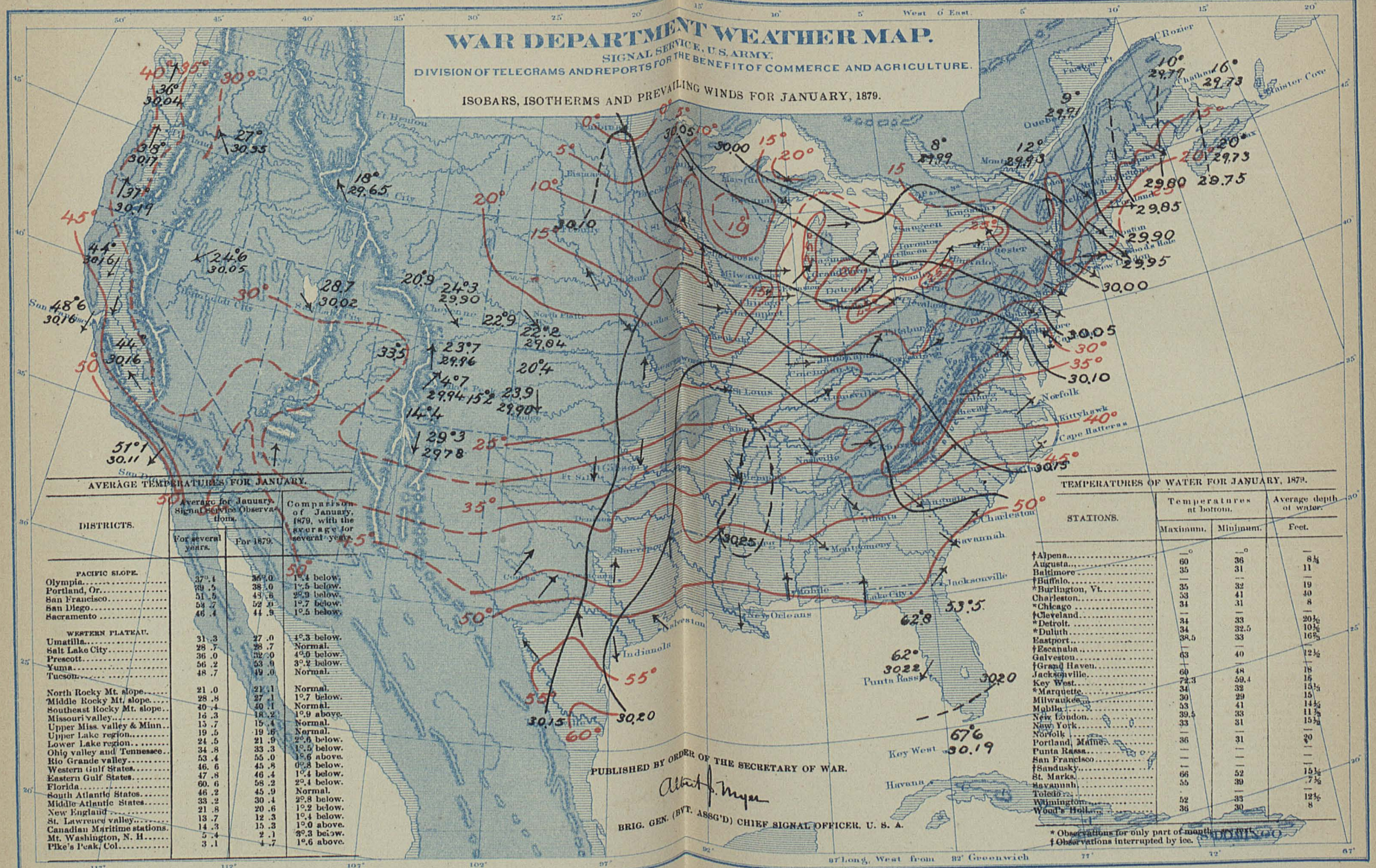
WAR DEPARTMENT WEATHER MAP.

SIGNAL SERVICE, U. S. ARMY.

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

ISOBARS, ISOTHERMS AND PREVAILING WINDS FOR JANUARY, 1879.



AVERAGE TEMPERATURES FOR JANUARY.

DISTRICTS.	Average for January. Signal Service Observations. For several years.	For 1879.	Comparison of January, 1879, with the average for several years.
PACIFIC SLOPE.			
Olympia	37°.4	36°.0	1°.4 below.
Portland, Or.	39 .5	38 .0	1°.5 below.
San Francisco	51 .5	48 .6	2°.9 below.
San Diego	54 .7	52 .0	1°.7 below.
Sacramento	46 .4	44 .9	1°.5 below.
WESTERN PLATEAU.			
Umatilla	31 .3	27 .0	4°.3 below.
Salt Lake City	28 .7	28 .7	Normal.
Prescott	36 .0	32 .0	4°.0 below.
Yuma	56 .2	53 .0	3°.2 below.
Tucson	48 .7	49 .0	Normal.
North Rocky Mt. slope	21 .0	21 .1	Normal.
Middle Rocky Mt. slope	28 .8	27 .1	1°.7 below.
Southeast Rocky Mt. slope	40 .4	40 .1	Normal.
Missouri valley	16 .3	18 .2	1°.9 above.
Upper Miss. valley & Minn.	15 .7	15 .4	Normal.
Upper Lake region	19 .5	19 .5	Normal.
Lower Lake region	24 .5	21 .9	2°.6 below.
Ohio valley and Tennessee	34 .8	33 .3	1°.5 below.
Rio Grande valley	53 .4	55 .0	1°.6 above.
Western Gulf States	46. 6	45 .8	0°.8 below.
Eastern Gulf States	47 .8	46 .4	1°.4 below.
Florida	60. 6	58 .2	2°.4 below.
South Atlantic States	46 .2	45 .9	Normal.
Middle Atlantic States	33 .2	30 .4	2°.8 below.
New England	21 .8	20 .6	1°.2 below.
St. Lawrence valley	13 .7	12 .3	1°.4 below.
Canadian Maritime stations	14 .3	15 .3	1°.0 above.
Mt. Washington, N. H.	5 .4	2 .1	3°.3 below.
Pike's Peak, Col.	3 .1	4 .7	1°.6 above.

TEMPERATURES OF WATER FOR JANUARY, 1879.

STATIONS.	Temperatures at bottom. Maximum.	Minimum.	Average depth of water. Feet.
	°	°	
†Alpena	—	—	—
Augusta	60	36	8¼
Baltimore	35	31	11
†Buffalo	—	—	—
*Burlington, Vt.	35	32	19
Charleston	53	41	40
*Chicago	34	31	8
†Cleveland	—	—	—
*Detroit	34	33	20½
*Duluth	34	32.5	10½
Eastport	38.5	33	16½
†Escanaba	—	—	—
Galveston	63	40	12½
†Grand Haven	—	—	—
Jacksonville	60	48	18
Key West	72.3	59.4	16
*Marquette	34	32	15½
Milwaukee	30	29	15
Mobile	53	41	14½
New London	39.5	33	11½
New York	33	31	15½
Norfolk	—	—	—
Portland, Maine	36	31	20
Punta Rassa	—	—	—
San Francisco	—	—	—
†Sandusky	—	—	—
St. Marks	66	52	15½
Savannah	55	39	7½
Toledo	—	—	—
Wilmington	52	35	12½
Wood's Holl	36	30	8

* Observations for only part of month.
† Observations interrupted by ice.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

Albert J. Myer

BRIG. GEN. (BVT. ASSG'D) CHIEF SIGNAL OFFICER, U. S. A.

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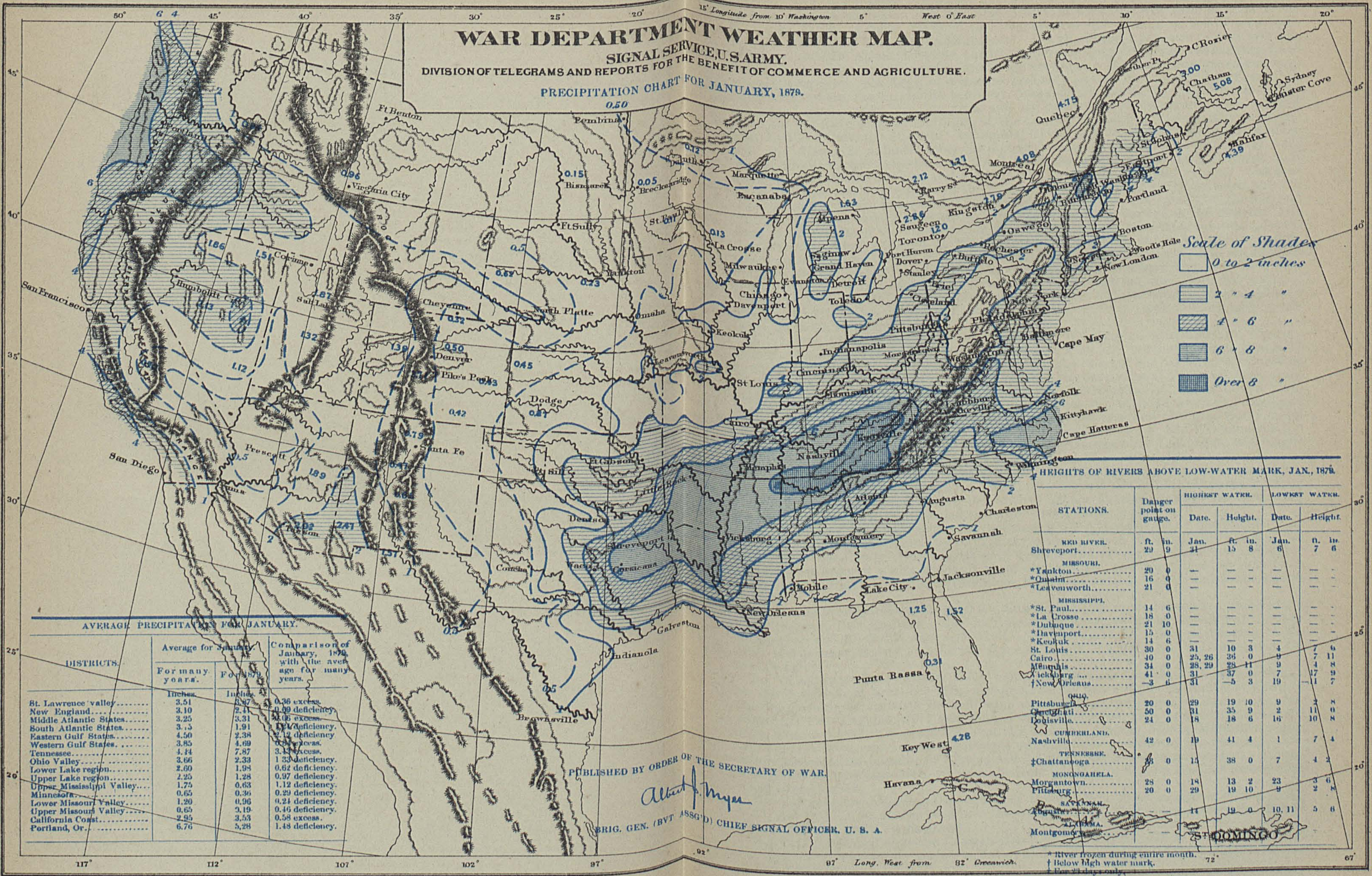
No. III.



AVERAGE PRECIPITATION FOR JANUARY.

DISTRICTS.	Average for January. For many years.	Average for January. For 1879.	Comparison of January, 1879, with the average for many years.
	Inches.	Inches.	
St. Lawrence valley	3.51	3.87	0.36 excess.
New England	3.10	2.41	0.69 deficiency.
Middle Atlantic States	3.25	3.31	0.06 excess.
South Atlantic States	3.[illegible]5	1.91	1.24 deficiency.
Eastern Gulf States	4.50	2.38	2.12 deficiency
Western Gulf States	3.85	4.69	0.84 excess.
Tennessee	4.44	7.87	3.43 excess.
Ohio Valley	3.66	2.33	1.33 deficiency.
Lower Lake region	2.60	1.98	0.62 deficiency.
Upper Lake region	2.25	1.28	0.97 deficiency.
Upper Mississippi Valley	1.75	0.63	1.12 deficiency.
Minnesota	0.65	0.36	0.29 deficiency.
Lower Missouri Valley	1.20	0.96	0.24 deficiency.
Upper Missouri Valley	0.65	0.19	0.46 deficiency.
California Coast	2.95	3.53	0.58 excess.
Portland, Or.	6.76	5.28	1.48 deficiency.

HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, JAN., 1879.

STATIONS.	Danger point on gauge.		Highest water. Date.	Highest water. Height.		Lowest water. Date.	Lowest water. Height.	
RED RIVER.	ft.	in.	Jan.	ft.	in.	Jan.	ft.	in.
Shreveport	29	9	31	15	8	6	7	6
MISSOURI.								
*Yankton	20	0	—	—	-	—	—	-
*Omaha	16	0	—	—	-	—	—	-
*Leavenworth	21	0	—	—	-	—	—	-
MISSISSIPPI.								
*St. Paul	14	6	—	—	-	—	—	-
*La Crosse	18	0	—	—	-	—	—	-
*Dubuque	21	10	—	—	-	—	—	-
*Davenport	15	0	—	—	-	—	—	-
*Keokuk	14	6	—	—	-	—	—	-
St. Louis	30	0	31	10	3	4	7	6
Cairo	40	0	25, 26	36	0	9	7	11
Memphis	34	0	28, 29	28	11	9	4	8
Vicksburg	41	0	31	37	0	7	17	9
†New Orleans	—3	6	31	—5	3	19	—11	7
OHIO.								
Pittsburgh	20	0	29	19	10	9	2	8
Cincinnati	50	0	31	35	9	2	11	0
Louisville	24	0	18	18	6	16	10	8
CUMBERLAND.								
Nashville	42	0	19	41	4	1	7	4
TENNESSEE.								
‡Chattanooga	[illegible]	0	15	38	0	7	4	2
MONONGAHELA.								
Morgantown	28	0	18	13	2	23	3	6
Pittsburg	20	0	29	19	10	9	2	8
SAVANNAH.								
Augusta	—	—	14	19	0	10, 11	5	6
ALABAMA.								
Montgomery	—	—						

* River frozen during entire month.
† Below high water mark.
‡ For 23 days only.

ing the day; the morning isotherm of zero curved through Wisconsin, thence to Pennsylvania and westward through Kentucky, Missouri, Kansas, Nebraska, and Western Dakota. 6th, the highest pressures extended from the Ohio Valley to the Gulf of Mexico, over which region the morning minimum temperatures ranged from 2° at Knoxville to 22° at Saint Mark's; the temperature still remaining below zero from Indiana and Indian Territory to Minnesota. 7th, the highest pressure moved over the South and Middle Atlantic States, the minimum morning temperatures ranging from 12° at Washington and Charlotte to 27° at Savannah; the temperature was everywhere above zero. 8th, highest pressure probably passed eastward, over or near the Bermudas, where the minimum morning temperature was 45.°5. High northeast to northwest winds preceded this area, and cautionary off-shore signals were ordered up along the Gulf coast at midnight of the 1st and morning of the 2d, and were justified by the following velocities: Indianola, NE. 36, Galveston, N. 25, and Saint Mark's, NW. 28. Along the Atlantic coast the signals hoisted on the 1st for storm No. II were changed to cautionary off-shore on the 2d, and the velocities are noticed under that storm, as also the high winds and severe snow-storms in the Lake region. The continued northwesterly winds along the Atlantic coast produced very low tides, and the observer at Baltimore reported the lowest tide on record at that place, on the 4th and 5th, during which several steamships and other vessels grounded in the channel. As some of the results of the extreme cold, the following items may be of interest: deaths from freezing were reported at Wilkesbarre, Pa., Fort Wayne and Vincennes, Ind., Leavenworth, Kans., Chicago, Ill., near Rockport, Copiah County, and in Lincoln County, Mississippi; all the locomotives on the Dakota Southern and New York City elevated railroads were disabled by freezing; river navigation was suspended at Cairo, where the ice in the Ohio extended from shore to shore, and at Memphis it was seriously interfered with by heavy floating ice filling the river from bank to bank and by the landings being ice-bound.

No. II. The pressure gradually increased over Washington Territory and Oregon, from the 1st to the 7th, and clear or fair weather, with cool northerly winds prevailed on the Pacific coast during these days, excepting the rains of the 1st and 2d, attending low area No. I. On the 7th the pressure reached the maximum at Portland, Oreg., and high northerly winds prevailed over California and Nevada. At Mare Island, Cal., high northwest winds continued from 9 a. m. to 4 p. m., with an average velocity of 39 miles per hour. The following velocities were also recorded at Signal Service stations: San Francisco, NE. 40; San Diego, N. 28; Sacramento, N. 33; Winnemucca (on the 6th), NW. 40; Pioche, N. 32. 8th, highest pressures over California, with light winds and calms, and clear, cool weather.

No. III. During the 8th the pressure rose over the Eastern slope, and northerly winds, with sleet and snow prevailed over the Southwest. 9th, this area extended from the Gulf to the Lakes, and on the 10th moved off the Atlantic coast, with increasing pressure. 11th and 12th, it passed eastward over the Bermudas.

No. IV. This area moved in rear of low area No. V. It appeared on the Pacific coast on the 10th and probably extended from Arizona to Texas on the 11th. On the 12th and 13th it was over the Gulf States, with diminishing pressure. Cautionary off-shore signals were ordered along the Gulf coast on the 11th and the following maximum velocities recorded on the 12th: Indianola, N. 31; Galveston, W. 36; and Saint Marks, NW. 28.

No. V was over Manitoba on the 14th, and on the 15th moved eastward north of the Lake region to New England. The minimum temperatures on the morning of the 15th, at Saugeen and Rockliffe, were —26° and —27°, respectively. On the morning of the 16th it was over Maine and Lower Canada, while low area No. VIII was over the Lower Lakes.

No. VI appeared over Oregon and Washington Territory on the 14th, and remained on the Pacific coast until the 18th, accompanied by generally clear and cool weather. On the morning of the 16th the following minimum temperatures of the month were recorded: Los Angeles, 36°; San Diego, 35°; Red Bluff, 27°; and Sacramento, 29°. 18th, this area extended eastward over the Western plateau, Rocky Mountain region and Eastern slope, and during the day the minimum temperature of the month (—33°) was recorded at the summit of Pike's Peak. 19th, it extended from the Rocky Mountains to the Southwest. 20th, covered the Gulf of Mexico and on the 21st passed eastward over Florida.

No. VII developed during the 16th over the Eastern slope, in rear of low area No. VIII, and by 11 p. m. had moved into the Ohio Valley. 17th, passed over the Middle Atlantic States and New England.

No. VIII developed over the Eastern slope on the 22d, in rear of low-pressure area No. XII. 23d, moved into the Ohio Valley and on the morning of the 24th covered the Atlantic States.

No. IX appeared over the Northwest, in rear of low area No. XIII, on the morning of the 25th and moved eastward during the day to the Lake region. 26th and 27th passed southeast off the Atlantic coast.

No. X developed over the Upper Mississippi Valley and Lake region on the 28th, in rear of low area No. XIV. It was probably dissipated on the 30th while over the Lower Lake region.

No. XI appeared over the Northwest on the 29th where it remained central until the 31st.

Areas of low barometer.—Fifteen are described and the tracks of eleven centers are shown on Chart No. I. Five had their origin west of the Rocky Mountains, three of which (Nos. IV, V, and VIII) followed very similar paths, namely, southeastward over the Western plateau to the Southwest, and thence northeastward over the eastern section of the United States, during the first half of the month; the other two (Nos. XIII and XIV) passed eastward along the northern boundary, and were instrumental in producing the southerly winds and high temperatures of the latter half of the month. From the small table at the lower left-hand corner of the chart it will be seen that the storm-centers of the present month have moved with unusual rapidity across the country, and a study of the international charts shows that some, at least, continued to move rapidly eastward after leaving the Atlantic seaboard. This is in strong contrast to the storm-centers of November and first half of December, during which period the average velocity of storm-centers across the land was much slower.

No. I is an area of low pressure which existed during the last few days of December, and continued during the 1st of January, central off the California coast. It produced heavy rains along the coast from Santa Barbara to Los Angeles on the 31st, and a waterspout, which was first observed on the ocean, passed northeastward up the valley of Mission Creek, doing considerable damage. The observer at Santa Barbara reports, 1st, 12:15 a. m. to 3:45 p. m., heavy east wind, one man killed by falling chimney. Considerable damage to wharf, wind-mills, fences, shade trees, and houses. At Mare Island, Cal., an easterly gale prevailed from 5 a. m. to 9 p. m. of January 1, with an average force of 44 miles per hour. The track of this center is not charted.

No. II.—On December 31, as an area of high pressure was moving eastward off the Atlantic coast, a center of low pressure apparently developed over the Gulf of Mexico, which moved, January 1, northeastward to North Carolina, accompanied by light rains and winds. On the 1st the pressure also fell in the Lake region, and by night a depression was central north of Lake Huron, with increasing westerly winds and snow over Lake Michigan and Illinois, in advance of high-pressure area No. I, the weather accompanying which latter area was to prove the most notable meteorological feature of the month. 2d, the center moved rapidly eastward to New England, and, joining the one from the Gulf, quickly developed into a severe storm; at 11 p. m. the pressure was lowest at Eastport, where the barometer read 28.82, or 1.18 inches below normal. At this station and at Quebec a severe easterly gale, with snow, prevailed; on the summit of Mount Washington the wind was NW. 84 miles, heavy snow; and thence over the Lake region and Middle States a steep barometric gradient existed, with brisk to high westerly winds and rapidly falling temperature. 3d, the center moved very slowly eastward over Eastern Maine, the pressure at Eastport remaining throughout the day about 28.55, or about 1.45 inches below normal; the lowest reading, 28.49, or 1.51 below, occurred at 2 p. m., January 3, after which time the wind changed from S. to NW. Light winds prevailed in the Canadian maritime provinces, but over New England, the Middle States, and Lower Lake region very cold and high westerly winds and gales attended the steep barometric gradient. 4th, the center passed eastward over Nova Scotia, the lowest pressure (apparently about 28.50, or 1.50 inches below normal, occurring at Halifax before the 7:35 a. m. observation, at which time the wind had changed to N. Light winds and calms prevailed over the Canadian maritime provinces and brisk westerly winds over New England. The barometric gradient over the Lower Lake region and Middle States continued very steep during the daytime, with high westerly winds and gales, but diminished after sunset with decreasing winds. Snow continued on the 5th in the Lower Lake region, but with diminished winds and higher temperature. Although the measured quantities of snow were quite moderate, except at Rochester on the 3d and 4th, when 2.31 inches melted snow were recorded, it was so badly drifted by the attending high winds as to seriously impede railroad communication, and traffic on the lines along the lake shores east of Cleveland was almost entirely suspended for several days. Cautionary signals were ordered at midnight of the 1st from Cape Lookout to Sandy Hook, which were changed to cautionary off-shore on the 2d, and at Milwaukee, Grand Haven and Ludington; and on the morning of the 2d along the New England coast, which were changed to off-shore during the afternoon. These signals were all justified, and the following (measured) high-wind velocities were recorded: On the 2d, Milwaukee, W., 41; Oswego, W., 40; Morgantown, W., 42; Grand Haven, NW., 41; Eastport, E., 60; Boston, W., 40; Wood's Holl, NW., 62; Sandy Hook, W., 72. 3d, Buffalo, SW., 47; Newport, W., 48; Barnegat, W., 48. 4th, Cape Lookout, NW., 44; Cape May, W. and NW., 60; Philadelphia, W., 48; For the progress of this storm over the Atlantic ocean attention is called to the chapter on international meteorology.

No. III.—As high-pressure area No. I moved southward along the eastern slope of the

Rocky Mountains on the 6th the pressure fell rapidly from Manitoba to Utah, with snow during latter part of day. At 4:35 p. m., the barometer at Pembina had fallen to 29.59, or 0.53 inch below normal, after which it commenced rising, and a secondary depression (low area No. IV) formed over Utah. 7th, center moved eastward north of the Upper Lakes, with southerly to westerly winds and light snows, thence to the Ohio Valley. 8th, moved eastward over Quebec, and southwesterly winds, cloudy and rainy or snowy weather prevailed, thence to Michigan, the Ohio Valley, Middle States, New England, Nova Scotia, and Cape Breton. 9th, it probably passed northeast over Labrador, but as its entire path was to the north of our stations it is not charted. Cautionary signals were ordered up at midnight of the 7th at Milwaukee, Grand Haven, and Ludington, which were justified, although late at Milwaukee.

No. IV developed over the Western plateau in the southwest quadrant of preceding area, during the latter part of the 6th. 7th, at 7:35 a. m. and 4:35 p. m. it was central over New Mexico, the barometer at Santa Fé reading about 29.47, or 0.26 below normal; southerly winds, cloud, and rain prevailed over southern portion of Arizona and from Texas to the Lower Mississippi Valley, and brisk to high northerly winds and snow from Nebraska to Utah and northern portions of Arizona and New Mexico; at Fillmore, Utah, seven inches of snow fell on the 6th and 7th. At 11 p. m., the center was transferred to the Lower Rio Grande Valley, and northerly winds and snow extended to southern portions of Arizona and New Mexico. 8th, moved northeast over the Gulf States, followed by northerly winds, increasing to gales along the coast, snow, sleet and rain in the Southwest, and accompanied over the interior of the Gulf States and Tennessee by heavy rains. 9th, moved rapidly northeast and at 11 p. m. was central between Capes Cod and Sable; east to south winds and heavy rains prevailed from Eastern Tennessee to New Jersey, and northerly winds, with heavy snows from West Virginia to New England, thus creating a second snow blockade, or rather prolonging that which attended area No. II; at 11 p. m., high northwest winds and gales prevailed along the coast from North Carolina to Maine. 10th, the center moved rapidly northeast, and its further history will be noted under international meteorology. Cautionary signals were ordered at Indianola and Galveston at midnight of the 6th, changed to off-shore midnight of the 7th; at Mobile and St. Marks at midnight of the 8th, changed to off-shore, morning of the 9th; from Savannah to Macon, morning of the 9th, from Cape Lookout to Wood's Holl, morning of the 8th, and from Boston to Eastport, afternoon of the 9th; those along the Atlantic coast were changed to off-shore on the afternoon of the 9th. All signals were justified. The following maximum velocities were recorded: on the 8th, at Indianola, N., 54; Galveston, NW., 40; on the 9th, Wilmington and Capes Lookout and Hatteras, SW., 44; Cape May, NW., 56; New York, NW., 40; on the 10th, Sandy Hook, NW., 56; Wood's Holl, NW., 48; Mount Washington, NW., 81.

No. V.—During the 8th the pressure fell rapidly from Washington Territory and Oregon to Western Montana, with rain and snow gradually extending southward; over 5 inches of snow fell at New Westminster, British Columbia, and at Yreka, Cal. 9th, the depression moved southward over the Western plateau, and by 11 p. m. was over Utah. Rain or snow, followed by clear or fair weather, prevailed from Idaho to northern California; from 4 to 5 inches of snow was reported at three stations in Nevada, and southerly winds, with rising temperature, over the eastern slope. 10th, moved slowly southeast, and by 11 p. m. was over Northwestern Texas; rapidly falling temperature, with snow, prevailed in Eastern Arizona and Southern New Mexico, and south to east winds, increasing cloudiness, and, by night, a general light rain from Indian Territory to the West Gulf coast. 11th, at 7:35 a. m., the lowest pressure was over Southern Texas; rain prevailed from Texas to Mississippi and heavy snow from Indian Territory to Cairo. During the day, it moved northeast to Alabama, with heavy rains in its northern quadrant from Louisiana to Tennessee. 12th, moved eastward off the North Carolina coast, where a severe gale prevailed at night, and was accompanied by heavy rains from Georgia and East Tennessee to Virginia. These rains, together with those of the 8th and 9th, accompanying area No. IV, resulted in heavy freshets in the rivers of this section; much damage occurred on those rivers which were ice-gorged, especially those of Eastern Tennessee. 13th, the depression passed north of Bermuda, as shown on Chart No. I, after which it has not been traced. Cautionary signals were ordered on the 11th from Charleston to Sandy Hook, which were all justified; and on the morning of the 12th, from New York to Wood's Holl, which were only justified within 100 miles of Sandy Hook. Maximum velocities on the 12th: Charleston, SW., 30; Wilmington, SW., 32; Cape Lookout, NW., 40; Kittyhawk, N., 63; Cape Henry, NE., 52; along the New Jersey coast the highest winds were NE., brisk.

No. VI passed eastward on the 9th north of Minnesota, where southerly winds and light snow prevailed.

No. VII.—As high-pressure area No. IV moved southward on the 10th over California, in rear of low area No. V, the barometer fell to the northward, with increasing precipitation and fresh to brisk southerly winds, and at 11 p. m. the lowest pressure was probably central on the coast of Washington Territory; at 4 p. m., a heavy SE.

gale prevailed over the Gulf of Georgia, while northeasterly winds were reported at Victoria, V. I., and New Westminster and Lytton, British Columbia. 11th, the lowest pressure extended from Oregon to Montana, and rain or snow fell from Northern California, where it was heaviest, to Idaho and northward. During the preceding night a southeast gale prevailed in the Sacramento Valley—maximum velocity at Red Bluff, SE., 44 miles. 12th.—Higher pressures from Oregon to Western Montana. At 7:35 a. m., the lowest pressure was recorded at Bismarck, Dak., (29.77, or 0.33 inch below normal), where calm, clear weather prevailed; at 11 p. m., the lowest pressures were recorded at Duluth and Marquette (29.78, or 0.30 below normal). East to north winds and snow prevailed throughout the day in Manitoba, and southerly winds with fair weather in Minnesota. 13th, was north of the Lake region and Saint Lawrence Valley; heavy snow and brisk to high winds were reported in the latter section. Cautionary signals were ordered up at Milwaukee, Grand Haven, and Ludington on the morning of the 13th in anticipation of increasing westerly winds, but were not justified, possibly because of the advance of area No. VIII.

No. VIII crossed the United States and probably the Atlantic Ocean. It appeared during the 13th to the north of Washington Territory and Idaho; southerly winds prevailed, with rain on the Pacific coast and snow in Idaho; by night the winds changed to northwest on the coast of Oregon, when the lowest pressure was probably over Idaho. 14th, it moved rapidly southward to Arizona as a heavy storm; heavy snows and brisk southerly, changing to northerly, winds prevailed over the *western plateaus*, and rain or snow followed by clear weather in Northern California; at Saint George, in Southern Utah, a smart shower was reported after 9 p. m., and heavy rain fell in Southern New Mexico during latter part of day. 15th, moved rapidly northeast to Illinois, preceded by easterly winds, increasing cloudiness and, by evening, rain or snow from Tennessee to the Lake Region and Middle Atlantic States. Heavy snow fell from Kansas to Lake Michigan. 16th, it moved rapidly eastward and by 4:35 p. m. the center was off Long Island. North of the center, namely, from the Lower Lakes to New England, cold northerly winds and heavy snow prevailed, but at the immediate center, and thence southward, high temperatures, southerly winds, and rain. The following temperatures were recorded at 7:35 a. m.: At Louisville and Cincinnati, 41°; Pittsburgh, 42°; Erie, 38°; Buffalo, 16°; Rochester, 12°; and Albany, —1°. At 11 p. m., northwest winds, and clear, cool weather prevailed throughout the Atlantic States, in advance of high area No. VII. Cautionary signals were ordered up on the morning of the 15th at Milwaukee, Grand Haven, Ludington and along the Atlantic coast from North Carolina to New Jersey; at 11 p. m. from New York to Wood's Holl, and on the morning of the 16th, thence to Eastport. They were justified, except at Cape Henry, Norfolk, Portland and Eastport. The maximum velocities were: Milwaukee, E. 36; Cape Lookout, NE. 36; Cape May, N. 28; Sandy Hook, E. 36; and Wood's Holl, NW. 32.

No. IX was central north of the Lake region on the 17th. A barometric depression extended thence to the Gulf, over which region snow or rain prevailed. The precipitation was heaviest from Central Texas to Missouri and Tennessee, and the map of departures from the normal show the formation of a new center of depression, which will be described as area No. X. 18th, the present center of depression moved eastward to the Gulf of Saint Lawrence, and southerly winds, with snow or rain, prevailed over the Atlantic States. At 11 p. m., the wind had veered to northwest, with clear weather over the Middle States and New England. No signals were ordered for this disturbance.

No. X.—As stated above, this center probably formed in the southern extremity of the former depression. During the 18th, it was over the South Atlantic States, where cloudy and rainy weather prevailed. 19th, it moved northeast off the coast with increasing energy. 20th, passed eastward south of Nova Scotia and Cape Breton; the pressure at Sydney falling to 29.00, or about 0.96 inches below normal. Cautionary off-shore signals were ordered up on the morning of the 19th, from Smithville, N. C., to Sandy Hook, which were justified on the 20th by the following maximum velocities: Wilmington, NW. 33; Cape Lookout, NW. 41; Kittyhawk, N. 50; Cape Henry and Cape May, NW. 56; and Sandy Hook, NW. 34. As the center passed south of Nova Scotia it was attended by brisk to high northeast, backing to northwest, winds; and hard gales were reported in 41° N., 58° W.

No. XI was central on the 21st north of the Lakes, in which region light snow prevailed, extending by night to New England. 22d, passed east over Maine and Nova Scotia, with heavy snow and fresh to brisk winds. Cautionary signals were ordered from North Carolina to Maine, and the following maximum velocities recorded: Kittyhawk, S. 26; Cape Henry, SE. 28; Cape May, S. 36; and Wood's Holl, SW. 36.

No. XII was central over Iowa on the morning of the 22d, having developed in the southwest quadrant of the preceding area. During the day it moved eastward accompanied by cloudy or fair weather, and by rising temperature south of the center; at 11 p. m. it was central over Lake Erie and light rain or snow prevailed thence to Vermont and Ontario. 23d, passed over New England and Nova Scotia with sleet or snow

over the Canadian provinces and Maine, but followed by clear weather by night. Cautionary signals were ordered up on the afternoon of the 22d on the North Carolina and New Jersey coasts, and those ordered up along the New England coast in advance of the preceding area were continued. The following maximum velocities were recorded: Cape Hatteras, SW. 27; Cape May, SW. 28; Sandy Hook, NW. 36; and Eastport, NW. 29.

No. XIII.—This area appeared over Oregon and Washington Territory during the latter part of the 22d, and passing eastward along the northern boundary of the United States, during the 23d, 24th and 25th, produced southerly winds and high temperatures over the entire country during these days. Heavy rains and occasionally high southerly winds prevailed on the Pacific coast during the 23d. 24th, the center moved rapidly eastward to north of the Lake region. Light rains continued from the Pacific coast to Utah and Montana, and at many stations thence to the Lake region the maximum temperatures of the month occurred. On the western plateau the following temperatures were recorded: At Winnemucca, 55°, Salt Lake City, 54°, and on the summit of Pike's Peak, 30°; and the observer at Austin, Nev., described the rain-fall at that place as being unusual at this season. 25th, the center passed over New England, with sleet or snow from Maine northward, and warm southwest winds and clear or fair weather southward, but followed at night over the Middle States and New England by brisk to high northwest winds and rapidly falling temperature. Cautionary off-shore signals were ordered up on the afternoon of the 25th from North Carolina to Maine, which were all justified. Maximum velocities: Cape Hatteras, NW. 48; Kittyhawk, N. 50; Cape Henry, NW. 48; Cape May, NW. 52; Sandy Hook, NW. 61; Newport, NW. 50; Wood's Holl, NW. 64; Boston, NW. 50; and Eastport, NW. 36.

No. XIV developed on the 25th over the *western plateaus*, over which region the high temperatures of the preceding day continued, with cloudy and rainy weather. At 11 p. m., the barometer at Salt Lake City read 29.53, or 0.49 below the normal, having fallen 0.48 inches since the preceding 11 p. m. report. 26th, lowest pressure moved rapidly over Montana and Dakota to Manitoba, accompanied by light snow or rain and brisk southerly backing to brisk and high northwest winds. Southerly winds and high temperatures prevailed from the Rocky Mountains and the Northwest to the Gulf coast, with clear or fair weather, except in the Southwest, where increasing cloudiness and rain was reported. A heavy thunder-storm occurred at San Antonio from 5 to 6 p. m., and commenced at Corsicana at 7:20 p. m. A tornado is reported to have passed over the town of Lockhart, Texas, at 9 p. m., which destroyed forty houses, killed one child and injured several persons. 27th, was central north of the Lake region and warm southerly winds; cloudy and rainy weather prevailed thence to the Gulf coast and New England; during the latter part of day, clearing or clear weather west of the Mississippi and over the Upper Lakes. 28th, center passed over Maine and Nova Scotia; southerly to westerly winds and high temperatures continued over the Gulf and Atlantic States, with partly cloudy weather and occasional light rain. In the Lake region and Ohio Valley the winds changed to west and north, where the temperature fell about ten degrees. From the 29th to the 31st, the pressure continued low and falling over the Canadian maritime provinces, with northwesterly winds and occasional light snows. Cautionary signals were ordered up at Milwaukee, Grand Haven, and Ludington on the morning of the 26th; from Cape Hatteras to New York at midnight of the 26th, and along the coast of New England morning of the 27th. These were justified at most stations, the following velocities being recorded: Milwaukee, SE. 30; Grand Haven, —, 32; Alpena, S. 36; Cape May, SW. 30; Wood's Holl, SW. 44.

No. XV probably developed over the interior of Texas on the 30th, on which day a tornado is reported to have passed northwestward over the town of New Braunfels, 30 miles NE. of San Antonio, by which "several buildings were blown to atoms and heavy weights carried great distances;" the storm-cloud moved from the south and was accompanied by hail. Throughout the whole day southerly winds, with temperatures ranging from 63° (a. m. minimum) at Mason to 83° (p. m. maximum) at Laredo, prevailed south of the thirty-second parallel, while north of this line northerly winds, with temperatures ranging from 40° (a. m. minimum) at Fort Sill to 49° at Fort Griffin. 31st, the depression passed over the Gulf and South Atlantic States, accompanied by cloudy and rainy weather.

INTERNATIONAL METEOROLOGY.

On chart No. IV are shown the probable tracks of storm-centers over the oceans, and in the upper right-hand corner will be found an index to the same. The following is a brief account of each storm, with a few items selected from the large mass of data made use of. No. I moved northeast off the west coast of Europe on November 23 and 24 and developed into an extensive area of low pressure, which continued over that continent until the 31st. No. II is a continuation of low-pressure area No. VIII de-

scribed in the December review, which continued its rapid northeast movement over the Atlantic, where low pressures and stormy weather had prevailed for several days previous. It was encountered on the 28th by steamer Anchoria in latitude 45° 46′ N., longitude 49° 43′ W., where the pressure had decreased to 28.60; and on the 29th and 30th by steamer Austrian, which vessel reports the low pressure of 27.88 at 6 a. m. of the 30th in 53° N., 25° W. At Monach light-house, Inverness, the pressure fell during the 29th and 30th and on the morning of the 31st reached 28.50, wind south; at 1 p. m. the wind "flew round like a shot" to north with rising pressure. It is highly probable the storm-area No. (VI and VII) described in the December review, passed eastward north of Newfoundland on December 25; was encountered on the 27th in 51° N., 31° W., by steamer MacGregor, which vessel reported, "wind blew with terrific force, causing tremendous sea, lost four life-boats, 190 head of cattle and 500 sheep;" and finally joined the present storm-area on the 29th to the northwest of the Irish coast. No. III probably formed in the southwest quadrant of area No. II, developed into a severe storm on January 2, central about latitude 50° N., longitude 40° W., and after moving north-northeast disappeared on the 5th. No. IV is a continuation of low-pressure area No. II of the present review and which was probably joined on the 9th by a secondary storm-center (No. V) from the southward, after which it moved southeast toward France. No. VI is a continuation of area No. IV of the present review, which closely followed in the path of the preceding area, until it arrived at mid-ocean, after which it passed to the north of the British Isles. No. VII probably formed in the southwest quadrant of the preceding area and moved southeastward to France.

Pacific Ocean.—An area of very low pressure probably existed and moved somewhat in the direction of track traced on chart from December 19 to 24, but sufficient reports are not yet to hand to justify a fuller report.

TEMPERATURE OF THE AIR.

The isothermal lines on chart No. II illustrate the general distribution of the temperature of the air for the month. By reference to the table on the left side of the chart, it will be seen that the temperature of the month has been very generally about or below the normal except in the Rio Grande Valley, the Missouri Valley, and at the Rocky Mountain stations, where it has been about one and a half degrees above.

Minimum and maximum temperatures, respectively: *Maine*—Orono, —21° and 34°; Eastport, —13°, 36°; Portland, 3°, 43°. *New Hampshire*—Mount Washington, —29°, 26°. *Vermont*—Woodstock, —25°, 51°; Burlington, —12°, 46°. *Massachusetts*—Billerica, —11°, 52°; Boston, 0°, 56°; Springfield, —5°, 52°. *Rhode Island*—Newport, 3°, 44°; Fort Adams, —4°, 46°. *Connecticut*—Mystic, —16°, 52°; New Haven, 3°, 54°; New London, 0°, 48°. *New York*—Schroon Lake, —33°, 50°; Plattsburg, Barracks, —17°, 36°; Buffalo, 1°, 43°; Oswego, 1°, 46°; New York City, —3°, 50°. *New Jersey*—Somerville, —11°, 47°; Trenton, 0°, 52°; Princeton, —8°, 49°. *Pennsylvania*—Franklin, —13°, 40°; New Castle, —16°, 47°; Pittsburgh, —11°, 54°; Philadelphia, —3°, 56°. *Delaware*—Dover, 2°, 62°. *Maryland*—Emmittsburg, —10°, 58°; Cumberland, —5°, 52°; Baltimore, 0°, 64°. *District of Columbia*—Washington, —0.5°, 66°. *Virginia*—Wytheville, —6°, 60°; Dover Mines, 8°, 71°; Mount Solon, —2°, 56°. *West Virginia*—Helvetia, —14°, 60°; Wellsburg, —12°, 48°; Morgantown, —5°, 60. *North Carolina*—Highlands, —1°, 65°; Wilmington, 19°, 78°; Murphy, —0°, 69°. *South Carolina*—Aiken, 15°, 78°; Charleston, 23°, 80°. *Georgia*—Gainesville, 10°, 72°; Saint Mary's, 24°, 78°; Augusta, 17°, 79°. *Florida*—Daytona, 30°, 76°; Gulf Hammock, 22°, 83°; Jacksonville, 25°, 80°. *Alabama*—Green Springs, 8°, 74°; Mobile, 15°, 73°; Montgomery, 14°, 75°. *Mississippi*—Vicksburg, 12°, 80°; Fayette, 7°, 76°. *Louisiana*—New Orleans, 20°, 78°; Point Pleasant, 10°, 77°; Okaloosk, 5°, 79°. *Texas*—Gilmer, —1°, 78°; Jacksboro, —2°, 80°; Laredo, 25°, 83°; Austin, 16°, 78°; Galveston, 23°, 71°; Corsicana, 4°, 78°. *Ohio*—Jacksonburg, —25°, 58°; Urbana, —23°, 51°; Columbus, —20°, 56°; Cincinnati, —10°, 64°. *Kentucky*—Danville, —12°, 66°; Bowling Green, —8°, 74°; Louisville, —10°, 66°. *Tennessee*—Clarksville, —10°, 70°; Austin, —6°, 76°; Memphis, 6°, 70°. *Arkansas*—Mount Ida, —9°, 72°. *Michigan*—Detroit, —15°, 44°; Grand Haven, 0°, 43°; Niles, —18°, 47°; Marquette, —6°, 45°. *Indiana*—Arlington, —25°, 57°; Spiceland, —23°, 56°; Indianapolis, —22°, 57°. *Illinois*—Sterling, —28°, 49°; Peoria, —21°, 46°; Mount Sterling, —22°, 58°; Cairo, —6°, 64°; Chicago, —18°, 49°. *Missouri*—Ashley, —27°, 60°; Pierce City, —16°, 56°; Corning, —23°, 52°; Saint Louis, —14°, 59°. *Kansas*—Topeka, —19°, 62°; Holton, —18°, 54°; Leavenworth, —14°, 56°; Dodge City, —9°, 61°. *Wisconsin*—Neilsville, —30°, 38°; Embarrass, —26°, 45°; Milwaukee, —20°, 46°. *Iowa*—Ames, —30°, 38°; Tabor, —22°, 54°; Dubuque, —22°, 46°; Des Moines, —21°, 52°. *Nebraska*—Genoa, —26°, 70°; Plattsmouth, —24°, 60°; Omaha, —22°, 62°. *Indian Territory*—Fort Sill, —9°, 70°; Fort Gibson —5°, 71°. *Minnesota*—Breckenridge, —32°, 47°; Duluth, —28°, 45°; Saint Paul, —26°, 49°. *Dakota*—Pembina, —32°, 36°; Bismarck, —29°, 46°; Yankton, —30°, 62°; Olivet, —29°, 65°. *Colorado*—Pike's Peak, —33°, 30°; Denver, —10°, 61°; Georgetown, 5°, 62°. *New Mexico*—Santa Fé, —2°, 76°; Fort Union, —4°, 72°. *Wyo-*

ming—Cheyenne, —15°, 60°; Fort Fred. Steele, —27°, 55°. *Montana*—Virginia City, —16°, 44°. *Utah*—Salt Lake City, 4°, 54°. *Nevada*—Winnemucca, —14°, 55°; Pioche, 5°, 57°. *Idaho*—Boise City, 3°, 53°. *California*—San Francisco, 40°, 62°; Los Angeles, 36°, 74°; Red Bluff, 27°, 63°; Sacramento, 29°, 63°; Visalia, 24°, 63°. *Oregon*—Portland, 20°, 52°.

Ranges of temperature.—The *monthly ranges* will appear from an examination of the minima and maxima just given. Greatest *daily ranges* vary in New England from 24° at Newport to 38° at Burlington; Middle States, 25° at Cape May to 39° at Albany; South Atlantic States, 19° at Cape Lookout to 36° at Atlanta; Gulf States, 20° at Key West to 36° at Saint Marks; Ohio Valley and Tennessee, 27° at Louisville to 38° at Pittsburgh and 33° at Knoxville; Lake region, 27° at Milwaukee to 41° at Sandusky; the Northwest, 23° at Davenport to 56° at Yankton; Rocky Mountain stations, 27° at Virginia City to 44° at Denver and Santa Fé; Western plateau, 23° at Salt Lake City to 40 at Winnemucca; California, 14° at San Francisco to 32° at San Diego.

Frost has occurred nearly every day over the northern sections of the country; in the interior of the Southern States and Texas, from the 1st to 21st, 24th; along the Gulf coast, 4th to 10th, 12th, 14th, and 21st.

Ice formed in the Gulf and South Atlantic States and on the Pacific coast as follows: Green Springs, Ala., 3d, 4th; Mayport, Fla., 4th, misty rain, freezing as it fell, forming fringes of ice along the eaves of buildings a foot in length, branches and twigs of trees covered with a glittering coat of ice, which did not entirely disappear until the morning of the 7th, an extremely unusual occurrence here; Point Pleasant, La., 2d to 7th, 9th, 10th, 19th, 20th; Franklin, N. C., 3d, skating on pond, ice 3½ to 6 inches thick; Gilmer, Tex., 20th to 22d; Sacramento, 15th, 16th, 18th to 21st, 30th, 31st; Visalia, Cal., 15th; Stockton, Tex., 5th; Eagle Pass, Tex., 4th, 6th, 9th, 12th, 19th; Decatur, Tex., 6th, battery frozen, 11th, ice on telegraph wire; Indianola, Tex., 6th; New Orleans, La., 5th: Saint Marks, Fla., 4th to 7th; Mobile, 3d, 5th, 20th; Jacksonville, 5th.

Ground frozen.—Green Springs, Ala., 20th; Franklin, N. C., 3d, 12 inches.

PRECIPITATION.

On Chart No. III is illustrated the general distribution of precipitation for the month. On the left side is a table giving the average precipitation for the month, which shows a large excess over Tennessee; a slight excess in the Saint Lawrence Valley, Western Gulf States, and California, and elsewhere a general deficiency, which is greatest in the East Gulf States and Oregon.

Special heavy rains.—8th and 9th, Knoxville, Tenn., 3.99 inches; Chattanooga, 3.12 inches; Fayetteville, N. C., 6.00 inches. 11th and 12th, Dover Mines, Va., 2.50 inches; Chattanooga, 3.31 inches; Gainesville, Ga., 2.77 inches; Murphy, N. C., 3.50 inches; 12th, Weldon, N. C., 2.56 inches. 15th, North Lewisburg, Ohio, 4.80 inches. 17th, Clarksville, Tenn., 2.40 inches. 18th and 19th, Fayetteville, N. C., 2.00 inches. 27th and 28th, Margaretta, Ohio, 3.70 inches.

Largest monthly rainfalls.—Fayetteville, N. C., 10.25 inches; Knoxville, 9.59; Baton Rouge barracks, La., 9.00; Murphy, N. C., 8.60; Chattanooga, Tenn., (for 23 days,) 8.48; Fort Canby, Wash. T., 8.24; Memphis, 7.71; Point Pleasant, La., 7.57; Shreveport, 7.31; Mount Washington, 7.13; Kittyhawk, 6.88; Corsicana, 6.72; Clarksville, Tenn., 6.47; Cape Hatteras, 6.44; McMinnville, Tenn., 6.42; Austin, Tenn., 6.38; Vicksburg, 6.18.

Smallest monthly rainfalls.—Burkes, Ariz., trace; Vail, Iowa, and Breckenridge, 0.05 inch; Ariz., Phœnix, and Omaha, 0.07 inch; Fredericksburg, Uvalde, and Brackettsville, Tex., 0.08 inch; Fort Lyon, Col., and Eagle Pass, Tex., 0.10 inch; Saint Paul, Minn., 0.11 inch; Castroville, Tex., and Plattsmouth, Nebr., 0.12 inch; Fort Leavenworth, Kans., 0.14 inch; Wickenburg, Ariz., Bismarck, Emerson, and De Soto, Nebr., 0.15 inch; Tabor, Iowa, 0.19 inch; Fort Garland, Col., 0.18 inch; Genoa, Nebr., Fort Dodge, Iowa, and Camp Verde, Ariz., 0.20 inch; Yankton, Dak., 0.23 inch; Pilot Point, Tex., 0.24 inch; Olivet, Dak., 0.25 inch; Concho, Tex., 0.26 inch; Cheyenne, 0.32 inch.

Floods.—The only floods reported were occasioned by ice gorges, and are noticed under the head of navigation.

Hail.—Denison, Tex., 8th; Saint Meinrad, Ind., 15th; Springfield, Mass., 9th; Plattsmouth, Nebr., 27th; Princeton, N. J., 8th, 17th, 23d; Troy, N. Y., 27th; Pike's Peak, 30th; Breckenridge, Minn., 24th; San Antonio, Tex., 26th.

Rainy Days.—The number of days on which rain or snow has fallen varies, as follows: New England, 7 to 20; Middle States, 7 to 19; South Atlantic States, 5 to 12; Gulf States, 6 to 17; Ohio Valley and Tennessee, 14 to 20; Lower Lake region, 10 to 22; Upper Lake region, 8 to 18; Upper Mississippi Valley, 4 to 9; Lower Missouri Valley, 4 to 7; Eastern slope, 3 to 14; Rocky Mountains, 4 to 10; Western plateau, 11 to 15; Pacific coast, 8 to 14.

Cloudy days.—For New England, the number varies from 8 to 20; Middle States, 6 to 18; South Atlantic States, 5 to 20; Gulf States, 4 to 21; Ohio Valley and Tennes-

see, 7 to 17; Lower Lake region, 14 to 25; Upper Lake region, 7 to 21; Upper Missouri Valley, 3 to 12; Lower Missouri Valley, 3 to 12; Eastern slope, 5 to 18; Rocky Mountains, 2 to 10; *Western plateaus*, 6 to 15; Pacific coast, 5 to 10.

Snow.—The precipitation northeast, north, and west of the Ohio Valley occurred generally as snow. On the Pacific coast and in the Gulf and South Atlantic States it occurred as follows: In *British Columbia* on the 5th and 8th. *Oregon*, 15th. *California*, on the coast mountains, 28th, and Sacramento, 13th. *Texas*, 4th, 5th, 6th, 8th to 11th. *Louisiana*, 3d, 4th, 5th. *Mississippi*, 4th, 5th, 9th. *Alabama*, 4th, 5th. *Georgia*, 4th, 5th. *North Carolina*, 8th, 19th.

Snow from a cloudless sky.—Newbury, Vt., 16th (6:30 p. m.), sky was perfectly clear, and yet for about twenty minutes there was a continuous fall of snow, the flakes were large, but very thin and transparent; sky was sufficiently clear that the zodiacal light shone with considerable brilliancy. Burlington, Vt., 14th, snow fell with sky so clear that stars were plainly visible.

Depth of snow on ground at end of month.—It varied in depth in the different sections as follows: *New England*, from trace in Connecticut to 36 inches in Maine and on Mount Washington. *Middle States*, 0 to 3 inches along the coast, to 27 inches in the interior. *Ohio*, 0 to 16 inches. *Lower Lakes*, 0 to 30 inches. *Upper Lakes*, 0 to 18 inches. *Upper Mississippi Valley*, 0 to 1 inch. *Illinois*, 3 to 12 inches. *Red River of the North Valley*, ½ to 5 inches. *Missouri*, 4 to 5 inches. *Dakota*, 0 to 1 inch, and snow drifts. *Rocky Mountains*, 0 at Santa Fé to 10 inches at Virginia City. *Western plateaus*, trace at Winnemucca to 7 inches at Pioche and 4 inches at Salt Lake City.

RELATIVE HUMIDITY.

The average percentage of relative humidity for the month ranges as follows: New England, 59 to 76; Middle Atlantic States, 63 to 80; South Atlantic States, 65 to 81; East Gulf States, 41 to 80; West Gulf States, 73 to 85; Lower Lakes, 73 to 82; Upper Lakes, 71 to 77; Ohio Valley and Tennessee, 62 to 77; Upper Mississippi Valley, 69 to 79; Lower Missouri Valley, 62 to 76; Red River of the North Valley, 85 to 88; Eastern slope, 61 to 82: Western plateau, 60 to 73; California, 64 to 73. *High stations* report the following, not corrected, for altitude: Mount Washington, 85; Pike's Peak, 40; Cheyenne, 61; Virginia City, 63; Denver, 52; Santa Fé, 55.

WINDS.

The prevailing winds at the Signal Service stations are shown by arrows on Chart No. II, from an examination of which it will be seen that the prevailing winds of the month were very generally from north to west, except along the Gulf coast and in Central Texas, where they were southerly.

Total movements of the air.—The following are the *largest* monthly movements recorded at the Signal Service stations, viz: Pike's Peak, 18,496 miles; Cape May, 15,376; Sandy Hook, 13,982; Thatcher's Island, 13,704; Wood's Holl, 13,216; Cape Lookout, 13,136; Kittyhawk, 12,131; Barnegat, 10,860; Sandusky, 9,834; Milwaukee, 9,826; Indianola, 9,733; Eastport, 9,521. The *smallest* are; Visalia, Cal., 1,963 miles; Fredericksburg, Tex., 2,208; Uvalde, Tex., 2,589; Dubuque, Iowa, 2,600; Nashville, 2,763; Shreveport, 2,894; Lynchburg, 3,122; Virginia City, Mont., 3,165: Fort Davis, Tex., 3,330; Boise City, Idaho, 3,442; San Antonio, Tex., 3,471; Indianola, 3,570; Augusta, Ga., 3,594.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily weather indications with the telegraphic reports for the succeeding twenty-four hours show the general percentage of omissions to be 0.6 per cent., and of verifications to be 86.2 per cent. The percentages of verifications for the four elements have been: weather, 90.9; wind, 83.2; temperature, 86.2; barometer, 84.6. The percentages of verifications by geographical districts have been: New England, 85.5; Middle States, 86.0; South Atlantic States, 88.6; East Gulf States, 87.0; West Gulf States, 83.5; Lower Lake region, 87.0; Upper Lake region, 88.1; Tennessee and the Ohio Valley, 83.6; Upper Mississippi Valley, 85.6; Lower Missouri Valley, 84.6. Of the 3,698 predictions that have been made, 122, or 3.3 per cent., are considered to have entirely failed; 177, or 4.8 per cent., were one-fourth verified; 356, or 9.6 per cent., were one-half verified; 303, or 8.2 per cent., were three-fourths verified; 2,741, or 74.1 per cent., were fully verified, so far as can be judged from the tri-daily weather maps.

Cautionary signals.—One hundred and sixty-seven cautionary signals were displayed, of which 140, or 83.8 per cent., were justified. One hundred and thirty-two cautionary off-shore signals were displayed, and of these 127, or 96.2 per cent., were justified as to direction; 118, or 89.4 per cent., were justified as to velocity. Of the cautionary off-shore signals, 63 were changed from cautionary. Two hundred and ninety-nine signals

of both kinds were displayed, of which 250, or 85.6 per cent., were fully justified. The above does not include signals ordered at 45 display stations where the velocity is only estimated and not measured. One hundred and ten cases were reported of winds of 25 miles or over where signals were not ordered; in only eight of these cases did the velocity reach 40 miles.

NAVIGATION.

In the table on right side of Chart No. III are given the highest and lowest readings on the Signal Service river-gauges during the month, with dates of same. On the 15th the *Tennessee*, at Chattanooga, was five feet above the danger-line, and on the 19th and 29th, respectively, the *Cumberland*, at Nashville, and the *Ohio*, at Pittsburgh, rose within a few inches of the danger-line.

Ice on rivers and lakes.—Missouri—Leavenworth, 31st, river frozen over during entire month, ice about 20 inches thick, heavily loaded teams crossed daily. *Mississippi*—Minneapolis, Minn., 31st, ice in river 26 inches thick. La Crosse, 31st, river frozen over during month. Dubuque, 29th, ice in river weak and porous from recent high temperatures and travel across entirely ceased. Keokuk, 31st, wagons and foot passengers crossed the river on ice during nearly the entire month. Saint Louis, 1st, river frozen solid above the bridge but clear in harbor to the south of it; 2d, river frozen, thin ice running in harbor; 3d, 4th, river frozen; 5th, river closed in harbor excepting a narrow channel one-fourth of a mile wide south of bridge, ferries stopped running; 6th to 24th, river frozen; 25th, ice decaying; 26th, ferries and tug-boats broke up gorge in river, river clear from the bridge south to Carondelet; 27th, river remained the same south of the bridge, ferries and tug-boats breaking gorge north of bridge, ice quite rotten; 28th, gorge north of bridge partially broken up, very little ice running in river, heavy ice loosened from above in the evening; 29th, slush ice running in river, but clear north of bridge; 30th, very little slush ice in river; 31st, heavy floating ice in river, steamer arrived in the afternoon from Cairo, navigation resumed. Cairo, river remained frozen to the 26th, breaking up in the evening; 30th, entirely clear of ice; navigation closed from December 28, 1878, to January 30, 1879. Memphis, 1st to 4th, 10th, 12th to 16th, floating ice in river; 14th, 16th to 27th, drift-wood in river. Point Pleasant, La., 6th to 15th, floating ice in river. *Verdigris River*—Independence, Iowa., 27th, ice broke up; 28th, river very high. *Arkansas*—Fort Gibson, 2d, river frozen over; 23d, ice all passed out of river; 27th, river rising rapidly and filled with floating ice and drift-wood. *Ohio*—Pittsburgh, 3d, river frozen over; 24th, ice-gorge in river; 27th, ice-gorge broken up, navigation open. Wellsburg, W. Va., 2d, river frozen over; 19th, ice started at 6:50 p. m., moved down about 100 feet and stopped, started again at 7:50 p. m., and run until about 11 p. m. 20th, ice started about 8 a. m. Cincinnati, 1st, floating ice in river, two boats left for Pomeroy, no arrivals; 2d, new ice covered the river, ice gorged for a short time, boats laid up, two arrivals, one from Kentucky River and one from Pomeroy; 3d, crossing river on ice five miles above station, ice gorged at many places between Aurora and Maysville; river closed in front of city at night; 4th, skating on river, ice gorged above and below city; 6th, skating and crossing on ice; 10th, ice in river still intact, rapid rise in the Kanawha, Guyan, and Big Sandy Rivers, and destruction of considerable floating property; many tug-boats employed in breaking up the ice in river near city; 11th, tug-boats breaking up the ice, pedestrians crossing on the ice; 12th, people crossing on ice, up to a late hour ice remained intact; 13th, river rising rapidly, ice broke at 4 p. m., ice running heavily and several gorges forming, very little damage done; 14th, heavy ice passing all day; 15th, heavy ice running until noon, navigation resumed; 16th, river rising, heavy ice passing; 17th, river falling, heavy ice passing; 18th, river rising, heavy shore-ice passing all day, ice in the Licking River began running out; 19th, river rising, very little ice passing, boats arriving report navigation very difficult and damaging the wheels, Licking River still running out, ice well broken up; 20th, river rising, heavy ice passing in the channel, in some instances 20 feet thick; 21st, river rising, very little ice passed, but in very large "bergs"; 22d, river falling, very large "bergs" running in morning, but very little ice in afternoon; 24th, river rising, very heavy ice passed on Ohio side in morning, navigation resumed from Parkersburg to New Orleans; 25th, river rising, floating ice in river; 26th, river rising, heavy ice passing in morning but disappearing in afternoon; 27th, river rising, scarcely any ice visible; 28th, river rising, heavy ice passing all day; 29th, heavy ice passing all day, thinning out some in the evening; 31st, river rising, no ice passed to-day. Cairo, 1st to 14th, heavy floating ice in river extending from shore to shore; 15th, 18th, about clear of ice; 13th, ice gorged in river above Paducah; 18th, Paducah, ice-gorge broke this morning; 20th, 21st, drift-wood in river; 22d, ten wrecks (barges and flat-boats) passed station during the day, caused by heavy floating ice; 19th to 22d, heavy floating ice in river; 23d to 25th, ice extending from Illinois shore to middle of river only; 26th to 31st, entirely clear of ice; navigation closed from December 25, 1878, to January 26, 1879; damage caused to shipping by heavy floating ice estimated at $65,000. Louisville, 2d, freezing along shore; 3d, river frozen over above station; 6th,

river frozen over except in current; 14th, ice in river breaking up; 15th, ice-gorge passed station, carrying away several canal barges and driving a steamboat ashore; 22d, small quantities of floating ice in river; 2d to 19th, Portland and Louisville Canal frozen over; 20th, canal open; 22d, navigation resumed to-day. *Alleghany*—Terentum, Pa., ice broke up; Pittsburgh, 3d, river frozen over; 18th, river open for several miles above city; 19th, ice-gorge broke about noon, sinking a number of canal boats and barges; 20th, 21st, 22d, river full of floating ice; 24th, little ice in river; 25th, river clear of ice; 28th, ice running all day; 29th, river full of floating ice; 30th, heavy ice moving all day; 31st, ice nearly all out. *Monongahela*—Morgantown, 17th, ice gorged in river, carrying away portion of river-gauge, water rose 12 feet in 30 minutes; 21st, heavy ice in river; 22d, river clear of ice; 23d, floating ice in river. Pittsburgh, 3d, river frozen over. *Buffalo Creek*—Wellsburg, West Va., 18th, ice run out, thawing rapidly. *Scioto River*—Columbus, 28th, ice broke up. *Tennessee River*—Chattanooga, 9th, two steamers sunk between Kingston and London by floating ice; 10th, river rising rapidly, gorge giving way above; 13th, river reached danger-line; 14th, river rising rapidly and overflowing lower portions of city; 15th, river reached highest point, 38 feet above zero of gauge; 16th, river falling. *Roanoke River*—Weldon, N. C., 3d, 4th, full of floating ice; 5th, frozen over solid, which had not occurred before since 1857; 6th, river seems to have stopped flowing, no water in view, ice seems to be lying on the bed of the river; 7th, one or two small streams commenced to flow on top of the ice; 8th, ice broke up and began moving in immense quantities; 12th, river high and rising, channel clear, ice heaped near the shore; 13th, river overflowing banks and rising all day; 14th, still rising, about 3 inches during the day and 12 during the night; 15th, rose 5 inches during day. *Red Island Creek*—Wytheville, Va., 12th, ice gorged, water overflowed the low ground, carrying away six cattle; in a short time gorge burst and tore out part of mill dam, carried off considerable material and excavated huge rocks, damages estimated at $500; 11th, ice moved out of Barrett's dam during the night; 12th, water very high. *Rivanna River*—Broad Oak, Va., 22d, river clear of ice. *James River*—Dover Mines, Va., 14th, river clear of ice; 16th, canal open to navigation, having been closed by ice for twenty-one days. *Potomac River*—Fort Whipple, Va, 1st, ice in river firm: 2d, river still frozen; off Fort Foote, 3d, ice 12 inches thick. Georgetown, continued frozen during the month. *Patapsco*—Woodstock, Md., 9th, river open. Baltimore, 3d, harbor and basin covered with solid ice, navigation almost entirely suspended; 4th, several tug-boats fast in the ice near Annapolis; schooner Eastern Light sunk of Hell Point, with 300 bushels of oysters, and schooner Burning Hall sunk near Highlands, the crews of both being compelled to make their escape on the floating ice; several oyster schooners fast in the ice and abandoned by the crews; 5th, fourteen tug boats and several oyster schooners ashore down the river. *Susquehanna*—Catawissa, Pa., north branch closed during month. *Hudson*—West Point, N. Y., 3d, river completely frozen over; New York, 3d, floating ice in river, causing many interruptions to travel; Sandy Hook, 3d, bay full of floating ice *Flushing Bay*—Flushing, N. Y., 31st, navigation still closed. *Narragansett Bay*—Newport, 3d, ice forming in harbor. *Buzzard's Bay*—New Bedford Mass., 6th, harbor covered with ice; 28th, ice breaking up. *Vineyard Sound*—Wood's Holl, 3d to 12th, ice in harbor; 13th, 25th, ice-gorge in harbor. *Otta Queche River*—Woodstock, Vt., ice on river 19 inches thick. *Lake Superior*—Duluth, 14th, ice forming rapidly on surface of lake; 15th, lake frozen; 26th, ice breaking up, harbor full of floating ice. *Lake Geneva*—Bloomfield, Wis., 6th, ice 16 inches thick. *Lake Michigan*—Grand Haven, 7th, miles of ice on lake outside of pier; 15th, in many places at the distance of half a mile from shore ice 30 to 35 feet deep, extending to the bottom of the lake; 16th, outlet made for the ice-bound vessels, through the force of the high east winds starting the ice. *Embarrass River*—Embarrass, Wis., 29th, ice on river 24 inches thick. *Grand River*—Grand Haven, 7th, river frozen over to a considerable distance from its mouth, ice extends nearly to the bottom; 15th, workmen trying to cut a channel at the mouth of river to liberate the ice-bound vessels. *Grand Traverse Bay*—Northport, Mich., 31st, no ice in bay. *Lake Erie*—Sandusky, 6th, teams came over ice from North Bass Island, distance twenty-four miles; ice in middle of lake reported 14 inches thick. Cleveland, 3d, lake covered with ice as far as the eye could reach; 6th, lake still frozen; 7th, ice in lake broken; 21st, heavy ice on lake; 27th ice solid; 29th, ice breaking up; 30th, ice driven ashore. *Cuyahoga River*—Cleveland, 21st, ice in river, 33 inches thick; 27th, ice breaking up. *Lake Champlain*—West Charlotte, Vt., 30th, lake mostly frozen over; 31st, floating ice in lake. Burlington, 10th, navigation closed; 29th, lake entirely frozen over; the records at this place show that the average date of closing, for the last sixty years, has been on January 29.

Low tides.—Indianola, Tex., 1st to 21st; Tybee Island, Ga., 12th; Baltimore, 4th and 5th, lowest tide on record.

TEMPERATURE OF WATER.

The *temperatures of water*, as observed in rivers and harbors, with average depth when observations were taken, are given in table on Chart No. II. At Alpena, Buf-

falo, Cleveland, Escanaba, Grand Haven, and Sandusky no observations were made on account of ice. At the following stations observations were only made on the dates named: at Burlington, from the 1st to 12th; Chicago, 24th to 31st; Detroit, 29th to 31st; Duluth, 1st to 14th and 27th to 31st; and at Marquette, 26th to 31st. Punta Rassa, Fla. (too late for table on chart), max. 70°, min. 54°, average depth 12 feet.

ATMOSPHERIC ELECTRICITY.

Thunder-storms.—Louisville, Ill., 28th; St. Meinrad, Ind., 28th; Bowling Green, Ky., 28th; Labanon, Mo., 28th; Tarentum, Pa., 27th; McMinnville, Tenn., 28th; Thomasville, Ga., 12th; Point Pleasant, La., 11th, 27th; Okalooska, La., 7th; Franklin, N. C., 28th; Clarkesville, Tex., 27th; San Antonio, Corsican, and Castroville, Tex., 26th; Shreveport, La., 11th; Saint Louis, 28th.

Telegraphic communication interfered with by atmospheric electricity: Bismarck, Dak., 7th, line heavily charged.

Auroras.—Wood's Holl, Mass., 13th; Thomasville, Ga., 17th; Cambridge, Mass., "aurora regularly looked for every day at 8 p. m.; moonlight at 8 p. m. on the 5th, 6th, 10th, 29th to 31st; some clouds in the north on the 6th to 14th; obscured on the 1st, 2d, 3d, 4th, 7th, 8th, 9th, 11th, 15th, 17th, 21st, 22d, 24th, 27th, and 28th; clear but no aurora on 12th, 13th, 16th, 18th, 19th, 20th, 23d, and 25th;" Franklin, N. C., 23d; Pembina, Dak., 23d; Fort Davis, Texas, 19th; Madison, Wis., 28th; Eastport, 1st, 21st, and 24th; Boston, 24th.

OPTICAL PHENOMENA.

Solar halos.—1st, Iowa, Massachusetts, Vermont, Michigan, New York, California, Dakota, Minnesota, Kansas. 2d, Iowa, Michigan, Dakota, Nebraska, Minnesota, Kansas, Illinois, Indiana, Maine. 3d, Iowa, Ohio, Connecticut, Illinois, Colorado, California, Dakota, Minnesota, Wisconsin, Georgia. 4th, Iowa, New Jersey, Tennessee, North Carolina, Nebraska, Dakota, Wisconsin. 5th, Dakota, Minnesota. 6th, Indiana, Vermont, Wisconsin, Maine, Dakota, Kansas. 7th, Maine, North Carolina, Illinois, Nebraska, New York, Pennsylvania, Vermont, Dakota, Ohio. 8th, Iowa, Kansas, Nebraska, Dakota, Minnesota. 9th, Iowa, Kansas, Dakota, Minnesota. 10th, Iowa, Michigan, Missouri, California, Kansas, Minnesota. 11th, Iowa, Massachusetts, New Jersey, Vermont, Virginia, New York, Connecticut. 12th, Iowa, Maine, Massachusetts, New York, Connecticut, Dakota. 13th, Iowa, Massachusetts, Nebraska, Vermont, Dakota. 14th, Iowa, Illinois. 15th, Pennsylvania. 16th, Kansas, Michigan, Dakota, Tennessee. 17th, Iowa, Maine, Massachusetts, Michigan, New York, Vermont, Connecticut, Illinois, Pennsylvania. 18th, Iowa, Dakota, Nebraska, Minnesota. 19th, Vermont, Dakota. 20th, Maine, Ohio, Illinois, Wisconsin. 21st, Iowa, Maine, Massachusetts, New York, Ohio, Vermont, Florida, Connecticut, Illinois, Utah, Dakota. 22d, Indiana, Ohio, Connecticut, Illinois, Missouri, Iowa. 23d, Illinois, Wisconsin. 24th, Massachusetts, Ohio, New York. 25th, Iowa, Ohio, Texas. 26th, Iowa, New York, Utah. 27th, North Carolina, Michigan, Georgia. 28th, Iowa, New York, Ohio, Georgia. 29th, Ohio, Vermont, New Jersey, Michigan, Nebraska, Colorado, Iowa, New York, Georgia. 30th, Iowa, Illinois, Nebraska, Ohio. 31st, Indiana, Iowa.

Lunar halos.—1st, Iowa, Maine, New York, Dakota, Illinois, Indiana, Massachusetts, Missouri, Vermont, Texas, Alabama, Wisconsin, Minnesota, Georgia. 2d, Iowa, Ohio, Illinois, Connecticut, Indiana, Michigan, Texas, Minnesota. 3d, Kansas, New Jersey, Wisconsin, Illinois, New York, Connecticut, California, Maine, Vermont, Nevada, Indian Territory, North Carolina, Massachusetts. 4th, Massachusetts, New Jersey, North Carolina, Illinois, New York, Connecticut, Missouri, Wisconsin, Minnesota, Ohio, Tennessee, Maine, Rhode Island. 5th, Maryland, New Jersey, Illinois, Tennessee, Connecticut, Maine, Montana, Dakota, Texas, Minnesota, Indiana. 6th, Indiana, Maine, Massachusetts, Ohio, Virginia, Texas, Illinois, Iowa, Missouri, Indian Territory, Louisiana, Wisconsin, Michigan, New York. 7th, Iowa, Maine, Maryland, Massachusetts, New Jersey, Pennsylvania, Virginia, Nebraska, Michigan, Tennessee, New York, Connecticut, Georgia, Colorado, Dakota, Minnesota, Wisconsin, West Virginia. 8th, Ohio, California, Illinois, Nevada, Dakota, Minnesota, Wisconsin, Iowa, Pennsylvania. 9th, Iowa, New York, Ohio, Nebraska, Indiana, Indian Territory, Minnesota. 10th, Illinois, Massachusetts, Ohio, Virginia, Texas, Michigan, Tennessee, North Carolina, Connecticut, West Virginia, Dakota, Iowa, Georgia, Maryland, Indiana. 11th, New York, Pennsylvania, Virginia, North Carolina, Missouri, Texas, Wisconsin, Ohio. 12th, Connecticut, Idaho, Texas, Georgia, Maine. 13th, Nevada, Iowa, Georgia. 14th, Indiana, New York, Maine, Missouri. 16th, Nebraska. 17th, Indiana, New York. 18th, Illinois. 21st, Illinois. 24th, Ohio, Illinois, Iowa. 25th, Illinois, Virginia. 26th, Iowa, Michigan, Missouri, Alabama, Tennessee. 27th, Texas, Missouri, Nebraska. 28th, New Jersey, New York, Virginia, Wisconsin, Missouri, Nebraska, Texas, New Mexico, Georgia. 29th, Indiana, Kansas, Ohio, Virginia, Michigan, Missouri, Colorado, Texas, West Virginia, Georgia. 30th, Illinois, Indiana, Nebraska, Ohio, Iowa, California, Minnesota, Wiscon-

sin, Michigan, Georgia. 31st, Indiana, Maine, New Jersey, Ohio, Iowa, Missouri, Dakota, Minnesota, Texas, Louisiana, Maine, Vermont.

Mirage.—Genoa, Nebr., 1st, 3d; Olivet, Dak., 26th, 29th, 30th; New Bedford, Mass., 15th; Pembina, Dak., 28th; Burlington, Vt., 3d, 5th.

MISCELLANEOUS PHENOMENA.

BOTANICAL.—*California*—Sacramento, 23d, poplar and other trees in bud. *Florida*—Mayport, 5th, oranges were picked encased in half an inch of ice; fruit uninjured. Houston, 8th, coldest morning for years; young orange trees are injured, but the bearing trees are not hurt; 31st, oats nearly all sown and corn-planting commenced. *Georgia*—Forsyth, 29th, alder bushes in full bloom, plum trees beginning to bloom. Augusta, 25th, elm trees budding; 27th, trimming trees about the city, planting English peas and early garden-vegetable seeds; 29th, japonicas in full bloom in the open air; 30th, peach trees beginning to bloom. *Indiana*—Greencastle, 23d, buds of the peach, plum, and cherry are generally killed, and the peach trees are largely, if not generally, killed; wheat is in the best condition, having been well protected by the snow. Brookville, 23d, wheat crop greatly benefited by the heavy covering of snow; peaches killed, apples not injured. Greensburg, 23d, wheat crop in fine condition, much benefited by the snow. Madison, 23d, peaches all killed, cherries and grapes have suffered much; wheat well preserved and protected. Anderson, 23d, wheat in splendid condition; fruit generally believed uninjured. Vincennes, 23d, fruit only slightly damaged; prospect for wheat very promising. Indianapolis, 23d, wheat in splendid condition, abundant harvest anticipated; peaches all killed and trees somewhat damaged; apples not injured; pears—fruit all killed, trees uninjured; cherries—fruit all killed, trees uninjured; grapes—some tender varieties killed; raspberries all damaged; quinces—fruit all killed and trees badly damaged; blackberries killed to some extent; strawberries in fine condition, being protected by the snow; grass in excellent condition. Shelbyville, 23d, fruit crop considerably injured, peaches believed destroyed; wheat much benefited by the snow. Aurora, 22d, wheat crop good; fruit crop much injured, especially peaches and cherries. Fort Wayne, 23d, fruit not as much injured as anticipated; wheat has received no damage. Vevay, 31st, peach trees, most flowering shrubs, and hardy hybrid roses are killed; great quantities of potatoes frozen in pits; wheat never looked more promising and thrifty; herbaceous plants have been saved by the covering of snow. *Illinois*—Mount Carmel, 23d, grain crop greatly benefited by the heavy snow; peaches entirely destroyed in some localities; apples not believed to be injured. *Iowa*—Independence, 27th, sap rising in osage orange, horse-radish and parsnips sprouting. *Kansas*—Holton, 31st, peach buds in some localities reported killed. *Kentucky*—Nicholasville, 22d, wheat and grass are uninjured, the average of the former is very large; fruit-growers state that there will be no fruit of any kind worth mentioning; young trees of all kinds are dead and many large trees froze and burst; flowers in pits suffered severely. Greenup, 24th, fruit crop severely injured except in sheltered localities; wheat crop decidedly improved by the heavy snow. Maysville, 23d, in some localities peaches and cherries have been killed by the cold, but generally these fruits have been saved; all other fruits give indications of abundant yields; wheat looks green and fresh and its growth vigorous. Ashland, 23d, amount of wheat sown is small compared to last year, but it is in a flourishing condition. Harrodsburg, 24th, fruit buds not injured much; wheat well protected. Paris, 23d, it is generally believed that all crops are not much injured by the snow or cold; in some portions of the Blue Grass region the fruits will all be lost. Adair County, 14th, the prospect for a good wheat crop very promising. Woodford County, 13th, wheat crop looking very fine, well protected by the snow. Grayson County, 15th, wheat crop very promising up to December 15, when by hard wet freezes its leaves were turned to a rusty brown color; it is now well protected by the snow and an average crop is anticipated. Barren County, 15th, the prospects are favorable for a good wheat crop; a full crop was sown. Todd County, 16th, wheat looking very well; it is deeply covered with snow; a good crop is expected. Breckenridge County, 16th, a very small acreage of wheat was sown here last fall, but it is looking well, and a rich harvest expected. *Louisiana*—Okalooska, 31st, grass starting, leaf-buds on rose-bushes opening. *Maryland*—Sandy Springs, 3d, hundreds of bushels of potatoes froze in cellars. *Mississippi*—Brookhaven, in bloom, 22d hyacinth, 29th jonquils; leafing, 23d woodbine, 29th spirea, 30th flowering almond and blackberry; 23d, strawberries ripe, but tasteless. Fayette, in bloom, 25th daffodils, 30th spirea. *Missouri*—Oregon, 26th, vegetables, grains, grasses, and weeds, uncovered by the melting snow, were found to have been growing all winter. Springfield, 31st, buds of peach and raspberry reported killed; 29th, blue grass sprouting and quite green. Louisiana, 31st, buds of peach and apricot killed. Lexington, 31st, peach buds safe along the river, but reported entirely killed six miles from the river. *Nebraska*—Genoa, 30th, frost out of ground, farmers seeding spring grain. Omaha, 31st, grass growing through the grain stubble, willow and cottonwood trees budding. *North Carolina*—Fayetteville, bud-

ding, 15th japonicas, 21st swamp bilberry and spirea; 21st, hyacinth and crocus sprouting; 21st, violets in bloom throughout month in the open air. *Ohio*—Tiffin, 22d, wheat crop considered safe, but peach trees without doubt killed entirely by the severe cold. Lancaster, 22d, many acres of corn still in the shock; wheat in good condition, saved by heavy snow; peaches and other small fruits very severely injured, but with apples and pears it is more favorable; all but the hardiest species of grapes have been extensively injured. Mansfield, 22d, wheat greatly benefited by the heavy snow; peaches generally conceded to be killed. Urbana, 22d, wheat doing nicely; apples in fine condition, but not so well with peaches. Marysville, 22d, so far the winter remarkably favorable to the wheat crop; so far as can be ascertained, peaches and the earlier varieties of cherries are badly injured. Franklin, 22d, wheat considered generally safe; peaches almost entirely destroyed; apples and pears still in pretty good condition. Germantown, 22d, fruit-raisers are uniform in the opinion that the present prospects are good for an average crop. Adams County, 22d, wheat and grass well set and protected nicely by the heavy snow, prospects of a good crop; grapes and peaches very unfavorable; cherries, currants, and plums not injured; apples in good condition; some fears expressed as to the pear crop. Kenton, Hardin County, 22d, wheat crop saved by the heavy snow; apples, peaches, pears, and cherries have all been killed. Hamilton, 22d, prospects flattering for large crops of wheat and barley. Cuyahoga County, 22d, much fear is expressed regarding the grain and grass crops, as the high winds have blown the fields bare in many places, exposing to the severe cold the tender roots of the plants; buds of the peach, pear, and cherry are not far enough advanced yet to be subject to much injury. Cadiz, 22d, wheat crop well protected by the snow; it is claimed by some that the peaches are all killed. Oxford, 24th, fruit is in all probability greatly injured. New Philadelphia, 23d, it is the general opinion that the wheat crop is not injured, except perhaps in a few localities on low, wet ground, where ice had formed. Columbus, 24th, weather very favorable to the wheat crop, it is well protected by the snow; peach buds are destroyed, and probably cherries and other small fruits; apples are uninjured. Middletown, 24th, wheat and barley well protected by the snow and doing nicely; apples are not hurt, but it is believed that peaches are all killed and many trees frozen to death; grapes and other small fruits are hurt some, but not all destroyed. Gallipolis, 22d, wheat preserved from injury by the heavy snow; in some cases peaches reported killed and trees split open by the intense cold. Chillicothe, 23d, wheat comparatively uninjured, the snow protecting the roots; peaches are almost entirely destroyed. Greenfield, 23d, wheat crop very promising; barley safe. Licking County, 23d, wheat and grass healthy and fresh, prospects of an abundant harvest; farmers and fruit-growers express the opinion that the extremely low temperature has not only injured the fruit buds, but also the trees, especially the peach. Coshocton County, 23d, wheat crop in good condition; it is the general opinion that fruit is not injured, except peaches in some localities. Eaton, 24th, grapes and peaches are conceded to be almost entirely destroyed; wheat in a fine green condition. Dayton, 24th, grain well protected by snow; peaches in some localities severely damaged; apples and plums somewhat affected. Jackson, 23d, fruit comparatively safe; wheat well protected. Fremont, 23d, wheat in splendid condition; peach and cherry buds killed; peach trees not much injured, but apple trees in some instances have burst. Circleville, 23d, the more tender varieties of fruit—peaches, cherries, &c.—are killed; many house plants frozen. Canton, 23d, peach trees are very generally killed by the frost, while apple trees have escaped untouched; wheat and grass are in good condition. Barnesville, 23d, peach crop is considered destroyed, many of the trees have actually burst from the frost; wheat is looking fine and a large crop is expected. *Texas*—Melissa, 31st, very little farm-work done during the month on account of the cold, wet weather; farmers are now beginning to plow vigorously. *West Virginia*—Parkersburg, 22d, wheat crop uninjured; fruit crop considerably injured; peaches ruined and many trees killed. Wheeling, 23d, wheat reported in excellent condition and the largest crop ever known is predicted; fruit very little injured, except peaches; a very heavy crop of apples is anticipated. *Wisconsin*—Embarras, 31st, winter grain suffering from severe cold.

BIRDS.—*Geese*—Saint Meinrad, Ind., 16th, flying N.; Somerset, Mass., 1st, S.; Corning, Mo., 3d, Plattsmouth, Neb., 24th, SE.; Norfolk, Ohio, 2d, SW.; Dover Mines, Va., 7th, S.; Independence, Iowa, 22d, 24th, and 25th, N.; Emory Grove, Md., 28th, SE.; Oregon, Mo., 27th; Melissa, Tex., 28th and 30th; Sacramento, Cal., 26th; Fort Sill, Ind. T., 30th; Fort Gibson, Ind. T., 28th. *Crows*—Monticello, Iowa, 28th; Bethel, Ohio, 27th; Northport, Mich., 31st; Oregon, Mo., 30th; Ringgold, Ohio, 22d, 23d, and 25th. *Chickadees*—Rowe, Mass., 19th; Northport, Mich., 31st. *Robins*—Elmira, Ill., 27th; Creswell, Kans., 27th and 29th; Fall River, Mass., 12th; Bethel, Ohio, 27th; Dover Mines, Va., 9th, immense flocks appeared; Broad Oak, Va., 2d and 31st, large flocks; Wellsburg, West Va., 2d; Nora Springs, Iowa, 20th; Glasgow, Mo., 25th; Ringgold, Ohio, 25th and 29th; Fort Gibson, Ind. T., 2d, large flocks flying S. *Rice-birds*—Uvalde, Tex., 17th. *Bluebirds*—Plattsmouth, Nebr., 24th; Weldon, N. C., 22d; Bethel, Ohio, 28th Broad Oak, Va., 31st, large flocks; Nora Springs, Iowa, 30th; Glasgow, Mo., 28th; Ring

gold, Ohio, 29th. *Sparrows*—Monticello, Iowa, 16th and 22d. *Redbirds*—Bethel, Ohio 27th; Oregon, Mo., 20th to 22d, 24th; Springfield, Mo, 24th. *Bluejays*—Monticello, Iowa, 15th, 21st; Rowe, Mass., 19th, 26th; Oregon, Mo., 18th; Springfield, Mo., 24th *Winter Wrens*—Fallston, Md., 25th. *Owls*—Oregon, Mo., 6th, 27th. *Snow-birds*—Monticello, Iowa, 5th: Rowe, Mass., 6th, 14th, 20th; Emory Grave, Md., 8th, 24th; Oregon, Mo., 7th, 11th, 17th. *Eagles*—Northport, Mich., 31st. *Waxwings*—Rowe, Mass., 4th, 8th, 10th, 11th, 19th, 20th, 22d, 24th, 25th, 30th. *Mocking-birds*—Weldon, N. C., 24th. *Ducks*—Creswell, Kans., 7th, 13th, 20th, 22d, 25th; Lebanon, Mo., 29th; Northport, Mich., 31st; Fort Gibson, Ind. T., 8th.

MISCELLANEOUS.—*Frogs piping*—Fort Barrancas, Fla., 23d; Okalooska, La., 17th; Fayetteville, N. C., 24th; Fayette, Miss., 14th. *Bats*—Uvalde, Tex., 28th. *Moths*—Fayetteville, N. C., 24th to 28th. *Wasps*—Fayette, Miss., 17th, 25th. *Black-beetles*—Fayetteville, N. C., 24th to 28th. *Lady-bugs*—Independence, Iowa, 27th. *Lizards*—Fayette, Miss., 29th. *Mosquitoes*—Okalooska, La., 29th. *Bees*—Fayette, Miss., 28th, carrying pollen.

Meteors.—Anna, Ill., 18th, 27th; New Corydon, Ind., 16th, 22d, 30th, 31st; Fort Dodge, Iowa, 7th, 22d; Fallston, Md., 16th, 7:45 p. m, large meteor moving W. along the S. horizon, color of red-hot iron, motion horizontal, altitude 30°; Woodstock, Md., 1st, 14th, 18th, 21st, 22d; Sandy Springs, Md., 11th; Rowe, Mass., 12th, 14th, 29th; Atco, N. J., 11th; Wappinger's Falls, N. Y., 10th, 20th, 22d, 25th; Atlantic City, N. J., 20th, 10 p. m., very brilliant meteor, descended from a point 10° S. of zenith, no fragment or train of light was seen to follow in its course; Detroit, Mich., 25th; Fort Pembina, Dak., 15th; Southington, Conn., 22d; Iowa City, Iowa, 29th: Thornville, Mich., 10th; Oregon, Mo., 12th, 17th, 18th, 21st; North Volney, N. Y., 24th; South Hartford, N. Y., 23d; Jacksonburg, Ohio, 25th, 26th, 29th; Boise City, Idaho, 18th; Fort Davis, Tex., 11th; Savannah, Ga., 14th, 29th; Charleston, 29th.

Zodiacal light.—New Corydon, Ind., 3d, 5th, 16th, 18th, 23d, 24th, 28th to 31st; Cresco, Iowa, 12th, 16th, 17th, 19th, 23d; Monticello, Iowa, 9th, 12th, 17th, 18th, evenings; Topeka, Kans., 11th; Orono, Me., 10th, 14th, 23d, evenings; Somerset, Mass., 10th, 13th, 14th, 18th, 20th, 22d, 23d, 24th, evenings; Corning, Mo., 18th; Atco, N. J., 10th, 13th, 14th, 18th to 23d, evenings; Princeton, N. J., 16th, 23d; Waterburg, N. Y., 12th, 13th, 18th, 23d; Bellefontaine, Ohio, 16th, 19th, 20th, 21st, 23d, 25th; Wytheville, Va., 11th, 13th, 19th, 21st, 22d, 23d, 25th; Rowe, Mass., 12th; Southampton, Conn., 18th, 22d, 23d; Olivet, Dak., 15th to 31st; Iowa City, Iowa, 12th; Okalooska, La., 19th and 20th; Cambridge, Mass., regularly looked for at 8 p. m., and distinctly seen on the 12th, 13th, 18th, 20th, 23d, visible through haze or among clouds at about 6:30 p. m., on the 14th, 16th, 19th, visible or suspected in moonlight on the 10th, 25th, observations on other evenings hindered by strong moonlight or clouds; Oregon, Mo., 11th to 13th, 16th to 25th; New Ulm, Tex., 23d; Savannah, Ga., 10th, 13th, 14th, 19th, 20th, 21st, 24th, evenings; Newbury, Vt., 10th, 14th, 15th, 16th, 23d, evenings. Looked for regularly before sunrise and after sunset at Mount Washington, but none observed, and at Pike's Peak, but observed only on 26th, evening.

Polar bands.—New Corydon, Ind., 5th, 6th, 10th, 18th, 20th, 24th, 25th, 28th, 30th; West Waterville, Me., 1st, 2d, 4th. Wytheville, Va., 3d, 7th, 11th, 13th, 15th, 17th, 20th, 26th, 30th; Nirvana, Mich., 24th; Woodstock, Vt., 7th, 17th, 19th.

Prairie fires.—North Platte, Nebr., 24th to 26th; Independence, Iowa, 29th; Fort Sill, Ind. T., 22d; Eagle Pass, Tex., 15th, 16th; Brackettsville, Tex., 17th, 19th; New Orleans, La., 3d, 17th, 26th.

Earthquakes.—*November*, United States Naval Hospital, Yokahama, Japan, 22d, 11:12 p. m., heavy shock lasting one minute; 11:21 p. m., light shock; 26th, light shock, lasting twenty seconds. *December* 17, at Yuma, Ariz., 4 p. m., slight shock, lasting eight seconds, perceptibly shaking buildings; and at Campo, Cal., 4:03 p. m., two very slight shocks, lasting about two seconds, motion from the SW., accompanied by a low rumbling noise. *January*, Arequipa, Peru, 9th, 11:15 p. m., a most severe shock. Iquique, Peru, 12th, about midnight, long and violent shock, accompanied by curious subterranean noise. On the 12th, in Florida, at Jacksonville, 11:40 p. m., two distinct shocks, lasting about thirty seconds; motion from NW. to SE.; some persons reported a slight rumbling noise accompanying the shocks; houses all over the city were felt to move; the telegraph operator at Lake City reports the shock as felt there almost simultaneous with Jacksonville; at Mayport observer states that all his household were awakened by the rattling of the doors and windows; a sort of undulatory motion of the house was only perceptible; at Gulf Hammock, 11:55 p. m., slight shock, a sudden impulse followed by a few vibrations; at Daytona, 11:50 p. m., a violent shaking and a loud rumbling noise as of an approaching train of cars, and then as if they jumped the rails and ran over the sleepers for a few seconds; clocks stopped and people were awakened and terribly frightened; direction probably from east to west; duration, four to six seconds. At Okahumpka, Fla., 12 p. m., observer states that he felt a shock, direction NNW. to SSE., lasting at least one minute, accompanied by a peculiar buzzing sound; vibrations of sufficient force to slightly rock his house, rattling glasses, dishes, &c., on the shelves. Saint Francis Barracks, Saint Augustine, Fla.,

13th, 11:55 p. m., two almost imperceptible tremblings were experienced, lasting about two seconds, with the same intervals of rest; these were followed by a rapid vibratory motion, apparently from east to west, lasting two or three seconds; in the small and weaker houses of the town small objects were thrown from shelves by the shock; plaster was detached from the walls of houses in several places; the sentry on post reports hearing at the time a heavy explosion, as of a distant torpedo at sea.

Sunsets.—The characteristics of the sky at sunset as indications of fair or foul weather for the succeeding twenty-four hours have been observed at all Signal Corps stations. Reports from 117 stations show 3,597 observations to have been made, of which 39 were reported doubtful; of the remainder 2,921, or 81.2 per cent., were followed by the expected weather.

Sun spots.—The following monthly record of observations by Mr. D. P. Todd, Nautical Almanac office, Washington, D. C., is communicated by Prof. S. Newcomb, U. S. N., in charge of that office:

January, 1879.	No. of New—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	
2—2 p. m.	1	2	0	0	0	0	1	2	
2—3 p. m.	0	0	0	0	0	0	1	2	
4—3 p. m.	0	0	1	2	0	0	0	0	Small group of faculæ.
7—2 p. m.	0	0	0	0	0	0	0	0	
13—3 p. m.	0	0	0	0	0	0	0	0	
14—3 p. m.	0	0	0	0	0	0	0	0	
16—2 p. m.	0	0	0	0	0	0	0	0	
18—2 p. m.	0	0	0	0	0	0	0	0	
20—2 p. m.	0	0	0	0	0	0	0	0	
21—3 p. m.	0	0	0	0	0	0	0	0	
23—4 p. m.	0	0	0	0	0	0	0	0	
25—2 p. m.	0	0	0	0	0	0	0	0	
27—2 p. m.	0	0	0	0	0	0	0	0	
29—3 p. m.	0	0	0	0	0	0	0	0	

Mr. Jay Harcourt, at Wappinger's Falls, N. Y., examined the sun on the following days, but observed no spots: 6th, 7th, 12th, 14th, 18th to 20th, 22d, 25th, 26th, 29th, 30th, 31st. Mr. David Trowbridge, at Waterburg, N. Y., examined the sun on the following days, but observed no spots: 1st, 11th to 13th, 17th, 22d, 24th to 26th, 28th to 31st. Mr. William Dawson, at Spiceland, Ind., examined the sun on the following days, but observed no spots: 18th, 21st, 26th, 28th; on the 30th one group was seen with two spots. Prof. G. Hinrichs, at Iowa City, Iowa, examined the sun on twenty days; no spots seen. Observations were also continued daily at Fort Whipple, Va., but no spots observed.

NOTES AND EXTRACTS.

Atmospheric electricity.—In *Nature* for January 2 is given a report on the observations of atmospheric electricity made seven times a day at Montsouris. It is stated that during a recent long continuance of high pressure, and with a variety of cold and unpleasant weathers, the indications were invariably of positive electricity; that the change to negative electricity took place simultaneously with the change to warmer, thawing weather. At page 220, January 9, it states that the electric indications at Kew were the same as at Montsouris.

Clouds and weather.—The following extracts are from a lecture by W. C. Ley, on clouds and weather-signs (*Nature*, 1878, page 178):

"As regards configuration, clouds seem naturally divisible into two groups, those which arrange themselves in layers, whose vertical diameter is small as compared with its horizontal, and those which assume spherical or hemispherical shapes; and this division is related to certain physical conditions of the atmosphere and of the earth's surface beneath the cloud. It is, however, essential that we should possess some name or system of names to distinguish those clouds which are conveyed by the upper currents, and the term cirrus, with its compounds, must be more closely restricted to this class of clouds than has yet been done. From the use of weather-maps a new science of the winds has originated, on which all attempts at weather forecasting must be based. The movements of the upper clouds afford most valuable information concerning the distribution and movement of the areas of high and low barometric pressure. Rules by which this information may be interpreted, based in great measure on a for-

mer investigation by the lecturer,[1] are somewhat complex, and cannot well be given in a brief *résumé* like the present.[2] It may be sufficient to explain that in the front of an advancing barometric depression there usually extends a bank of the halo-producing cirro-stratus, the exterior edge of which is, roughly speaking, a parabola, the focus of which lies in the line about to be traversed by the center of the depression. On the right-hand of the center this bank or sheet is abruptly broken and is succeeded in the rear by local shower-clouds. On the left-hand the sky commonly continues overcast, but the cloud-plane gradually descends until little is to be seen but low stratus. A backing of the upper current takes place until after the center of the depression has passed. In whatever direction a depression is advancing the same characteristic phenomena are observed. Thus changes in the clouds indicate to us probable alterations of wind and weather."

"While the nimbus, which exists in the front of a depression, first makes its approach evident by changes in the higher cloud-strata, the process of nubification is the converse of this in those local showers which commonly occur on the right-hand and in the rear of a center of depression, and therefore when the barometer is rising or just about to rise. These latter are developed in an upward direction through the formation of cumulus. The precipitation which occurs in them—always preceded by a change of appearance in the domes of cloud, which assume a soft and cirriform aspect—is attributed to the neutralization of electricities as the summit of the cloud passes into a higher region; but there are important differences of appearance between those cumuli which are likely, and those which are unlikely, to undergo this transformation."

Scintillation of stars.—From observations for many years on the scintillation of the stars, Montigny derives the following conclusions (*Nature*, page 233):

"M. Montigny tried to solve the question whether the changes of color in scintillation follow certain definite laws; whether, for instance, their relative frequency expressed in numbers shows differences which depend on the nature of the star's own light, on the star's elevation above the horizon, or on the condition of the atmosphere.

"The way in which the observations were made was the following: For each evening of observation, not only the values for the intensity of scintillation were entered for each star, reduced to a distance of 60° from the zenith, but each single color observed in the circular image was also noted down. Further, the observations made in wet weather were noted separately from those made during dry weather. Finally, the various colors were entered on a table divided into seven columns, respectively headed, red, orange, yellow, green, blue-green, blue, and violet. The sum total of any column thus indicates the number of times which the color in question was observed in a certain star. Arcturus, for instance, in 131 observations during moist weather, showed the red color 130 times and blue 118 times. These numbers thus express the absolute frequency of these two colors. If we compare the number of 130 for red, with the sum total of all colors shown by Arcturus during rainy weather, which is 491, then we obtain the relative frequency of red, which is 0.265, or multiplied by 1,000 = 265. Therefore in 1,000 changes of color which appeared in Arcturus during rainy weather red occurred 265 times and blue 240 times.

"The observations show (1) the relative frequency of red is far greater than that of any other color in rainy weather as well as in dry; (2) red, green, and particularly orange, are seen more frequently in dry weather than in wet; (3) the frequency of yellow and blue is, on the contrary, greater in wet weather than in dry.

"Although the differences in the frequency of one and the same color, according to the state of the atmosphere, are rather limited, they nevertheless indicate an important fact. It is also remarkable that the numeric differences in the complementary colors, red and green on the one hand, and blue and yellow on the other, lie in the same direction. It is further worthy of notice that the greater frequency of blue in rainy weather agrees well with the fact that the blue greatly predominates during such weather in the image of the star as shown by the scintillometer. This predominance of blue has also been frequently observed a short time previous to rainy weather.

"For the sake of comparison M. Montigny has calculated the relative frequency of colors in two stars of the second type. The stars selected were Pollux, with a very characteristic spectrum, and Capella, which scintillates with great regularity. Both stars are yellow, and their spectra show very thin, dark lines. The influence of the weather was equally apparent in these stars; in dry weather red was more frequent, and in rainy weather blue."

Direction of motion of cyclones.—Mr. Eliot, meteorological reporter for the province of Bengal, announces that a cyclonic vortex, when generated in the middle of the Bay of Bengal, always travels toward that part of the coast where the wind velocity for the time being is least in comparison with the average velocity for the same place and time

[1] "Relation between the Upper and Under Currents of the Atmosphere around Areas of Barometric Depression." Quart. Journ. of Met. Soc., vol. iii, p. 437.
[2] The lectures will shortly be published.

of year. This law has been verified by almost all the cyclonic disturbances that have occurred in the bay since a chain of meteorological observatories was established round it, and it lends a great deal of support to the theory that a cyclonic vortex is developed through the accumulation, concentration, and condensation of aqueous vapor over a region of comparative calm.

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ALBERT J. MYER,
Brigadier-General (Brevet Assigned), Chief Signal Officer U. S. A.

PAPER 37.

MONTHLY WEATHER REVIEW, FEBRUARY, 1879.

INTRODUCTION.

In compiling the present review the following data, received up to March 14, have been made use of, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at 119 Signal Service stations and 11 Canadian stations, telegraphed to this office; monthly journals and means, 126 and 145 respectively, as telegraphed to this office; monthly means from 13 of the latter; reports from 26 special from the former, and monthly means from 13 of the latter; reports from 26 special sunset stations; 232 monthly registers from voluntary observers; 48 monthly registers from United States Army post-surgeons; marine records; international simultaneous observations; monthly reports from voluntary observers in, and the local weather services of, the States of Iowa and Missouri; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

Upon Chart No. II is exhibited by the isobaric lines the general distribution of the atmospheric pressure, as reduced to sea-level, for the month. Compared with the means for February of previous years, those of the present month are decidedly above the normal on the Pacific coast from San Francisco northward, in the Northwest and over the Gulf States, but are about normal in the Atlantic States and Lake region.

The local barometric ranges for the month, as reduced to sea-level, have been largest over New England and New York, and smallest along the Gulf coast and from the Rocky Mountains westward. Taken by districts they vary as follows: New England, from 1.85 at Eastport to 1.55 at New Haven and 1.33 on summit of Mount Washington; Middle Atlantic States, 1.63 at Albany to 1.11 at Norfolk; South Atlantic States, 1.00 at Charlotte to 0.61 at Jacksonville; Lake region, 1.52 at Rochester to 1.04 at Milwaukee; Ohio Valley and Tennessee, 1.23 at Pittsburgh to 0.88 at Chattanooga and 0.96 at Nashville; Gulf States, 0.35 at Key West to 0.71 at Montgomery, 0.74 at Indianola and 0.93 at Corsicana; the Northwest and eastern slope of the Rocky Mountains, 1.42 at Pembina to 0.98 at La Crosse, 1.26 at North Platte and 1.05 at Fort Sill; Rocky Mountains, 0.50 at Cheyenne to 0.72 at Santa Fé and 0.74 at Pike's Peak; Western Plateau, 0.55 at Winnemucca to 0.80 at Boise City; California, 0.43 at Red Bluff to 0.62 at San Francisco.

Areas of high barometer.—Nine are described below. Six of these first appeared north of Dakota or Minnesota, and moved south or east towards the Gulf or Atlantic coasts. Nos. II, VI and IX appeared over the Pacific States, over which region the pressure was above the normal on twenty-four days.

No. I is a continuation of area No. XI, noticed in the January review. It was central over the Northwest on January 30 and 31, during which days a severe northerly snowstorm prevailed in central Nebraska. In consequence of this snow, remaining on the ground throughout the entire month of February, and the prevailing low temperatures, thousands of cattle are reported to have died on the plains. From February 1 to 3 the highest pressure moved south-southeast to the Gulf of Mexico, and cool northwesterly winds, gradually backing to warmer west or southwest, prevailed west of the Mississippi. The minimum temperatures of the month prevailed in the South Atlantic States and Florida from the 2d to the 4th. In Texas northeasterly winds, with cloudy and rainy weather, backed to warmer southerly on the 3d, in advance of low pressure area No. II.

No. II continued over Washington Territory and Oregon from the 1st to the 5th. During these days cool, clear weather and northerly winds generally prevailed throughout the Pacific States, excepting the rain in Southern California on the 3d and 4th, attending low area No. II. On the 4th the winds increased to brisk and high in the Sacramento Valley, and on the 5th the pressure commenced falling north of Oregon,

with southerly winds and by night light rains, in advance of low area No. IV. From the 5th to the 7th the lowest temperatures of the month occurred from the Pacific coast to Western Texas, and it is probable that this area of high pressure was transferred to the Southwest, in rear of low area No. II. The following minimum temperatures of the month were recorded: On the 5th, San Francisco, 43°; Los Angeles, 38°; Sacramento, 33°; Boise City, 9°; Pioche, 5°; Cheyenne, —6°, and Pike's Peak, —21°; on the 6th, at San Diego, 38°; Santa Fé, —3°, and Dodge City, 6°; and on the 7th, Fort Craig, N. Mex., 14°; Graham, Tex., 17°, and Galveston, 36°. During the 7th this area moved northeast to the Ohio Valley, and on the 8th east off the Middle Atlantic coast.

No. III.—On the 7th and 8th the pressure rose over Manitoba, and on the latter day cold northerly winds spread southward to Kansas and Missouri. 9th, the highest pressure moved rapidly southeast, and by night extended from the Lower Lakes to the Middle and South Atlantic coast. 10th, it moved off the Atlantic coast, followed by easterly winds and increasing cloudiness in advance of low area No. IV.

No. IV followed in rear of low area No. V. 11th, was over Manitoba. 12th, center moved south to Dakota and Minnesota, and northerly winds extended to the interior of Texas and Tennessee. 13th, was central in the Missouri Valley, and a brisk norther commenced on the Texas coast. Cautionary off-shore signals ordered on the 12th at Indianola and Galveston were justified on the 13th and 14th by N. 36 and 32 respectively. 14th, moved into the Mississippi Valley, and on the 15th passed east over the Atlantic States. The following minimum temperatures of the month attended this area: On the 12th, at Deadwood, Dak., —12°; 14th, North Platte, —13°; Corsicana, 23°; 15th, Cleveland, —2°; Knoxville, 11°; Vicksburg, 24°; Montgomery, 28°; New York 8°, and Lynchburg, 17°.

No. V was north of Manitoba on the 15th, and on the 16th spread eastward north of the Lake region. 17th, moved east to the Saint Lawrence Valley, with very low temperatures in Ontario, the a. m. minimum at Rockliffe being —30°. High pressures and low temperatures continued over the Canadian maritime provinces until the morning of the 20th, during which day the barometer fell rapidly in advance of low area No. VI; the barometer at Halifax, N. S., fell from 30.32, at 7:35 a. m. (Washington time) of the 20th, to 28.90 at 7:35 a. m. of the 21st.

No. VI.—Higher pressures prevailed on the Pacific coast from the disappearance of the secondary depression attending low area No. IV to the 18th, with partly cloudy or cloudy weather and light rains from San Francisco northward. On the 19th and 20th the maps of departures from the normal show a decided excess, averaging about 0.30 of an inch, over Utah and New Mexico, and a rapid fall occurred during latter day in Washington Territory.

No. VII appeared over Manitoba on the 19th, and at 11 p. m. the pressure reached the maximum of the month (30.84 or 0.62 above normal) at Pembina, minimum a. m. temperature on the morning of the 20th, —37°. 20th moved south and east, and at 11 p. m. extended from the Lakes to the Gulf. 21st, the pressure fell over the Lake region, and at 11 p. m. the highest pressure was over the South Atlantic States and Florida.

No. VIII appeared north of Montana on the 25th; was central over the Northwest on the 26th; over the Ohio Valley and Lake region on the 27th, and over the Saint Lawrence Valley and Maine on the 28th. During the passage of the area the maximum pressure of the month occurred from the Lower Lakes eastward; and the following minimum temperatures of the month were recorded: On the 26th at Pembina, —44°; Bismarck, —26°; Fort Gibson, 14°. 27th, Embarrass, Wis., —40°, mercury froze at daylight; Duluth, —26°; Port Huron, —5°. 28th, Burlington, —7°; Wood's Holl, 11°; on Mount Washington the minimum was —21°. At this station the minimum for the month (—23°) occurred on the 25th.

No. IX.—From the 21st to the 28th high pressures generally prevailed along the Pacific coast, except on the 23d and 27th, on which days temporary depressions accompanied by heavy rains, existed over Washington Territory. Clear weather generally prevailed over California, and partly cloudy weather with occasional light rains, excepting the above, over Oregon and Washington Territory.

Areas of low barometer.—Nine well-defined areas of low pressure have appeared upon the tri-daily charts for the present month, and the tracks of the centers of seven of these depressions will be found on Chart No. I. Of the two tracks not on the above chart, that of area No. I will be found on the international chart of storm-tracks. That of No. VII was considered too far north to appear on Chart No. I. Areas Nos. IV and VII probably originated west of the Rocky Mountains; areas Nos. II, III, VI, VIII, and IX over the eastern slope of the Rocky Mountains north of Wyoming, and area No. V over Utah or Colorado. This offers a strong contrast to February, 1878, during which month seven of the eleven areas of low pressure which appeared within the limits of the United States were traced from the Pacific Ocean, and six of these entered the States south of the forty-seventh parallel. The daily charts made from the international (7:35 a. m., Washington time) simultaneous reports, received at this office, show the areas of low pressure over the North Pacific Ocean during that month

to have moved slowly eastward, and to have extended much farther south along the American coast than, in all probability, they usually do. During the present month high pressures have predominated over the Pacific States, and the area of low barometer has probably existed further north.

No. I.—From the 1st to the 3d of the present month the pressure continued very low over the Canadian maritime provinces, due probably to the existing low pressures over the northern portion of the North Atlantic Ocean and to the passage northeastward of low-pressure area No. XV, of the January review. On the early morning of the 1st high northerly winds prevailed on the North Carolina coast, and brig Maid of Llangollen reported severe gale during the day within sight of the Bermudas. At Prospect, Bermuda, the pressure fell from about normal on the morning of January 31 to 29.65 at 9 a. m., February 1st; wind SW. 2d, barometer at Prospect, Bermuda, 9 a. m., 29.68. Very low pressures, brisk northwesterly winds and snow prevailed from Maine to Cape Breton. 3d, low but slowly rising pressure continued over Nova Scotia, Cape Breton, and New Brunswick, with westerly winds and clearing weather. Cautionary signals were ordered up at midnight of January 31 along the North Carolina and New Jersey coasts, and were justified by the following velocities: Kittyhawk and Cape Henry, NW. 42; Cape May, NW. 52, and Sandy Hook, NW. 46. On the afternoon of February 1 the above signals were changed to off-shore, and cautionary off shore signals were ordered up from New York to Eastport; these latter were justified by brisk to high northwest winds. The first portion of the track of this area will be found on Chart No. I, accompanying the January review, after which it probably crossed the ocean, as shown on the international chart of storm-tracks.

No. II.—After the passage southward of high area No. I on the 1st the temperature rose rapidly over Wyoming and Montana, and partly cloudy weather, with light winds and calms, prevailed over this region until the morning of the 3d. 3d, southerly winds and rising temperature, with increasing cloudiness, prevailed from the Lower Missouri Valley to Texas, and with rain during the latter part of the day from the Rio Grande Valley to Southern California; but from Wyoming and Montana to Minnesota the winds changed to colder northerly and a somewhat heavy snow storm set in, which extended during the 4th southward to Utah, Northern New Mexico, and Kansas. These conditions gradually developed an extensive area of low pressure, the center of which moved southward on the 3d, and on the morning of the 4th a well developed barometric depression was central from Arizona to Northwestern Texas, the barometers at Santa Fé and Fort Sill reading 29.37 and 29.63, respectively; or, about 0.35 inches below the normal. Heavy rains fell during the early morning of the 4th in Arizona, and at 7:35 a. m. the area of precipitation extended from Southern California to Wyoming, and thence to Texas and Mississippi. During the day increasing cloudiness, followed by rain or snow, prevailed from the Gulf to the Lakes, and the center of depression moved east to Arkansas. Cautionary off-shore signals were ordered at Indianola and Galveston at midnight of the 4th, and were justified on the morning of the 5th. Maximum velocities: Indianola, N. 37, and Galveston, N. 26. 5th, center moved east of the Ohio valley and Middle Atlantic States; the area of precipitation extended from the Gulf States to the Lakes and Atlantic coast, being heaviest in Tennessee and Kentucky and falling as snow north of a line drawn from Columbus, Ohio, to Connecticut. Cautionary signals ordered up along the coast from Smithville to New York on the morning of the 5th, and changed to off-shore on the afternoon, were justified except at Cape Henry and Norfolk. Maximum velocities: Cape Lookout, SW. 40; Cape May, SE. and NW. 32, and Sandy Hook, N. 27. As this area passed east of the Atlantic coast the region of brisk to high winds was confined to a narrow belt lying between the parallels of 34 and 40; during the latter half of the 5th and morning of the 6th the pressure fell at the Bermudas, with rising temperature and southwest winds, and on the 6th steamer Westbourne, latitude 39° N., 60° W., experienced a gale from SW. (hurricane) to NW., while to the northward easterly winds and squally weather were reported. The track of this area is prolonged on the international chart, as there is probably some connection between it and the area of very low pressure which existed over the ocean east of the fortieth meridian on the 9th.

No. III probably developed over Wyoming and Montana during the 6th and 7th, and moved almost directly east along the forty-fifth parallel to Nova Scotia by midnight of the 9th. At 11 p. m. of the 6th the lowest pressure of the week (29.40, or 0.23 below normal) occurred at Virginia City, Montana. 7th, southeast winds and light snow in Dakota. 8th, center moved to Lake Huron; light snows fell from Minnesota to Ontario. Cautionary signals were ordered at Milwaukee, Grand Haven, and Ludington on the afternoon of the 8th and were justified; maximum velocities: Milwaukee, NW. 31, and Grand Haven, SW. 28. 9th, moved east to Nova Scotia; brisk and occasionally high westerly winds and light snows, followed by clear weather from the Lower Lakes to New England. Cautionary signals were ordered at Eastport on the morning of the 9th and were justified by a northwest gale, which reached its maximum (43) at 10 a. m. of the 10th. Cautionary off-shore signals were also ordered on the

morning of the 9th along the New Jersey coast and were justified; maximum velocities: Cape May, NW. 32, and Sandy Hook, NW. 36.

No. IV.—During the 7th and until afternoon of the 8th the pressure fell rapidly on the Pacific coast. 8th, brisk and occasionally high southerly winds and heavy rains prevailed north of San Francisco; at 4:30 p. m. the lowest pressure (29.36, or 0.33 below normal) was recorded at Olympia. Heavy NE. winds, with three inches of snow, were reported at New Westminister, B. C., and at Victoria, V. I., a severe SW. gale prevailed. At night clearing and clear weather was reported at Portland and Olympia, and the lowest pressure probably moved eastward. Low pressures, however, continued over this region until the 12th, on the morning of which day a second minimum occurred at Olympia. Cloudy and rainy weather continued during these days from Northern California to Utah and Idaho, with southerly winds, high temperatures, and gradually increasing pressure. On the 11th, colder northerly winds, snow, and rain prevailed in Washington Territory, and the observers at Westminister, B. C., and Victoria, V. I., report very heavy northerly snow-storms. 9th, lowest pressure was over Montana and Dakota. 10th, moved down the Missouri Valley, preceded by southerly winds and rain in the Mississippi Valley and Eastern Texas, and followed by northerly winds with snow from Montana and Wyoming to Lake Superior, and with clear, cooler weather from Nebraska to Western Texas. In the latter State a tornado occurred about 5 p. m., of which notice is made under the head of local storms. 11th, it moved to the Lower Lakes, and south to west winds and rain prevailed thence to the Gulf and Atlantic coasts; northerly winds and heavy snow from the Upper Lake region to the Saint Lawrence Valley. 12th, moved down the Saint Lawrence Valley with increasing energy. Heavy rains or snow prevailed, in advance of the center, along the New England and Canadian coasts and Saint Lawrence Valley during first half of day. Heavy freshets resulted from Pennsylvania to New England, and in Canada railroad traffic was seriously impeded by snowdrifts. 13th, it probably passed northeastward over Labrador. Cautionary signals ordered on the afternoon of the 9th at Milwaukee, Grand Haven, and Ludington; at 4:35 p. m. and midnight of the 10th from Smithville, N. C., to New York, and on the morning of the 11th, from New Haven to Eastport, were all justified; those along the Atlantic coast were changed to cautionary off shore at midnight of the 11th or morning of the 12th. Maximum velocities: Milwaukee, N., 30; Grand Haven, N., 36; Smithville, SW., 31; Cape Lookout, SE., 38; Cape May, W., 36; Sandy Hook, NW., 46; New London, NW., 36; Boston, SW., 55, and Eastport, S. 36.

No. V.—During the latter part of the 14th, on the 15th and morning of the 16th, the lowest pressures were over Utah, Colorado, and New Mexico, while on the Pacific coast and over the eastern section of the country the barometer was decidedly above normal. (See areas of high pressure, Nos. V and VII.) Over this region the present area slowly developed, with cloudy weather and light snow. On the 16th the center moved southeast over Texas, and the area of rain or snow spread rapidly eastward to the southern portion of the Lake region and South Atlantic coast. 17th, the center moved off the coast of North Carolina and the area of precipitation spread over the Middle States and New England. Heavy rains fell in Tennessee and North Carolina, but from Kentucky and Virginia northward, except along the immediate coast south of Barnegat, the precipitation occurred as snow. 18th, northerly winds, rain or snow continued, throughout the Atlantic States and Lower Lake region in advance of area of high pressure No. VI. Cautionary signals ordered along the Atlantic coast, from Smithville to New York on the afternoon of the 16th, from New Haven to Boston on the morning, and at Portland and Eastport on the afternoon of the 17th, were all justified. Maximum velocities: Cape Lookout, S. 32; Cape May, NE. 28; Sandy Hook E. 37; Boston, N. 37, and Eastport, NE. 33.

No. VI approached Manitoba from the northward on the 17th, and on the 18th moved east-southeast to Southern Minnesota, accompanied by light snow. 19th, continued east-southeast to the Lower Lakes, and rain or snow extended south to Tennessee and east to New Jersey and New England. 20th, moved east over the Middle States and Southern New England with increasing energy. High northerly winds and gales prevailed along the coast from North Carolina to Maine, accompanied by a heavy snow-storm over New England, and by clear and colder weather southward. 21st, the pressure fell rapidly over Nova Scotia and Cape Breton, producing a very steep barometric gradient over the Canadian maritime provinces and Maine. At 4:35 p. m. the pressure at Halifax, N. S., had fallen to 28.75, or about 1.15 inches below normal; and at 11 p. m., at Sydney, C. B., to 28.50, or about 1.39 below the normal. Northeasterly backing to northwesterly gales and heavy snows prevailed over the Canadian maritime provinces and Eastern Maine, and northwest gales, with clear, colder weather, over the rest of New England. Cautionary signals ordered on the morning of the 19th at Milwaukee, Grand Haven, and Ludington, and at midnight of same day from Smithville, N. C., to Eastport, were all justified. Those along the Atlantic coast, from Smithville to Sandy Hook, were changed to cautionary off-shore on the morning of the 20th, and from New York to Wood's Holl on the afternoon of same day. Maximum velocities: Milwaukee,

NW., 28; Wilmington, NW., 37; Cape Lookout, NW. 44; Cape Henry, NW. 54; Cape May, NW. 56; Sandy Hook, NW. 48; Wood's Holl, E. 40 and NW. 48; Boston, NW. 40; and Eastport, NW. 52.

No. VII.—Falling barometer, southerly winds and rain, followed by rising barometer and northwest winds, prevailed in Oregon and Washington Territory during the 20th, and by midnight an area of low pressure was central north of Montana. 21st, it passed over Manitoba to north of Lake Superior, and thence during the 22d to north of the Saint Lawrence. During the latter day high temperatures, cloudy weather and rain prevailed from the interior of the Gulf and South Atlantic States to Lake Erie, and thunder-storms occurred in the Lower Mississippi Valley. 23d, it moved northeast to the north of the Saint Lawrence. Clearing weather, with occasional light snows, prevailed from the Lake region to New England; and high temperatures, with rain and thunder-storms, followed at night by cooler, clearing weather, in the East Gulf and South Atlantic States. Cautionary signals ordered on the morning of the 21st at Milwaukee, Grand Haven, and Ludington, and along the Atlantic coast from Smithville, N. C., to Sandy Hook, were justified. Maximum velocities: Milwaukee, W. 36; Grand Haven, W. 50; Cape Lookout, SW. 27; Kittyhawk, SW. 30; Cape May, S. 33, and Sandy Hook, NW. 32. As the center of depression continued to the north of our stations its track is not charted.

No. VIII appeared in the Upper Missouri Valley on the 23d and moved southeast to Missouri on the 24th. Clear or fair weather and high temperatures prevailed to the south and west of the center, and the maximum temperatures of the month occurred at stations along the eastern slope of the Rocky Mountains. Over the Lake region and the Northwest east to north winds prevailed, with low but rising temperatures, snow and sleet, gradually changing to rain in Northern Illinois as the center of depression approached. 25th, center moved slowly east to Ohio. Southerly winds and high temperatures prevailed from the Ohio Valley and Virginia southwards; light rains fell in Tennessee, Kentucky, and the Virginias. North of the center of depression snow or sleet prevailed, changing to rain along the southern shores of the Lower Lakes, with easterly winds from New England to Lake Ontario and northerly winds from Lake Erie westward. 26th, center of depression moved northeast to the valley of the Saint Lawrence; brisk to high southerly winds, with high temperatures and light rains, prevailed throughout the Atlantic States during the day, but changed to colder northwest during the night in advance of high area No. X. 27th, center moved rapidly eastward over the Gulf of Saint Lawrence, followed by brisk northwest winds and heavy rain, sleet or snow in Maine and New Brunswick. During the passage of this depression the following highest temperatures of the month occurred at stations to the south of the center: on the 24th, at Dodge City, 74°, Fort Gibson, 77°, and Denison, Tex., 78°; 25th, Shreveport, 80°, Montgomery, 73°, Chattanooga, 69°, Louisville, 65°, and Cleveland, 47°; 26th, Savannah, 74°, Wilmington, 73°, Fort Whipple and Philadelphia, 60°, Rochester, 46°, and Boston, 56°. The sudden fall of temperature in advance of high area No. X produced the largest daily ranges of the month at the majority of stations over the region traversed. Cautionary signals ordered up at Milwaukee, Grand Haven, and Ludington, and along the Atlantic coast from Smithville to New York, on the afternoon of the 24th; from New Haven to Boston on the morning, and at Portland and Eastport at midnight of the 25th, were all justified. Maximum velocities: Milwaukee, NW., 34; Cape Lookout, NE., 44; Kittyhawk, NE., 50; Cape May, S., 40 and NW., 46; Sandy Hook, SE., 28; Wood's Holl, S., 48, and Portland, N., 36.

No. IX was central over Southwestern Montana and Wyoming on the 27th, with cloudy weather and high temperatures near or south of the center, and cold easterly winds and snow in the Missouri and Mississippi Valleys in rear of high area No. X. 28th, center moved southeast to Iowa and thence to Wisconsin; cloudy or partly cloudy weather, with light rain or snow, prevailed thence to the Lake region; northerly winds, with snows, followed by clear weather, gradually spread southward to Kansas and Missouri. Cautionary signals ordered up at Milwaukee, Grand Haven, and Ludington on the morning, and along the Atlantic coast from Smithville, N. C., to New York on the afternoon of the 28th, were only justified at the Lake stations and on the North Carolina coast. Maximum velocities: Milwaukee, S. 30, and Cape Lookout, NE. 46.

INTERNATIONAL METEOROLOGY.

On Chart No. IV are shown the probable tracks of storm-centers over the oceans deduced from data received at this office up to February 8; and in the upper right hand corner will be found an index to the same. In the upper left hand corner is a small table giving the approximate wind direction and probable maximum velocities (in miles per hour) attending the depressions on the dates given. Below is a brief notice of these, and also of some over the Southern Hemisphere.

Atlantic Ocean.—No. I is a continuation of area No. VIII of the January review; it

probably moved rapidly east-northeast and developed into a severe storm on January 18 and 19 over the Middle Atlantic, after which it passed southeast over Spain. No. II, is a continuation of No. VII of January review, and probably followed the track shown on chart in advance and to the north of the preceding area. No. III, is a continuation of area No. X of the January review, and probably passed northward over Newfoundland. No. IV, is a continuation of area No. XII of the January review, which moved east-northeast and on the 25th developed into quite a severe storm about latitude 54° N., longitude, 30° W. No. V is a continuation of area No. XIII of the January review; it passed northward on the 27th, being opposed by high pressures over the East Atlantic. No. VI.—Low pressures were indicated in the positions marked upon the chart on January 29 and 30, and on February 2 a "violent revolving storm," with tremendous sea, was reported in 43° N., 24′ W.; this was probably near the center of the low area which, on the 4th, passed southeastward over France. No. VII is a continuation of area No. I of the present review, which moved northeastward with increasing energy, and developed into a somewhat severe storm north of the fiftieth paralled. No. VIII is a continuation of No. II of the present review; it passed between the Bermudas and Nova Scotia on the 6th; on the 7th and 8th was attended over mid-ocean by rainy and squally weather, and on the 9th and 10th developed into a severe storm east of the fiftieth meridian; on the 11th it probably divided into two centers as shown. *South Atlantic Ocean.*—At Montevideo, December 31, 1878, a heavy SW. gale, or "pampero," commenced, lasting until the morning of January 2, 1879; the barometer fell to its lowest level, 29.48, at 11 p. m., December 31; the storm was preceded by NW. and N. winds, and accompanied by thunder, lightning and rain; the maximum velocity of wind was 65 miles per hour. On December 30, in latitude 30° S., 28° W., a sharp shock of an earthquake was felt by the British ship Coolen. *North Pacific Ocean.*—November 27 to 30, from 38° N., 168° W. to 34° N., 176° W., fresh to strong westerly gales, with heavy seas, hail and sleet, lowest barometer, 29.50. January 15, at 10 p. m., a thunder-storm passed over Yokohama attended with rain and hard squalls, during which the pressure fell to 29.61, wind SW., moderate gale. *South Pacific Ocean.*—November 13, Bark Ophelia (from San Francisco to Queenstown) passed Pitcairn Island November 10, and on the 13th entered a "heavy cyclone." *Victoria, Australia.*—On September 24 and 25, 1878, an area of low pressure passed over this colony, during which the barometer at Melbourne fell to 29.192 (or 0.827 below the average for September); it was accompanied by gales and squally weather, with thunder, lighting and hail showers. *Indian Ocean.*—On December 15, 1878, a cyclone, probably traveling southward, was encountered by the following vessels: ship John O'Gaunt, latitude 20° S. longitude, 74° E., "hurricane"; ship Charlotte Croom, 18° 49′ S., 68° 23′ E., "cyclone, barometer fell to 28.80"; bark Dulcimer, 21° S., 73° E., "cyclone, beginning at ENE., veering to N. and ending at NNW., bad weather lasting 24 hours; bark Anglo, Norman (left Amoy October 31, passed Cape of Good Hope, January 7), no date, 20° S. 70° E., "cyclone traveling SSW., barometer 28.66, hove to 36 hours under bare poles, terrific sea washing decks. *Bay of Bengal*—No. I (see chart No. IV) probably formed over the Gulf of Martaban from November 12 to 17; on the 17th the lowest pressure was southwest of Burmah, with E. gales and rain at Diamond Island; on the morning of the 21st it was east of Masulipatam, and heavy rains, with thunder and lightning from the E., prevailed along the coast northwards. The steamship Mira (at Calcutta, November 20, reported bad weather from 10° N. 84° E. to 15° N. 86° E. No. II. On November 29, rain and moderate squalls were suspected to the south or southeast of Cape Negrais, with strong E. winds at Diamond Island; 30th, doubtful weather was indicated from Cape Megrais and the Andamans to the opposite coast of Madras; *December* 1 to 4, falling pressure and cloud and rain prevailed on the Coromandel coast, and on the 5th a well-defined depression appeared, which moved northward on the 6th and 7th; very heavy rains fell during these days to the northeast of the storm-center, the excessive amount of 21,2 inches being recorded at Vizagapatum during the 48 hours preceding 10 a. m. of the 8th; at this place the wind veered from NE. to SSE. and S. After this storm the northeast monsoon probably became fully established over the bay.

TEMPERATURE OF THE AIR.

The isothermal lines on Chart No. II illustrate the general distribution of air for the month. By reference to the table on the left side of the chart it will be seen that the temperature of the present month has been very generally below that of the mean for several years past east of the Rocky Mountains, the deviation averaging from two to three degrees, except over New England and the Saint Lawrence Valley, where it is from four to six degrees below. Over the Western plateau the temperature has been decidedly above the normal.

Minimum and maximum temperatures, respectively: *Maine*—Orono, —10° and 43°; Eastport, 6°, 46°; Portland, 6°, 45°. *New Hampshire*—Mount Washington, —23°, 14°; Dunbarton, —10°, 46°. *Vermont*—Burlington, —7°, 38°; Newport, —26°, 36°. *Massachusetts*—Rowe, —6°, 36; Boston, 4°, 56°; Springfield, 4°, 47°. *Rhode Island*—

Newport, 10°, 48°. *Connecticut*—New London, 8°, 49°; Colebrook, —4°, 46°; Southington, 0°.4, 51°. *New York*,—Madison Barracks, —25°, 40°; Plattsburg Barracks, —16°, 35°; Schroon Lake, —20°, 38°; Buffalo, —2°, 43°; New York City, 8°, 49°; Rochester, —2°, 46°. *New Jersey*—Princeton, 1°, 55°; Atco, 8°; 63°. *Pennsylvania*—Tioga, —13°, 42°; Philadelphia, 8°, 60°; Pittsburgh, 4°, 54°; Catawissa, 1°, 46°. *Delaware*—Dover, 14°, 62°. *Maryland*—Woodstock, 7°, 55°; New Market, 10°, 50°; Baltimore, 12°, 58°. *District of Columbia*—Washington, 11°, 58°. *Virginia*—Wytheville, 6°, 65°; Snowville, 10°, 48°; Lynchburg, 17°, 57°; Norfolk, 22°, 70°. *West Virginia*—Helvetia, —4°, 60°; Morgantown, 12°, 60°; Wellsburg, 2°, 48°. *North Carolina*—Highlands, 11°, 57°; Weldon, 24°, 75°; Wilmington, 23°, 72°. *South Carolina*—Aiken, 26°, 69°; Charleston, 30°, 72°. *Georgia*—McPherson Barracks, 14°, 71°; Savannah, 31°, 74°; Augusta, 27°, 74°. *Florida*—Key West, 56°, 82°; Saint Marks, 29°, 71°; Houston, 34°, 78°. *Alabama*—Green Springs, 20°, 72°; Mobile, 34°, 75°; Montgomery, 28°, 73°. *Mississippi*—Brookhaven, 26°, 69°; Vicksburg, 24°, 76°. *Louisiana*—Okalooska, 26°, 78°; New Orleans, 38°, 75°; Shreveport, 25°, 80°; *Texas*—Concho, 18°, 85°; Indianola, 36°, 75°; San Antonio, 32°, 88°; Castroville, 32°, 91°; Terril, 22°, 74°. *Ohio*—Ruggles,—6°, 53°; Columbus, 4°, 56°; Cincinnati, 6°, 61°; Toledo, 4°, 48°. *Kentucky*—Louisville, 6°, 65°; Bowling Green, 5°, 66°. *Tennessee*—Nashville, 11°, 67°; Memphis, 16°, 69°; Chattanooga, 16°, 69°. *Arkansas*—Mount Ida, 18°, 74°. *Michigan*—Alpena, —22°, 40°; Marquette, —20°, 39°; Detroit, —3°, 4°; Northport, —10°, 38°. *Indiana*—Saint Meinrad, —9°, 62°; Indianapolis, —1°, 58°; New Harmony, —2°, 61°. *Illinois*—Rockford, —22°, 44°; Louisville, —4°, 60°; Chicago,—6°, 51°; Cairo, 8°, 67°; *Missouri*—Frankford, —8°, 62°; Kansas City, 1°, 75°; Saint Louis, 4°, 65°. *Kansas*—Fort Leavenworth, —3°, 71°; Fort Wallace, 2°, 84°; Dodge City, 6°, 74°. *Wisconsin*—Neilsville, —36°, 38°; Ashland, —30°, 29°; Madison, —12°, 46°; La Crosse, —21°, 45°. *Iowa*—Nora Springs, —20°, 43°; Des Moines, —12°, 52°; Vail, —16°, 57°. *Nebraska*—Norfolk, —16°, 67°; Omaha, —9°, 60°; North Platte, —13°, 47°; Fort Sidney, —13°, 69°. *Indian Territory*—Fort Sill, 16°, 79°; Fort Gibson, 14°, 77°. *Minnesota*—Breckenridge, —34°, 39°; Saint Paul, —22°, 35°. *Dakota*—Pembina, —44°, 30°; Yankton, —17°, 62°; Bismarck, —26°, 74°. *Colorado*—Pike's Peak, —21°, 26°; Denver, —3°, 72°; Fort Lyons, —10°, 83°. *New Mexico*—Santa Fé, —3°, 75°; Fort Union, —13°, 74°; Fort Craig, 14°, 82°. *Wyoming*,—Cheyenne, —6°, 59°; Fort Fred. Steele, —20°, 55°. *Montana*—Virginia City, —9°, 50°. *Utah*—Salt Lake City, 8°, 68°. *Nevada*—Winnemucca, 7°, 69°; Pioche, 5°, 69°. *Idaho*—Boise City, —9°, 64°. *California*—Sacramento, 33°, 73°; Visalia, 32°, 79°; Los Angeles, 38°, 80°; San Francisco, 43°, 70°; Red Bluff, 31°, 76°; San Diego, 38°, 74°.

Ranges of temperature.—The *monthly ranges* will appear from an examination of the minima and maxima just given. Greatest *daily ranges* vary in New England from 27° at New London and 32° at Eastport to 34° at Boston; Middle States, 17° at Cape May and 27° at Albany to 33° at Cape Henry; South Atlantic States, 23° at Savannah, Smithville, Cape Lookout, and Cape Hatteras to 37° at Augusta; Gulf States, 14° at Key West and 18° at Galveston to 33° at Montgomery and Corsicana: Ohio Valley and Tennessee, 25° at Indianapolis to 41° at Cincinnati and 35° at Morgantown; Upper Lake region, 27° at Chicago and Grand Haven to 36° at Marquette and Escanaba; Lower Lake region, 23° at Sandusky to 35° at Rochester; the Northwest, 26° at Davenport to 47° at Yankton and 45° at Pembina; Eastern slope, 39° at Fort Gibson to 41° at North Platte; Rocky Mountains, 22° on Pike's Peak to 44° at Denver and 43° at Santa Fé; Western plateau, 27° at Salt Lake City to 35° at Winnemucca; California, 20° at San Francisco to 30° at Los Angeles and Visalia and 28° at Red Bluff and Sacramento.

Frost has occurred quite frequently over the northern sections of the country; in the interior of the Southern States and Texas from the 1st to 4th, 6th to 10th, 13th to 24th, 27th, 28th; along the immediate Gulf coast on the 3d, 4th, 8th, 9th, 14th, 19th, 20th, 21st, 27th, 28th; and on the Pacific coast, 1st, 2d, 3d, 5th, 6th.

Ice formed in the Gulf, South Atlantic and Pacific States as follows: Charlotte, N. C., 17th; Charleston, 2d, 3d; Augusta, 21st, 22d, 27th, 28th; Denison, Tex., 6th, 7th; Gatesville, Tex., 3d, 6th, (8th, "intensely cold, ice all about,") 13th, 14th, 18th; Melissa, Tex., 3d, 15th, 25th, ¼ inch; Wilmington, N. C. 21st; Brookhaven, Miss., 2d, 3d, 8th, 9th, 14th, 15th, 19th, 20th, 27th, 28th; Fayette, Miss., 3d, 19th, 27th; Gainesville, Ga., 17th, ¼ inch; Sacramento, Cal., 5th, 6th.

Ground frozen.—Green Springs, Ala., 14th, 27th, 28th; Brookhaven, Miss., 14th, 15th, 27th; Eagle Pass, Tex., 7th.

PRECIPITATION.

On Chart No. III is illustrated the general distribution of precipitation for the month. On the left side is a table showing a comparison of the present month with several previous Februarys, from which it will be seen that there has been a general deficiency, except in the Upper Lake region and Minnesota and on the Pacific coast; at Portland, Oreg., and Olympia, Wash., the excess has been nearly equal to the average February rainfall.

Special heavy rains.—3d and 4th, Wickenburg, Arizona, 2.14 inches. 11th, Smithville,

N. C., 2.63; Fayetteville, N. C., 4.25 inches. 16th and 17th, Chattanooga, 2.54; Fayetteville, N. C., 16th to 18th, 4.00 inches. 22d, Okalooska, La., 2.40 inches. 22d and 23d, Vicksburg, 2.15.

Largest monthly rainfalls.—Olympia, Wash., 15.59 inches; Portland, Oreg., 13.22; Fayetteville, N. C., 10.13; Mount Washington, 7.01; White Plains, N. Y., 6.47; Gainesville, Ga., 6.18; Chattanooga, Tenn., 5.85; Vicksburg, 5.63; Knoxville, 5.61; Cape Hatteras, N. C., 5.09; San Francisco, 4.90; Smithville, N. C., 4.76; Cape Lookout, N. C., 4.68; Charleston, 4.56.

Smallest monthly rainfalls.—Jacksborough, Tex., none; Fort Lyon, Col., 0.04 inch; Pilot, Tex., 0.05; Concho, Tex., 0.06; Dodge City, Kans., 0.08; Camp Verde and Florence, Ariz., 0.14; Vail, Iowa, 0.15; Pioche, Nev., 0.17; Stockton, Tex., 0.18; Cheyenne and Fort Hays, Kans., 0.20; Winnemucca, Nev., and Fort Sill, Ind. T., 0.21; Santa Fé, N. Mex., 0.23; Fort Snelling, Minn., 0.24; Fort McPherson, Nebr., 0.26; Castroville, Tex., 0.29; Visalia, Cal., Fort Craig, N. Mex., Morristown, Dak., and Fort Union, N. Mex., 0.30; Phœnix, Ariz., 0.34; Graham, Tex., 0.35; Fort Fred. Steele, Wyo., and Yankton, Dak., 0.36; Denver, 0.39; Warrensburg, Mo., 0.13; Macon, Mo., 0.25; Phelps, City, Mo., 0.22; Grand City, Mo., 0.20, and northwestern portion of Iowa generally less than 0.50.

Drought.—Uvalde, Tex., 26th—Sheep owners report this month the most severe known; many sheep and goats have died from cold and starvation; vegetation is backward, and nearly all springs are dry.

Hail.—Fort Fred. Steele, Wyo., 15th; Morristown, Dak., 28th; New Bedford, Mass., 26th; Freehold, N. J., 25th, 26th; Flushing and Cape Vincent, N. Y., 26th; Wilmington, N. C., 8th, 18th; North Lewisburg, Ohio, 22d, 28th; Woodstock, Vt., 26th; Helvetia, W. Va., 11th; Boise City, Idaho, 14th; Fort Sill, Ind. T., 14th; San Antonio, Tex., 23d; Castroville, Tex., 22d; Fredericksburg, Tex., 1st; Graham, Tex., 16th; Shreveport, La., 25th; Dubuque, Iowa, 24th; Logansport, Ind., 25th; Little Egg Harbor, N. J., 27th.

Rainy days.—The number of days on which rain or snow has fallen varies as follows: New England, 13 to 17; Middle States, 7 to 16; South Carolina States, 9 to 13; Gulf States, 2 to 12; Ohio Valley and Tennessee, 10 to 20; Lower Lake region, 15 to 23; Upper Lake region, 14 to 18; Upper Mississippi Valley, 12 to 15; Lower Missouri Valley, 4 to 11; Eastern slope, 0 to 13; Rocky Mountains, 2 to 11; Western plateau, 1 to 14; Pacific coast, 6 to 11.

Cloudy days.—For New England the number varies from 9 to 18; Middle States, 7 to 14; South Atlantic States, 7 to 13; Gulf States, 2 to 12; Ohio Valley and Tennessee, 8 to 18; Lower Lake region, 13 to 21; Upper Lake region, 9 to 17; Upper Mississippi Valley, 8 to 13; Lower Missouri Valley, 9 to 11; Eastern slope, 5 to 14; Rocky Mountains, 2 to 10; Western plateau, 1 to 17; Pacific coast, 4 to 11.

Snow.—The precipitation in the northern sections occurred generally as snow. On the Pacific coast and in the South Atlantic States and Texas it occurred as follows: in *British Columbia*, on the 7th, 8th, 10th, 11th, "heaviest storm since 1861–'62, and came according to cloud movement, from the SW; at Victoria the snow was four to five feet deep." *California*, on the Coast Range Mountains, 19th; on Sierra Nevadas, during the entire month; *Texas*, 1st, 2d, 14th; *North Carolina*, 1st, 8th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 20th; *Georgia*, 14th, 16th.

Depth of snow on ground at end of month.—It varied in the different sections as follows: *New England*, trace to 38 inches, and 48 inches on Mount Washington. *Middle States*, 0 to ½ inch along the coast to 36 inches in the interior. *Ohio*, trace to 18 inches. *Lower Lakes*, 0 to 18 inches. *Upper Lakes*, 2½ to 30 inches. *Upper Mississippi Valley*, trace to 25 inches. *Indiana*, 0 to 10 inches. *Red River of the North Valley*, 4½ to 8 inches. *Missouri Valley*, 0 to 6 inches. *Rocky Mountains*, Cheyenne, Virginia City, and Pike's Peak, 3 inches.

RELATIVE HUMIDITY.

The average percentage of relative humidity for the month ranges as follows: New England, 59 to 78; Middle States, 58 to 79; South Atlantic States, 57 to 78; East Gulf States, 69 to 76; West Gulf States, 56 to 77; Lower Lakes, 71 to 82; Upper Lakes, 70 to 78; Ohio Valley and Tennessee, 59 to 73; Upper Mississippi Valley, 66 to 74; Lower Missouri Valley, 64 to 69; Red River of the North Valley, 84 to 92; Eastern slope, 50 to 91; Western plateau, 48 to 67; California, 69 to 87. *High stations* report the following, not corrected for altitude: Mount Washington, 85; Pike's Peak, 51; Santa Fé, 50; Cheyenne, 52; Denver, 57.

WINDS.

The prevailing winds at the Signal Service stations are shown by arrows on Chart No. II, from an examination of which it will be seen that over the eastern section of the country they have been from northerly to westerly except where influenced by

local causes, of which marked cases are seen in the NE. wind along the North Carolina coast, the south wind at Burlington, Vt., and the east winds at Oswego and Grand Haven; opposing northerly and southerly winds have prevailed from Texas to Colorado and thence to Arizona. Northerly winds in California and southerly winds from Oregon to Utah and thence northward.

Total movements of the air.—The following are the *largest* monthly movements recorded at the Signal Service stations, viz: Pike's Peak, 21,218 miles; Sandy Hook, 13,101; Cape Lookout, 12,901; Cape May, 12,772; Wood's Holl, 12,435; Indianola, 11,101; Barnegat, 10,161; Cape Hatteras, 10,095; Eastport, 9,722; Sandusky, 9,596; Cheyenne, 9,501; Breckenridge, 9,199; Milwaukee, 8,723; Grand Haven, 8,529. The *smallest:* Deadwood, Dak., 1,726 miles; Visalia, Cal., 1,977; Nashville, 2,591; Los Angeles, Cal., 2,607; Uvalde, Tex., 2,635; Fredericksburgh, Tex., 2,948; Indianapolis, 3,029; Lynchburgh, 3,105; Fort Craig, N. Mex., 3,178; San Diego, 3,294; Salt Lake City, 3,336; Fort Davis, 3,429; Dubuque, 3,473; Augusta, 3,475; Shreveport, 3,500.

Local storms.—Tornado at Riverdale, Caddo Parish, La. *February* 10, about 5 p. m., a black cloud resembling a waterspout was observed moving from the SW. to SE. along the southern horizon apparently reaching to the ground and accompanied by thunder and lightning, hail, and a terrible rumbling noise. The storm left a very clean path, averaging about 100 yards in width, uprooting and in many places twisting off at the stump trees of from 3 to 4 feet in diameter. It prostrated at least 3,000 panels of fence, demolished two cabins, carrying a portion of one of them across the river and scattering the remainder a distance of 100 yards. The tornado then crossed the river, throwing the water to a great height. On the Sunny Point plantation it blew a dwelling-house off the blocks on which it rested, carrying it 10 feet and settling flat on the ground. Cabins, dwellings, and gin-house damaged to the amount of $1,000. The large gin-house was twisted into two parts, one of which was carried across the river on the Hamilton plantation, and the other blown into the river. A new wagon was snatched up by the whirling storm and smashed into pieces. A piece of hewn timber 10 by 16 inches and 40 feet long was carried a quarter of a mile. On the Hamilton plantation two cabins were demolished and two persons injured; the storm then disappeared in the swamp.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily weather indications with the telegraphic reports for the succeeding twenty-four hours show the general percentage of omissions to be 0.9 per cent., and of verifications to be 92.2 per cent. The percentage of verifications for the four elements have been: weather, 95.9; wind, 93.6; temperature, 01.9; barometer, 90.2. The percentage of verifications by geographical districts have been: New England, 93.8; Middle States, 94.1; South Atlantic States, 92.3; East Gulf States, 92.7; West Gulf States, 90.9; Lower Lake region, 94.1; Upper Lake region, 92.5; Tennessee and the Ohio Valley, 95.8; Upper Mississippi Valley, 92.1; Lower Missouri Valley, 91.4; Northern Pacific coast region, 91.1; Central Pacific coast region, 96.4; Southern Pacific coast region, 83.9. Of the 3,437 predictions that have been made, 76 or 2.2 per cent. are considered to have entirely failed; 52 or 1.5 per cent. were one-fourth verified; 237 or 6.9 per cent. were one-half verified; 36 or 1.1 per cent. were three-fourths verified; 3,036 or 88.3 per cent. were fully verified, so far as can be judged from the tri-daily weather maps.

Cautionary signals.—One hundred and forty-three cautionary signals were displayed, of which 135 or 94.4 per cent. were justified. One hundred and ten cautionary off-shore signals were displayed, and of these 109 or 99.1 per cent. were justified as to direction; 98 or 89.1 per cent. were justified as to velocity. Of the cautionary off-shore signals, 72 were changed from cautionary. Two hundred and fifty-three signals of both kinds were displayed, of which 233 or 92.1 per cent. were fully justified. The above does not include signals ordered at 45 display stations where the velocity is only estimated and not measured. Forty cases were reported of winds of 25 miles or over where signals were not ordered.

NAVIGATION.

In the table, on the right side of Chart No. III, are given the highest and lowest readings, on the Signal Service river-gauges during the month, with dates of same.

Ice on rivers and lakes.—*Missouri.*—Omaha, 28th, river frozen during month, ice giving away along banks, teams have ceased to cross, but foot-passengers cross daily with safety. Leavenworth, 7th, ice in river weakening; 10th, ice-gorge below city broke in the afternoon; 11th, 26th, river full of floating ice. Brunswick, river has been frozen over since December 20; February 7, ice began to move, melted gradually and caused no damage; river closed seven miles above here. *Kansas River.*—Kansas City, Mo., 1st and 9th, floating ice; 10th, river clear; 14th, ice moving until 4 p. m., then closed; 19th, river open; 26th and 27th, floating ice; 28th, river clear. *Magnoketa River*—Monticello, Iowa, 1st, ice in river 24 inches thick. *Mississippi*—Muscatine, Iowa, 10th, 12th, 14th, teams crossing on the ice; this has continued for past fifty days. Keokuk, 24th,

ice above the bridge nearly all broken and heaping up along the shores; ice south of the bridge yet solid. Saint Louis, heavy ice in river 1st, 2d, 12th, 13th, 15th to 18th, 27th; light ice 3d, 11th, 19th to 21st, 28th; river clear 4th, 5th, 6th, 7th, 8th, 9th, 10th, 22d to 26th; 14th, river full of floating ice, navigation temporarily suspended; 27th, heavy ice in river and running slowly; 18th, navigation resumed. La Crosse, 28th river frozen during month, teams crossing continually. Saint Paul, river frozen during month, teams crossing every day. Cairo, 15th, 16th, 17th, floating ice in river. *Ohio*—Wellsburgh, W. Va., 1st, navigation resumed; 6th, large quantities of shore ice, river almost clear of floating ice; 7th, clear of ice; 15th to 18th, full of floating ice, navigation suspended; 19th, full of floating ice, but steamers of the first class running; 22d, navigation suspended except to first-class steamers; 28th, river rising and full of floating ice. Cincinnati, 2d, drift-wood and floating ice in river; 14th, canal frozen over, shore ice forming along river; 18th, small quantities of soft ice in river; 19th, some ice in river but not enough to obstruct boats; 20th, considerable ice in river, boats found difficulty in forcing their way through it; 21st, heavy floating ice in river; 22d, 23d, small quantities of floating ice. *Tennessee River*—Chattanooga, 2d, thick ice in river. *Miami River*—Cincinnati, 14th, floating ice in river. *Licking River*—Cincinnati, 14th, floating ice in river. *Allegheny River*—Pittsburgh, 15th, 26th, 27th, 28th, large quantities of floating ice in river. *Monongahela River*—Morgantown, W. Va., 16th, large quantities of floating ice in river. Pittsburgh, 26th, 27th, 28th, floating ice in river. *Susquehanna River*—Catawissa, Pa., north branch closed during the month, ice 8 or 10 inches thick. *Delaware River*—Trenton, N. J., ice in river broken up, having been closed for 46 days; 15th, river frozen again. *Hudson River*—Garrisons, N. Y., 28th, river still closed with ice. *New Jersey coast*—Long Branch, 11th, the vast field of ice which has filled the "Horseshoe" for over a month has been moving away gradually for the past two days. Last night the remaining portion, containing many thousand acres, moved slowly out with the tide. *Flushing Bay*—Flushing, N. Y., 13th, bay open, tug-boat passed through with cargo of coal; 15th, bay closed; 26th, reopened by a channel being sawed through the ice, tug-boat arrived with coal; 28th, another boat arrived with coal. *Deerfield River*—Rowe, Mass., 12th, ice passed out. *Otta Quechee River*—Woodstock, Vt., 12th, breaking up; 13th, river clear. *Lake Superior*—Duluth, 1st to 5th, harbor frozen over, and also lake as far as the eye can reach, average thickness, 14 inches; Marquette, 5th, ice in harbor. *Lake Michigan*—Grand Haven, 26th, lake frozen as far as the eye can reach, though the Milwaukee boats still keep a channel through it. *Grand Traverse Bay*—Northport, Mich., bay all open outside of harbor. *Grand River*—Grand Haven, Mich., river still full of floating ice. *Lake Geneva*—Bloomfield, Wis., 4th, ice 25 inches thick. *Saint Clair River*—Port Huron, Mich., 13th, ice so thick that the Grand Trunk Railroad Company are compelled to blast it by exploding sunken torpedoes in order to make a passage for their ferry-boats. *Detroit River*—Detroit, 2d, ice along the shore. *Lake Erie*—Cleveland, 1st, large floes of floating ice moved toward the shore by the prevailng N.W. winds; 2d, floating ice as far as the eye can reach; 4th, lake covered with floating ice; 8th, lake frozen out to a great distance, very thick near shore; 11th, ice firm on lake; 12th, ice breaking up; 15th, lake frozen; 17th, ice still firm; 18th, lake covered with ice; 22d, ice breaking up. *Sandusky Bay*—Sandusky, 28th, ice in middle of bay 20 inches thick, loaded wagons and sleds crossed over to the Peninsula and Johnson's Island. *Lake Champlain*—West Charlotte, Vt., 1st, lake frozen over; 2d, crossing on the ice; 4th, ice-boats crossed; 10th, lake open near Four Brothers' Island; 12th, open from Hillsborough Point, N. Y., to Hill Point, Vt., and north to the islands; 15th, lake closed, people crossing; 16th, teams crossed for first time; 25th, cutting ice 12 inches thick. *Mount Desert Sound*—Mount Desert, Me., 1st, frozen over.

High tides.—Cape Lookout, N. C., 8th, 19th.

TEMPERATURE OF WATER.

The *temperature of water*, as observed in rivers and harbors, with average depth when observations were taken, are given in table on Chart No. II. At Alpena, Buffalo, Burlington, Cleveland, Escanaba, Grand Haven, Sandusky, and Toledo no observations were made on account of ice. At the following stations observations were only made on the dates indicated: Chicago, 1st, 13th, 17th to 25th, 28th; Detroit, 1st; Duluth, 1st to 5th; Marquette, 1st to 4th; Milwaukee, 8th to 17th; New York City, 6th to 13th, 20th, 21st, and 26th.

ATMOSPHERIC ELECTRICITY.

Thunder-storms.—7th, Florida. 8th, Florida. 9th, Mississippi. 10th, Missouri, Mississippi, Louisiana, Texas. 11th, Florida, West Virginia, Georgia, North Carolina. 14th, Idaho. 16th, Texas. 17th, Florida, Alabama, Louisiana, Georgia. 18th, Alabama Georgia, Louisiana, North Carolina, Florida, South Carolina. 22d, Alabama, Indiana Louisiana, Mississippi, Texas, Missouri, Illinois, Tennessee, Kentucky. 23d, Florida

Mississippi, Texas, Alabama. 25th, Illinois, Indiana, Tennessee, Mississippi, Louisiana. 26th, Mississippi, Texas, Virginia, and Connecticut.

Auroras.—Monticello, Iowa, 22d; Topeka, Kans., 2d; Mechanics Falls, Me., 13th; Cambridge, Mass., regularly looked for each evening at 8 p. m., except the 10th, but none seen; observations hindered by clouds on the 3d, 5th, 6th, 11th, 16th to 20th, 22d, 23d, 25th, 26th; partially cloudy in the north, 1st, 13th, 27th; moonlight, 1st, 2d, 4th, 7th, 8th, 27th, 28th; evenings on which the aurora might have been seen, if present, 9th, 12th, 14th, 15th, 21st, 24th; Atco, N. J., 28th; Cape Vincent, N. Y., regularly looked for each evening at 8 p. m., but none observed; Pembina, Dak., 11th, 14th; Coalville, Utah, 13th.

OPTICAL PHENOMENA.

Solar halos.—1st, Iowa, Maine, Indian Territory. 2d, Iowa, Florida, Connecticut. 3d, Iowa, Maine, Nebraska, Pennsylvania, Utah, Dakota. 4th, Indiana, Michigan, Pennsylvania, Dakota, Ohio, Georgia. 5th, Illinois, Iowa, Maine, Massachusetts, New Hampshire, New York, Dakota. 6th, Connecticut, Maine, Massachusetts. 7th, Connecticut, Maine, Texas, Dakota, Tennessee. 8th, Kansas, Utah, Dakota, Texas, Minnesota, New Mexico. 9th, Indiana, Iowa, Michigan, Mississippi, Ohio, North Carolina, Georgia. 10th, Illinois, Indiana, Michigan, Mississippi, New Jersey, New York, Ohio, Pennsylvania, Texas, Iowa, Dakota, Georgia, North Carolina, Virginia. 11th, Iowa, Maine, Dakota. 12th, Kansas, Iowa, Nebraska, Dakota, Minnesota, Georgia. 13th, Illinois, Iowa, Michigan, Minnesota, Georgia. 14th, Illinois, Indiana, Iowa, Mississippi, Nebraska, Texas, Dakota. 15th, Indiana, Iowa, Illinois. 16th, Connecticut, Iowa, New Jersey, New York, Pennsylvania, Ohio, Virginia. 17th, Maine, Michigan, New York, Vermont, Dakota. 18th, Michigan, New York. 19th, Illinois, Iowa, New York, Dakota, Minnesota, Georgia. 20th, Utah, Ohio, Georgia. 21st, Nebraska, New Hampshire, Nevada, Iowa. 22d, Connecticut, Maine, Mississippi, New Hampshire, New York, Utah, Texas, Iowa, Ohio. 23d, Illinois, Kansas, Massachusetts, Nebraska, New Hampshire, Tennessee, Dakota, Iowa, North Carolina, Maine. 24th, Indiana, Michigan, New Hampshire, Ohio, Dakota, Georgia. 25th, Iowa, Nebraska, New Hampshire, Dakota, Ohio, Georgia. 26th, Illinois, Iowa, Nebraska, Tennessee, Texas. 27th, Iowa, Ohio, Virginia, Nebraska, Texas, Tennessee, Georgia, Connecticut. 28th, Illinois, Indiana, Iowa, Michigan, Ohio, Virginia, Dakota, Texas, Tennessee.

Lunar halos.—1st, Maine, Michigan, New Hampshire, New Jersey, New York, Pennsylvania, Vermont, Virginia, Wisconsin, New Mexico, Louisiana, Dakota, Minnesota, Tennessee, Connecticut, Rhode Island. 2d, Alabama, Illinois, Indiana, Maine, Massachusetts, Michigan, Mississippi, Nebraska, New Jersey, Ohio, Idaho, New Mexico, Dakota, Missouri, Wisconsin, Florida, Georgia, Rhode Island. 3d, Connecticut, Illinois, Indiana, Iowa, Mississippi, Nebraska, New Jersey, New York, California, Indian Territory, Dakota, Texas, Louisiana, Missouri, Wisconsin, Ohio, Florida, Virginia, New Hampshire. 4th, Nebraska, New Jersey, New York, North Carolina, Pennsylvania, Virginia, Colorado, Kansas, Dakota, Wisconsin, Ohio, Georgia, Maryland, Connecticut, Massachusetts, New Hampshire, Rhode Island, Maine. 5th, Iowa, Maine, Nebraska, Pennsylvania, Virginia, Wisconsin, Idaho, Indian Territory, North Carolina. 6th, Ohio, Vermont, Idaho, Texas, Wisconsin, New Hampshire, Maine. 7th, Iowa, Maine, California, Colorado, Texas, Dakota, New Mexico, Ohio, Virginia, New Hampshire. 8th, Indiana, Missouri, Dakota, Texas, Wisconsin, New Mexico, Ohio, Kentucky, Tennessee, Vermont. 9th, Illinois, Ohio, Tennessee, Virginia, Dakota, Iowa, Missouri, New York. 10th, Indiana, Michigan, Ohio, Tennessee, Virginia, Dakota. 11th, Kansas, Nebraska, Dakota. 12th, New Mexico. 14th, Missouri, New York, Texas. 15th, Indiana. 23d, Vermont. 24th, Pennsylvania, Nevada. 25th, Missouri, Nevada, Colorado, Georgia. 26th, Iowa, Missouri, Nebraska, Virginia, California, Colorado, Texas. 27th, Indiana, Massachusetts, Nebraska, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Virginia, California, Colorado, Texas, Tennessee. 28th, Michigan, New York, Ohio, Pennsylvania, Virginia, West Virginia.

Mirage.—New London, Conn., 24th; Pembina, Dak., 15th.

MISCELLANEOUS PHENOMENA.

BOTANICAL.—*Alabama*—Green Springs, in bloom, 1st, red maple, 20th, plums, 28th, peaches; 20th, quinces in leaf. *California*—Sacramento, in bloom, 16th, almond trees, 23d, apricots, 28th, peaches and other fruit trees in bloom. Visalia, in bloom, 22d, almond trees, 24th, peach. The past winter is considered to have been the severest on record throughout California, and the San Francisco Bulletin of February 13 gives a very complete review by counties, of the reports of the owners of orange, lemon, lime, and citron plantations. The uniform report is that in low valleys, and at a few extreme high elevations, the cold has been so severe as to injure or kill these trees, but that the vast majority of the plantations having been located on hillsides of moderate elevations, have not suffered seriously, and that the cultivation especially of orange and lemon is

hereafter to be no longer considered as an experiment in California. The lowest temperatures recorded by thermometers were frequently not so destructive as the frosts that occurred when higher temperatures prevailed. Frequently severe winds intensified the injury due to low temperatures. *Florida*—Fort Barrancas, in bloom, 2d, peaches. Houston, in bloom, 10th, roses; 19th, wild plums; 21st, peaches; 13th, farmers finished sowing oats; 25th, planting corn. *Georgia*—Forsyth, in bloom, 25th, peaches. Saint Mary's, in bloom, 10th, strawberries; 20th, peaches. Augusta, 15th, peach trees beginning to bloom; 24th, English pease up, and lettuce in the market. *Indiana*—Saint Meinrad, 27th, peaches mostly killed; grass and wheat green and promising. *Iowa*—Fort Madison, 8th, horse-radish sprouting. *Kansas*—Creswell, 18th, peach buds and trees killed. *Louisiana*—Oskaloosa, in bloom 27th, plums and violets; 28th, peaches beginning to bloom, all vegetation ten to fifteen days later than last year. *Michigan*—Litchfield, 28th, peaches not killed, fair prospect for all kinds of fruit. *Mississippi*—Brookhaven, in bloom, 1st, yellow jessamine; 17th, maple; 18th, plums; 20th, peach budswelling; 12th, crab-apple leafing. Fayette, in bloom, 21st, pears; 22d, Chinese quinces wild violets, slippery elm; 24th, wild plum and pitch pine. *Missouri*—Corning, 28th, winter wheat in fine condition. Springfield, 28th, rhubarb sprouting in the open air, blue grass and clover green, buds of early foliage bursting. Throughout the State complaints of injury to the peach crop are quite general. *Nebraska*—Clear Creek, 28th, farmers breaking and raking cornstalks preparatory to seeding. Howard, 28th, peach buds appear to be killed. *North Carolina*—Fayetteville, in bloom, 1st, japonicas and jonquils; 11th, hyacinths; 17th, flowering maple; 23d, apricot; 11th, wheat crop fine, fruit of all kinds uninjured. *Ohio*—Bethel, 25th, maple sap running. *South Carolina*—Aiken, in bloom, 24th, peaches and plums. *Tennessee*—McMinnville, in bloom, 16th, jonquils, lilacs budding. Chattanooga, in bloom, 21st, violets and crocus; 24th, forsythia. *Texas*—Melissa, 28th, ground too dry for oats to sprout, wheat needing rain very much. Austin, 28th, in bloom, peach and plums. Terrill, 20th, commenced planting corn. Gatesville, in bloom, 22d, peach and elm, grass growing. *Virginia*—Broad Oak, 28th, wheat and oats looking badly.

BIRDS.—*Martins*—Houston, Fla., 12th. *Blackbirds*—Dover Mines, Va., 22d; Geneva, Nebr., 22d. *Geese*—Fort Madison, Iowa, 11th, 24th; Oregon, Mo., 22d, 23d, 24th; Corning, Mo., 1st to 23d; Kansas City, Mo., 4th, 7th, 21st; Plattsmouth, Nebr., 4th, 9th, 10th; Flushing, N. Y., 15th; Bethel, Ohio, 25th; Ringgold, Ohio, 25th; North Lewisburg, Ohio, 28th; Jacksonburg, Ohio, 28th; Melissa, Tex., 2d, 18th; Dover Mines, Va., 23d, 26th; Howard, Nebr., 23d; Sacramento, Cal., 4th, 7th, 16th; North Platte, Nebr., 28th; Leavenworth, 22d, large flocks; Saint Mark's, Fla., 22d; Keokuk, 23d; Lynchburg, Va., 7th. *Robins*—Topeka, Kans., 23d; Sandy Springs, Md., 28th; Plattsmouth, Nebr., 4th, 24th (in large numbers); Flushing, N. Y., 16th, first appearance; Bellefontaine, Ohio, 2d; Jacksonburg, Ohio, 25th; Ringgold, Ohio, 24th, 28th, in large numbers; Broad Oak, Va., 28th; Chattanooga, Tenn., 27th. *Woodpeckers*—Monticello, Iowa, 2d, 15th, 24th. *Owls*—Monticello, Iowa, 1st, 6th; Uvalde, Tex., 16th. *Chickadees*—Monticello, Iowa, 9th, 20th, 23d. *Prairie Chickens*—Corning, Mo., 1st to 28th. *Ducks*—Corning, Mo., 1st to 28th; Beloit, Wis., 28th. *Bluejays*—Rowe, Mass., 22d, 25th; Niles, Mich., 3d, 5th; Oregon, Mo., 3d, 6th. *Wax Wings*—Rowe, Mass., 1st, 2d, 4th, 7th, 13th, 17th, 22d. *Bluebirds*—Somerset, Mass., 16th; Oregon, Mo., 3d, 6th; Jacksonburg, Ohio, 5th; Melissa, Tex., 18th; Broad Oak, Va., 28th. *Hawks*—Corning, Mo., 1st to 28th. *Crows*—Corning, Mo., 1st to 28th; Linden, N. J., 10th, 28th; Princeton, N. J., 9th, 10th; Jacksonburg, Ohio, 28th. *Sparrows*—Bellefontaine, Ohio, 28th; Augusta, Ga., 27th. *Mocking Birds*—Melissa, Tex., 24th; Fayette, Miss., 28th. *Cedar Birds*—Dover Mines, Va., 15th to 28th. *Redbird*—Oregon, Mo., 1st, 9th, 16th, 20th; Melissa, Tex., 16th, 22d. *Meadow Larks*—Fallston, Md., 23d.

MISCELLANEOUS.—*Frogs piping*—Louisville, Ill., 24th; Weldon, N. C., 11th, 25th. *Mosquitoes*—Weldon, N. C., 25th. *Locusts*—Creswell, Kans., 23d. *Butterflies*—Fayette, Miss., 19th, 21st, 22d. *Bees*—Anna, Ill., 3d; Saint Meinrad, Ind., 27th, young bees; Afton, Iowa, 21st; Litchfield, Mich., many swarms killed by the severe cold; Oregon, Mo., 2d, 3d, 7th, 21st; North Lewisburg, Ohio, 25th.

Meteors.—New Corydon, Ind., 14th, 18th; Cresco, Iowa., 17th; Fort Dodge, Iowa., 19th; Woodstock, Md., 9th; Fayette, Miss., 1st, 19th, 24th, 27th; Clear Creek, Nebr., 6th, 8th; Hector, N. Y., 15th; Palermo, N. Y., 15th; Fort Davis, Tex., 20th, 8 p. m., very bright meteor, with long trail, from northeast to southeast of station, also on the 25th; Punta Rassa, 18th, unusual number observed moving from NE. to SW; North Lewisburg, Ohio, 28th; Wytheville, Va., 14th; Indianola, Tex., 21st, 7:20 p. m., very brilliant meteor about 25° from zenith, moving to the SE.; length of path 30° or 35°; exploded at about middle of path; duration, five or six seconds; Knoxville, 26th, 9:40 p. m., very bright meteor observed 55° above the south horizon, moving SW., disappearing at about 25° above horizon; Atlantic City, N. J., 14th, 9:30 p. m., very brilliant meteor descended from a point 20° NE. of zenith; no train or fragments. Iowa, on the 17th, at 7:30 p. m., a very bright meteor was seen in Howard, Gasper and Wayne Counties.

Zodiacal light.—Southington, Conn., 9th, 12th, 15th, 21st, evenings; New Corydon, Ind., 8th, 9th, 13th, 14th, 22d, 23d, evenings; Cresco, Iowa, 8th, 13th, 14th, 15th, 16th,

21st, 22d evenings; Monticello, Iowa, 8th, 13th, 14th, evenings; Mechanic's Falls, Me., 19th, evening; Cambridge, Mass., regularly looked for each evening at 8 p. m., except the 10th; visible 9th, 12th, 13th, 14th, 15th, 21st; observations hindered by moonlight or clouds, 1st to 8th, 11th, 16th to 20th, 22d to 28th; Somerset, Mass., 9th, 10th, 12th, 14th, 15th, 21st, evenings; Fall River, Mass., 8th, 9th, 14th, 15th, 16th, evenings; Rowe, Mass., 14th, 15th, 19th, evenings; Corning, Mo., 8th, 13th, 20th, 22d, evenings; Oregon, Mo., 13th, 14th, 19th, 20th, 23d, evenings; Clear Creek, Nebr., 8th, 9th, 13th, 14th, 19th, 21st, 22d, 23d, evenings; Contoocookville, N. H., 8th, 12th, 19th, 21st, evenings; Freehold, N. J., 21st, evening; Atco, N. J., 8th, 9th, 14th, 15th, 18th, 21st, 23d, 28th, evenings, hindered by clouds or moonlight, 1st to 7th, 10th, 11th, 12th, 13th, 16th, 17th, 19th; 20th, 22d, 24th, 25th, 26th. 27th; Princeton, N. J., 8th, 21st, 23d, evenings; Waterburg, N. Y., 9th, 13th, 14th, 15th, 16th, 21st, 22d, evenings; Argyle, N. Y., 13th, 14th, 15th, 21st, evenings; Cape Vincent, N. Y., 24th, 27th, 28th, evenings; Fayetteville, N. C., 12th, 13th, 14th, 18th to 21st, evenings; Bellefontaine, Ohio, 9th, 15th, 22d, evenings, New Ulm, Tex., 8th, 12th, 19th, 20th, 26th, evenings; Wytheville, Va., 13th, 14th, 15th; 18th, 21st, 23d, evenings; Pike's Peak, looked for, but not observed, 1st to 19th, 22d, 23d, 25th, 26th, 28th; observed on the 20th, 21st, 27th, evenings; 24th, in the morning; Colorado Springs, looked for, but not observed, 1st to 28th; Keokuk, 9th; New Haven, Conn., 24th, evening; Mount Washington, looked for, but not observed, 1st, 2d, 3d to 28th. In Iowa it was observed on ten evenings.

Polar bands.—New Corydon, Ind., 9th, 22d; Gardiner, Me., 1st, 7th, 22d, 25th; Oregon, Mo., 14th; Clear Creek, Nebr., 3d, 4th, 8th, 9th, 15th, 18th, 19th, 22d, 27th; Freehold, N. J., 3d, 14th, 21st, 24th; Vineland, N. J., 27th; Thornville, Mich., 3d, 24th, 27th; Wytheville, Va., 7th, 9th, 10th, 14th, 16th, 26th, 27th; Fancy Gap, Va., 27th; Pembina, Dak., 3d.

Prarie and forest fires.—Houston, Fla., 22d, 27th; Creswell, Kans., 7th, 8th, 9th, 11th, 12th, 13th, 14th, 17th to 22d, 24th, 26th, 27th, 28th; Colorado Springs, Colo., 24th; Dodge City, Kans., 21st; Yankton, 2d, 3d, 7th, 8th, 9th, 10th, 22d, 23d, 28th; Corsicana, Tex., 22d, 26th; Saint Mark's, Fla., 1st; Independence, Kans., 2d, 3d, 9th, 11th, 12th, 14th, 19th to 28th; Graham, Tex., 8th, 9th, 10th, 22d, 23d, 24th, 27th.

Earthquakes.—*January*—United States Naval Hospital, Yokohama, Japan, 3d, 9h. 58′ a. m., sharp shock, lasting three seconds. *February*—Visalia, Cal., 4th, 0h. 8′ a. m., shock lasting five seconds, preceded by peculiar rumbling noise; 0h. 8′ 7″ a. m., second shock, much heavier than first, lasting nine seconds; the motion appeared to come from the SE. or E. This shock was felt all over the surrounding country, in many places cracking the walls and upsetting the furniture.

Sunsets.—The characteristics of the sky at sunset, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal-Corps stations. Reports for 124 stations show 3,435 observations to have been made, of which 57 were reported doubtful; of the remainder 2,825 or 82.2 per cent., were followed by the expected weather.

Sun spots.—The following monthly record of observations by Mr. D. P. Todd, Nautical Almanac Office, Washington, D. C., is communicated by Prof. S. Newcomb, U. S. N., in charge of that office:

February, 1879.	No. of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	
3—3 p. m.	0	0	0	0	0	0	0	0	
4—2 p. m.	0	0	0	0	0	0	0	0	
7—4 p. m.	0	0	0	0	0	0	0	0	
8—3 p. m.	0	0	0	0	0	0	0	0	
13—2 p. m.	0	0	0	0	0	0	0	0	
14—3 p. m.	1	2	0	0	0	0	1	2	
15—2 p. m.	0	0	0	0	0	0	1	2	Spots small and faint.
18—3 p. m.	0	0	0	0	0	0	0	0	
20—3 p. m.	0	0	0	0	0	0	0	0	
21—3 p. m.	0	0	0	0	0	0	0	0	
25—3 p. m.	0	0	0	0	0	0	0	0	
27—3 p. m.	0	0	0	0	0	0	0	0	
28—3 p. m.	0	0	0	0	0	0	0	0	

Mr. William Dawson, at Spiceland, Ind., examined the sun on the following days, but observed no spots: 2d, 3d, 4th, 7th, 8th, 9th, 13th, 18th, 20th, 22d, 23d, 26th, 27th, and 28th; on the 14th four spots and one group were seen, 15th, seven spots and one

group, 25th, four spots and one group. Mr. David Trowbridge, at Waterburg, N. Y., examined the sun on the 7th, 8th, 9th, 10th, 14th, 15th, 19th, 24th, 27th and 28th, but observed no spots. Mr. H. D. Gowey, at North Lewisburg, Ohio, reports no sun-spots during the month. Prof. Gustavus Hinrichs, of Iowa City, Iowa, observed the sun's disk on fourteen days, but saw no spots. Observations were also continued at Fort Whipple, Va., but no spots reported.

NOTES AND EXTRACTS.

Dr. Köppen, of the *Deutsche Seewarte*, publishes the following note on the mean pressure of the atmosphere in the interior of Asia: "The two most important features in the geographical distribution of the mean pressure of the atmosphere are, first, the maximum which through the whole year lies in the neighborhood of 30° to 35° north (and south) latitude on the oceans and the west coasts of the continents; and, second, the inverse relations of the continents and oceans of the temperate zones, especially the winter maximum of pressure in the interior of the continents. While there is little difficulty in determining the details of the first-named feature, since it comes directly to the knowledge of every observing navigator and without further discussion of his observations, although its theoretical explanation still leaves much to be desired—yet in respect to the second feature it is quite the reverse. The origin of this feature is easily understood as due to the great contrasts of temperature between the continents and neighboring oceans. For forty years it has been known that the barometric pressure in Southern Siberia averages twenty millimeters and more less in summer than in winter. But on account of the entire absence of measures of altitude in Siberia, determined independently of atmospheric pressure, it was not possible to accurately determine the differences in the pressure in the interior and on the coasts, or to reduce the pressure in the interior to sea-level. This uncertainty has lately been removed by the results of the Levelling Expedition conducted eastward to the sea of Baikall, at the suggestion and under the direction of the Imperial Russian Geographical Association. Some of these results have been published by Woeikof, and show that all previous assumptions as to the high pressure in winter in Southern Siberia, were considerably below the truth. Thus, the normal pressure for January, in the region east of Lake Baikall, becomes 778 millimetres (30.63 inches), or higher than anywhere else outside of Asia; and individual maxima above 800 millimeters (31.50 inches), frequently occur.

A magnetic storm occurred May 14, of which accounts have been published from various stations where regular recording instruments are kept in action. It began as shown in the following table, where the times are reduced to Greenwich:

Name.	Date.	Declination.	Horizontal force.	Vertical force.
Greenwich	14th	6 h. 5 m., a. m		
Stonyhurst	14th	6 h. 4 m., a. m		
Zikawei	14th	6 h. 4 m., a. m		
Melbourne	14th	6 h. 20? m., a. m		
Madison, Wis	14th	5 h. 58 m., a. m	6 h. 3 m., a. m	7 h. 8 m., a. m

It is not stated how much the sluggishness of the recording magnet, or other instrumental error, may have affected these figures, but it is evident that the disturbance was nearly simultaneous throughout the world, and that any investigation into the origin of such disturbances will require the use of apparatus that will record to seconds of time rather than to minutes.

Observations of temperature at distant places.—The following apparatus is adopted for keeping a record not only of underground temperatures, but by a slight modification it allows of observing the temperature of the air at points upon mountain-tops or in stationary balloons.

Several instruments have been contrived which, when buried in the earth, with wires coming from them to the surface, admit of having their temperatures observed by electrical means.

One of these is Siemen's resistance thermometer; another is Wheatstone's telegraphic thermometer, of which a description will be found in the report of the Dundee meeting of the British Association; another is Becquerel's thermo-electric apparatus, which has been employed by its inventor and his son and grandson for some forty years. It is described in the following terms in the first report of this committee (1868):

"The thermo-electric method might also be followed with great advantage. Two wires, one of iron and the other of copper, insulated by gutta-percha or some other covering, as in submarine cables, and connected at their ends, might be let down so as to bring their lower junction to the point where the temperature is to be taken, their

upper junction being immersed in a basin of water, and the circuit completed through a galvanometer. The temperature of the water in the basin might then be altered till the galvanometer gave zero indication."

Sir Wm. Thomson now adds the recommendation that, in carrying out this method, the two wires, each well covered with gutta-percha, should be twisted together; that the wires should be stout and as homogeneous as possible throughout, and that a piece of stout copper tube should be attached to the lower junction, this tube being uncovered and in close contact with the earth all round, its purpose being to insure that the junction takes the proper temperature.

It would probably be desirable, in filling up the bore, to mix clay with the original material to render it watertight, for it would be impossible to render the filling of the bore as compact as the surrounding rock.

Several pairs of wires would be buried in the same bore, with their lower junctions at different carefully-measured depths.

The upper junctions would be kept in a room provided with a steady table for a mirror galvanometer.

Rainfall.—A steady decrease in the depth of water in the upper portions of the Amazon has been observed of late years, so that navigation is sometimes impeded. It is suggested that this must be due to a general diminution of rainfall in the interior of South America, such as has been observed in other countries in connection with cosmic-phenomena.

Barometer.—John Allan Broun communicates to Nature an extract from a forthcoming work on the diurnal oscillations of the barometer. Having carefully examined the law of these oscillations at Makerston, Dublin, Greenwich, and Brussels, he concludes that the semi-diurnal oscillation is due to a cosmic cause, independent of local influences, while the diurnal oscillation shows that part of the solar action which is modified by atmospheric conditions not yet determined. The semi-diurnal oscillation is due to an action of the sun, which is repeated equally twice each day like the solar oceanic tide. The instrumental errors arising from unknown errors in the temperature and coefficient of expansion of the mercury and brass and from other sources indicated by Wild are apparently briefly referred to, and are probably quite sensible in amount and systematic periodicity in the four series here discussed.

Arctic meteorology.—Lieutenant Weyprecht and Count Wilczek propose to spend at least one year in physical observations in Nova Zembla or some other point on the north coast of Europe or Asia, and invite others to make similar observations simultaneous with their own.

The general results of the observations made by Mr. O. T. Sherman, of the Howgate expedition to Annanatook (latitude 66° 13′ 45″, longitude 67° 18′ 39″ W.), are given in the following table:

Date.	Barometer reduced to sea-level.	Temperature.			Sea-water temperature.		Precipitation.	Wind.		Cloudiness.
		Maximum.	Minimum.	Mean.	Surface.	Eighteen feet below.	Inch.	Prevailing.	Mean hourly velocity.	
1877—September	29.705	47.0	+23.0	+37.0	35	.....	8.88	NW.	5.5	0.89
October	29.743	35.2	+ 4.0	+22.8	30	.....	1.07	NW.	7.0	0.80
November	29.773	28.0	—10.0	+ 7.3	28.8	.....	1.04	W.	12.5	0.71
December	29.573	21.5	—41.0	—11.8	27.8	.....	0.98	W.	9.0	0.49
1878—January	29.595	21.5	—49.5	—17.6	28.2	.....	0.5	W.	4.2	0.44
February	29.724	11.5	—42.6	—18.0	29	29.2	0.49	W.	3.3	0.65
March	29.823	35.8	—45.0	—13.7	.....	.....	0.5	W.	4.8	0.62
April	29.993	35.4	—14.0	+10.4	.....	.....	0.77	W.	6.7	0.60
May	29.961	48.5	— 8.0	+25.6	29	29.5	1.18	SE	6.2	0.76
June	29.790	55.3	+18.0	+34.9	31.8	31.1	1.85	W.	6.6	0.79
July	29 753	52.8	+34.0	+40.0	38.2	32.4	4.18	SE.	16.6	0.77

Atmospheric electricity.—The following extract from a memoir by Prof. J. D. Everett, of Belfast, presents views held by eminent electricians:

1. In discussions relating to the electrical condition of the air at a specified point three things must be carefully distinguished—electrical density, electrical force, and electrical potential.

(*a.*) The electrical *density* at a point in the air is the quantity of electricity per unit volume with which the air at the point is charged.

(*b.*) The electrical *force* at a point is the force with which a unit of positive electricity would be acted on, if brought to the point without altering by its inductive action the previously existing distribution.

(*c.*) The electrical *potential* at a point is the work which would be done by electrical force upon a unit of positive electricity passing from the point to the earth, the movement of this unit being supposed not to disturb the pre-existing distribution.

2. Suppose an insulated conducting disc several yards in diameter, to be fixed at the distance of one yard from a perfectly level surface forming part of the earth. Let the disc receive a positive charge, the intervening air being uncharged. Then the state of this intervening air, as regards the three particulars above distinguished, will be as follows:

(*a.*) The electrical density will be zero at all points of it.

(*b.*) The electrical force at all points of it will be finite, and will be directed from the disc toward the earth.

(*c.*) The electrical potential will be nearly zero at points very near the earth, and will increase in approaching the disc, its value at points very near the disc being nearly as great as the potential of the disc, which is a constant quantity for all parts of the disc.

3. The electrical force will be nearly constant over all the region considered, except the circumferential portion. Leaving the circumferential portion out of account, and therefore regarding the force as constant, the potential at any point will be equal to the product of the force by the distance of this point from the surface to the earth; and the potential of the disc will be equal to the product of the force by the distance between the disc and the earth.

4. The general proposition of which this is a particular case is that if we travel along a line of force from any point A to any other point B, the product of the mean force by the distance traveled is equal to the difference of potentials A and B.

5. The definition of potential above given (1, *a*) tacitly assumes the potential of the earth to be zero. Strictly speaking, we have no knowledge of absolute potential, but only of difference of potential.

6. In observations of atmospheric electricity the element directly observed in potential, the potential at a point in the air.

7. Instruments for the observation and measurement of potential are called *electrometers*, which are described in the *Annuaire de la Société Météorologique de France*, volume XXV, 1877, containing a comprehensive article on atmospheric electricity by M. Alfred Angot, entitled *L'Électricité atmosphérique, d'après les travaux de Sir W. Thomson et la Conférence de M. Mascart.*

8. In every electrometer the potential which is directly measured is that of a certain insulated conductor forming part of the instrument. In order to measure the potential at a point in the air, we must first reduce this conductor to the potential which exists at that point. The apparatus for attaining this end is called a *collector.*

9. The most efficient collectors act by convection. A rapid discharge of matter is caused to take place from a projecting portion of an insulated conductor, and the matter, as it passes off, carries electricity with it until electrical equilibrium is attained.

10. In Sir William Thomson's water-dropping collector, a fine stream of water issues from the end of a long pipe, and the point in the air whose potential is attained is the point where the water ceases to be a continuous stream, and begins to be a succession of detached drops.

11. When a flame or a discharge of hot smoke is employed to collect electricity the potential attained is that of the region where the hot gases have become just cool enough to lose their conducting power, for hot gas is a conductor and cold gas is a non-conductor.

Sir William Thomson employs, in connection with his portable electrometer, matches formed of blotting-paper, steeped in nitrate of lead, dried and formed into rolls with the aid of a little gum. They burn without flame and are not extinguished by rain.

12. Some observers—notably Peltier, Quetelet, and Dellmann—have adopted an altogether different mode of observing. Instead of observing the potential at a point in the air, they have observed the density of the electricity residing on an exposed conductor connected with the earth, or, to put the matter more simply, they have observed the charge residing on the earth's surface.

13. The theoretical connection between the two modes of observation is as follows:

Suppose a large open and level area on the earth's surface to be uniformly electrified. Then the lines of electrical force over this area will be vertical up to a considerable height, and the intensity of the force will be sensibly uniform at all heights, up to that at which the charge of electricity in the air beneath is of sensible magnitude in comparison with that on the surface of the earth; for if we consider the space bounded by a vertical cylindrical tube of unit section, the charge residing on that portion of the earth which forms the base of the tube, together with the charge in the air within the tube up to any height, is equal to the force at this height, divided by 4. If the force is uniform, the potential at any height is the product of the force by the height (art. 3). The potential at a given point in the air near the earth will therefore vary directly as the charge on the earth's surface beneath it. The signs of these two quantities will, however, be opposite. If the charge on the earth's surface be negative, as is usually the case, the potential in the air will be less strongly negative or more strongly positive than that of the earth, and is therefore to be reckoned positive when we assume the potential of the earth as zero.

14. The effect of irregularities on the earth's surface, including under the name "earth" trees, buildings, and all other conductors in communication with the ground, is to make the distribution of electricity over the surface unequal, in accordance with the law that the density is greatest on the projecting parts of a conductor. The potential at a given distance from the surface, if this distance is not too great, will be nearly proportional to the density, and will therefore be greatest over the projecting parts.

15. Some observers have employed a pointed conductor for collecting atmospheric electricity. In theory, an infinitely sharp point could retain no charge, and would therefore reduce the conductor to which it belongs to the potential of the air close to the point; but actual points fall short of attaining this end by sensible and uncertain amounts. A pointed collector cannot now be regarded as a scientific instrument.

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ALBERT J. MYER,
Brigadier-General (Brevet Assigned), Chief Signal Officer U. S. A.

PAPER 38.

MONTHLY WEATHER REVIEW, MARCH, 1879.

INTRODUCTION.

In compiling the present review the following data, received up to April 14, have been made use of, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at 122 Signal Service stations and 12 Canadian stations, as telegraphed to this office: monthly journals and means, 142 and 141 respectively, from the former, and monthly means from 13 of the latter; reports from 27 special sunset stations; 205 monthly registers from voluntary observers; 55 monthly registers from United States Army post-surgeons; marine records; international simultaneous observations; monthly reports from voluntary observers in, and the local weather services of, the States of Iowa and Missouri; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

Upon Chart No. II is illustrated the general distribution of the atmospheric pressure, as reduced to sea-level, for the month by the isobaric lines. Compared with the means for March of previous years, the average pressure for the present month is lower 0.08 inch for Portland, Oreg., and from 0.01 to 0.02 for Minnesota and Red River of the North Valley. For all the other districts it averages above; California, 0.03 to 0.05; Rocky Mountains stations, from 0.05 in Montana to 0.12 in New Mexico; plains of Kansas, Nebraska, and Indian Territory, 0.10 to 0.12; Missouri Valley, 0.03 to 0.06; Mississippi Valley (except Minnesota), 0.02 at La Crosse to 0.09 at Cairo; Gulf States, 0.05 to 0.08; Ohio Valley and Tennessee, 0.07 to 0.09; Upper Lake region, 0.00 to 0.08; Lower Lake region, 0.06 to 0.12; South Atlantic States, 0.04 at Charleston to 0.15 at Cape Hatteras; Middle Atlantic States, 0.06 to 0.12; New England, 0.11 to 0.16 inch.

The local barometric ranges for the month are as follows: California, least, from 0.42 inch at San Diego to 0.67 at Red Bluff; Western Plateau, 0.60 at Pioche to 0.90 at Boise City; Rocky Mountains, 0.55 at Fort Craig to 0.87 at Virginia City; Portland, Oreg., 1.19; Gulf States, 0.50 at Key West to 0.90 at Saint Mark's, 0.68 at New Orleans, and 1.19 at Fort Stockton; Tennessee and the Ohio Valley, 0.83 at Cairo to 1.01 at Knox-

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WAR DEPARTMENT WEATHER MAP.
SIGNAL SERVICE, U.S.A.
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.
AVERAGE PROGRESS OF AREAS OF LOW BAROMETER
EAST OF THE 100TH MERIDIAN.
No. | Velocity.
I. — miles per hour.
II. 50 do.
III. — do.
IV. 32 do.
V. 23 do.
VI. — do.
VII. 34 do.
VIII. 35 do.
IX. 30 do.
X. 50 do.
XI. 50 do.
XII. 45 do.
XIII. 32 do.
XIV. 26 do.
XV. 20 do.
XVI. 30 do.
XVII. — do.
XVIII. — do.
TRACKS OF CENTRES OF AREAS OF LOW BAROMETER FOR MARCH, 1879.
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
BRIG. GEN. (BVT. ASSG'D) CHIEF SIGNAL OFFICER U. S. A.
NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7:35 A. M., the 4:35 P. M., and 11 P. M., (Washington mean time,) observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.
San Francisco
San Diego
Salt Lake City
Cheyenne
Denver
Pikes Peak
Santa Fe
Chicago
St Louis
Detroit
Toledo
Pittsburg
Indianapolis
Louisville
Nashville
Atlanta
Augusta
Charleston
Savannah
Jacksonville
Mobile
New Orleans
Galveston
Indianola
Punta Rassa
Key West
Havana
Norfolk
Kittyhawk
Cape Hatteras
Wilmington
Boston
Portland
Halifax
Quebec
Chatham
Louisbourg
Eastport
Pembina
Bismarck
Ft Sill
Denison
Shreveport
Vicksburg
Montgomery
Lake City
Cuba
Chihuahua
Durango
Mazatlan
Guaymas
Grand Haven
Milwaukee
Saugeen
Toronto
Kingston
Oswego
Rochester
Buffalo
Cleveland
Stanley
Dover
Northfield
Portland
Boston
New London
Block Island
Cape May
Pittsburg
Wheeling
Lynchburg
Knoxville
Chattanooga
Memphis
Shreveport
Galveston
Indianola
Punta Rassa
Key West
Havana
SAN DOMINGO
West 0° East
Long. West from 82° Greenwich

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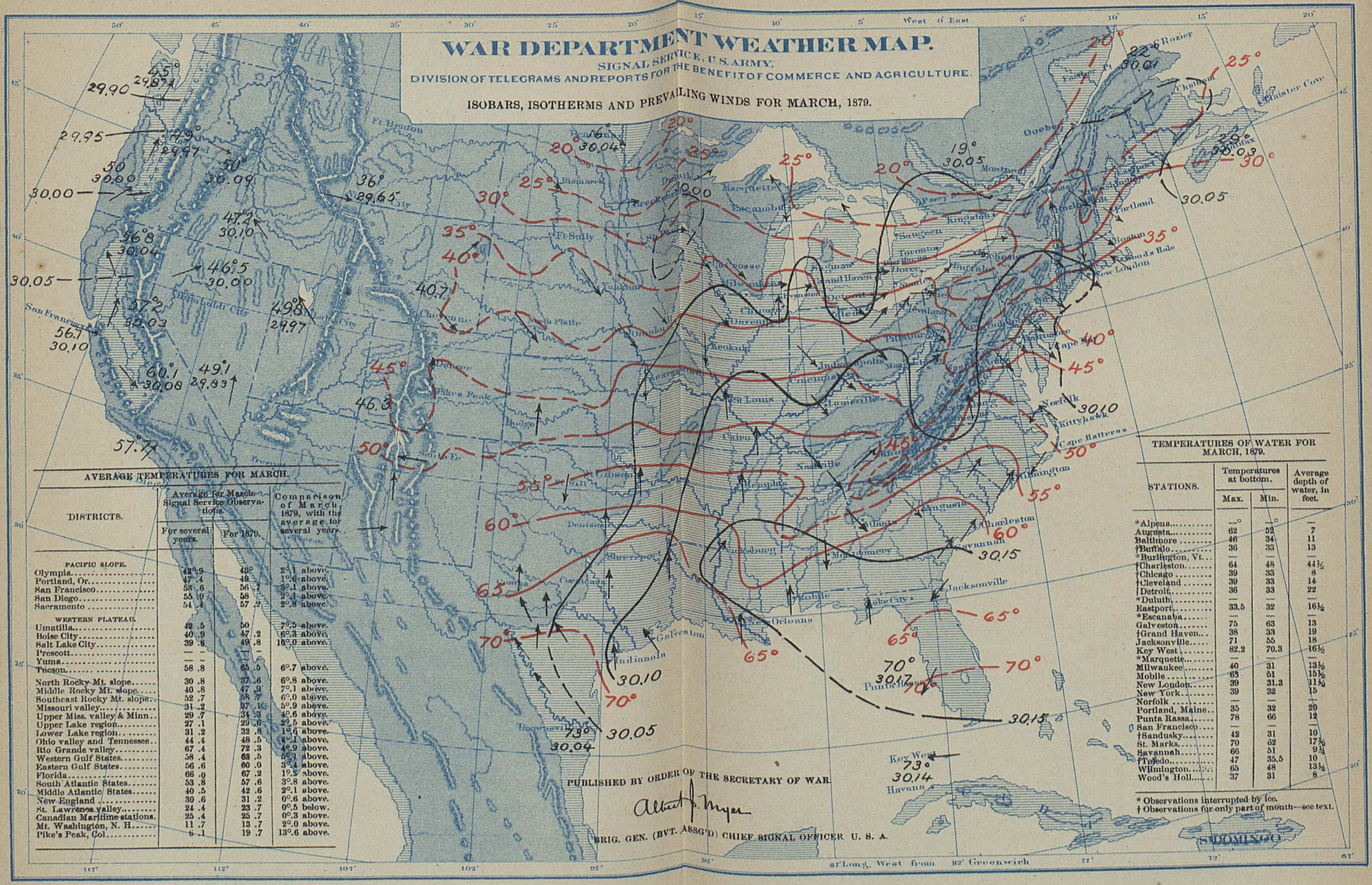

AVERAGE TEMPERATURES FOR MARCH.

DISTRICTS.	Average for March. Signal Service Observations. For several years.	Average for March. Signal Service Observations. For 1879.	Comparison of March, 1879, with the average for several years.
PACIFIC SLOPE.			
Olympia	42°.9	45°	2°.1 above.
Portland, Or.	47 .4	49	1°.6 above.
San Francisco	53 .6	56 .7	3°.1 above.
San Diego	55 .9	58	2°.1 above.
Sacramento	54 .4	57 .2	2°.8 above.
WESTERN PLATEAU.			
Umatilla	42 .5	50	7°.5 above.
Boise City	40 .9	47 .2	6°.3 above.
Salt Lake City	39 .8	49 .8	10°.0 above.
Prescott	— –	— –	
Yuma	— –	— –	
Tucson	58 .8	65 .5	6°.7 above.
North Rocky Mt. slope	30 .8	37 .6	6°.8 above.
Middle Rocky Mt. slope	40 .8	47 .9	7°.1 above.
Southeast Rocky Mt. slope	52 .7	58 .7	6°.0 above.
Missouri valley	31 .2	37 .1	5°.9 above.
Upper Miss. valley & Minn.	29 .7	34 .3	4°.6 above.
Upper Lake region	27 .1	29 .6	2°.5 above.
Lower Lake region	31 .2	32 .8	1°.6 above.
Ohio valley and Tennessee	44 .4	48 .5	4°.1 above.
Rio Grande valley	67 .4	72 .3	4°.9 above.
Western Gulf States	58 .4	63 .5	5°.1 above.
Eastern Gulf States	56 .6	60 .0	3°.4 above.
Florida	66 .0	67 .2	1°.2 above.
South Atlantic States	53 .8	57 .6	3°.8 above.
Middle Atlantic States	40 .5	42 .6	2°.1 above.
New England	30 .6	31 .2	0°.6 above.
St. Lawrence valley	24 .4	23 .7	0°.5 below.
Canadian Maritime stations.	25 .4	25 .7	0°.3 above.
Mt. Washington, N. H.	11 .7	13 .7	2°.0 above.
Pike's Peak, Col	6 .1	19 .7	13°.6 above.

TEMPERATURES OF WATER FOR MARCH, 1879.

STATIONS.	Temperatures at bottom. Max.	Temperatures at bottom. Min.	Average depth of water, in feet.
*Alpena	—°	—°	—
Augusta	62	52	7
Baltimore	46	34	11
†Buffalo	36	33	13
*Burlington, Vt.	—	—	—
†Charleston	64	48	44½
†Chicago	39	33	8
†Cleveland	39	33	14
†Detroit	36	33	22
*Duluth	—	—	—
Eastport	33.5	32	16½
*Escanaba	—	—	—
Galveston	75	63	13
†Grand Haven	38	33	19
Jacksonville	71	55	18
Key West	82.2	70.3	16½
*Marquette	—	—	—
Milwaukee	40	31	13½
Mobile	63	51	15½
New London	39	31.3	11½
New York	39	32	15
Norfolk	—	—	—
Portland, Maine	35	32	20
Punta Rassa	78	66	12
San Francisco	—	—	—
†Sandusky	42	31	10
St. Marks	70	52	17½
Savannah	66	51	9½
†Toledo	47	35.5	10
Wilmington	65	48	13½
Wood's Holl	37	31	8

* Observations interrupted by ice.
† Observations for only part of month—see text.

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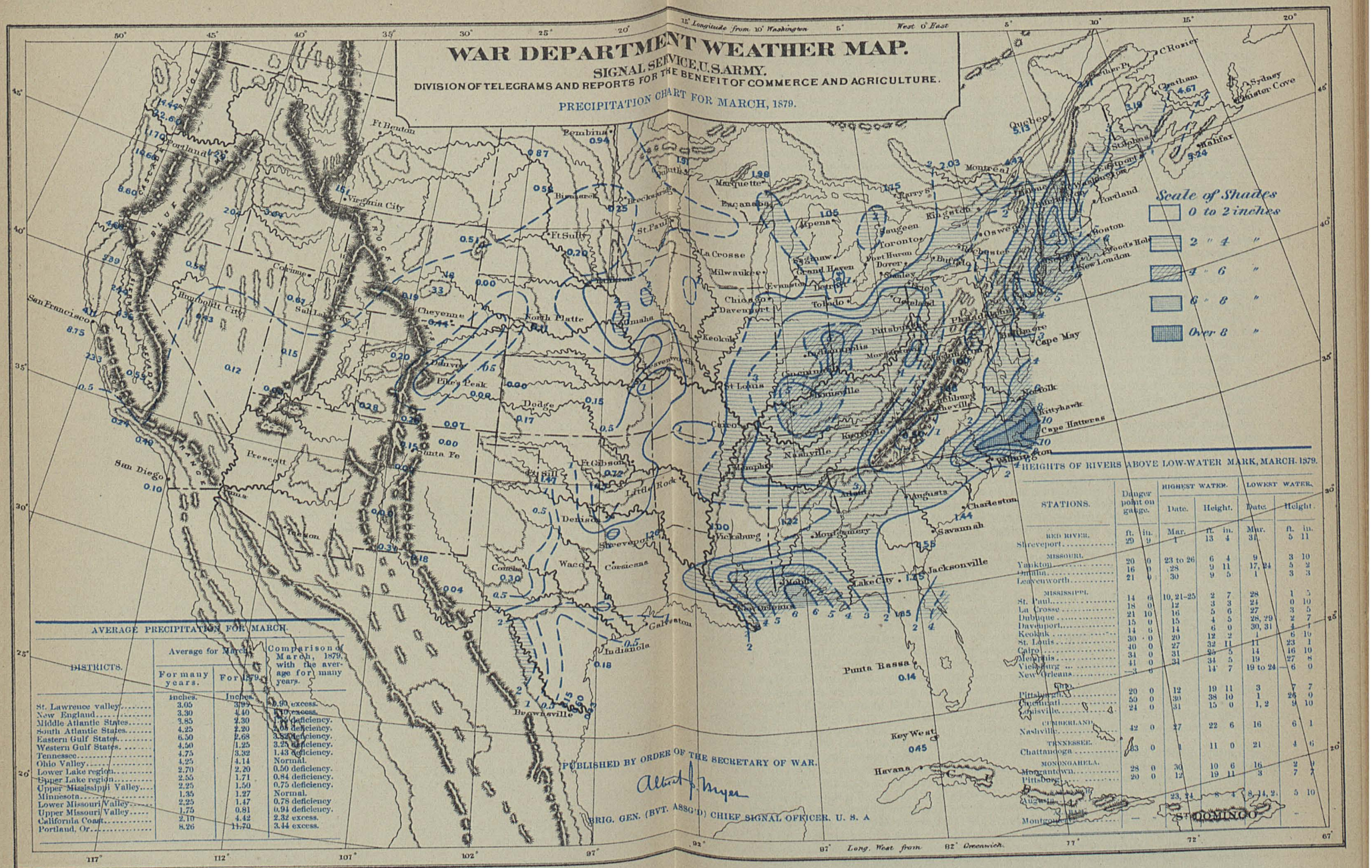
WAR DEPARTMENT WEATHER MAP.

SIGNAL SERVICE, U.S. ARMY.

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

PRECIPITATION CHART FOR MARCH, 1879.



AVERAGE PRECIPITATION FOR MARCH.

DISTRICTS.	Average for March: For many years.	Average for March: For 1879.	Comparison of March, 1879, with the average for many years.
	Inches.	Inches.	
St. Lawrence valley	3.05	3.99	0.93 excess.
New England	3.30	4.40	1.10 excess.
Middle Atlantic States	3.85	2.30	1.55 deficiency.
South Atlantic States	4.25	2.20	2.05 deficiency.
Eastern Gulf States	6.50	2.68	3.82 deficiency.
Western Gulf States	4.50	1.25	3.25 deficiency.
Tennessee	4.75	3.32	1.43 deficiency.
Ohio Valley	4.25	4.14	Normal.
Lower Lake region	2.70	2.20	0.50 deficiency.
Upper Lake region	2.55	1.71	0.84 deficiency.
Upper Mississippi Valley	2.25	1.50	0.75 deficiency.
Minnesota	1.35	1.27	Normal.
Lower Missouri Valley	2.25	1.47	0.78 deficiency
Upper Missouri Valley	1.75	0.81	0.94 deficiency.
California Coast	2.10	4.42	2.32 excess.
Portland, Or.	8.26	11.70	3.44 excess.

HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, MARCH, 1879.

STATIONS.	Danger point on gauge.		Highest water. Date.	Highest water. Height.		Lowest water. Date.	Lowest water. Height.	
	ft.	in.	Mar.	ft.	in.	Mar.	ft.	in.
RED RIVER.								
Shreveport	20	9	1	13	4	31	5	11
MISSOURI.								
Yankton	20	0	23 to 26	6	4	9	3	10
Omaha	16	0	28	9	11	17, 24	5	2
Leavenworth	21	0	30	9	5	1	3	3
MISSISSIPPI.								
St. Paul	14	6	10, 21–25	2	7	28	1	5
La Crosse	18	0	12	3	3	24	0	10
Dubuque	21	10	16	5	6	27	3	5
Davenport	15	0	15	4	5	28, 29	2	7
Keokuk	14	6	14	6	0	30, 31	4	7
St. Louis	30	0	20	12	2	1	6	10
Cairo	40	0	27	32	11	11	23	1
Memphis	34	0	31	25	5	14	16	10
Vicksburg	41	0	31	34	5	19	27	8
New Orleans	3	6		14	7	19 to 24	6	0
OHIO.								
Pittsburgh	20	0	12	19	11	3	7	7
Cincinnati	50	0	30	38	10	1	26	0
Louisville	24	0	31	15	0	1, 2	9	10
CUMBERLAND.								
Nashville	42	0	27	22	6	16	6	1
TENNESSEE.								
Chattanooga	33	0	1	11	0	21	4	6
MONONGAHELA.								
Morgantown	28	0	30	10	6	16	2	0
Pittsburg	20	0	12	19	11	3	7	7
[illegible]								
Augusta			23, 24	8	4	8, 14, 2.	5	10
[illegible]								
Montgomery	—	—					—	

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

Albert J. Myer

BRIG. GEN. (BVT. ASSG'D) CHIEF SIGNAL OFFICER, U. S. A.

ville; plains of Nebraska, Kansas, and Indian Territory, 1.16 at Fort Gibson to 1.46 at North Platte; Northwest, 0.89 at Saint Louis to 1.27 at Saint Paul, 1.45 at Yankton, and 1.00 at Bismarck; Red River of the North Valley, 1.15 at Pembina to 1.39 at Breckenridge; Upper Lake region, 0.96 at Chicago to 1.26 at Marquette; Lower Lake region, 0.97 at Cleveland to 1.21 at Oswego; Middle Atlantic States, 1.26 at Fort Whipple to 1.46 at New York City; South Atlantic States, 1.03 at Jacksonville to 1.61 at Cape Hatteras; New England, 1.29 on Mount Washington to 1.38 at Burlington, 1.86 at Wood's Holl, and 1.94 at Eastport.

Areas of high barometer.—Of these eleven were sufficiently well marked to merit a description. In the Atlantic States and Florida, generally, the minimum temperatures of the month were produced by No. I on the 1st and 2d; in Dakota, Montana, Idaho, Nevada, and Utah, by No. II on the 1st; in California, by No. III on the 3d; over the northern portions of New York and New England, by No. IV on the 6th; in the Upper Mississippi and Lower Missouri Valleys and Kansas on the 14th, in the Upper Lake region, from the 15th to the 17th, and over Lake Erie, the Ohio Valley, West Virginia, Tennessee, and the Gulf States west of Georgia, from the 17th to the 19th, by No. VI.

No. I, described as No. VIII for February, was central over the Gulf of Saint Lawrence on the morning of the 1st; minimum temperature below zero from northern New England north and northeastward, and —17° at Chatham; reduced barometer at Chatham 30.84 inches, and at Sydney 0.91 above normal. During the day it disappeared in advance of low pressure No. I. Along the North Carolina coast northeast gales prevailed: Cape Lookout, 44, and Kittyhawk, 32 miles per hour.

No. II.—This high pressure area is a continuation of No. IX, described in February review. 1st, it was central in Dakota; barometer 0.52 above the normal at Yankton; a. m. minimum temperature, —28° at Fort Garry, —27° at Fort Buford, —1 at Yankton, and below freezing from thence to Washington Territory, Oregon, Nevada, northern portions of Arizona, New Mexico, Texas, and Missouri, and to the Lake region. 2d, by morning it had moved to the Lake region; barometer reduced to sea-level at Parry Sound 30.74, or 0.68 above the normal. 3d, central north of Lake Ontario, barometer averaging 0.63 above normal. During the day it rapidly passed to the New England coast; p. m. barometer at Boston 30.67, or 0.74 above normal. 4th, by morning the pressure had considerably diminished in advance of low pressure No. II, and was highest from Northern Georgia to the Middle Atlantic coast and Southern Nova Scotia. During the day it lost its identity over the Southern States as the following approached from the westward. Cautionary off-shore signals were displayed at Indianola and Galveston in anticipation of a "norther," but not justified.

No. III.—2d, in the morning the pressure was high over California, with cool, clear weather; during the day it rapidly extended eastward over the mountains, as shown by the departures from the normal of the barometric readings. 4th, morning, it was central over Nebraska and Kansas; during the day it probably united with a second area, which advanced southeastward over Manitoba, and at midnight reached from Lake Superior to Western Kentucky. 5th, central northeast of Lake Huron; at Ottawa, a. m. barometer 30.74, and minimum temperature —11°. 6th, by morning it had advanced eastward to Western Nova Scotia; barometer 30.70, or 0.81 above normal, at Halifax. The temperature fell to —12° at Chatham and Farther Point. In advance of low pressure No. IV, it disappeared eastward.

No. IV probably developed over the Lake region, night of the 6th and 7th, and then moved south and eastward, with cold, partly cloudy weather, and, along the New Jersey and New England coasts, northwest gales, where off-shore signals would have been justified. 8th, in the morning the barometric ridge extended from the Middle Atlantic States to the Saint Lawrence Valley; highest over Western New England.

No. V.—There was a decided increase in pressure over California on the 9th, which rapidly extended northeastward on the 10th, so that by midnight it was central in Western Nebraska and Southern Dakota, and where it probably united with a second high area which advanced southeastward from British Columbia. 11th, highest in Manitoba during the p. m., with the barometric ridge covering the Mississippi Valley. 12th, a. m., central over the Ohio Valley, after which it passed to the eastward over the Middle Atlantic coast, with diminishing central pressure.

No. VI.—While the pressure was considerably above the average in California and Nevada on the 11th, it rapidly rose above the normal in Washington Territory and Oregon, and extended its influence southeastward. 12th, it was central near Western Oregon; a. m. barometer at Roseburg 30.53, and 0.53 above the normal at Olympia, Wash. During the day it continued advancing east and southward across the mountains, with cold and clear weather. 13th, by night the central highest pressure reached Dakota and Nebraska, producing low temperatures and northwesterly gales throughout the Northwest and Kansas; midnight barometer at Yankton 30.67, or 0.50 above normal. 14th, a. m. minimum temperature below zero from Northern Nebraska to Montana, Dakota, and Minnesota, and —18° at Fort Garry. As it progressed southeastward to the central Mississippi Valley the central pressure diminished. 15th, in the morning a second high area appeared in the Northwest. The two combined by night and were central over North-

ern Missouri; a. m. minimum temperature —22° at Pembina. 16th, it withdrew northward to the Red River of the North, with temperature —26° at Pembina, as low pressure No. X advanced northeastward from Texas; after which it again moved southward over the Lower Missouri Valley on the 17th, where it remained nearly stationary on the 18th, with low temperatures from the Northwest to the Lake region. 19th, as low pressure No. XI advanced southeastward over Kansas, this high area rapidly withdrew to the South Atlantic coast, and thence on the 20th and 21st along the coast beyond Nova Scotia. At midnight of the 13th a "norther" was anticipated on the Texas coast, and off-shore signals hoisted, but not justified.

No. VII.—During the night of the 20th it reached Minnesota from the northward. 21st, it extended over the Lake region. 22d, crossed New England; at midnight the barometer at Sydney stood 0.53 above the normal, after which it disappeared to the eastward in advance of low pressure No. XII.

No. VIII.—21st, the pressure increased considerably in California and extended its influence eastward across the Rocky Mountains. 22d, it continued increasing, and by night it was central in Indian Territory. 23d, it advanced northeastward over the Ohio Valley to the Middle States, and disappeared on the 24th.

No. IX.—The barometers reached their highest points in Washington Territory and Oregon during the night of the 22d; 0.26 above the normal at Olympia. 23d, it rapidly advanced southeastward, and at midnight was central in Colorado. 24th, a. m. barometer 0.36 above normal at Dodge City. By midnight it was central in Southern Illinois, with barometric ridges running from thence to Lake Superior and from Southern Missouri to Central California. 25th, it continued its eastward course. 26th, in the morning it covered the Saint Lawrence Valley and eastern half of the Middle States. 27th, by midnight it was central over the Gulf of Saint Lawrence, with increased pressure; barometer at Sydney 30.51, or 0.61 above normal. 28th, disappeared as low-pressure No. XV progressed eastward.

No. X.—It was first felt during the night of the 26th in Northern California and Western Oregon. 27th, the pressure increased from the Pacific States to Montana, Wyoming, and Colorado, with colder, clearing weather; a. m. and p. m. barometer at Roseburg 0.30 above the normal, and 0.29 at Boise City. 28th, it covered the entire region from the Pacific coast to the Missouri Valley and the Southwest, and advanced toward the last section; central in Utah; p. m. and midnight barometer at Salt Lake City 0.42 above the normal. 29th, it continued nearly stationary, but with diminishing pressure; at midnight the barometric ridge reached from Montana to New Mexico 30th, the pressure having been below the normal over the entire country from the Mississippi Valley eastward and diminished on the Pacific coast, this high area was dissipated in the Rocky Mountain region.

No XI made its appearance in Montana during the night of the 30th. On the 31st it advanced southeastward toward the Northwest and Colorado. By midnight it was apparently central in Wyoming; barometer at Cheyenne, 0.25 above normal.

Areas of low barometer.—Upon Chart No. I are shown the tracks of the centers of eighteen. An examination of the chart will show that a majority of the storms passed eastward over Washington Territory and Oregon. In some cases the tracks are indicated by broken lines, as it is impossible to definitely locate them, on account of the small number of stations in that region, from some of which reports have not yet been received. In fact, it is believed that the centers of some have crossed farther to the northward. Generally in the high country between the Pacific coast range and the Rocky Mountains the barometric range and precipitation have been comparatively small, also the winds less strong, during the progress of these disturbances. During the advance of Nos. V, VI, and VII the maximum temperatures of the month were generally produced in the Lake region and Upper Ohio Valley from the 8th to the 10th, and over the Middle States, New England, and North Carolina from the 10th to the 12th; of No. XV, throughout the Northwest, from the 26th to the 28th, and from the Lower Ohio Valley to the South Atlantic and Gulf States, except North Carolina and Texas, on the 28th and 29th; of No. XVII, from the Pacific coast eastward to New Mexico, Colorado, Wyoming, Montana, and Western Dakota, from the 29th to the 31st; of No. XVIII, in Texas on the 30th and 31st.

Nos. I and III.—The former is a continuation of No. IX, described in the February review. 1st, it moved from Wisconsin northeastward into Canada. Light snow and sleet occasionally fell from the Northwest to the Lakes, Saint Lawrence Valley, Maine, and New Brunswick. High pressure No. I quickly followed it, producing steep barometric gradients, and resulting high northwesterly winds in the Northwest and Upper Lake region. The cautionary signals displayed at Milwaukee, Grand Haven, and Ludington were justified. A barometric trough extended toward Texas, in which No. III gradually developed. Light rains were frequent from Texas to the Ohio Valley. 2d, the central depression, although considerably above the normal, advanced to West Virginia. Light rains prevailed from Missouri, Arkansas, and Tennessee northeastward, turning to snow from Iowa to Lake Erie, and from latter to Maryland and Northern Virginia. Along Lake Erie northeasterly gales occurred. The disturbance was

dissipated during the night. Maximum hourly wind velocities of NE. 27 miles at Toledo and NE. 40 miles at Cleveland were recorded, while snow was falling, but the display of cautionary signals had not been resumed on account of the suspension of navigation. Warning was sent to Toronto for the Canadian stations along the Lakes and in the Saint Lawrence Valley.

No. II.—By midnight of the 1st the pressure had reached its minimum along the coast of Washington Territory and Oregon; 0.43 below the normal at Portland; gales prevailed along the coast, with rain; Pacific Mail steamship Dakota encountered a very severe gale at night off Washington Territory, barometer 29.18 inches; at Roseburg, W. 32 miles; in Shasta Valley, California, southerly gale. 2d, it advanced into Montana, with numerous light rains in the northern half of California, Oregon, Washington Territory, Idaho, and turning to snow in Western Montana. At Mare Island navy-yard, California, the wind velocity averaged W. 54.7 miles. 3d, passed over Northern Dakota into Canada; p. m. barometer 0.37 below normal at Pembina. The rain and snow area reached the Upper Mississippi Valley. High winds occurred at Mare Island, Cal., averaging 38 miles per hour from the W.; at Winnemucca, W. 32; Salt Lake City, W. 37, with light snow; Cheyenne, NW. 36; and Dodge City, SW. 36 miles. 4th, its progress northeastward, and north of the Saint Lawrence Valley, was very rapid. Light rains were frequent from the Lakes and Ohio Valley eastward, partly changing to snow over the northern sections, with occasionally high winds: Pembina, NW. 29; Milwaukee and Alpena, SW. 27; Port Huron, SW. 32; Saugeen, S. 30; Farther Point, SW. 45 miles.

No. IV.—3d, the pressure having regained its normal again, began diminishing in Washington Territory and Oregon, reaching its minimum during the night, with rainy weather. 4th, the central depression probably advanced into Montana, with heavy rains and southerly gales, thence to the northern half of California; an average of S. 56.4 miles at Mare Island, Cal.; highest velocity, SE. 36 at Roseburg; SE. 40 at Red Bluff; SW. 35 at Winnemucca; and SE. 28 at Boise City; hurricane at some distance off the mouth of the Columbia River. 5th, by morning it was central in Northern Dakota, and later moved into Canada. Frequent light rains accompanied it from Indian Territory to the Upper Lakes, partly as snow in latter. 6th, its path was north of the Lakes, but at night changed its course southeast toward New England. From the Ohio Valley northward and eastward rainy weather or snow prevailed, with high winds or gales at places; at Alpena, NW. 36; Cleveland, S. 35. 7th, it crossed New England and passed off the coast of Nova Scotia. From its track northward snow fell, accompanying northeast backing to northwest gales; at Boston, NW. 33; Eastport, NE. 45 miles. Cautionary signals displayed on the 5th along Lake Michigan and the North Carolina and New Jersey coasts were partly justified; the off-shore signal for Eastport was ordered late.

Nos. V and VI.—After the previous storm had passed eastward from the Pacific coast, before the pressure could regain the normal, it again began diminishing on the 5th from California to Montana. At midnight the storm-center was off the coast of Oregon. Rainy weather prevailed from Washington Territory to the northern portions of Nevada and California, with frequent southerly gales: at Red Bluff, SE. 39; Mare Island, SSW. an average of 62.5 miles per hour. 6th, the central depression apparently passed up the Columbia River and into Northern Montana, accompanied by heavy rains along the coast and light rain or snow over the interior, with strong southerly winds veering to westerly; at Pioche, S. 36 miles. At Portland, a. m. barometer 29.39, or about 0.63 below normal. In northern California the heavy rains produced floods. 7th, by morning it was central in Western Dakota, as shown by the wind directions at the various stations; a. m. barometer at Bismarck, 0.52 below normal. During the day it developed into two distinct depressions, one passing northeast into Manitoba, the other southeast into Western Iowa. From Montana to Northern Utah snow and rain accompanied it; at Deadwood, S. 28 miles. While still below the normal the pressure again fell from Washington Territory to the northern half of California, with rainy weather and increasing southerly winds, and storm No. VI made its appearance; it rapidly extended its influence southeastward to Montana, Wyoming, and Colorado; high winds occurred at Red Bluff, SE. 28, and Winnemucca, SW. 28 miles. 8th, by midnight No. VI was central in Western Dakota. The peculiar course taken by the southern branch of No. V was no doubt due to the low pressure left over the elevated region to the westward, while it was high to the eastward, and to the quick succession of No. VI. From Utah to Montana and Dakota light rains were frequent, turning to snow over the northern portion, with gales at places; NW. 32 at Cheyenne. From Kansas to the Lakes and in the Middle States light rains and high winds occasionally prevailed; S. 32 at Fort Sill; SW. 32 at Dodge City; SW. 33 at Grand Haven. In Northern Pennsylvania, Western New York, and Central and Northern Ontario heavy thunder-storms are reported to have occurred, with hail in latter. 9th, the two probably united in Minnesota, and passed over Lake Superior into Canada; a. m. barometer at Breckenridge 29.41, or 0.58 below normal. Frequent rains were reported from the Northwest to the Lakes, with southerly gales over latter; SW. 36 at Milwaukee and Grand Haven; SW.

40 at Saugeen; SW. 34 at Sandusky; S. 34 at Cleveland. During the 10th the central depression passed eastward, at some distance north of the Saint Lawrence Valley, producing light rains from the Middle States northeastward. Cautionary signals were displayed from the 7th to the 9th along Lake Michigan, and justified; 8th, on Texas coast, partly.

No. VII.—Before rising to the normal, after the passage of No. VI, the barometer commenced falling night of the 7th in Washington Territory and Oregon. 8th, p. m. barometer at Portland 29.40, or 0 64 below normal; at Virginia City 0.43 below by midnight. Rainy weather prevailed from Northern California to Washington and Idaho Territories, and continued the following day, partly turning to snow toward latter, with southerly gales at many points: SE. 39 at Red Bluff, and SW. 44 at Winnemucca. 9th, as the center moved into Manitoba light snow fell from Montana to Northern Dakota, with southerly gales at places to the southward. 10th, while the central depression was north of the Lakes, in the barometric trough to the southward light rains fell from Missouri and the Ohio Valley to Southern Michigan and the Lower Lake region, except that heavy rains accompanied thunder-storms over the southern portion of this area. Southerly veering to northwest gales were produced over the Upper Lake region; W. 30 at Duluth; SW. 30 at Alpena; NW. 31 at Milwaukee; and SW. 40 at Grand Haven. 11th, by morning the center was near Quebec; barometer 0.50 below normal. During the day it moved eastward to the Gulf of Saint Lawrence. Light rains were frequent from the Central Gulf States northeastward to the Lower Lakes, Saint Lawrence Valley, New Brunswick, and Nova Scotia. After the winds shifted to west or northwest they increased in force; W. 33 at Parry Sound; W. 45 at Farther Point; W. 30 at Boston; and NW. 28 at Philadelphia and Cape May. The off-shore signals ordered on the 11th for the North Carolina and New Jersey coasts were succeeded by northwesterly gales.

No. VIII.—Strong southerly winds and frequent light rains continued from Northern California to Washington Territory on the the 9th, with increasing pressure. 10th, the barometer fell, and reached its minimum of 0.23 below the normal by midnight at Olympia. Cloudy and rainy weather continued in Washington Territory and Oregon, with southerly winds; light rain and snow in Idaho; and snow along Fraser River, British Columbia, with northeast winds. During the night the center moved northeastward into British Columbia, and on the 11th southeastward into Eastern Montana, producing light snow or rain in that section. 12th, as it progressed toward the Upper Lakes it was accompanied by brisk to high winds, and in its northern half by snow and rain: NE. 40 miles at Duluth; SW. 35 at Milwaukee, and NW. 38 at Grand Haven. 13th, it advanced to Northern New England, where it was dissipated. On Long Island Sound very rough weather was experienced. High winds occurred at Sandusky, N. 28; at Kittyhawk, SW. 31; at Cape May, S. 38; at Philadelphia, SW. 30 miles. In the barometric trough, which formed to the southward, a slight depression developed on the Gulf coast, and produced rainy weather in that section. Cautionary signals were displayed on the 13th on the North Carolina and New Jersey coasts, and followed by southerly gales at places.

No. IX formed during the night of the 13th over the Upper Lake region, where the pressure had remained below the average after the previous disturbance passed eastward, and while high pressure area No. V was advancing southeastward over the Northwest. The barometric gradient became very steep, with resulting northerly gales and frequent snow from Dakota, Minnesota, and Wisconsin to Kansas and Missouri: NW. 32 at Bismarck; NW. 35 at Breckenridge; N. 36 at Cheyenne; NE. 44 at Dodge City; NW. 30 at Omaha, and NW. 28 miles at Saint Paul. 14th, the center took an eastward course to New England. Rainy weather accompanied it in the Eastern, Gulf, and Atlantic States, and very generally snow, with winds shifting to high westerly or gales in the Lake region: NW. 36 at Milwaukee and Grand Haven; W. 32 at Parry Sound; W. 34 at Sandusky, and W. 26 at Toronto and Rochester. On Mount Washington the maximum hourly velocity of the month, 114 miles, occurred this date. During the 15th it disappeared over the Gulf of Saint Lawrence, followed by colder, clearing weather from the Lakes to the Atlantic coast, and at many points by westerly gales: Detroit, W. 27; Sandusky, W. 36; Buffalo, SW. 36; Farther Point, W. 30; Cape May, NW. 30; Boston, NW. 26 miles. Cautionary signals displayed the 13th and 14th for Lake Michigan were fully justified; the off-shore signals for the New Jersey and North Carolina coast, only partly.

No. X.—This disturbance can be traced to the Pacific coast. On the 14th the barometer fell somewhat below the normal in California, with a tendency to extend northeastward toward Montana; at Los Angelos, Cal., there was a slight fall of rain. 15th, the depression, after having advanced toward Wyoming and Colorado, took a southeasterly course toward Texas, where occasional rains fell at night. From Montana to Southwestern Dakota light snow was reported. At Winnemucca high west winds—35 miles—prevailed during the afternoon. 16th, after reaching Texas the central pressure began diminishing. As it progressed northeastward, frequent rains, accompanying thunderstorms at places, prevailed from the Western Gulf States to Arkansas, Ken-

tucky, and the Virginias, with warm southerly winds, and snow from thence to Wyoming, Nebraska, Iowa, and the Lower Lake region, with northerly winds. 17th, rainy weather prevailed from the Eastern Gulf States to Southern New England, and snow from thence northward. In the northern portions of the Middle and Eastern States the snow-storm was severe. As high pressure No. V quickly followed it the barometric gradient became steep, and high winds and gales were frequent: Indianola, NE. 46; Punta Rassa, SE. 30; Wilmington, SW. 32; Cape Hatteras, S. 35; Cape Lookout and Cape Henry, N. 44; Atlantic City and Boston, NW. 36; Portland, NE. 33; Eastport, NE. 34 miles; Halifax, S. 30 miles. Off-shore signals were hoisted for a "norther" on the Texas coast night of the 16th, and fully justified; the cautionary signals of the 16th and 17th, from North Carolina to New England, were followed by gales; Toronto was also notified for the stations in Nova Scotia, New Brunswick, and Newfoundland.

No. XI.—This storm crossed Oregon on the 18th; p. m. barometer at Portland, Oreg., 0.25 below the normal. Threatening and rainy weather prevailed from thence to California and Nevada; at Winnemucca, wind S. 36 miles. 19th, by midnight it was central in Western Kansas; barometer at Dodge City 0.34 below normal. In its northern quadrant light snow fell; in southern, light rains, with high southerly wind at Dodge City. 20th, from Nebraska eastward to the Lower Lake region northeasterly winds and snow, at places heavy, accompanied its progress; from Southern Missouri and Tennessee to the Middle Atlantic States, southerly winds and generally light rains. The central depression decreased during the day, the barometric gradient became less steep, and the winds were only fresh to very brisk. 21st, it rapidly moved northeastward off the coast of Nova Scotia. Light snows were frequent on its northern and light rains on its southern side. High winds occasionally occurred along the Texas, North Carolina, and New Jersey coasts: S. 36 at Indianola, SW. 30 at Wilmington, SW. 32 at Cape Lookout, SW. 28 at Kittyhawk, and SE. 31 at Sandy Hook. Signals were ordered the 19th for Lake Michigan; 20th for Texas coast, Lake Erie, North Carolina and New Jersey coasts, and partly verified.

No. XII.—After the previous storm had left the Pacific coast, the pressure rose very slightly before it again diminished. 19th, threatening and rainy weather and southerly winds prevailed from California to Washington Territory. At midnight the storm-center reached the coast from the westward; barometer at Portland, 0.33 below the normal; SE. 28 miles at Red Bluff. 20th, light rains were frequent as far south as Nevada and Utah and turning to snow in Montana, while the central depression moved into Montana; p. m. barometer 0.19 below normal at Virginia City. 21st, high pressure No. VI, which was advancing southeastward over the Lake region, forced it to change its direction toward Texas. Light snows were frequent throughout the Northwest, and rain areas thence to the Gulf States, with thunder-storms in Arkansas and Alabama. Northwest gales succeeded the depression in Wyoming, Colorado, and Nebraska: NW. 36 miles at Cheyenne, Denver, and North Platte. At midnight it curved to the northeastward, and rapidly moved on the 22d to Lake Ontario; a. m. barometer at Cincinnati 0.31 below normal. The area of precipitation became very extensive, and included the entire country from the Mississippi Valley eastward; from the Lake region to New England principally as snow; south and east of the Ohio Valley, frequent thunder-storms. The barometric gradient grew more steep upon its northern and eastern sides, producing gales: Sandusky, E. 32; Boston and New London, E. 28; Wood's Holl, SE. 40; Sandy Hook, SE. 35; Cape May, SE. 32; Norfolk, S. 28; Wilmington, SW. 33; Augusta, S. 30; Atlanta, S. 32. At Milledgeville, Ga., a tornado is reported to have formed, which destroyed houses, trees, &c., and carried the bridge spanning the Oconee River from its piers. 23d, it crossed Nova Scotia with northeasterly gales, and was followed in the Atlantic States by high pressure No. VI, clearing weather, and along the Middle Atlantic coast by northerly gales; at Eastport, NE. 30; Cape May, NW. 35; Cape Hatteras, NE. 33; Kittyhawk, NE. 32; Cape Lookout, NE. 31 miles. The signals ordered up the 22d along Lakes Erie and Ontario, and from North Carolina to Maine, were very generally succeeded by gales. Warnings were telegraphed for all the Canadian stations.

No. XIII.—Light rains, southerly winds, and diminishing pressure from Northern California to Puget Sound on the 21st indicated its approach, with the center at some distance to the northward. 22d, threatening and rainy weather continued as on the previous day, and extended into Montana as light snow, with high westerly winds at Umatilla and Winnemucca. 23d, as the center passed over Minnesota the p. m. barometer at Saint Paul fell 0.45 below the normal. The rain area extended to Northern Illinois and Lake Michigan, with increasing southerly winds, changing to snow along the northern side of the track, with strong easterly winds. The pressure was high to the southeastward, while it was quickly followed by high-pressure No. VIII; northwesterly gales resulted from Montana and Dakota to Kansas and Northern Missouri; at Fort Keogh, Montana, NW. 33; Fort Stevenson and Yankton, Dakota, NW. 40; Cheyenne, NW. 36; North Platte, NW. 60 miles. 24th, it moved into Canada, accompanied by rain or snow. In the Lake region the winds generally veered to westerly

gales; W. 39 at Milwaukee; NW. 38 at Grand Haven; W. 29 at Port Huron; SW. 36 at Cleveland, and NW. 30 at Toronto. On the 23d signals were ordered for the Upper Lakes and Lake Erie; 27th, for Lake Ontario, and from Norfolk to Portland. Along the Lakes they were fully verified, and along the coast generally not justified.

No. XIV.—Like the preceding storm, rainy weather, southerly winds, and falling barometer from Northern California to Western Washington Territory, on the 23d, indicated its approach; heavy easterly winds in gusts and heavy rain at New Westminister, B. C.; by midnight the center had reached the coast of the latter. 24th, its course was northeastward into British Columbia; the barometers at Boise City and Virginia City did not even fall below the normals. 25th, light rains were frequently reported from Idaho to the Upper Mississippi Valley, and the center advanced to Northern Minnesota; p. m. barometer at Pembina 0.52 below normal; at North Platte the wind velocity reached NW. 48 miles. 26th, light rains were very general from the interior of the Southern States and the Middle States to the Lakes—partly as snow in two last sections. Along the Middle Atlantic coast the wind increased to gales at night: SE. 34 at Cape Hatteras; SE. 36 at Atlantic City; SE. 45 at Barnegat; SE. 48 at Sandy Hook, and SE. 35 at New York City. At Melissa, Tex., a destructive thunder and hail storm occurred in the evening. 27th, it passed over New Jersey into the Atlantic. Easterly gales prevailed from Long Island to Massachusetts, with heavy rains; E. 35 at New London; SE. 32 at Wood's Holl, and SE. 38 at Boston. On the 28 and 29th it was felt at Bermuda by strong southerly winds, with rain, veering to northwesterly, and barometer at 9 a. m. of latter date 29.77 inches. Signals were ordered the 25th for Lakes Superior and Michigan; 26th, Lakes Huron and Erie, New Jersey and North Carolina coasts; 27th, along New England coast. Along the Lakes they were partly, and along the coast fully, justified. Warnings were also sent for the Canadian stations along the Lakes on the 26th.

No. XV.—During the 25th this storm advanced from the Pacific Ocean to the coast of Washington Territory. The United States steamship Alaska reports having experienced a terrific hurricane from the southeast during the afternoon and for eighteen hours off that coast. Rainy weather prevailed in Washington Territory and Oregon all day, with south and east winds. During the night the center evidently passed over Puget Sound; the barometer at Olympia fell but 0.24 below the normal. 26th, an extensive barometric trough formed to the southward, in which southerly gales prevailed; at Winnemucca, SW. 56, and Salt Lake City, SE. 34 miles. Falling barometer, winds shifting to warmer southerly, and increasing cloudiness over the northwest indicated its approach. 27th, light rains fell as far southward as Utah, New Mexico, and Western Texas, with thunder-storms in Southern Dakota. By midnight it was central in Minnesota, with a narrow barometric trough running to Texas; p. m. barometer at Breckenridge about 0.60 below normal. Throughout the Northwest it was preceded by brisk to high southerly winds, which shifted to northwest gales in Dakota and Nebraska; SE. 36 at Breckenridge; SE. 31 at Saint Paul; NW. 32 at Yankton, and NW. 58 at North Platte. 28th, as it progressed eastward, threatening and rainy weather prevailed from the Lakes to Texas and the Ohio Valley, with frequent thunder-storms and brisk to high winds. 29th, during the day a second depression developed to the southward, which was central over Southeastern Virginia at 4.35 p. m.; p. m. barometer at Norfolk 0.53, and midnight at Montreal 0.55, below the normals. From Lake Huron, the Lower Lakes, and the Saint Lawrence Valley to the northern portion of the Gulf States, rain was frequent. High winds and gales occurred from the North Carolina to the New Jersey coast; SW. 40 at Wilmington; SW. 35 at Kittyhawk, and SE. 28 at Sandy Hook. 30th, as shown on the chart, the two united over Maine, and there lost the distinctive features, owing to the advance of storm No. XVI. On the 28th, off-shore signals were ordered for the Texas coast, and cautionary signals for Lake Erie and the New Jersey coast; 29th, warnings were dispatched for the Canadian stations in the Saint Lawrence Valley, New Brunswick, and Nova Scotia, and cautionary signals ordered to be displayed along the coast from North Carolina to Maine. The last were very generally succeeded by southerly gales; the others only partly justified.

No. XVI.—After the previous disturbance had passed northeastward the pressure continued considerably below the normal, and on the morning of the 30th a decided depression had developed in North Carolina; barometer at Wilmington 29.45, or 0.66 below the normal, southeast wind and threatening weather. By 4:35 p. m. the Cape Lookout barometer had fallen to 29.10, or 0.92 below the normal; the winds along the North Carolina coast had shifted to north and east and increased to gales, with very heavy rains. In about latitude 30° N., longitude 79° 30′ W., several vessels encountered heavy SSW. gales, which veered to NNW. and increased to hurricane force; 30° N., 70° W, very heavy westerly gales on this and following days, heavy seas stove deck-houses, sails blown away, &c.; 32° 30′ N., 77° 15′ W., heavy SW. gale veered to NW., heavy sea; 34° N., 75° 40′ W., hurricane from NNE. veered to NW. for fifteen hours; off Cape Hatteras severe NE. gale for thirty hours; 36° 10′ N., 72° 10′ W., strong SE. gale for twelve hours, suddenly changed to NNE., blew with hurricane violence, continued for thirty

hours, and backed to NW., barometer 28.30, bad cross-seas, decks swept, struck by lightning; off Hatteras, SE. gale, veered to S. and SW., suddenly shifted to WNW. and increased to a hurricane, with heavy cross-sea; 33° 45′ N., 77° 10′ W., most violent gale ever experienced; at Bermuda squally weather commenced in the evening. Maximum velocities: SW. 36 at Punta Rassa; NW. 32 at Saint Mark's and Atlanta; NW. 39 at Savannah; NW. 36 at Wilmington; N. 52 at Cape Lookout, and NE. 61 at Kittyhawk. 31st, its path was evidently farther to the eastward than as traced on the chart; at Bermuda, by noon, barometer fell to about 29.30, with heavy wind, thunder-storm and hail; 36° 30′ N., 73° W., heavy E. gale, veered to NW., increased to hurricane; 200 miles east by south from Sandy Hook, heavy S. gale, veered to NE. for two days with heavy cross-sea, barometer 28.37 inches; along the coast from North Carolina to Maine terrific NE. gales prevailed and gradually backed to NW., with snow, partly turning into rain, on the New England coast; shipping suffered very heavily, numerous vessels having been damaged, while reports have been received of the total loss of a number. Maximum velocities: N. 65 miles at Kittyhawk; N. 78 at Cape Henry; NW. 60 at Cape May; NW. 48 at Philadelphia; NW. 56 at Sandy Hook; NW. 30 at New London; NW. 48 at Wood's Holl; NW. 33 at Boston; N. 36 at Portland, and NE. 36 at Eastport. In the afternoon isobar 29.30 included an immense area—the greater portions of Nova Scotia and New England, the New Jersey coast, and thence to Bermuda. By midnight the barometer at Portland had fallen to 28.92, or 1.02 below normal; at Eastport, to 28.83, or 1.07 below normal, with heavy thunder-storm; at Halifax, to 28.95, with heavy rain and southeast wind. During the following day the center passed over Nova Scotia to the Gulf of Saint Lawrence; the p. m. barometer at Halifax fell extraordinarily low, 28.50, or 1.33 below the normal. For several days later incoming vessels report having experienced gales and high sea to the eastward of Nova Scotia. This was the most severe and destructive storm of the month. Cautionary signals were kept up the 30th along the New England coast and ordered for the North Carolina coast; also, off-shore signals for the New Jersey coast. On the 31st all signals were changed to off-shore. Warnings were continued for the Canadian stations in Nova Scotia and New Brunswick. All were well justified by the subsequent gales.

No. XVII. During the night of the 29th the pressure fell below the normal in California and Oregon. 30th, it continued diminishing, with increasing cloudiness, and extending eastward toward the Rocky Mountains. 31st, a. m. barometer at San Francisco 0.32 below normal; the central depression moved northward toward Oregon; frequent light rains fell in California.

No. XVIII probably passed southeastward over the Northwest on the 30th as a slight barometric depression. 31st, it developed into a storm-area over the Southwest, with frequent light rains thence to Tennessee, the Ohio Valley, Upper Lake region, Northwest, Wyoming, Colorado, and New Mexico. Brisk to high southerly winds prevailed in the Southwest, and high northerly winds or gales in the Northwest, where the barometric gradient became quite steep through the rapid advance of high-pressure No. X. The wind velocity reached S. 32 miles at Indianola; NE. 48 at Dodge City; NE. 32 at North Platte; N. 31 at Yankton; NW. 35 at Breckenridge, and NW. 42 at Pembina. The midnight barometer at Shreveport fell to 0.42 below the normal.

INTERNATIONAL METEOROLOGY.

On Chart No. IV are shown the probable tracks of storm-centers over the oceans, deduced from data received at this office up to April 5; and in the upper right-hand corner will be found an index to the same. In the upper left-hand corner is a small table giving the approximate wind direction and probable maximum velocities (in miles per hour and metres per second) attending the depressions on the dates named. The following is a brief notice of the same, and also of some storms over the southern hemisphere.

Atlantic Ocean.—No. I is a continuation of area No. III of the February review; it passed rapidly eastward, south of Newfoundland, on the 10th of February. On the 11th it was encountered by the steamships Ohio and Hibernian, and on this day and the 12th it prevailed as a violent storm between the meridians 50° and 25° W. On the 13th and 14th it moved southeast off the Irish coast, and high pressures, with fresh to strong westerly gales, prevailed over mid-ocean; on the latter day, and until the 18th, it was accompanied by severe gales and hurricane-winds from the Bay of Biscay to the Baltic. No. II is a continuation of area No. IV of the same review. It passed northeastward to the north of Newfoundland on February 13. From the time of the passage eastward of the preceding area to the 19th, the pressure remained quite low over the British Isles, with the center of depression apparently to the west-northwest, and it is possible that the present area moved somewhat as shown on chart; on the 20th it was over the British Isles, and on the 22d approached the Baltic. No. III is a continuation of No. VI of the same review. During February 21 and 22 it moved slowly as a very severe storm, as shown on the chart; on the 22d it passed northward over Newfoundland, and severe southerly gales were experienced as far east as 37° W.

From the 24th to the 26th it probably moved eastward, and passed to the north of Scotland on the 27th. No. IV developed in the southwest quadrant of area No. II on the 23d. No. V developed further southward, over Algeria, on the 24th. As the two latter storms moved northward they were accompanied by very severe and destructive gales over the whole of Western Europe. *South Atlantic and Indian Oceans.*—The following reports probably refer to the same storm, the center of which evidently moved eastward at a short distance to the south of the positions on the dates named: *September* 28, 1878, latitude 37° 41′ S, longitude 0° 13′ W., terrific cyclone; 30th, 40° 30′ S., 25° 20′ E., hurricane from NNW., veering to W. and SW., lasting 20 hours; *October* 5, 38° 11′ S., 59° E., hurricane from NE., NNW., and SSW., lasting three days. *Pacific Ocean.*—Storms moved in the directions indicated by the tracks Nos. I, II, III, and IV on the dates named, but reports are too meager to determine the positions of their centers with any degree approaching accuracy. No. IV was accompanied by a northerly gale and heavy rain on *February* 23, at Yokohama; barometer at 11:30 a. m., 28.97 inches. *South Pacific Ocean.*—*May* 6 and 7, 1878, severe hurricane passed over Paumota Islands, (17° S., 143° W.,) "by which 150 lives were lost, and $250,000 worth of property destroyed." *December* 9, 1878, 3° 52′ S., 167° 31′ W., barometer 29.77, E. gale; 13th, 22° 17′ S., 174° 36′ W., barometer 29.85, E. to N. gale, squally, heavy rain; 27th and 28th, Sydney harbor, New South Wales, barometer 29.56 to 29.83, cloudy and rainy weather, followed by SSE. squalls. *January* 30, 1879, 33° 53′ S., 152° 16′ E., barometer 29.73, N. gale. *Southern Ocean.*—*May* 4, 1878, 47° S., 110° E., 10 p. m., barometer fell to 28.76, with terrific NNW. gale and tremendous sea. *May* 12 to 18, 1878, very heavy W. gale off south coast of New Zealand, the barometer falling to 28.40 on the 17th. *Indian Ocean.*—*December* 12, 1878, 12° 55′ S., 99° 45′ E., "cyclone," wind veering from ESE. to S. and SW., lasting 24 hours. Ship Lady Palmerston, from Calcutta, *November* 29, and Sand Heads, *December* 1, 1878, experienced a "cyclone" in the Indian Ocean lasting seven days, and rounded Cape of Good Hope January 25, 1879, *January* 24, 1879, a "cyclone," traveling southward, was probably central about 23° S., 67° E., at midnight of the above date; it was encountered by ships John R. Worcester and Paul Jones. *February* 26, 1879, a "cyclone" passed southward east of Mauritius during the morning; at this place the wind backed from ESE. to W. SW. and attained a mean hourly velocity of 63 miles from 10:30 to 11:30 a. m.; the barometer, which had been slowly falling from the 22d to the 25th, fell very rapidly on the morning of the 26th, and reached its minimum, 29.183 (corrected and reduced), at 11:40 a. m.; rainfall, 2.54 inches. "Lloyd's agent at Freemantle, Western Australia, reports that three vessels were wrecked during hurricane (no date) at Lacepedes, vessels total loss, crews saved." *Cerro de Pasco, Peru.*—Dr. Geo. A. Ward, in forwarding meteorological reports from Pasco, gives the altitude of station as 14,400 feet above sea-level; he states that the storms of that neighborhood are exceedingly local in their effects, usually being of short duration and accompanied by much electricity. Earthquakes occasionally occur, and those reported will be found under the special heading near the end of this review. A "frosty fog" often occurs, which is considered to be productive of pulmonary diseases. The observations consist of temperatures (taken at irregular hours) and various meteorological notes for the months of May, June, August, September, October, November, and December, 1878. The following table gives the highest and lowest temperatures and number of days on which rain or snow and frosts were observed each month:

Date.	Temperatures.				No. of days.	
	Hour.	Max.	Hour	Min.	Rain or Snow.	Frosts.
1878—May	4 p. m.	60°	7 a. m.	26°	5	7
June	4:15 p. m.	44°	6 a. m.	26°	7	8
August	9 a. m.	66°	6:40 a. m.	27°	5	7
September	1:15 p. m.	56°	6:20 a. m.	36°	9	3
October	12:30 p. m.	58°	6:05 a. m.	34°	15	5
November	11:15 a. m.	57°	7 a. m.	32°	21	3
December	3:50 p. m.	57°	6 a. m.	32°	19	7

TEMPERATURE OF THE AIR.

The isothermal lines upon Chart No. II show the general distribution of the temperature of the air for the month. By a reference to the table of average temperatures upon the same chart it will be seen that the temperature for the present month averages above that for several years in all the districts, especially throughout the elevated country between the Mississippi Valley and the Sierra Nevada Mountains; Salt Lake City and Pike's Peak unusually high.

Minimum and maximum temperatures, respectively, are for *Maine*—at Portland, 10° and 55°; Gardiner, —7°, 45°; Eastport, 4°, 44°. *New Hampshire*—Mount Washington, —10°, 35°; Dunbarton, —5°, 55°. *Vermont*—Burlington, 0°, 50°; Woodstock, —10°, 55°. *Massachusetts*—Westborough, 10°, 62°; Williamstown, 3°, 51°; Boston, 8°, 61°. *Rhode Island*—Newport, 16°, 55°. *Connecticut*—Mystic, 12°, 62°; New London, 15°, 55°. *New York*—Plattsburg Barracks, —6°, 44°; Starkey, —2°, 72°; Buffalo, 13°, 64°; New York City, 29°, 72°; Schroon Lake, —12°, 52°; Nile, 0°, 60°. *New Jersey*—Princeton, 13°, 65°; Atco, 22°, 71°. *Pennsylvania*—Tioga, 8°, 64°; Pittsburgh, 19°, 77°; Philadelphia, 19°, 69°; Westchester, 15°, 67°; Tarentum, 14°, 74°; Egypt, 13°, 64°. *Delaware*—Dover, 24°, 66°. *Maryland*—Woodstock, 14°, 70°; Emmittsburg, 15°, 76°. *District of Columbia*—Washington, 21°, 75°. *Virginia*—Broad Oak, 20°, 82°; Norfolk, 29°, 79°. *West Virginia*—Helvetia, 22°, 72°; Morgantown, 23°, 74°. *North Carolina*—Highlands, 18°, 67°; Weldon, 27°, 84°. *South Carolina*—Aiken, 29°, 80°; Charleston, 35°, 78°. *Georgia*—Savannah, 38°, 85°; Atlanta, 31°, 79°. *Florida*—Jacksonville, 44°, 86°; Key West, 66°, 83°. *Alabama*—Mobile, 39°, 85°; Montgomery, 33°, 85°. *Mississippi*—Vicksburg, 32°, 84°; Brookhaven, 32°, 80°. *Louisiana*—New Orleans, 45°, 84°; Baton Rouge Barracks, 36°, 89°. *Texas*—Denison, 26°, 92°; Concho, 27°, 97°; Galveston, 45°, 85°; Clarksville, 36°, 94°; Austin, 38°, 89°; Melissa, 28°, 94°. *Ohio*—Jacksonburg, 14°, 78°; Westerville, 3°, 71°; Cincinnati, 18°, 74°. *Kentucky*—Louisville, 22°, 79°; Bowling Green, 20°, 82°. *Tennessee*—Memphis, 26°, 85°; Nashville, 22°, 81°. *Arkansas*—Mount Ida, 21°, 88°. *Michigan*—Escanaba, —10°, 57°; Alpena, —8°, 66°; Detroit, 14°, 67°. *Indiana*—Spiceland, 10°, 72°; New Harmony, 16°, 78°. *Illinois*—Peoria, 5°, 74°; Chicago, 16°, 71°; Anna, 21°, 86°. *Missouri*—Oregon, 4°, 89°; Saint Louis, 16°, 82°. *Kansas*—Morse, 2°, 84°; Holton, 8°, 90°; Topeka, 4°, 92°. *Wisconsin*—Embarrass, —6°, 65°; Madison, 5°, 68°; La Crosse, 1°, 67°. *Iowa*—Vail, —3°, 80°; Dubuque, 7°, 71°; Des Moines, 1°, 79°. *Nebraska*—Genoa, —1°, 77°; Emerson, 5°, 96°; Omaha, 31°, 82°. *Indian Territory*—Fort Sill, 21°, 95°; Fort Gibson, 24°, 88°. *Minnesota*—Duluth, —14°, 62°; Breckenridge, 24°, 69°. *Dakota*—Pembina, —26°, 52°; Yankton, —3°, 87°; Deadwood, —5°, 71°. *Colorado*—Colorado Springs, 12°, 77°; Denver, 17°, 81°; Pike's Peak, —4°, 43°. *New Mexico*—Santa Fé, 25°, 82°; Fort Union, 10°, 77°. *Wyoming Territory*—Cheyenne, 8°, 77°; Fort Fetterman, 6°, 79°. *Montana*—Virginia City, 14°, 68°. *Utah*—Salt Lake City, 28°, 77°; Fort Douglas, 25°, 80°; Kanab, 43°, 86°. *Nevada*—Winnemucca, 16°, 82°, Pioche, 25°, 77°. *Arizona*—Florence, 37°, 95°; Tucson, 39°, 90°; Phœnix, 43°, 94°. *Idaho*—Boise City, 27°, 75°. *California*—San Fransico, 47°, 77°; Los Angeles, 42°, 99°; Sacramento, 38°, 75°; San Diego, 44°, 99°; Red Bluff, 38°, 82°; Visalia, 38°, 91°; Pinceton, 40°, 85°; Salinas, 32°, 80°. *Oregon*—Portland, 33°, 73°; Eola, 32°, 76°.

Ranges of temperature.—The *monthly ranges* will appear from an examination of the minima and maxima just given. Greatest *daily ranges* vary in New England from 20° at Wood's Holl to 36° at Burlington; Middle States 23° at Cape May to 36° at New York, Washington, and Lynchburg; South Atlantic States, 20° at Cape Lookout to 38° at Augusta; Gulf States, 12° at Key West to 24° at Galveston, 26° at Mobile, 32° at Saint Marks and Vicksburg, and 39° at Corsicana; Western Texas, 28° at Laredo to 45° at Mason and Fort Concho; Ohio Valley and Tennessee, 26° at Cairo to 43° at Knoxville and 40° at Pittsburgh; Lower Lake region, 26° at Buffalo and Erie to 33° at Sandusky; Upper Lake region, 28° at Port Huron to 41° at Escanaba; the Northwest, 28° at Davenport to 43° at Breckenridge and Pembina and 49° at Yankton; Eastern slope, 41° at Fort Sill to 47° at North Platte; Rocky Mountain stations, 27° at Virginia City to 47° at Santa Fé and 51° at Fort Craig; Western plateau, 30° at Boise City to 48° at Winnemucca; California, 21° at San Francisco to 43° at San Diego; Oregon, 26° at Portland.

Frost has occurred quite frequently over the northern sections of the country; in the interior of the Southern States and Texas from the 1st to 5th, 15th to 20th, 24th, 25th, 31st; along the immediate Gulf coast on the 4th, 12th, 18th, 19th, 22d; Campo, Cal., 1st, 2d, 4th, 5th, 11th, 12th; Umatilla, Oreg., 1st, 3d, 13th, 14th, 21st; Portland, Oreg., 1st, 5th, 13th; Victoria, B. C., 5th, 7th, 21st. Not any reports have been received of destructive frosts during the month.

Frost out of ground.—Riley, Ill., 25th; Woodstock, Md., 22d; Fallston, Md., 20th.

Ground frozen.—Murphy, N. C., 31st; Waltham, Mass., 31st, two feet deep.

Ice formed in the Gulf and South Atlantic States as follows: Denison, Tex., 17th; Okaloosa, La., 18th, 19th; Charlotte, N. C., 18th; Fayette, Miss., 18th; Augusta, Ga., 2d.

PRECIPITATION.

The general distribution of the rain-fall, which includes melted snow, for the month is illustrated as accurately as possible upon Chart No. III. In the lower left-hand corner of the same will be found a table giving average precipitation of March by districts. Slight excesses have occurred in the Saint Lawrence Valley and New England; and large excesses from Eastern Washington Territory to the northern half of California, due to the frequency of low-pressure areas. It has been about normal in

Minnesota and the Ohio Valley. In the remaining sections there has been a deficiency; especially in the Southern Atlantic and Gulf States, over which a general storm has not passed during the month. The rain-fall of 0.83 inches at Tucson, Ariz., was received after the preparation of the chart.

Special heavy rains.—4th and 5th, San Francisco, 4.80 inches; Red Bluff 3.07 inches; Sacramento, 2.38 inches. 9th and 10th, Eola, Oreg., 2.20 inches. 12th and 13th, New Ulm., Tex., 2.94 inches. 13th, Fort Barrancas, Fla., 1.75 inches. 19th, Fort Barrancas, Fla., 3.65 inches. 21st, Mobile, 4.20 inches (in 9 hours). 22d, White Plains, N. Y., 2.20 inches. 23d and 24th, Eola, Oreg., 1.99 inches. 23d to 25th, Fort Stevens, Oreg, 8.05 inches. 26th and 27th, White Plains, N. Y., 2.30 inches. 26th, Melissa, Tex., 3 50 inches, (in 3 hours). 27th to 29th, Fort Stevens, Oreg., 4.40 inches.

Largest monthly rain-falls.—Fort Stevens, Oreg, 22.60 inches; Olympia, Wash., 14.44; Cape Hatteras, 12.77; Portland, Oreg., 11.70; Fort Canby, Wash, 10.92; Eola, Oreg., 10.66; San Francisco, Cal., and Fayetteville, N. C., 8.75; Roseburg, Oreg., 8.60; Mount Washington, 7.51; Cape Henry, 7.47; Saint Meinrad, Ind., 7.23; Fort Barrancas, Fla., 7.14; Newport, 6.18.

Smallest monthly rain-falls.—Kit Carson and Fort Lyon, Colo., Fort Union and Fort Craig, N. Mex., Fort Wallace, Kans., Hamilton, Nev., Saint George, Utah, none; Fort Hays and Waterville, Kans, trace; Fort Davis, Tex., 0.04 inches; Fort Leavenworth, Kans., 0.06 inches; Saint Mary's, Wyo., and Trinidad, Col., 0.07 inches; San Diego, Cal., 0.10 inches; Punta Rassa, Fla., 0.14 inches; Boerne and Indianola, Tex., 0.18 inches.

Hail.—Salt Lake City, 27th; Santa Fé, 3d; Cheyenne, 19th; Point San José, Cal., 6th; Fort Garland, Colo., 21st., 31st; Fort Columbus, N. Y., 8th, 9th; Fort Concho, Tex., 27th; Fort Fred Steele, Wyo., 3d, 19th, 20th; Fort Fetterman, Wyo., 3d; Green Springs, Ala., 26th; Olivet, Dak., 23d; Gainesville, Ga., 22d; Mount Sterling, Ill., 1st, 2d, 20th, 21st; Anna, Ill., 16th; Spiceland, Ind., 10th, 29; Cresco, Iowa, 9th, 12th; Independence, Iowa., 28th; Gardiner, Me., 31st; Sandy Springs, Md., 17th; Camp McDermit, Nev., 26th; San Francisco, 6th, 7th; Portland, Oreg., 2d; Corsicana, 26th, very severe, five miles NW. of station, stones fell to the depth of 3 inches; Somerset, Mass, 9th; New Bedford, Mass, 17th, 22d; Rowe, Mass, 14th; Fall River, Mass, 9th, 17th, 22d; Detroit, 5th; Nirvana, Mich, 12th; Brookhaven, Miss., 16th, 21st, 22d; Fayette, Miss., 22d; Genoa, Nebr., 27th; Trenton and Princeton, N. J., 8th; Vineland, N. J., 26th; Freehold, N. J., 6th, 8th; Melissa, Tex., 26th, very severe, stones drifted in some places to the depth of 2 feet; Ardenia, N. Y., 22d; Flushing, N. Y., 9th; Nile, N. Y., 8th; Murphy, N.C., 30th; Webster, N.C., 22d; Westerville, Ohio, 24th, 29th; Bellefontaine, Ohio, 26th; Jacksonburg, Ohio, 10th, 20th; North Lewisburg, Ohio, 24th; Catawissa, Pa., 22d; Battle Creek, Mich., 10th; New Westminister, B. C., 2d, 7th, 8th, 9th, 10th, 22d; Fillmore, Utah, 20th; Roseburg, Oreg., 20th.

Rainy days.—The number of days on which rain or snow has fallen varies as follows: New England, 11 to 21; Middle States, 6 to 20; South Atlantic States, 3 to 16; Gulf States, 3 to 8; Lower Lakes, 16 to 25; Upper Lakes, 11 to 17; Ohio Valley and Tennessee, 10 to 19; Upper Mississippi Valley, 12 to 18; Lower Missouri Valley, 4 to 14; Eastern Slope, 0 in Kansas to 9 in Western Dakota; Rocky Mountains, 0 in Southern New Mexico to 13 in Montana; Western Plateau, 2 in Southern Nevada to 17 in Idaho; Pacific coast, 4 in Southern California to 23 in Northwestern Oregon.

Cloudy days.—For New England the number varies from 8 to 19; Middle States, 5 to 11; South Atlantic States, 2 to 12; Gulf States, 1 to 7; Lower Lakes, 12 to 23; Upper Lakes, 9 to 13; Ohio Valley and Tennessee, 2 to 14; Upper Mississippi Valley, 3 to 10; Lower Missouri Valley, 4 to 11; Eastern Slope, 2 to 8; Rocky Mountains, 4 to 11; Western Plateau, 5 to 19; Pacific coast, 8 to 18.

Snow fell in the different districts as follows: *New England*, 1st, 2d, 4th to 9th, 11th to 23d, 25th to 31st; *Middle States*, 2d, 3d, 6th, 7th, 13th, 17th, 18th, 19th, 21st, 22d, 26th; *Ohio Valley and Tennessee*, 1st, 3d, 14th to 20th, 25th, 30th, 31st; *Lower Lakes*, 2d to 6th, 13th to 27th, 30th, 31st; *Upper Lakes*, 1st, 2d, 4th, 5th, 6th, 12th to 24th, 26th, 27th, 31st; *Upper Mississippi Valley*, 1st, 2d, 3d, 7th, 9th, 11th to 16th, 18th, 20th, 21st, 22d, 23d, 31st; *Eastern Slope*, 1st, 2d, 3d, 8th, 9th, 11th, 12th, 13th, 15th, 16th, 18th, 20th to 23d, 31st; *Rocky Mountains*, 1st to 4th, 6th to 9th, 12th, 13th, 15th to 22d, 27th, 31st; *Western Plateau*, 3d, 6th to 9th, 19th, 20th, 21st; *Oregon*, 2d, 4th, 6th, 7th, 8th; *California*, 2d, 3d, 6th to 8th; *British Columbia*, 4th, 9th, 10th, 22d.

Snow from a cloudless sky.—Madison, Wis., 14th, one-fourth inch.

Depth of snow on ground at end of month.—It varied as follows: *New England*—from 0 at Burlington and Eastport to 35 inches, and on Mount Washington, 40 inches. *Middle States*—northern portion, trace to 15 inches; at North Volney, N. Y., 0 to 4 feet deep in "openings" and 12 to 18 inches in the woods. *Lower Lake region*—0 to 3 inches. *Upper Lake region*—0 to 5 inches. *North Carolina*—observers at Murphy and Webster report snow on mountains. *California*—the Sacramento observer reports snow in the Sierra Nevada Mountains. Summit of *Pike's Peak*, 3 inches.

Droughts.—Visalia, Cal., 10th, grain crops suffering for want of rain. Campo, Cal., 31st, vegetation drying up; cattle and sheep suffering badly. Kanab, Utah, 13th, 14th, very dry, vegetation suffering; 16th, farmers watering wheat; 17th to 31st, no

rain, drought severe. Holton, Kans, 31st, ground very dry, grain crops suffering considerably. Independence, Kans, 31st, wheat, oats, and grass very much in need of rain. San Antonio, Tex., 12th. Mason, Tex., 26th, wheat crop suffering, foliage and grasses very backward. Corsicana, Tex., 18th, crops suffering in various localities west of station; 26th, drought very severe; in some sections, ten miles west of station, it is reported that no rain has fallen for ten weeks. Gatesville, Tex., 12th, first rain this year. Austin, Tex., 31st, everything suffering from a protracted and severe drought, only 9.32 inches of rain since July 1, 1878.

Floods.—Sacramento, Cal., 14th, 15th, river 23 feet and 4 inches above low-water mark, levee broken one-half mile above city, flooding the "tule" lands; also reported that far down the river crops in some instances submerged. Red Bluff, Cal., 4th, river rising very rapidly; 5th, 3 p. m., 17 feet and 10 inches above low-water mark (danger-line 20 feet); 6th, 3 p. m., 22 feet and 9 inches; 7th, river falling. Columbus, Ohio, 22d, heavy rain-storm. Scioto River overflowed, washouts on all the railroads.

RELATIVE HUMIDITY.

The average percentage of relative humidity for the month ranges as follows: New England, 68 to 76; Middle States, 52 to 77; South Atlantic States, 52 to 84; East Gulf States, 66 to 74; West Gulf States, 60 to 84; Lower Lakes, 71 to 79; Upper Lakes, 65 to 75; Ohio Valley and Tennessee, 55 to 67; Upper Mississippi Valley, 62 to 69; Lower Missouri Valley, 55 to 60; Red River of the North Valley, 75 to 89; Eastern Slope, 52 to 82; Western Plateau, 28 to 60; California, 57 to 79. *High stations* report the following not corrected for altitude: Mount Washington, 88; Pike's Peak, 39; Santa Fé, 35; Cheyenne, 44; Denver, 45; Virginia City, 55; Colorado Springs, 61.

WINDS.

The prevailing winds at the Signal Corps stations are shown by the arrows, flying with the wind, on Chart No. II. The *maximum* velocities (in miles per hour) have been given in the description of the movements of areas of low pressure. On Mount Washington the highest velocity, W. 114 miles, was recorded on the 14th; from seven observations taken daily the following results: calm at 2 observations, N. at 3, NW. at 123, W. at 33, SW. at 16, S. at 3, SE. at 20, E. at 4, and NE. at 13 observations.

Total movements of the air.—The following are the *largest* monthly movements recorded at the Signal Corps stations, viz: Pike's Peak, 18,389 miles; Cape Lookout, 13,101; North Platte, 11,081; Fort Dodge, 10,823; Cape May, 10,731; Sandy Hook, 10,652; Cape Henry, 10,518; Wood's Holl, 10,504; Cape Hatteras, 10,365; Breckenridge, 10,360; Sandusky, 10,194; Milwaukee, 9,960; Red Bluff, Cal., 9,791; Indianola, 9,683; Cheyenne, 9,121; Winnemucca, 9,096 The *smallest* are Florence, Ariz., 1,652 miles; La Messilla, N. Mex., 1,787; Nashville, 2,110; Visalia, Cal., 2,611; Los Angeles, Cal., 2,214; Deadwood, Dak., 3,284; Augusta, 3,296; Lynchburg, 3,294; Uvalde, Tex., 3,417; San Antonio, Tex., 3,441; Montgomery, 3,798 Fort Davis, Tex., 3,761.

Local storms.—Tornado in Macoupin County, Illinois, *March* 10, in the afternoon, a black cloud having the appearance of a large spinning top was seen to move in southwesterly direction. It would rise and then touch the earth sweeping everything in its path; houses, barns, trees, &c., were totally destroyed. Near Prairietown, Madison County, the storm found its first and as far as can be ascertained its only victims. A man working on his farm was raised in the air about 30 feet and carried a distance of 500 yards, resulting in death; a child was blown out of its mother's arms and killed, the father of the child and five remaining children were very seriously injured; another man had his shoulders broken: several others were injured; "houses were scattered to the winds, and farm property generally destroyed by its fury." Many persons described the storm cloud as resembling a large balloon; track about a quarter of a mile wide. Storms that uprooted trees, blew down fences, barns, &c., were experienced on the same day in the neighboring counties of Madison, Montgomery, Bond, and Clinton. Its formation was due to two conditions: 1st, a narrow barometric trough reaching from storm-center No. VII southward: 2d, the rapid advance of a high pressure area from the westward, causing a sudden shift of the wind, from southerly to northerly.

Waterspouts.—Ship India was abandoned April 1, 200 miles from the capes of the Delaware. She was caught between two waterspouts one of which passed forward, burst and fell on deck crushing it, and filled vessel with water.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily weather indications, with the telegraphic reports for the succeeding twenty-four hours, shows the general percentage of omissions to be 1.2 per cent. and of verifications to be 89.7 per cent. The percentage for the four elements have been: Weather, 92.1; wind direction, 90.0; tem-

perature, 90.3; barometer, 86.3. The percentage of verifications by geographical districts have been: New England, 89.3; Middle States, 90.5; South Atlantic States, 91.6; East Gulf States, 90.7; West Gulf States, 87.8; Lower Lake region, 91.2; Upper Lake region, 89.6; Tennessee and the Ohio Valley, 89.4; Upper Mississippi Valley, 88.1; Lower Missouri Valley, 89.1; Northern Pacific coast region, 91.1; Central Pacific coast region, 88.7; Southern Pacific coast region, 87.5. Of the 3,766 predictions that have been made, 91, or 2.4 per cent. are considered to have entirely failed; 86, or 2.3 per cent. were one-fourth verified; 346, or 9.2 per cent. were one-half verified; 228, or 6.0 per cent. were three-fourths verified; 3,015, or 80.1 per cent., were fully verified, so far as can be judged from the tri-daily weather maps.

Cautionary signals.—One hundred and ninety-nine cautionary signals were displayed during the month, of which 157, or 78.9 per cent. were justified; 81 cautionary off-shore signals were displayed, and of these 69, or 85.2 per cent. were justified as to direction; 72, or 88.9 per cent. were justified as to velocity. Of the cautionary off-shore signals 42 were changed from cautionary; 280 signals of both kinds were displayed, of which 223, or 79.6 per cent. were fully justified. The above does not include signals ordered at 47 display stations, where the velocity is only estimated and not measured. Sixty-four cases were reported of winds of 25 miles or over where signals were not ordered.

NAVIGATION.

Stage of water in rivers.—In the table, on the right-hand side of Chart No. III, are given the highest and lowest readings of the Signal Corps river-gauges for the month, with the dates. The *Red* River steadily fell throughout the month at Shreveport. In the *Savannah* River at Augusta the changes were slight, except rises of about 2 feet on the 14th and 23d. The *Cumberland*, at Nashville, fell from 18 feet 4 inches, 4th, to 6 feet 1 inch, 16th; rose to 22 feet 6 inches by the 27th; then fell to 15 feet, 31st. *Tennessee*, at Chattanooga, fell from 11 feet, 1st, to 4 feet 6 inches by 21st; rose to 6 feet 11 inches, 26th; fell to 5 feet 10 inches by 31st. *Ohio*, at Pittsburgh, rose from 7 feet 7 inches, 3d, to 19 feet 11 inches, 12th; fell to 7 feet 8 inches, 21st; rose to 10 feet 7 inches, 24th; fell to 8 feet 11 inches, 26th; rose to 14 feet 10 inches by 31st. At Cincinnati, fell from 29 feet 6 inches, 3d, to 27 feet, 6th; rose to 38 feet, 15th; fell to 28 feet, 21st; rose to 38 feet 10 inches by 30th. At Louisville, it generally rose from 9 feet 10 inches, 1st, to 13 feet 6 inches, 14th and 17th; fell to 11 feet 6 inches, 21st; rose to 15 feet, 31st. *Arkansas*, at Little Rock, changes unimportant and river low. *Missouri* was low, and the changes slight, until towards the latter part of the month it began rising from Yankton to Saint Louis. *Mississippi*, above Cairo the river was low, and the changes were slight. At Cairo, fell from 25 feet 6 inches, 1st, to 23 feet, 11th; rose to 33 feet, 27th; fell to 31 feet 10 inches, 31st. At Memphis, fell from 19 feet 10 inches, 1st, to 16 feet 10 inches, 14th; rose to 25 feet 5 inches by 31st. At Vicksburg, fell from 33 feet, 1st, to 27 feet 7 inches, 18th; rose to 34 feet, 31st. At New Orleans there was a fall of 1 foot 5 inches from the 1st to the 19th, and a rise of 1 foot the last week.

Ice on rivers and lakes.—*Yellowstone River*—Fort Buford, Dak., 9th, ice breaking up; 14th, river frozen over; 25th, floating ice. *Missouri River*—Fort Buford, Dak., 28th, ice breaking up and moving. Bismarck, 29th, ice breaking up. Fort Hale, Dak., 11th, river opened. Fort Randall, Dak., 7th, river open, floating ice; 18th, large quantities of floating ice. Yankton, 8th, ice broke up; 20th, river gorged below city; 21st, river frozen over; 23d, river open. Plattsmouth, Nebr., 6th, ice breaking up. Leavenworth, 2d, 19th, 20th, floating ice in river. *Red River of the North*—Pembina, 26th, water several feet deep on the ice; 28th, teams crossing. *Mississippi River*—Saint Paul, 9th, river closed, except near gauge; 25th, ice breaking up; 26th, river opened from St. Anthony's Falls to about three miles below Saint Paul; 27th, 28th, floating ice. La Crosse, 7th, ice thawing rapidly; 11th, ice moved out; 26th, ferry-boat made first trip, navigation fairly opened, but dangerous on account of large quantities of floating ice; 29th, first steamer left for down river. Dubuque, 5th, ice weakening; 8th, river open; 9th, floating ice; 10th, river clear, ferry-boats resumed trips; 16th, 18th, river full of floating ice: 21st, river frozen over at Eagle Point; 22d, first boat of season (from Saint Louis); 28th, first raft from up river passed down. Davenport, 8th, ice commenced moving at 6 a. m. opposite East Davenport, and at sunset the river was clear as far as visible; 10th, almost clear: floating ice, 9th, 11th, 17th, 18th, 19th; 16th, first steamer of the season (from Saint Louis); 17th, ferry-boats resumed trips; 24th, first steamer passed, going south. Burlington, 6th, ice broke up; 7th, clear; 16th, navigation opened, first steamer (from Saint Louis). Fort Madison, Iowa, 12th, first boat up river to Madison. Keokuk, 4th, ice breaking up; 5th, ice broke up south of bridge, river navigable to all points south, floating ice; 8th, first steamer (from Saint Louis), river clear. Saint Louis, 1st, river clear; 3d, slush-ice. *Monongahela River*—Morgantown, W. Va., 4th, first log-rafts of season passed down river. *Hudson River*—Albany, 27th, floating ice; 31st, several ice gorges between Albany and New York. Poughkeepsie, 16th, first boat of season from New York. New-

burg, 13th, river open. West Point, 10th, ferry-boat forced passage across river; 13th, first steamer passed up river. Garrison's, N. Y., 10th, ice broken up; 28th, disappeared from ponds. *Lake Superior*—Duluth, 12th, ice in harbor broken up by heavy winds; 13th, lake frozen over as far as visible; 15th, first departure, tug forced way through the ice with difficulty; 17th, tug returned, having succeeded in getting within 26 miles of Prince Arthur's Landing, where she landed her passengers on the ice; 31st, harbor almost free of ice. *Lake Michigan*—Grand Haven, 9th, ice along shore disappeared; 18th, harbor blockaded by ice; 20th, blockade broken up by easterly winds; navigation open. Chicago, 10th, lake shores entirely free from ice. *Lake Huron*—Port Huron, 20th, navigation opened. *Saint Clair River*—Port Huron, 6th, ice breaking up. *Detroit River*—Detroit, 31st, navigation opened, steamer arrived from New Baltimore, Mich. *Lake Erie*—Cleveland, 6th, 10th, floating ice; 13th, lake clear; 24th, navigation opened. Sandusky, 11th, lake clear, eastward as far as visible, but to the W. and NW. an unbroken field of ice from 15 to 30 inches thick; 20th, large fields of moving ice; 24th, steamers made first trips, tug sunk by heavy masses of ice, through which she tried to force a way. Buffalo, 1st, lake frozen, except in channel, clear beyond breakwater; navigation closed during the entire month. *Lake Champlain*—frozen over the entire month.

TEMPERATURE OF WATER.

The temperatures of water, as observed in rivers and harbors, with average depth when observations were taken, are given in table on Chart No. II. At Alpena, Burlington, Duluth, Escanaba, and Marquette observations were not taken on account of ice. At the following stations observations were only taken on the dates indicated: Buffalo, 20th to 31st; Cleveland, 10th to 13th, 15th to 19th, 22d to 31st; Chicago, 4th to 31st; Detroit, 5th to 31st; Grand Haven, 9th to 31st; Sandusky, 14th to 31st; Toledo, 15th to 31st.

ATMOSPHERIC ELECTRICITY.

Thunder-storms.—1st, Ohio; 3d, New Mexico; 4th, Missouri; 5th, Iowa, Illinois, Missouri; 6th, Iowa, Illinois, Indiana, Missouri, Nebraska; 7th, Kansas, Michigan, California; 8th, Michigan, New York, Kansas, Minnesota, Ohio, Iowa, Missouri, Nebraska, New Jersey, Pennsylvania, Vermont, Wisconsin; 9th, Michigan, New York, Iowa, Illinois, Ohio, Indiana, Maryland, Massachusetts, Wisconsin; 10th, Michigan, New York, Iowa, Missouri, Pennsylvania, Ohio, Kentucky, West Virginia Indiana, Illinois; 11th, New York, Alabama, Arkansas, Texas, Florida, Pennsylvania, Illinois, Tennessee, North Carolina, Ohio, Vermont, Virginia, Georgia; 12th, Indian Territory, Texas, Florida, Georgia, Michigan; 13th, Florida, Arkansas, Tennessee, Georgia; 14th, Texas, Florida, Massachusetts, New Jersey, New York, North Carolina, Pennsylvania, Virginia, Georgia; 15th, Arkansas, Texas, New Jersey, Virginia; 16th, Arkansas, Florida, Tennessee, Georgia, Mississippi, New York; 17th, Florida, Rhode Island, Virginia, Connecticut, Massachusetts, Mississippi, New Jersey; 19th, Florida; 20th, Florida, Tennessee, Nebraska; 21st, Alabama, Florida, Missouri, Illinois, Georgia, Kentucky, Mississippi, Ohio, South Carolina, Georgia, North Carolina; 22d, New York, Florida, Kentucky, Ohio, Illinois, Tennessee, Georgia, Indiana, Mississippi, New Jersey, North Carolina, Pennsylvania, South Carolina, Texas, Virginia; 23d, New York, Virginia; 24th, Virginia, Tennessee, Maryland, New Jersey, North Carolina; 25th, Dakota, Texas, Missouri, Tennessee, Indiana, Ohio, Virginia; 26th, Alabama, Utah, Texas, Missouri, Kentucky, Indiana, Illinois, Tennessee, Ohio, Virginia; 27th, Colorado, Dakota, Florida, Missouri, Minnesota, Georgia, Virginia, North Carolina, South Carolina; 28th, Indian Territory, Michigan, Nebraska, Texas, Florida, Iowa, Wisconsin, Illinois, Ohio, Indiana, Kentucky, Missouri; 29th, Iowa, Ohio, Indiana, Pennsylvania, Tennessee, Kentucky, Maryland, Mississippi, North Carolina, Texas, Virginia, West Virginia; 30th, California, Pennsylvania, North Carolina, South Carolina, Virginia; 31st, Arkansas, New Mexico, Indian Territory, Texas, Tennessee, Illinois, Maine, Nevada.

Auroras.—Cambridge, Mass., regularly looked for at 8 p. m., none seen; cloudy, 1st, 2d, 4th, 6th, 12th, 14th, 17th, 20th to 31st; moonlight, 3d, 5th, 7th, 8th; no observation, 9th. Oregon, Mo., 10th. Vevay, Ind., 14th. Starkey, N. Y., 11th, 26th. Iowa City, Iowa, 19th, 23d.

Telegraphic communication interfered with by atmospheric electricity.—Albuquerque, N. Mex., 31st; San Diego, Cal., 28th; Santa Fé, 3d, 31st; Colorado Springs, Colo., 27th, line heavily charged; Laredo, Tex., 11th, 28th; Graham, Tex., 11th, 31st; Mason, Tex., 26th; McKavitt, Tex., 12th; Castroville, Tex., 28th; Eagle Pass, Tex., 28th; Cape Lookout, N. C., 29th, instruments had to be cut out; Chattanooga, Tenn., 11th, electricity entered telegraph office, passed two arresters with loud explosion.

OPTICAL PHENOMENA.

Solar halos.—1st, New York, New Hampshire, Georgia, Oregon; 2d, Connecticut, Dakota, Iowa, Massachusetts, Michigan, New Hampshire, New York, Georgia; 3d, Massachusetts, Wisconsin; 4th, Iowa, Michigan, Missouri; 5th, New Jersey, Michigan,

Georgia, Oregon; 7th, Ohio, Michigan, Georgia, Oregon; 8th, Ohio, Georgia; 9th, Ohio, 10th, Georgia; 11th, Mississippi, Ohio, Illinois, New York; 12th, Louisiana, Mississippi, Michigan, Ohio, Indiana; 13th, Connecticut, Dakota, Iowa, Ohio, West Virginia, Indiana, Missouri, New Hampshire, New York, North Carolina, Oregon; 14th, Nebraska, Dakota, Minnesota, New Hampshire, Maine; 15th, Ohio, Illinois, Pennsylvania, Vermont; 16th, California, Connecticut, Utah, Minnesota, Ohio, Maryland, New Jersey, Virginia, Oregon; 17th, California; 18th, Connecticut, Massachusetts; 19th, Michigan, Nebraska, Oregon; 20th, Connecticut, New York, Kansas, Michigan, New Jersey, California; 21st, Utah, Wisconsin; 22d, Utah, Illinois, Maine, Massachusetts, New Hampshire, New York, Vermont; 23d, Kansas, Dakota, Iowa, Indiana, Michigan; 24th, Connecticut, Dakota, Florida, Missouri, Illinois, Iowa, Massachusetts, New Hampshire, New Jersey, New York, Vermont, Georgia; 25th, Dakota, Iowa, Missouri, Ohio, Illinois, Indiana, Georgia; 26th, Utah, New Jersey, New York, North Carolina, Connecticut; 27th, Dakota, Illinois, Ohio, South Carolina; 28th, Ohio, Indiana, Michigan; 29th, Iowa, Kansas, Oregon; 30th, Colorado, Maryland, New Jersey, North Carolina, California; 31st, Utah, Ohio, Indiana, Michigan, New Jersey.

Lunar halos.—1st, Utah, Nevada, Wisconsin, Minnesota, Michigan, New Jersey. 2d, New Mexico, Nebraska, Michigan, New York, Iowa, Massachusetts, New Hampshire, Vermont. 3d, Utah, Idaho, Nebraska, Indian Territory, Texas, Dakota, Missouri, Wisconsin, Michigan, New York, Iowa, Kansas, Massachusetts, Missouri, Vermont. 4th, Alabama, Texas, Louisiana, Iowa, Missouri, Minnesota, New York, Ohio, Tennessee, Illinois, Indiana, Kansas, Maine, Massachusetts, New Jersey, Virginia, Vermont, Georgia. 5th, California, Nebraska, New York, Ohio, Indiana, Kansas, Missouri, New Jersey, Pennsylvania, Georgia, North Carolina, Virginia, Connecticut. 6th, Colorado, Dakota, Wisconsin, Michigan, Ohio, Pennsylvania, West Virginia, Iowa, Maine, Missouri, Vermont, Oregon. 7th, Colorado, Dakota, Texas, New York. 8th, Colorado, New York, West Virginia, Michigan, Georgia. 9th, Wisconsin, New Jersey. 10th, Georgia, Maryland. 11th, Michigan, Indiana. 12th, Tennessee, Maine. 13th, Vermont. 14th, Tennessee, New York. 16th, Idaho, Wisconsin. 17th, Nebraska. 20th, Wisconsin. 23d, Utah. 25th, Mississippi. 26th, Texas, Iowa, Massachusetts, Connecticut. 27th, Iowa, Indiana, Ohio, Georgia. 28th, Dakota, West Virginia, Missouri, New Jersey, New York, North Carolina, Virginia, New Hampshire. 29th, Idaho, Dakota, Ohio, North Carolina, Oregon. 30th, Connecticut, New Mexico, Colorado, Kansas, Massachusetts, Missouri, New Jersey, New York, Georgia, Virginia, New Hampshire. 31st, Kansas, Texas, Ohio, Indiana, Missouri, New Jersey.

Mirage.—Olivet, Dak., 1st, 4th, 26th, 30th; Pembina, Dak., 24th; Breckenridge, Minn., 1st, 2d; Lynn, Mass, 6th.

MISCELLANEOUS PHENOMENA.

BOTANICAL.—*Alabama*—Green Springs, in bloom, 10th, dogwood, 15th, sassafras, 17th, red buckeye and yellow jessamine, 18th, fish poison, 28th, calycanthus, 29th, sweet gum. *Arkansas*—Mount Ida, in bloom, 6th, peach and plum, 15th, apple and pear, 22d, quince, 20th, dogwood and red oak. *Colorado*—Georgetown, 15th, few miles below station, trees in bloom and in leaf, grass 3 inches high. *Dakota*—Olivet, 6th, sowing wheat; 8th to 12th, plowing. *Florida*—Houston, 10th, corn planting begun; 31st, cotton planting commenced, Milton, all peach trees in full bloom; 6th, oak trees in blossom; 17th, small figs on trees, stalks of Irish potatoes one foot high; 31st, roses and other hardy flowers in full bloom. *Georgia*—Forsyth, 31st, vegetation ten to fifteen days earlier than for many years, corn planting begun. Augusta, in bloom, 5th, wistaria, 6th, plum, 18th, jonquils; 8th, tree buds swelling; 11th, Irish potatoes sprouting, trees leafing; 22d, asparagus, beets, and English pease in market. *Illinois*—Riley, 10th, some farmers sowing wheat. Anna, in bloom, 26th, peach. *Indiana*—Vevay, Prof. Chas. G. Boernur reports as the result of a series of fourteen years' observations (in the same exposure) upon the first flowering of the "Crocus," that "the earliest opening of the flower occurred on February 18, 1877, and the latest on March 19, 1870, being a difference of four weeks in the extremes." New Corydon, 31st, wheat, winter barley, rye and clover are in a very good condition, orchards and vineyards have not suffered by cold, pear trees will be covered with blossoms. Saint Meinrad, in bloom, 9th, crocus and tulip. *Indian Territory*—Fort Gibson, in bloom, 9th, wild plum, 10th, peach, plum, cherry and apple, 11th, wild daises and red bud, 13th, jonquils, tulips and hyacinths, 27th, forest trees leafing. *Iowa*—Vail, 10th, spring work commenced, sowing grain and plowing. Keokuk, 8th, trees budding. Dubuque, in bloom, 10th, maple, six days earlier than for thirty years. *Kansas*—Holton, in bloom, 9th, elm; 31st, most fruit thought to be killed, forest trees leafing. *Maryland*—Woodstock, 10th, grass in sheltered places beginning to grow, swamp willow budding; 22d, white maple budding, *Massachusetts*—New Bedford, 11th, in bloom, snow-drop and crocus. Fall River, in bloom, 7th, snow-drop. Waltham, 31st, buds of poplar and willow swelling. *Michigan*—Northport, in bloom, 20th, polyanthus. *Missouri*—Oregon, sprouting, 6th, tulips, 9th, dandelions, 22d, hops; in bloom, 7th, elm, 8th, red maple, 29th, crocus. *Mississippi*—

Brookhaven, 25th, second crop of strawberries ripening; 31st, finished planting corn and sugar cane, acreage of latter very large for this section, oat crop looks well, fruit crop very promising. *Nebraska*—Howard, 31st, peach trees reported killed throughout the county. *Nevada*—Winnemucca, in bloom, 21st, apricot and other fruit trees twelve miles south of station; Boise City, in bloom, 22d, yellow jessamine, 28th, apricot, 31st, peach; 1st, blackberries frozen. *New Jersey*—Atco, in bloom, 27th, moss vine. *New York*—Flushing, in bloom, 30th, yellow tulip. *New Mexico*—Santa Fé, in bloom, 27th, apricot, plum, and peach, much earlier than usual. *North Carolina*—Weldon, plums, 17th, peach, 23d, white mulberry; in bloom, 23d, peach and plum; leafing, 23d, maple and weeping willow. Murphy, in bloom, 31st, peach, pear and plum. Fayetteville, 31st, wheat and oats in fine condition, fruit uninjured. *Ohio*—Ruggles, 31st, wheat very poor, badly winter-killed. Jacksonburg, 8th, winter wheat and barley very promising. *Oregon*—Portland, in bloom, 22d, peach, 30th, plum. *Tennessee*—McMinnville, in bloom, 1st, iris, 3d, maple, 8th, wild flowers, 9th, spirea and peach, 21st, plum. Knoxville, in bloom, 11th, peach. Chattanooga, in bloom, 1st, japonicas and hyacinths, 10th, peach, 12th, pear, 26th, apple and cherry. *Texas*—Melissa, in bloom, 5th, wild flowers, some corn planted. Clarksville, 31st, corn planting nearly finished, cotton planting will soon commence, oats and barley look well, very little wheat in the county, fruit crop promises to be very abundant. Pilot Point, in bloom, 2d, peach and plum. Mason, in bloom, 26th, hawthorn. Uvalde, in bloom, 25th, china trees; 9th, trees in full leaf. *Utah*—Fort Douglass, in bloom, 18th, apricot. *Virginia*—Wytheville, in bloom, 9th, forsythia and crocus; leafing, 8th, gooseberry, 11th, lilac; budding, 8th, aspen. Dover Mines, in bloom, 1st, alder, 5th, maple, 10th, aspen, 17th, apricot, 28th, peach, 29th, cherry; 31st, vegetation very backward. Johnsontown, in bloom, 10th, crocus. *West Virginia*—Morgantown, in bloom, 8th, lilac and red maple, 10th, gooseberry. *Vermont*—East Middlebury, 28th, sugar making commenced, and trees yielding finely.

BIRDS.—*Robins*—New Corydon, Ind., 8th; Belvidere, Ill., 8th, Afton, Iowa, 9th; Vail, Iowa, 7th; Holton, Kans., 7th; Woodstock, Md., 4th; Fallston, Md., 21st; Waltham, Mass., 10th; Somerset, Mass., 1st; Fort Adams, R. I., 23d; Southington, Conn., 1st; Highland, Ill., 4th, 5th; Emory Grove, Md., 21st to 30th; New Bedford, Mass., 10th; Fall River, Mass., 11th; Springfield, Mass., 9th; Westborough, Mass., 10th; Northport, Mich., 10th; Litchfield, Mich., 1st; Detroit, Mich., 11th; Fayette, Miss., 25th; Nirvana, Mich., 28th, 29th, 31st; Thornville, Mich., 7th; Corning, Mo., 23d, 24th, 25th; Oregon, Mo., 1st, 7th; Dunbarton, N. H., 14th; Vineland, N. J., 29th; Princeton, N. J., 9th; Starkey, N. Y., 11th; Waterburg, N. Y., 13th; North Volney, N. Y., 14th; Penn Yan, N. Y., 9th; Bellefontaine, Ohio, 8th; Bethel, Ohio, 6th; Margaretta, Ohio, 9th; Cincinnati, 8th; North Lewisburg, Ohio, 10th; Tioga, Pa., 11th; Catawissa, Pa., 11th; Litchfield, Pa., 21st; Woodstock, Vt., 29th; Keswick, Va., 31st; Bloomfield, Wis., 7th; Embarrass, Wis., 28th, 29th; Wautoma, Wis., 12th; Manitowoc, Wis., 28th; Keokuk, 8th; Madison, Wis., 8th; Columbus, Ohio, 19th; Albany, 11th; Philadelphia, 11th; Saint Albans, Vt., 28th; Contoocookville, N. H., 11th; Boonsboro, Iowa, 19th; New Westminister, B. C., 11th. *Geese*—Mystic, Conn., 13th, 14th, 30th; Elmira, Ill., 7th; Riley, Ill., 8th; New Corydon, Ind., 6th, 26th; Mount Sterling, Ill., 7th; Belvidere, Ill., 8th; Afton, Iowa, 6th; Fort Madison, Iowa, 6th; Somerset, Mass., 24th; Fort Adams, R. I., 13th; Saint Meinrad, Ind., 18th; Independence, Kans., 7th, 8th, 26th; Emory Grove, Md., 12th, 24th, 27th, 29th; New Bedford, Mass., 17th, 24th, 25th; Springfield, Mass., 30th; Oregon, Mo., 5th, 6th; Corning, Mo., throughout month; Kansas City, Mo., 30th; Plattsmouth, Nebr., 17th; Emerson, Nebr., 3d; Genoa, Nebr., 7th; Starkey, N. Y., 18th, 25th; Penn Yan, N. Y., 27th; Fayetteville, N. C., 5th; Bellefontaine, Ohio, 11th; Margaretta, Ohio, 9th; North Lewisburg, Ohio, 22d; Westchester, Pa., 17th; Catawissa, Pa., 11th, 16th, 29th; Melissa, Tex., 5th; Johnsontown, Va., 13th; Wautoma, Wis., 10th; Colorado Springs, Colo., 26th; North Platte, Nebr., 5th; Omaha, 11th; Fort Gibson, 16th; Bismarck, 30th; Yankton, 2d, 8th, 14th; Corsicana, Tex., 7th, 24th, 25th; Davenport, 30th; Saint Louis, 3d; Breckenridge, 28th, 29th; Madison, Wis., 8th; Morgantown, 8th; Cairo, 5th, 6th, 7th; Burlington, Vt., 21st; Portland, Oreg., 7th, 31st; Red Bluff, Cal., 31st; Boonsboro, Iowa, 4th, 6th, 7th, 8th. *Crows*—New Corydon, Ind., 6th; Saint Mienrad, Ind., 6th; Independence, Kans., 26th; Rowe, Mass., 10th, 11th, 12th, 13th; Northport, Mich., 13th; Corning, Mo., throughout month; Genoa, Nebr., 7th; Bellefontaine, Ohio, 9th; Bethel, Ohio, 6th; Embarrass, Wis., 9th; Wautoma, Wis., 11th. *Ducks*—New Corydon, Ind., 6th; Cresco, Iowa, 11th; Vail, Iowa, 7th; Fort Hale, Dak., 27th; Emory Grove, Md., 7th, 9th, 15th, 23d; Oregon, Mo., 5th, 6th; Nirvana, Mich., 26th; Corning, Mo., throughout month; Plattsmouth, Nebr., 17th; Emerson Nebr., 4th; Genoa, Nebr., 7th; Cape Vincent, N. Y., 11th; Jacksonburg, Ohio, 1st; North Platte, Nebr., 5th; Saint Mark's, Fla., 10th; Davenport, 7th; Pembina, 7th; Dubuque, 6th, 17th, 19th; Madison, Wis., 8th. *Cranes*—Creswell, Kans., 13th; Fayette, Miss., 16th; Nirvana, Mich., 28th, 29th, 31st; Emerson, Nebr., 8th; Melissa, Tex., 24th; Fort Gibson, 2d. *Bluebirds*—Mount Sterling, Ill., 5th; Anna, Ill., 4th; Belvidere, Ill., 8th; Afton, Iowa, 6th; Fort Madison, Iowa, 6th; Morse, Kans., 5th; Woodstock, Md., 1st; Waltham, Mass., 10th; Somerset, Mass., 1st; Southington, Conn., 7th; Emory Grove, Md., 24th, 26th, 31st; New Bedford, Mass., 23d, 24th; Fall River, Mass., 10th; Springfield, Mass., 11th; Westboro, Mass., 10th; Rowe, Mass., 11th, 12th; Litchfield,

Mich., 3d; Oregon, Mo., 7th; Nirvana, Mich., 28th, 29th, 31st; Thornville, Mich., 7th; Dunbarton, N. H., 12th; Vineland, N. J., 6th; Linden, N. J., 5th; Princeton, N. J., 4th; North Volney, N. Y., 13th; Penn Yan, N. Y., 9th; Flushing, N. Y., 9th; North Lewisburg, Ohio, 23d; Tioga, Pa., 11th; Cincinnati, 8th; Catawissa, Pa., 2d; Litchfield, Pa., 10th; Accotink, Va., 7th; Keokuk, 7th: Madison, Wis., 8th; Columbus, Ohio, 19th; Atlantic City, N. J., 11th; Albany, 10th; Middlebury, Vt., 31st; Contoocookville, N. H., 13th; Boonsboro, Iowa, 19th. *Martins*—New Corydon, Ind., 6th; Afton, Iowa, 29th; New Market, Md., 24th; Fayette, Miss., 15th; Ashley, Mo., 27th; Weldon, N. C., 28th; Fayetteville, N. C., 15th; Bethel, Ohio, 27th; Jacksonburg, Ohio, 31st; Ringgold, Ohio, 25th; Catawissa, Pa., 28th; Clarksville, Tex., 10th; Melissa, Tex., 5th; Keokuk, 24th: Saint Louis, 28th; La Crosse, 30th. *Killdeers*—Afton, Iowa, 7th; Belvidere, Ill., 8th; Fort Madison, Iowa, 7th; Topeka, Kans., 6th; Atco, N. J., 5th; Emerson, Nebr., 7th; Waterburg, N. Y., 19th; Bellefontaine, Ohio, 8th; Ringgold, Ohio, 25th; Bloomfield, Wis., 7th. *Snipe*—Riley, Ill., 8th; Vail, Iowa, 7th; Saint Meinrad, Ind., 8th. *Sparrows*—Waltham, Mass., 11th; Somerset, Mass., 4th; Highland, Ill., 4th, 5th; Emory Grove, Md., 24th to 31st; Detroit, Mich., 11th; Woodstock, Vt., 29th; Embarrass, Wis., 4th; Wautoma, Wis., 22d. *Mockingbirds*—Brookhaven, Miss., 1st; Keswick, Va., 31st; Fort Gibson, Ind. T., 6th; Uvalde, Tex., 2d. *Owls*—Emory Grove, Md., 24th, 29th; Oregon, Mo., 1st, 5th. *Snowbirds*—Waltham, Mass., 10th; Oregon, Mo., 1st, 18th. *Swallows*—Somerset, Mass., 5th; Fayette, Miss., 28th; Brookhaven, Miss., 30th; Jacksonburg, Ohio, 31st; Fort Gibson, 15th; Portland, Oreg., 12th; New Westminster, B. C., 16th, 22d. *Blackbirds*—Elmira, Ill., 6th; New Corydon, Ind., 6th, 24th, 25th; Mount Sterling, Ill., 31st; Fort Madison, Iowa, 6th; Vail, Iowa, 7th; Fallston, Md., 2d; Waltham, Mass., 12th; Southington, Conn., 9th; Sandy Springs, Md., 1st; Oregon, Mo., 5th. 6th; Corning, Mo., throughout month; Dunbarton, N. H., 14th; Vineland, N. J., 29th; Moorestown, N. J., 4th; Starkey, N. Y., 10th, 14th; Waterburg, N. Y., 26th; Bellefontaine, Ohio, 9th; Bethel, Ohio, 1st; Cincinnati, 2d; Ringgold, Ohio, 8th; Catawissa, Pa., 11th; Wytheville, Va., 24th; Bloomfield, Wis., 7th; Manitowoc, Wis., 28th; Howard, Nebr., 8th.

FISH.—*Herring*—Fall River, Mass, first caught at Westport Harbor, last year appeared as early as February 16. Somerset, Mass., 17th, first caught. *Shad*—Fayetteville, N. C., 4th, first caught. *Smelt*—Somerset, Mass., 10th, first caught. *Bass*—Somerset, Mass., 21st, first caught.

MISCELLANEOUS.—*Frogs piping*—Elmira, Ill., 10th; New Corydon, Ind, 24th; Belvidere, Ill., 9th; Morse, Kans., 5th; Woodstock, Md., 27th; New Market, Md., 10th; Emory Grove, Md., 4th, 8th, 15th, 21st, 30th; Highland, Ill., 7th, 8th; Saint Meinrad, Ind., 7th; Creswell, Kans., 8th, 25th; Independence, Kans., 6th; Topeka, Kans, 26th; Vineland, N. J., 25th; Moorestown, N. J., 10th; Linden, N. J., 15th; Starkey, N. Y., 16th; Flushing, N. Y., 30th; Little Mountain, Ohio, 9th, 29th; Bethel, Ohio, 5th; Margaretta, Ohio, 10th; Jacksonburg, Ohio, 10th; Ringgold, Ohio, 8th; North Lewisburg, Ohio, 10th; Catawissa, Pa., 30th; McMinnville, Tenn., 8th; Wytheville, Va., 7th, 8th; Keswick, Va., 4th, 5th; Johnsontown, Va., 9th; Accotink, Va., 7th; Dover Mines, Va., 5th; Bloomfield, Wis., 10th; Wautoma, Wis., 28th; Frankford, Mo., 7th; Howard, Nebr. 9th; Keokuk, Iowa, 26th; Portland, Oreg., 12th, 13th. *Mosquitos*—Oregon, Mo., 27th; Fayette, Miss., 31st. *Honey bees*—Emory Grove, Md., 21st, 29th; Keswick, Va., 4th, 5th; Embarrass, Wis., 9th; Keokuk, 7th. *Grasshoppers*—Melissa, Tex., 12th; Corsicana, Tex., 15th, large numbers of young ones. *Butterflies*—Anna, Ill., 5th; Emory Grove, Md., 9th, 12th, 28th; Oregon, Mo., 30th, 31st; Brookhaven, Miss., 1st; Starkey, N. Y., 13th; Melissa, Tex., 12th; Dover Mines, Va., 9th; Uvalde, Tex., 26th; Keokuk, 8th. *Fire flies*—Houston, Fla., 12th, 23d; Fayette, Miss., 20th; Brookhaven, Miss., 16th. *Wasps*—Brookhaven, Miss., 3d; Dover Mines, Va., 6th. *House flies*—Independence, Kans., 10th; Oregon, Mo., 7th; Indianola, Tex., 26th; Keokuk, 7th. *Dragon flies*—Fayette, Miss., 21st; Kansas City, Mo., 25th.

Meteors.—Woodstock, Md., 7th, 11th, 12th, 13th, 14th to 25th. Emmittsburg, Md., 16th. Fayette, Miss., 10th, 23d, 26th. Corning, Mo., 14th, 20th, 30th. Princeton, N. J., 9th, 7:16 p. m., very brilliant meteor; direction south of east; length of visible path about 100°; color, first yellowish, later white, leaving a train of sparks; when brightest exceeded Venus in intensity, resembling a ball from a Roman candle; visible ten or fifteen seconds. Trenton, N. J., 9th, 7:15 p. m., very brilliant meteor; direction, east to west; color, yellow; duration, twenty seconds; trail, bright scarlet. Freehold, N. J., 9th, 12th. Atco, N. J., 11th and 12th. Princeton, N. J., 8th. Waterburg, N. Y., 10th. Jacksonburg, Ohio, 15th, 30th. Hulmesville, Pa., 9th, 7 p. m., large and brilliant meteor passed from SW. to NE.; duration, about four seconds. Wilmington, 31st, 2 a. m., a most brilliant meteor from the NW. exploded when about the zenith; while in motion it emitted a brilliant light, leaving a trail of fire apparently about 50 yards in length.

Polar bands.—New Corydon, Ind., 8th, 7th, 11th, 13th, 16th, 25th, 28th, 31st; Thornville, Mich., 20th, 21st, 31st; Freehold, N. J., 19th, 26th; Leavenworth, 17th; Saint Paul, Minn, 4th; Woodstock, Vt., 8th, 11th, 26th; Wytheville, Va., 5th, 7th, 18th, 20th.

Prairie and forest fires.—Fort Randall, Dak., 3d, 5th, 6th, 9th, 10th, 11th, 12th, 15th, 19th, 26th, 29th; Fort Union, N. Mex., 10th, 14th, 23d, 26th, 27th, 28th; Mt. Ida, Ark., throughout month; Independence, Iowa, 19th; Creswell, Kans., 5th to 15th, 18th, 25th;

Independence, Kans., 6th to 16th; De Soto, Nebr., throughout month; Genoa, Nebr., 21st to 31st; North Platte, 25th, very destructive to ranches and cattle; Dodge City, 12th, 17th, 21st, 22d to 25th, 27th; Fort Gibson, 21st, 24th, 25th; Yankton, 8th, 9th, 10th, 28th, 29th, 30th, 31st; from the 28th to 31st, devastated a great part of the Big Sioux Valley, destroying over fifty farms, also churches, school-houses, and several human lives; Eagle Pass, Tex., 25th; Fort Davis, Tex., 25th, 26th, 27th, 28th; Corsicana, 24th; Breckenridge 10th; Madison, Wis., 19th; Chattanooga, Tenn., 5th; Wytheville., Va., 14th, 15th, 16th, 28th; Graham, Tex., 19th, 20th, 22d, 24th, 25th, 30th; Coleman, Tex., 7th; Punta Rassa, Fla., 6th and 7th.

Earthquakes.—Granada, Nicaragua, C. A., June 9, 1878, 4:30 p. m., shock from NW. to SE., duration 17 seconds; 17th, 11:15 a. m., slight shock, NW. to SE., 11 seconds. Cerro de Pasco, Peru, June 16, 1878, two severe shocks; 19th, 1:30 a. m., severe shock. United States Flagship Monongahela, Yokohama, Japan, reports January 21, 1879, 2:35 a. m., smart shock, motion in a southerly direction, sharp at first, gradually diminishing and immediately followed by a less violent shock, the whole lasting from 5 to 6 seconds; 27th, 10:50 a. m., another shock, which was much more severe at Tokio. United States Naval Hospital, Yokohama, Japan, January 21, 3:40 a. m., smart shock, duration about 15 seconds; 23d, a. m. light shock; 26th, 4 p. m., light shock; 27th, 10:47 a. m., smart shock, duration 5 seconds; 28th, 1 a. m., light shock; February 27, 2:45 a. m., smart shock, duration 45 seconds. San José de Costa Rica, C. A., February 15, 10:46 p. m., feeble shock; 18th, 3:10 a. m., very feeble shock; 26th, at 6, 6:10 and 6:30 a. m., feeble shocks, and at 4:40 p. m., stronger shock. March 18, 0:17 a. m., strong shock, oscillations from E. to W., lasting 10 seconds; at Alojuela, 0:15 a. m., strong shock of short duration.

Sunsets.—The characteristics of the sky at sunset, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Corps stations. Reports from 123 stations show 3,798 observations to have been made, of which 56 were reported doubtful; of the remainder, 3,021, or 79.5 per cent. were followed by the expected weather.

Pollen.—Prof. W. H. Chandler, Lehigh University, South Bethlehem, Pa., writes that during Sunday night, March 16, there was a slight fall of snow in that section, and on Monday morning, when the snow had melted, a yellow deposit was found covering the ground, more or less; upon examining the deposit, it was found to be the pollen of pine trees. The United States Signal Corps observer at New Orleans reports light showers on the 17th, and states that "a peculiar feature of the rain was its yellow color, which was due to large quantities of the pollen of the cyprus tree floating in the atmosphere." The United States Signal Corps observer at Lynchburg, Va., forwarded on the 21st a sample of the yellow deposit which had fallen with the rain during the preceding night; it was transmitted to the Surgeon General, U. S. A., for microscopical examination. Maj. J. J. Woodward, Surgeon, U. S. A., reports that "the yellow powder which gives it its physical properties consists entirely of the characteristic triple-grained pollen of the pine. The pine woods in the region around Lynchburg had been in blossom, I believe, for some days previous to the 20th, and the direction of the wind at the time should indicate where the pollen came from. Under favorvorable circumstances, however, the pollen may be carried long distances, so that its source is not necessarily near the town.

Sun-spots.—The following record has been forwarded by Prof. S. Newcomb, U. S. N., Superintendent Nautical Almanac, Washington, D. C.: Observations were taken by Mr. D. P. Todd, assistant, on March 1st, 3d, 4th, 5th, 7th, 8th, 10th, 11th, 12th, 13th; 15th, 16th, 18th, 19th, 25th, 28th and 31st, but not any spots were seen. Mr. Wm. Dawson, Spiceland, Ind., reports having taken observations on the 1st, 3d, 4th, 5th, 7th, 8th, 9th, 11th, 12th, 14th, 16th, 17th, 18th, 23d, 24th, 25th, 27th, 28th, 29th and 31st; not any spots were seen except one small spot on the 14th, one-third of the way from the center to the south edge of the sun. Mr. David Trowbridge, Waterburg, N. Y., examined the sun on the 3d, 7th to 14th, 16th, 19th and 20th without observing any spots. Prof. Gustavus Hinrichs, Iowa City, Iowa, reports having observed on nineteen days, and that the sun was free from spots visible in his telescope. At Fort Whipple, Va., observations were continued throughout the month without having seen any spots.

New stations.—Since August, 1878, instructions have been issued establishing stations of the *first class* as follows: October 15, 1878, Deadwood, and discontinuing Lead City, Dak. April 9, 1879, Springfield, Ill.; 10th, Little Rock, Ark.

The following have been announced as *display stations* (for displaying cautionary signals), viz: September 17, Gloucester, Mass., and included in *section eight.* September 19, Fall River, Mass., to repeat Newport signals. September 26, Port Eads, La., to repeat New Orleans signals. October 1, Stonington, Conn., to repeat New London signals. October 18, Fall River, Mass., placed in *section eight.* November 1, Pensacola, Fla., to repeat Mobile signals. January 21, 1879, City Island, New York Harbor, to repeat New York City signals. February 6, Tybee Island, Ga., changed from *first class.* February 7, New Buffalo, Mich., discontinued; Muskegon, Mich., placed in *section three.*

Published by order of the Secretary of War.

ALBERT J. MYER,
Brigadier-General, Brevet Assigned, Chief Signal Officer, U. S. A.

PAPER 39.

MONTHLY WEATHER REVIEW, APRIL, 1879.

INTRODUCTION.

In compiling the present review the following data, received up to May 14, have been made use of, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at 122 Signal Service stations and 12 Canadian stations, as telegraphed to this office; monthly journals and means, 134 and 150 respectively, from the former, and monthly means from 14 of the latter: reports from 28 special sunset stations; 217 monthly registers from voluntary observers; 40 monthly registers from United States Army post-surgeons; marine records; international simultaneous observations; monthly reports from voluntary observers in, and the local weather services of, the States of Iowa and Missouri; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

Upon Chart No. II is shown the general distribution of the atmospheric pressure, as reduced to sea-level, for the month by the isobaric lines. Compared with the means for April of previous years, the average pressure of the present month is lower for the Middle Atlantic and New Enland States from .02 of an inch in Virginia to .10 in Maine. It is about normal for the South Atlantic and Gulf coasts, and from the Pacific coast toward Utah and Montana. For the remaining districts it is higher: Ohio Valley and Tennessee, from .03 to .08 inch; Lake region, from .00 along Lake Ontario to .09 on Lakes Michigan and Superior; Upper Mississippi Valley, .05 to .07 inch; Lower Missouri Valley, .03 to .12 inch; Red River of the North, .01 to .06 inch; Rocky Mountains and Eastern slopes, .01 to .07 inch.

The local barometric ranges for the month are as follows: California, from .34 of an inch at San Diego to .65 at Red Bluff; Oregon, 1.03 at Portland to 1.04 at Roseburg; Western plateau, from .47 at Pioche to .65 at Salt Lake City; Rocky Mountains, from .64 at Virginia City and Cheyenne to .72 on Pike's Peak; Eastern Rocky Mountain slope, from .78 at Deadwood and .92 at Fort Sill to 1.34 at North Platte; Gulf States, from .41 at Key West to .85 at Montgomery, .74 at New Orleans, .93 at Corsicana, and 1.08 at Mason, Tex.; South Atlantic States, from .83 at Jacksonville to 1.02 at Charlotte, N. C.; Ohio Valley and Tennessee, from .76 at Memphis to 1.118 at Pittsburgh; Missouri Valley, from .96 at Leavenworth to 1.29 at Yankton; Red River of the North Valley, from 1.10 at Pembina to 1.13 at Breckenridge; Upper Mississippi Valley, from .80 at Saint Louis to .97 at Dubuque; Upper Lake region, from .74 at Duluth to 1.31 at Milwaukee; Lower Lake region, from .94 at Rochester to 1.08 at Toledo; Middle Atlantic States, from .97 at Norfolk to 1.18 at Albany; New England, from 1.17 at New Haven to 1.52 on Mount Washington and 1.62 at Eastport.

Areas of high barometer.—Of these eight are described. No. I generally produced the minimum temperatures of the month in Texas on the 2d. No. II was quite remarkable in that the minimum temperature over nearly the entire country from the Rocky Mountains eastward accompanied it; on the 3d, from Eastern Montana, Wyoming, and Colorado eastward to Michigan, Lake Erie, and the Ohio Valley; 4th, Gulf States (excepting Texas and Florida), South Atlantic States, Middle States, and Northern New England; 5th, Southern New England; 6th, Northern Florida. No. IV generally caused the minimum temperatures from California to Utah on the 8th and 9th.

No. I is a continuation of No. XI, described in the *March* review. On the morning of the 1st it was central in Nebraska and Southern Dakota, with clear weather and temperatures below freezing from Montana and Wyoming to Kansas and the Lakes; minimum temperature at Pembina, —8°; a. m. barometer at Dodge City 0.29 inch above normal. 2d, by morning it had moved southward to New Mexico and Texas; frost occurred in northern portion of latter. During the day it lost its distinctive features, on account of the sudden advance of the following.

No. II began advancing southward from Manitoba, morning of the 2d, over Dakota and Minnesota; a. m. barometer (reduced to sea-level), 30.54 inches, and minimum temperature —8° at Fort Garry. 3d, it was central in the morning near Fort Garry, with barometer 30.65; at Pembina it was 0.50 above the normal, and minimum temperature —10°. The temperature was below freezing thence to Montana, Wyoming, Colorado, Indian Territory, the Alleghanies, and Lake region. Over the interior of the Southern States frosts were produced. During the day it continued extending itself southward. 4th, in the morning it appeared as an extensive barometric ridge, reaching from Central Texas to the Red River of the North. To the southeastward the temperature continued falling; in Tennessee, northern portion of Alabama and Georgia, and the Atlantic States, except the immediate South Carolina coast, it fell to and below freezing. 5th, it covered the Mississippi Valley, and central near Cairo; at Green

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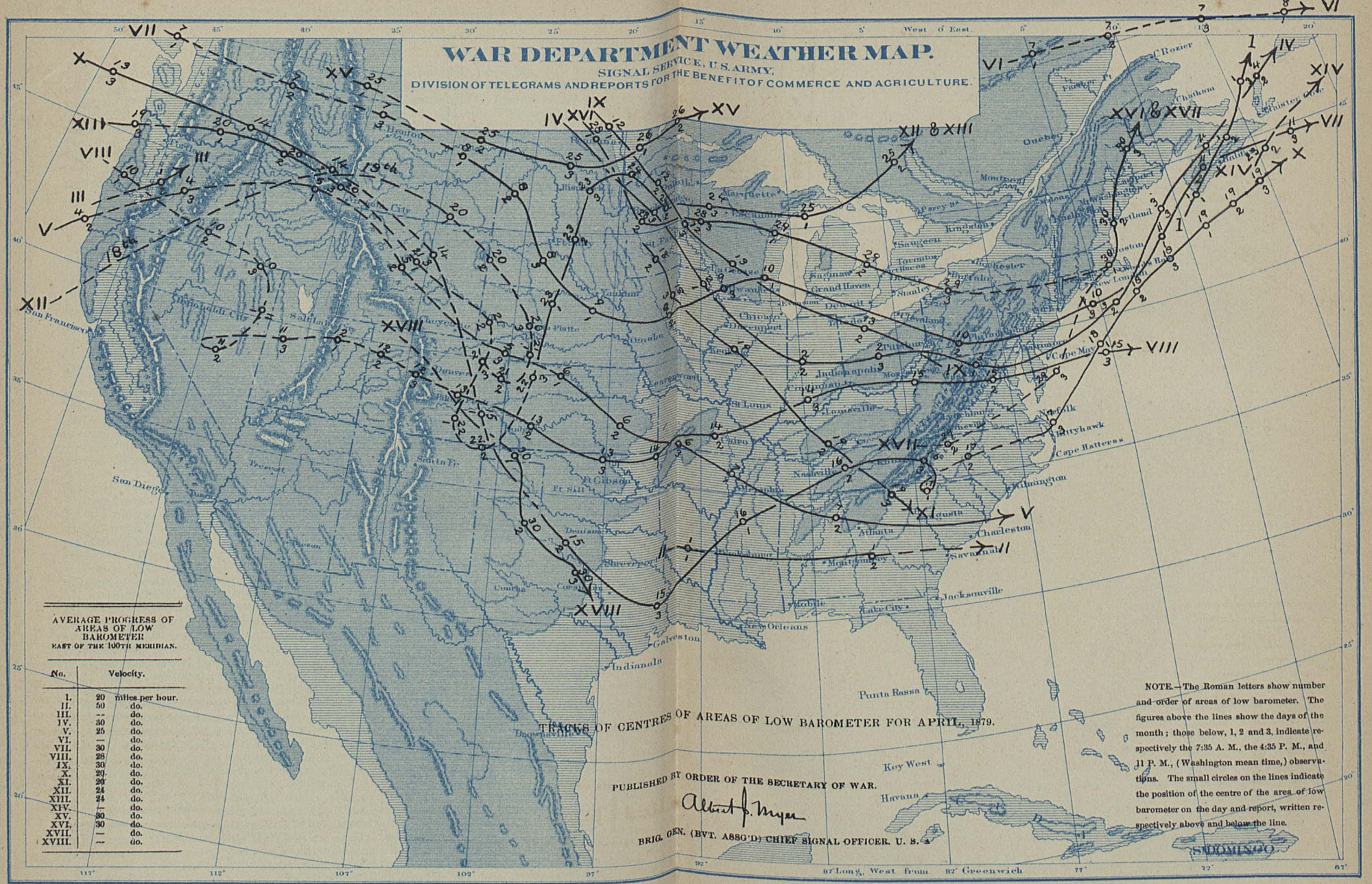
No. 1.


WAR DEPARTMENT WEATHER MAP.
SIGNAL SERVICE, U.S. ARMY.
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.
TRACKS OF CENTRES OF AREAS OF LOW BAROMETER FOR APRIL, 1879.
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
BRIG. GEN. (BVT. ASSG'D) CHIEF SIGNAL OFFICER. U. S. A.
NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7:35 A. M., the 4:35 P. M., and 11 P. M., (Washington mean time,) observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.
AVERAGE PROGRESS OF AREAS OF LOW BAROMETER
EAST OF THE 100TH MERIDIAN.
No. Velocity.
I. 20 miles per hour.
II. 50 do.
III. -- do.
IV. 30 do.
V. 25 do.
VI. — do.
VII. 30 do.
VIII. 28 do.
IX. 30 do.
X. 20 do.
XI. 20 do.
XII. 24 do.
XIII. 24 do.
XIV. — do.
XV. 30 do.
XVI. 30 do.
XVII. — do.
XVIII. — do.
West 0° East
87° Long. West from 82° Greenwich
San Francisco
San Diego
Denver
Omaha
Chicago
St Louis
Cairo
Memphis
Nashville
Atlanta
Savannah
Charleston
Jacksonville
Mobile
New Orleans
Galveston
Indianola
Punta Rassa
Key West
Havana
Cape Hatteras
Kittyhawk
Norfolk
Wilmington
Cape May
Boston
Portland
Quebec
Montreal
Kingston
Toronto
Rochester
Buffalo
Cleveland
Detroit
Grand Haven
Saugeen
Marquette
Escanaba
Bismarck
Yankton
Salt Lake
Santa Fe
Trescott
Ft Gibson
Ft Sill
Shreveport
Concha
Brownsville
Indianapolis
Cincinnati
Louisville
Pittsburgh
Philadelphia
Baltimore
Washington
Cape Rozier
Chatham
Halifax
Pictou
Sydney
Portland
Boston
New London
Hartford
Albany
Burlington
Montgomery
Lake City
Brownsville
SAN DOMINGO

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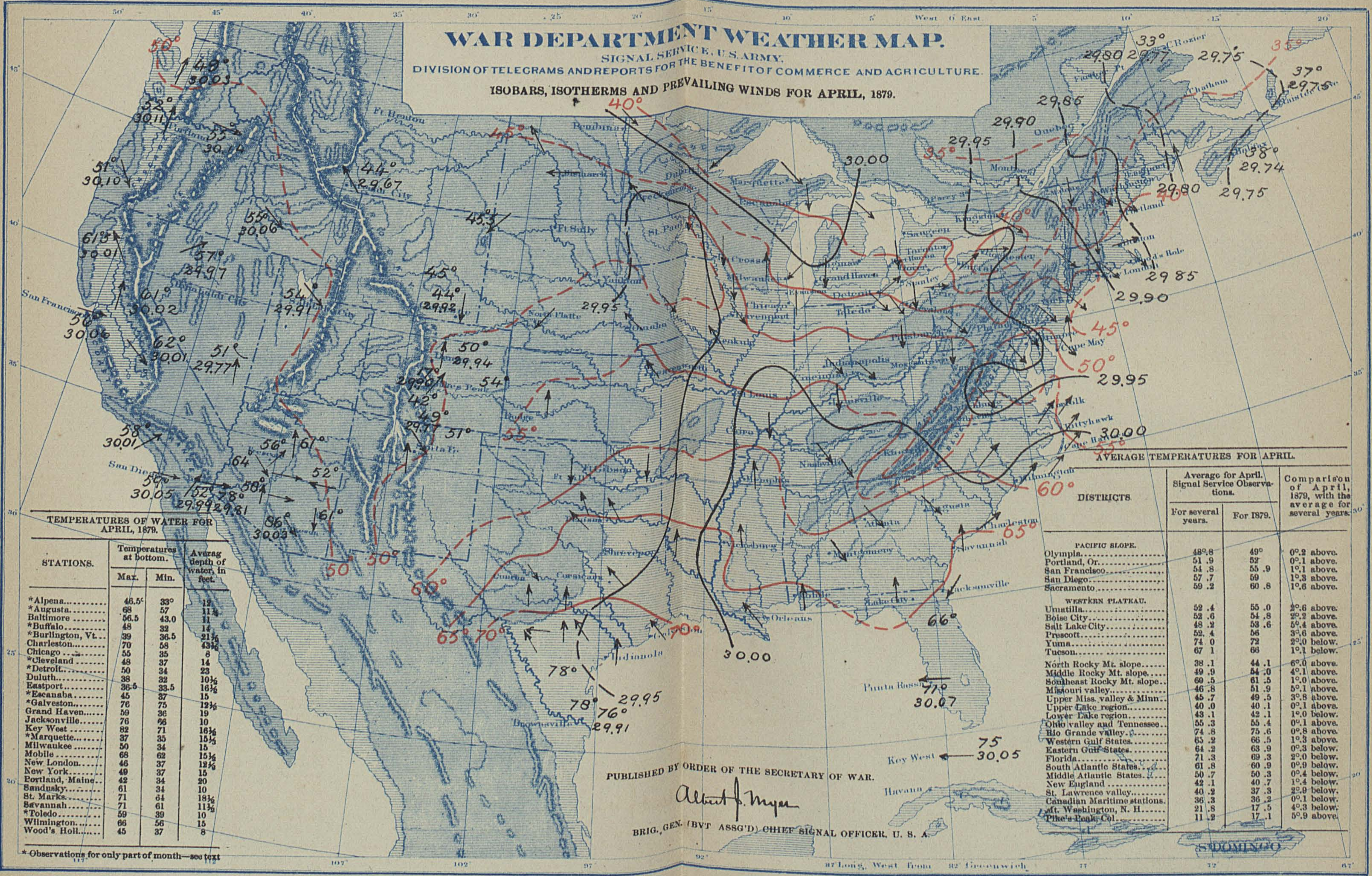
WAR DEPARTMENT WEATHER MAP.

SIGNAL SERVICE, U. S. ARMY.

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

ISOBARS, ISOTHERMS AND PREVAILING WINDS FOR APRIL, 1879.



TEMPERATURES OF WATER FOR APRIL, 1879.

STATIONS.	Temperatures at bottom.		Averag depth of water, in feet.
	Max.	Min.	
*Alpena	46.5°	33°	12
*Augusta	68	57	11½
Baltimore	56.5	43.0	11
*Buffalo	48	32	14
*Burlington, Vt.	39	36.5	21½
Charleston	70	58	43½
Chicago	55	35	8
*Cleveland	48	37	14
*Detroit	50	34	23
Duluth	38	32	10½
Eastport	36.5	33.5	16½
*Escanaba	45	37	15
*Galveston	76	75	12½
Grand Haven	59	36	19
Jacksonville	76	66	10
Key West	82	71	16½
*Marquette	37	35	15⅓
Milwaukee	50	34	15
Mobile	68	62	15½
New London	46	37	12½
New York	49	37	15
Portland, Maine	42	34	20
Sandusky	61	34	10
St. Marks	71	64	18½
Savannah	71	61	11½
*Toledo	59	39	10
Wilmington	66	56	15
Wood's Holl	45	37	8

* Observations for only part of month—see text

AVERAGE TEMPERATURES FOR APRIL.

DISTRICTS.	Average for April. Signal Service Observations.		Comparison of April, 1879, with the average for several years.
	For several years.	For 1879.	
PACIFIC SLOPE.			
Olympia	48°.8	49°	0°.2 above.
Portland, Or.	51 .9	52	0°.1 above.
San Francisco	54 .8	55 .9	1°.1 above.
San Diego	57 .7	59	1°.3 above.
Sacramento	59 .2	60 .8	1°.6 above.
WESTERN PLATEAU.			
Umatilla	52 .4	55 .0	2°.6 above.
Boise City	52 .6	54 .8	2°.2 above.
Salt Lake City	48 .2	53 .6	5°.4 above.
Prescott	52. 4	56	3°.6 above.
Yuma	74 0	72	2°.0 below.
Tucson	67 1	66	1°.1 below.
North Rocky Mt. slope	38 .1	44 .1	6°.0 above.
Middle Rocky Mt. slope	49 .9	54 .0	4°.1 above.
Southeast Rocky Mt. slope	60 .5	61 .5	1°.0 above.
Missouri valley	46 .8	51 .9	5°.1 above.
Upper Miss. valley & Minn.	45 .7	49 .5	3°.8 above.
Upper Lake region	40 .0	40 .1	0°.1 above.
Lower Lake region	43 .1	42 .1	1°.0 below.
Ohio valley and Tennessee	55 .3	55 .4	0°.1 above.
Rio Grande valley	74 .8	75 .6	0°.8 above.
Western Gulf States	65 .2	66 .5	1°.3 above.
Eastern Gulf States	64 .2	63 .9	0°.3 below.
Florida	71 .3	69 .3	2°.0 below.
South Atlantic States	61 .8	60 .9	0°.9 below.
Middle Atlantic States	50 .7	50 .3	0°.4 below.
New England	42 .1	40 .7	1°.4 below.
St. Lawrence valley	40 .2	37 .3	2°.9 below.
Canadian Maritime stations	36 .3	36 .2	0°.1 below.
Mt. Washington, N. H.	21 .8	17 .5	4°.3 below.
Pike's Peak, Col.	11 .2	17 .1	5°.9 above.

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Albert J. Myer

BRIG. GEN. (BVT ASSG'D) CHIEF SIGNAL OFFICER, U. S. A.

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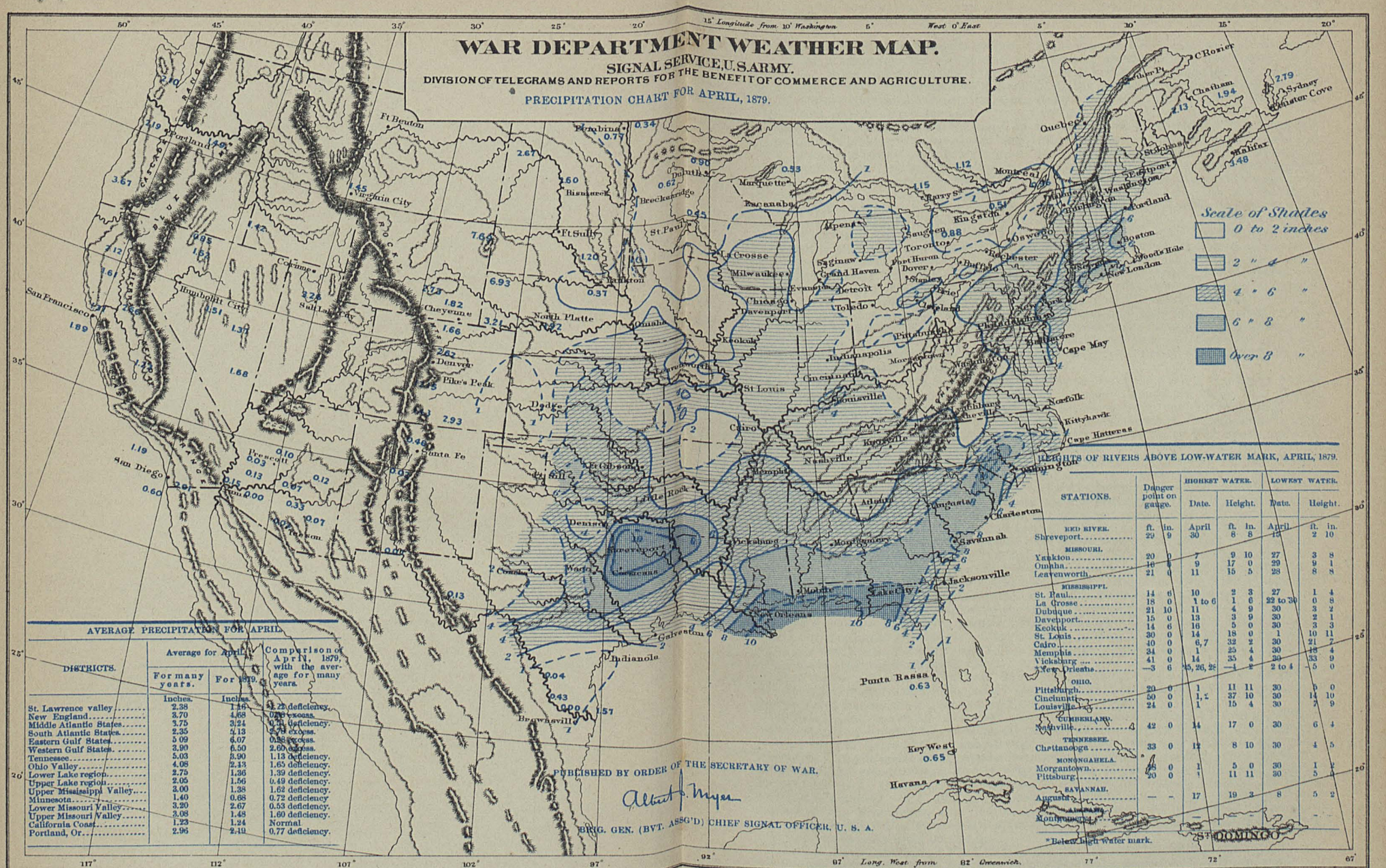
WAR DEPARTMENT WEATHER MAP.

SIGNAL SERVICE, U. S. ARMY.

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

PRECIPITATION CHART FOR APRIL, 1879.



AVERAGE PRECIPITATION FOR APRIL.

DISTRICTS.	Average for April. For many years.	Average for April. For 1879.	Comparison of April, 1879, with the average for many years.
	Inches.	Inches.	
St. Lawrence valley	2.38	1.16	1.22 deficiency.
New England	3.70	4.68	0.98 excess.
Middle Atlantic States	3.75	3.24	0.51 deficiency.
South Atlantic States	2.35	4.13	1.78 excess.
Eastern Gulf States	5.09	6.07	0.98 excess.
Western Gulf States	3.90	6.50	2.60 excess.
Tennessee	5.03	3.90	1.13 deficiency.
Ohio Valley	4.08	2.43	1.65 deficiency.
Lower Lake region	2.75	1.36	1.39 deficiency.
Upper Lake region	2.05	1.56	0.49 deficiency.
Upper Mississippi Valley	3.00	1.38	1.62 deficiency.
Minnesota	1.40	0.68	0.72 deficiency
Lower Missouri Valley	3.20	2.67	0.53 deficiency.
Upper Missouri Valley	3.08	1.48	1.60 deficiency.
California Coast	1.23	1.24	Normal
Portland, Or.	2.96	2.19	0.77 deficiency.

HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, APRIL, 1879.

STATIONS.	Danger point on gauge.		Highest water. Date.	Highest water. Height.		Lowest water. Date.	Lowest water. Height.	
	ft.	in.	April	ft.	in.	April	ft.	in.
RED RIVER.								
Shreveport	29	9	30	8	8	12	2	10
MISSOURI.								
Yankton	20	0	7	9	10	27	3	8
Omaha	16	0	9	17	0	29	9	1
Leavenworth	21	0	11	15	5	28	8	8
MISSISSIPPI.								
St. Paul	14	6	10	2	3	27	1	4
La Crosse	18	0	1 to 6	1	6	22 to 30	0	8
Dubuque	21	10	11	4	9	30	3	2
Davenport	15	0	13	3	9	30	2	1
Keokuk	14	6	16	5	0	30	3	3
St. Louis	30	0	14	18	0	1	10	11
Cairo	40	0	6, 7	32	2	30	21	7
Memphis	34	0	1	25	4	30	18	4
Vicksburg	41	0	14	35	4	30	33	9
New Orleans	—3	6	25, 26, 28	—1	2	2 to 4	—5	0
OHIO.								
Pittsburgh	20	0	1	11	11	30	9	0
Cincinnati	50	0	1, 2	37	10	30	14	10
Louisville	24	0	1	15	4	30	7	9
CUMBERLAND.								
Nashville	42	0	14	17	0	30	6	4
TENNESSEE.								
Chattanooga	33	0	12	8	10	30	4	5
MONONGAHELA.								
Morgantown	18	0	1	5	0	30	1	2
Pittsburg	20	0	1	11	11	30	5	0
SAVANNAH.								
Augustia	—	—	17	19	2	8	5	2
ALABAMA.								
Montgomery	—	—	—	—	—	—	—	—

*Below high water mark.

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Albert J. Myer

BRIG. GEN. (BVT. ASSG'D) CHIEF SIGNAL OFFICER, U. S. A.

Springs, Ala., heavy white frost occurred the two previous mornings, and this morning blighted the leaves of many trees and killed peaches, &c. 6th, by midnight it had moved southeastward, with diminished central pressure, off the South Carolina coast.

No. III.—This high area seems to have formed from one which advanced northeastward from California over Nevada on the 5th, and another which progressed southward from Manitoba on the 6th. 7th, it was central in Minnesota during the morning; barometer at Saint Paul 0.28 above normal. Later it passed southeastward over the Upper Ohio Valley to the North Carolina coast. 9th, a. m. barometer at Cape Hatteras 30.28, or 0.32 above normal.

No. IV appeared on the Pacific coast on the 8th; p. m. barometer at Red Bluff and Sacramento 0.28 above the normals. 9th, it advanced southeastward over Nevada and Utah towards Arizona and New Mexico. 10th, probably central over New Mexico in the morning, and by midnight appeared as a barometric ridge, extending from New Mexico and Western Texas to Minnesota. 11th, by afternoon it was central over Lake Superior. 12th, morning, it covered the country from the Lakes to the Southern States, with cool, clear weather, and was central in Indiana. During the day it withdrew southeastward to the South Atlantic coast.

No. V.—During the 14th and 15th it advanced eastward over the Pacific coast. 16th, by morning the barometer reached its maximum; at Roseburg, 30 47, and at Olympia 0.41 above the normal. Cool and generally clear weather prevailed from the Pacific coast to the Rocky Mountains, and extended southeastward, with increasing pressure, toward Texas and the Lakes. 17th, a. m., it was central over Wyoming, Colorado, Nebraska, and Kansas; barometer at North Platte 0.30 above the normal. Freezing temperatures were reported as far south as Arizona and New Mexico. 18th, at Fort Sill, a. m. barometer 0.43 above the normal, with the barometric ridge extending over Lake Superior. During the day it continued southeastward, and by morning of the 19th was central over the Southwest. Later it disappeared over the Gulf of Mexico, with diminishing central pressure.

No. VI apparently advanced southeastward over Manitoba during the night of the 18th to the Upper Lakes on the 19th, and the Lower Lakes on the 20th. 21st, it covered the country from the Mississippi Valley eastward, with cool, clear weather. In the morning it was central over the Upper Ohio Valley, where it continued on the 22d, but with increased pressure; barometer at Pittsburgh, 30.51, or 0.50 above normal. During the day it passed to the South Atlantic coast.

Nos. VII and VIII.—During the 20th the pressure rapidly increased on the Pacific coast. 21st, by morning it was central on the coast of Oregon: Roseburg, barometer 30.59, or 0.51 above the normal; p. m. barometer at Olympia 0.55 above normal. During the day it advanced northeastward around the low pressure then central over Eastern Colorado. From Montana to Nevada and the northern portions of Arizona and New Mexico the minimum temperature fell to and below freezing. 22d, it apparently developed a second No. VIII, which passed over Montana into Manitoba; p. m. barometer at Fort Garry rose to 30.35; the center was probably at some distance to the northward. 23d, No. VII slowly advanced southeastward from Oregon, and on the 24th toward New Mexico, where it was dissipated on the 25th. No. VIII, on the 23d, moved southeastward from Manitoba; midnight barometers at Parry Sound and Ottawa 30.46. 24th, it was central in the morning over Eastern New York; at Albany, barometer 30.46, or 0.49 above normal. During the day it passed to the South Atlantic coast with diminished pressure. After the 25th several high areas crossed the country from the North Pacific coast to the Mississippi Valley, but not of sufficient importance to warrant describing them.

Areas of low barometer.—Eighteen have been charted. No. I was the most severe and destructive storm along the coast. No. X was next in point of severity, especially on the North Pacific, New Jersey, and New England coasts.

No. I.—This severe storm, described in the *March* review as No. XVI, and so destructive to shipping, crossed Nova Scotia on the 1st. From thence toward the lakes and New Jersey the barometric gradient was remarkably steep, and northwesterly gales prevailed. To the southward beyond Bermuda vessels report having experienced terrific southerly gales, veering to westerly, at places of hurricane force, with high or tremendous seas. On Mount Washington the hourly wind velocity reached 182 miles during the evening. The off-shore signals, which had been displayed the previous day along the New Jersey and New England coasts, were fully justified; they were lowered evening of the 1st, which was too soon for the New England coast, where high off-shore winds continued on the 2d.

No. II is a continuation of No. XVIII of *March*. During its rapid progress eastward on the 1st light rains were frequent in the Southern States, and it disappeared on the South Atlantic coast in the large area of low pressure which extended from Lake Huron, the Lower Lakes, South Atlantic States, and Bermuda to Newfoundland. On the Texas coast high southerly winds were succeeded by a severe "norther" as high-pressure No. I moved southward. High southwest winds also prevailed at Saint

Mark's, Fla. Off-shore signals were ordered morning of the 1st for the Texas coast. Maximum velocities: N. 32 miles at Galveston and N. 48 at Indianola.

No. III.—The depression numbered XVII for *March* probably advanced northeastward to Oregon on the 1st of *April*. Light rains became general in California and Nevada, and extended to Oregon and Washington Territory the following day.

No. IV.—During the afternoon of the 1st its advance was indicated by rapidly falling barometer and very brisk winds in Dakota and Minnesota; southeast winds with snow at Fort Garry and Pembina. By midnight it was central in Minnesota. 2d, it moved southeastward with diminishing central pressure and increasing winds. Heavy snow fell in its north and northeastern side, while to the southward clear weather prevailed. 3d, as it progressed to the coast of Maine, the central pressure continued falling; midnight barometer at Portland 29.28, 0.65 below the normal. Along the Middle Atlantic and Southern New England coasts light rains occasionally fell, but thence to the Lakes snow prevailed. From North Carolina to the Lakes and New England northwesterly gales accompanied it. 4th, it moved northeast toward Newfoundland, producing heavy snowfall. The p. m. barometer at Sydney fell to 29.02, or 0.84 below the normal. To the westward the winds gradually diminished in force. Cautionary signals were ordered night of the 2d (late) for Lake Erie; also morning of the 3d for Lake Michigan (late) and the North Carolina and New Jersey coasts. Off-shore signals were hoisted during the latter date from North Carolina to Maine. Maximum velocities: NW. 40 at Milwaukee, N. 35 at Grand Haven, NW. 46 at Sandusky, NW. 52 at Cleveland, NW. 44 at Cape Hatteras, W. 44 at Cape Henry, NW. 60 at Baltimore, NW. 62 at Cape May, N. 50 at Sandy Hook, NW. 48 at Wood's Holl, and N. 31 at Portland.

No. V approached the Pacific coast on the 4th; p. m. barometer at Roseburg 0.24 below the normal. Threatening and rainy weather prevailed from California and Oregon to Southwestern Montana, with thunder-storm at Sacramento. 5th, it rapidly progressed east and southeastward to Eastern Colorado, with frequent rains, partly as snow in Nevada and Wyoming. West of the Mississippi Valley diminishing pressure, rising temperature, and increasing southerly winds marked its advance; velocity at North Platte, SE. 44, at Dodge City and Fort Sill, S. 32 miles. 6th, light rains fell from Utah to Iowa, Indiana, Kentucky, Tennessee, and Arkansas, with N. 52 miles at Pike's Peak. 7th, it passed to the South Atlantic States where it was dissipated; accompanied by light rains over the Southern States. The cautionary signals ordered morning of the 6th for Indianola and Galveston were justified at former—S. 30 miles; those for Lake Michigan, only partly. The off-shore signals for the North Carolina coast on the 7th were verified as to velocity, but not as to direction; NE. 39 at Cape Lookout to N. 45 miles at Cape Henry.

No. VI.—This disturbance probably developed from No. V to the north of the Lake region on the 6th. 7th, it passed eastward at some distance to the north of New England. From the Lower Saint Lawrence Valley to Nova Scotia light snows or rains accompanied it. Brisk to high westerly winds succeeded it, which during afternoon of the 8th increased at Farther Point to SW. 45 miles.

No. VII.—During the afternoon of the 6th the pressure fell below the normal along the Pacific coast, with rain in the northern half of California and Southwestern Oregon, and thunder-storm at Roseburg. 7th, the pressure reached its minimum at Olympia; a. m. barometer 29.70, or 0.28 below normal. Light rains fell from the coast to Idaho and Utah, with thunder-storm at Red Bluff, and high winds at places; Pioche, Nev., S. 35, and Umatilla, Oreg., SW. 28 miles. By midnight the center had reached Montana, and the Virginia City barometer fell 0.35 below normal. 8th, it advanced to Southern Dakota; midnight barometer at North Platte, 0.44 below normal. Light rains or snow were frequent from thence to the Middle and North Pacific coasts, with high winds at places; NW. 43 at Cheyenne. Rapidly falling barometer and increasing southeastly winds and cloudiness, followed by rain from the northwest to the southwest, marked its advance. At Fort Sill the wind reached a velocity of SE. 36; at North Platte, SE. and W. 78, and at Breckenridge, SE. 42 miles. 9th, a. m. barometer at Yankton, 0.58 below normal, with the barometic trough running thence north and south. Light rains occasionally fell over the southwest, but thence to the Northwest, Upper Lakes, Lake Erie, Ohio Valley, and Tennessee rainy weather prevailed, with high winds and gales at places, and thunder-storms to the south of its track; NW. 40 at Fort Buford, NW. 72 at North Platte, NW. 52 at Cheyenne, and SW. 32 at Saint Louis. 10th, by morning the barometer at Milwaukee read 29.05, or 0.85 below the normal. The rain-area extended eastward to the Atlantic coast, but generally as snow from the Lakes to New England, with severe gales at many points: SW. 32 miles at Milwaukee, E. 37 at Escanaba, E. 36 at Alpena, SW. 34 at Jacksonville and Wilmington, SW. 44 at Kittyhawk, S. 44 at Cape May, N. 36 at Sandy Hook, and N. 36 at Boston. The central depression moved very quickly from Lake Michigan to the east of New Jersey. During the afternoon the barometric trough extended from Illinois to Virginia, New Jersey, and Pennsylvania. 11th, as it progressed northeastward to Nova Scotia severe easterly gales, backing to northerly, with rain, sleet, and snow, accompanied it; N. 42 at Boston, NE. 36 at Portland, NE. 56 at Eastport, and SE. 28 at Hal-

ifax. Cautionary signals were ordered morning of the 8th for Lake Superior and Michigan and the Texas coast; night of 9th for Lake Erie, New Jersey, and North Carolina coasts; 10th, Lakes Huron (late) and Ontario, and New England. They were fully justified, except for Lake Huron. Warnings were also sent for the Canadian stations, but too late for those from Nova Scotia to the mouth of the Saint Lawrence.

No. VIII.—Rainy weather prevailed in Washington Territory and Oregon on the 9th, and extended to Central California the 10th as the central depression advanced southeastward. At San Francisco the west wind reached 29 miles. 11th, light rains fell during the morning in Nevada and Southern California, with high northerly winds to the north of the center. 12th, light rains or snow from Arizona and Southern California to Colorado and Utah, with SW. gale (35 miles) at Fort Craig, N. Mex. 13th, as it approached Indian Territory threatening and rainy weather prevailed from the Southwest to the Lower Missouri Valley and Wyoming. 14th, the central pressure diminished; p. m. barometer at Cairo 0.44 below normal. The rain-area extended eastward to Ohio, western portion of Middle States, and the South Atlantic States, with thunderstorms along the track of its center. High northerly winds occurred on Lake Michigan and southerly along the Central Gulf and North Carolina coasts: N. 30 at Milwaukee, S. 54 at New Orleans; and S. 32 at Smithville. 15th, as it passed eastward over the Middle Atlantic coast it was accompanied by rainy weather from the Lower Lakes to the Atlantic coast, with gales at places; NE. 34 miles at Sandusky, and S. 34 at Cape Hatteras. Night of the 14th signals were ordered for North Carolina coast (late) and Cape May; 15th, from New Jersey to Connecticut, and for Lake Erie (late). Off-shore signals were hoisted on the Texas coast night of the 15th. Except along the North Carolina coast the signals were not justified. The warnings sent for the Canadian stations on the lakes were not verified.

No. IX produced threatening weather and frequent light rains during its progress from Northern Dakota and Manitoba to the Lakes and Middle States.

No. X.—During the night of the 12th light rains commenced falling along the coast of Washington Territory and Oregon. 13th, rainy weather continued and extended south to Central California, with increasing southerly winds; SE. 28 miles at Red Bluff. At night the center of the storm passed into the interior. 14th, a. m. barometer at Olympia 29.56, or 0.42 below normal. Its rapid movement to Wyoming on this and to Texas on the succeeding day was probably due to the pressure having been left below the normal over that region by No. VIII. Frequent but generally light rains fell from the Pacific coast to Colorado and western portions of Wyoming and Montana. At Umatilla, Oreg., the westerly winds reached 30 miles. 15th, by midnight the storm-center had reached Southeastern Texas, with frequent thunder-storms throughout the Gulf States; Galveston barometer 0.46 below normal. 16th, the rain-area extended to the Ohio Valley, Pennsylvania, and New Jersey, with thunder-storms throughout the Gulf and South Atlantic States, and increasing winds along the coast. At Indianola the northwest wind increased to 48 miles. 17th, north of its track to the Lower Lakes and Southern New England, rainy weather, with northeasterly gales, prevailed; southward to Florida, thunder-storms, with southerly gales veering to westerly; NE. 35 miles at Cleveland, NE. 42 at Sandy Hook, NE. 40 at Atlantic City, S. 40 at Cape Hatteras, SW. 48 at Cape Lookout, SW. 40 at Saint Mark's, and S. 28 at Punta Rassa and Key West. 18th, as it moved northeastward along the coast it increased in severity; p. m. barometer at New London 0.60 below normal, and at Wood's Holl it fell to 29.20; in Northern New England and Nova Scotia the rain changed to snow; NW. 48 miles at Cape May, NE. 50 at Sandy Hook, NW. 44 at Wood's Holl, NE. 54 at Boston, NE. 33 at Portland, NE. 35 at Eastport, and NE. 114 on Mount Washington. The two following days it disappeared to the eastward of Nova Scotia. Off-shore signals were ordered for the Texas coast night of the 15th; lowered morning of the 16th, not justified; again hoisted afternoon 16th, justified, but late. Cautionary signals were ordered up the 16th along Lakes Michigan and Erie, Connecticut to North Carolina, at Mobile and Saint Mark's; 17th, from Connecticut to Maine. They were well justified, except for Lake Michigan and Mobile. Warnings were also sent for the Canadian stations on Lakes Erie and Western Ontario the 16th, but probably not justified; 18th, for those in the Saint Lawrence Valley, New Brunswick and Nova Scotia, and generally verified.

No. XI was a slight depression in which the barometers did not fall below the normal until it reached the Lower Ohio Valley. The accompanying winds were fresh to brisk, and there was scarcely any precipitation.

No. XII.—The pressure began diminishing along the California coast on the 17th. 18th, it extended northeastward toward Utah and Montana, with light rains from Oregon and northern half of California to Western Montana. The center probably passed over Northern California into Idaho. 19th, it reached Montana and Wyoming; p. m. barometer at Virginia City 0.24 below normal. 20th, by midnight it had advanced to Nebraska, with increasing southerly winds thence toward the Mississippi Valley; SE. 62 at North Platte and SW. 62 on Pike's Peak. The pressure was high over the entire country to the eastward, and having been closely followed by No. XIII it was merged into it during the 21st.

No. XIII.—The center passed eastward into Washington Territory during the night of the 19th, with rainy weather and strong southerly winds thence to Central California; SE. 30 miles at Red Bluff; midnight barometer at Olympia 0.48 below normal. 20th, it crossed Montana, with frequent rain or snow and at places high winds or gales between the Pacific coast, the Northwest, and Colorado. 21st, it united with No. XII, and the central pressure, which in the morning had been 0.46 below the normal at North Platte, began rising, due to the high pressure to the eastward and to that which rapidly followed it from the North Pacific coast. Rains were frequent in the Missouri Valley, partly changing to snow towards Utah and New Mexico, with high winds; E. 32 miles at Fort Stevenson, Dak., SE. 32 at Yankton, S. 52 at Fort Sill, SE. 32 at Indianola and NW. 38 at Cheyenne. 22d, by midnight the pressure had risen above the normal at all stations, except at Santa Fé. Rainy weather prevailed from the Northwest to New Mexico and Texas, with very heavy thunder-storms in last. At Indianola the hourly wind-velocity reached SE. 35 miles. 23d, as it moved northward the central pressure again fell below the normal; NE. gale occurred at Duluth; heavy rains in Texas and Dakota. 24th, light rains were frequent from the Northwest and Upper Lakes to Southwest. On the Texas coast a disturbance developed, which caused heavy rains and northeast gales. 25th, it disappeared into Canada, accompanied over the Lakes by rainy weather, occasional thunder-storms, and gales; W. 32 miles at Grand Haven, SW. 34 at Port Huron, SW. 35 at Cleveland, and W. 32 at Rochester. The cautionary signals ordered for the Texas coast on the 21st were fully justified, but lowered too soon. On the 23d signals were also ordered for Lakes Superior, Huron, and Northern Michigan, but succeeded by gales at Duluth alone; 25th, for Lakes Michigan (late), Huron, and Erie and the New Jersey coast—partly justified. Warnings were dispatched mornings of the 23d and 25th for Canadian lake stations.

No. XIV was a slight depression which appeared off the coast of Nova Scotia on the 23d, producing light rains thence to Lake Ontario. Maximum velocities: NE. 36 at Farther Point, N. 36 at Portland, and N. 40 at Boston. Signals were ordered for Eastport, and on account of a high pressure advancing over the Lake region, for Lake Ontario, the New Jersey and North Carolina coasts. They were only justified at Eastport. Warnings were also sent for St. John's and Halifax.

No. XV advanced southeastward into Dakota the 25th, with light rains and brisk winds. 26th, the a. m. barometer at Pembina 0.46 below normal. While the central depression moved into Canada, in the barometric trough to the southward over the Gulf States rains were numerous. In the extreme Northwest gales, with rain, occurred; N. 35 miles at Bismarck. 27th, a secondary depression developed and passed eastward north of the Saint Lawrence Valley during the following day. Rainy weather accompanied it as far south as the Gulf States. Signals ordered for Lake Michigan on the 27th were not justified.

Nos. XVI and XVII.—The former was a slight depression, which produced light rains and occasionally high winds, during its advance over Minnesota and the Lake region; W. 32 miles at Sandusky. The latter developed over the South Atlantic States. 30th, by midnight they reached Maine as a well-marked depression; barometer at Eastport 29.54, or 0.30 below normal. Rainy weather accompanied them, and northeast gale at Farther Point. The signals ordered the 29th for Lakes Michigan and Huron were late and not justified; 30th, for Eastport, followed by SE. gale. The off-shore signals on the 30th from North Carolina to Massachusetts were very generally succeeded by high off-shore winds.

No. XVIII.—The charts of barometric departures from the normals show that a very slight depression crossed Oregon and Northern California on the 28th and Utah and Colorado the 29th without producing any precipitation, except at Virginia City. 30th, as it reached Texas the central pressure diminished, and generally light rains were reported from Wyoming and Colorado to Tennessee and Arkansas.

INTERNATIONAL METEOROLOGY.

On Chart No. IV are shown the probable tracks of storm-centers over the oceans, deduced from data received at this office up to May 5, and in the upper right-hand corner will be found an index to the same. In the upper left-hand corner is a small table giving the approximate wind-direction and probable maximum velocities (in miles per hour and meters per second) attending the depressions on the dates named. The following is a brief notice of the same, and also of some storms over the southern hemisphere:

North Atlantic Ocean.—No. I probably developed slowly, during the 2d of March, about in the position shown, as a secondary center to low-pressure area No. I of the March review, which latter had probably passed northward on the 1st. No. II is a continuation of No. II low-pressure area of March, and is only repeated on present chart as it appears probable that during March 5th a barometric trough extended from its center far southward over the ocean, in the southern extremity of which storm No. III developed, as shown on present chart. No. IV is a continuation of low-pressure area No.

VII of March review; it rapidly passed eastward over Newfoundland during the latter part of the 12th, and probably moved southward off the European coast from the 15th to the 18th, although reports are too meager to determine the position of its center with much accuracy. On the 19th and 20th, it was probably joined off the Spanish coast by the following area, after which it moved eastward over the Mediterranean. No. V is a continuation of low area No. IX of the March review; it passed eastward over Newfoundland during the night of March 15, moved eastward until the 18th, thence southward and probably joined the preceding area on the 19th. No. VI developed during the 17th over the Gulf of Mexico, as low area No. X of the March review moved northeastward over the Atlantic States; it passed over the Bermudas on the 19th, and to the southward of Newfoundland on the 20th, after which it has not yet been traced as it was probably not accompanied by high winds. No. VII is a continuation of low area No. XI of the March review; it passed eastward south of Newfoundland on the morning of the 22d, and having developed increased energy on the 25th, moved southeastward over France to the Eastern Mediterranean by the 30th. No. VIII is a continuation of low area No. XIII of the March review; it probably passed eastward to the north of Newfoundland on the 25th, developed increased energy on the 27th, and moved thence to the north of Scotland. No. IX is a continuation of No. XIV of March review; it was felt at the Bermudas on the morning of the 29th, but has not been traced after the 30th. No. X is a continuation of low area No. XVI of March review, and No. I of the present review; this storm-center arrived off the coast of Ireland on April 5, and passed thence over Central Europe to the Black Sea by the 10th. No. XI developed over the western Mediterranean on April 10 and 11, in rear of the preceding area, and passed northeastward over the Black Sea on the 13th. *South Atlantic Ocean.*—February 7, 1879, 50° 02′ S., 57° 41′ W., barometer 29.18, W. by N. fresh gale, rough sea, cloudy; 27th, 47° 32′ S., 62° 19′ W., barometer 29.19, SSW. fresh gale, rough sea, cloudy. *North Pacific Ocean.*—Three well-developed depressions appeared during the latter part of February and first half of March on the east coast of Asia, and the tracks Nos. I, II and III, indicate their general directions, although reports are too meager to allow them to be considered as anything more than approximations. No. I passed eastward at a short distance north of Zi-Ka-Wei, China, on February 27; at this place the lowest barometer (29.73) occurred at 2 p. m., and the wind veered from SE. by S. and W. to NW.; total rain-fall 1.39 inches. Nos. II and III probably moved in the directions shown, although there is no data yet to hand to mark the exact positions of their centers. *South Pacific Ocean.*—"January 9 and 10, 1879, between Feejee Islands and New Hebrides, hurricane with heavy seas." Ship Othello reports February 8, 17° 40′ S., 172° E., severe NW. gale increasing at 10 p. m. to hurricane; 9th, 5 a. m., hurricane at its height, wind terrible—8 a. m., moderated, fearful sea, wind SW.—noon, moderate but sea very high—4 a. m. (probably should be p. m.), another gale more violent than before, wind NNE., with thunder and lightning—later, wind S. and high confused sea; 10th, SW. heavy gale, moderating during afternoon." *Indian Ocean.*—"January 20, 1879, 16° S., 100° E., decks filled with water during heavy SE. gales."

TEMPERATURE OF THE AIR.

The isothermal lines on Chart No. II show the general distribution of the temperature of the air for the month. By a reference to the table of average temperatures upon the same chart it will be seen that for the present month it averages below that for a number of years at Yuma and Tucson, Arizona, in Eastern Gulf States, Florida, Atlantic States, Lower Lake region, Saint Lawrence Valley and on Mount Washington. For the remaining districts it has averaged higher than usual, especially from Utah and Northern Arizona northeastward to the Upper Mississippi Valley.

Minimum and maximum temperatures, respectively, are for *Maine*—at Orono, 14° and 64°; Eastport, 16°, 55°; Portland, 23°, 62°. *New Hampshire*—Mount Washington, —7°, 42°; Dunbarton, 18°, 73°. *Vermont*—Newport, 11°, 62°; West Charlotte, 18°, 72°; Burlington, 13°, 68. *Massachusetts*—Rowe, 14°, 60°; Billerica, 22°, 79°; Boston, 19°, 70°; *Rhode Island*—Fort Adams, 21°, 70; Newport, 22°, 67°. *Connecticut*—Southington, 19°, 71°, Mystic, 25°, 72°; Hew Haven, 22°, 71°. *New York*—Madison Barracks, 9°, 70°; West Point, 17°, 80°; Plattsburg Barracks, 11°, 64°; Albany, 17°, 69°; New York City, 24°, 72°; Rochester, 11°, 75°; Buffalo, 15°, 71°. *New Jersey*—Princeton, 19°, 81°, Vineland, 30°, 83°; Atco, 29°, 84°; *Pennsylvania*—Franklin, 12°, 76°; New Castle, 20°, 84°; Philadelphia, 25°, 80°; Pittsburgh, 23°, 82°; Litchfield, 15°, 73°; Catawissa, 23°, 81°, *Delaware*—Dover, 32°, 80°. *Maryland*—Woodstock, 22°, 81°; Emmittsburg, 23°, 83°; Baltimore, 29°, 83°. *District of Columbia*—Washington, 27°, 85°. *Virginia*—Wytheville, 22°, 79°; Accotink, 30°, 87°; Norfolk, 28°, 86°. *West Virginia*—Helvetia, 22°, 80°; Wellsburg, 26°, 88°: Morgantown, 22°, 82°. *North Carolina*—Highlands, 20°, 72°; Weldon, 34°, 88; Greensboro, 32°, 80°. *South Carolina*—Aiken, 35°, 85°; Charleston, 39°, 81°: *Georgia*—Forsyth, 34°, 84°; Quitman, 36°, 86°; Augusta, 34°, 85°. *Florida*—Milton, 24°, 76°; Houston, 32°, 92°; Jacksonville, 39°, 83°. *Alabama*—Green Springs, 30°, 81°.

Montgomery, 36°, 87°; Mobile, 40°, 86. *Mississippi*—Brook Haven, 36°, 79°; Fayette, 38°, 82°; Vicksburg, 39°, 83°. *Louisiana*—Okalooska, 36°, 85°; Shreveport, 44°, 85°; New Orleans, 46°, 85°. *Texas*—Concho, 35°, 97; Eagle Pass, 46°, 100°; Denison, 40°, 85°; Austin, 50°, 85°; Uvalde, 37°, 98°; Galveston, 56°, 82°; Corsicana, 37°, 87°; Indianola, 52°, 89°; El Paso, 31°, 98°. *Ohio*—North Lewisburg, 14°, 81°; Jacksonburg, 19°, 90°; Columbus, 18°, 82°; Cincinnati, 23°, 82°. *Kentucky*—Bowling Green, 28°, 85°; Louisville, 26°, 84°. *Tennessee*—Knoxville, 24°, 87°; Memphis, 36°, 85°; Austin, 32°, 84°. *Arkansas*—Mount Ida, 28°, 82°. *Michigan*—Alpena, 5°, 66; Marquette, 12°, 80°; Nirvana, 19°, 87°; Detroit, 21°, 76°. *Indiana*—New Corydon, 16°, 81°; Saint Meinrad, 27°, 85°; Indianapolis, 21°, 82°. *Illinois*—Riley, 8°, 84°; Sterling, 22°, 88°; Chicago, 17°, 80°; Cairo, 29°, 83°. *Missouri*—Pierce City, 14°, 87°; Kansas City, 14°, 89°; Saint Louis, 25°, 83°. *Kansas*—Topeka, 10°, 86°; Independence, 26°, 90°; Dodge City, 19°, 87°. *Iowa*—Logan, 12°, 78°; Guttenburg, 18°, 88°; Des Moines, 17°, 84°. *Nebraska*—Plattsmouth, 12°, 80°; Fort McPherson, 14°, 85°; Fort Hartsuff, 9°, 81°. *Indian Territory*—Fort Sill and Fort Gibson, 31°, 84°. *Minnesota*—Duluth, 7°, 69°; Breckenridge, 4°, 77°; Saint Paul, 13°, 81°. *Dakota*—Olivet, 9°, 82°; Deadwood, 20°, 71°; Bismarck, 11°, 75°; Pembina, —10°, 75°; Yankton, 7°, 80°; Morristown, 20°, 82°. *Colorado*—Pike's Peak, —10°, 37°; Fort Lyon, 25°, 84°; Denver, 28°, 76°; Fort Garland, 15°, 74°; Colorado Springs, 24°, 71°. *New Mexico*—Fort Union, 21°, 80°; Santa Fé, 23°, 84°. *Wyoming*—Cheyenne, 22°, 72°; Fort Fred. Steele, 17°, 76°. *Utah*—Promontory, 25°, 78°; Ogden, 36°, 83°; Fort Douglas, 28°, 70°; Salt Lake City, 30°, 74°. *Nevada*—Tecoma, 16°, 80°; Winnemucca, 26°, 77°; Pioche, 26°, 90°; Camp Halleck, 29°, 83°. *Arizona*—Yuma, 48°, 103°; Tucson, 39°, 97°. *Idaho*—Boise City, 32°, 80°. *Montana*—Virginia City, 18°, 66°. *California*—San Francisco, 46°, 76°; Los Angeles, 42°, 88°; Summit, 20°, 55°; Red Bluff, 40°, 87; Visalia, 40°, 89°; Campo, 26°, 90°; Indio, 50°, 109°; Mammoth Tank, 52°, 108°. *Oregon*—Portland, 35°, 77°; Roseburg, 32°, 75°. *Washington Territory*—Olympia, 32°, 64°.

Ranges of temperature.—The *monthly ranges* will appear from an examination of the minimum and maximum just given. Greatest *daily ranges* vary in New England from 18° at Wood's Holl and summit of Mount Washington to 34° at Springfield; Middle Atlantic States, 25° at New York City to 43° at Lynchburg; South Atlantic States, 21° at Cape Lookout to 35° at Augusta; Eastern Gulf States, 15° at Key West to 34° at Montgomery; West Gulf States, 19° at Galveston to 47° at Uvalde, Texas; Ohio Valley and Tennessee, 31° at Cairo to 38° at Memphis; Lower Lake region, 23° at Oswego to 35° at Buffalo; Upper Lake region, 25° at Chicago to 39° at Marquette; Upper Mississippi Valley, 28° at Keokuk to 39° at Saint Paul; Missouri Valley, 33° at Omaha to 47° at Yankton; Red River of the North, 38° at Pembina to 43° at Breckenridge; Eastern Rocky Mountain slope, 36° at Deadwood and 39° at Fort Sill to 50° at North Platte; Rocky Mountains, 17° on Pike's Peak and 31° at Virginia City to 45° at Cheyenne; Western Plateau, 32° at Pioche to 40° at Winnemucca and Boise City; California, 24° at San Francisco to 56° at Campo; Arizona, 55° at Yuma to 58° at Tucson; Oregon, 29° at Portland and 31° at Roseburg; Washington Territory, 27° at Olympia.

Frost, injurious to vegetation, is reported as follows: Green Springs, Alabama, 5th, peaches killed, and the foliage of many trees frost-bitten. A report, dated the 18th, gives the following information: Burke County, Georgia, peaches nearly all killed; Talbot County, Georgia, peaches one-half killed; Sumter County, Georgia, fruit materially injured; Montezuma County, Georgia, crops not materially damaged by late frost; Rockdale County, Georgia, young corn killed; Thomas County, Georgia, corn injured; Valdosta County, Georgia, considerable damage to cotton and other vegetables. Houston, Florida, 5th, great damage to vegetables and early cotton; Mayport, Florida, 5th, 6th, vegetation considerably injured; Gulf Hammock, Florida, 5th, 6th, cotton so severely damaged that it had to be replanted, corn and sugar-cane damaged somewhat; Thomasville, Georgia, 5th, vegetation considerably damaged; Peoria, Illinois, 3d, many flowers killed; Independence, Kansas, 2d, 3d, 4th, peaches all killed; Creswell, Kansas, 18th, fruit badly injured; Lenoir, North Carolina, 9th, peaches killed; Aiken, South Carolina, 4th, 5th, fruit injured, pea-blossoms and leaves of trees killed; McMinnville, Tennessee, 3d, 4th, 5th, early fruit considerably injured; Boise City, Idaho, 26th, all kinds of fruit frost-bitten; Saint Mark's, Florida, 6th, considerable injury to corn, cotton, and tender vegetation; Mobile, Alabama, 5th, potatoes and beans severely injured; Knoxville, Tennessee, all fruits supposed to be killed in this vicinity; Cairo, Illinois, peaches reported entirely destroyed; Nashville, Tennessee, 4th, peaches killed; Chattanooga, Tennessee, 5th, fruit injured; Charlotte, North Carolina, 4th, 5th, vegetables and fruit all destroyed, wheat and oats badly damaged; Wilmington, North Carolina, 4th, great damage to early vegetables and fruit; Augusta, Georgia, 4th, fruit and vegetables seriously injured; Lynchburg, Virginia, 4th, fruit slightly injured; Yreka, California, 7th, 20th, heavy frost, peaches killed; Great Bend, Kansas, 3d, peaches damaged.

Frost out of ground.—Muscatine, Iowa, 1st; Monticello, Iowa, 1st; Waltham, Massachusetts, 16th; Contoocookville, New Hampshire, 15th; Hector, New York, 14th.

Ice formed at Salt Lake City on the 9th; Santa Fe, New Mexico, 9th, 10th, 13th, 23d and in the Southern States as follows: Forsyth, Georgia, 4th, 5th; Weldon, North Carolina, 4th, 13th; Wilmington, North Carolina, 4th; Statesville, North Carolina, 4th;

McMinnville, Tennessee, 3d, 4th, 5th; Cairo, Illinois, 3d, 4th, 5th; Charlotte, North Carolina, 4th, 5th; Cape Lookout, North Carolina, 4th; Augusta, Georgia, 4th; Green Springs, Alabama, 3d, 4th, 5th, 6th; Gulf Hammock, Florida, 5th; Palermo, New York, 4th, ice on pond 16 inches thick; Strafford, Vermont, 29th, streams clear of ice; Dunbarton, New Hampshire, 30th, ice still on ponds; Rowe, Massachusetts, 30th, ice completely covers a reservoir pond except about the edges where streams flow in, although it is fully open to the sun; it is said to be very rare for it to be found clear of ice before May 1.

Ground frozen.—Atco, N. J., 20th; Palermo, N. Y., 4th; Egypt, Pa., 18th; Chambersburg, Pa., 12th; Mount Solon, Va., 3d; Neillsville, Wis., 2d, from 3½ to 5 feet deep.

PRECIPITATION.

The general distribution of the rain-fall, which includes melted snow, for the month is illustrated as accurately as possible upon Chart No. III. In the lower left-hand corner of same will be found a table giving the average precipitation of April by districts. In New England, the South Atlantic and Gulf States it has been larger than usual. Along the California coast an average fall has taken place. In the remaining districts there has been a deficiency.

Special heavy rains.—13th and 14th, Okalooska, La., 3.20 inches. 14th and 15th, Mobile, Ala., 3.33 inches; Fort Barrancas, Fla., 5.40 inches; Saint Mark's, 5.15 inches. 15th, Shreveport, 4.64 inches in eight hours. 15th and 16th, Brookhaven, Miss., 3.15 inches. 15th to 17th, Thomasville, Ga., 5.54 inches. 16th, Okalooska, La., 2.60 inches; New Orleans, 2.82; Aiken, S. C., 3.60 inches; Montgomery, Ala., 2.52. 16th and 17th, Savannah, Ga., 6.11; Charleston, S. C., 5.09; Wilmington, N. C., 2.61 inches; Forsyth, Ga., 3.65 inches; Quitman, Ga., 3.90; Fayetteville, N. C., 3.00 inches. 16th to 18th, Fort Barrancas, Fla., 4.08 inches. 21st to 22d, Wellington, Kans., 3.13 inches; Fort Sill, Ind. T., 6.46 inches; Graham, Tex., 3.68 inches (supposed total about 4.03 inches). 21st to 23d, Hat Creek, Wyo., 6.74 inches. 22d, Corsicana, Tex., 6.31 inches (in four hours); Melissa, Tex., 4.00 inches. 22d and 23d, Clarksville, Tex., 5.50 inches; Austin, Tex., 4.40 inches. 23d, Corsicana, Tex., 3.31 inches. 23d and 24th, New Ulm, Tex., 5.12 inches. 25th and 26th, New Orleans, 4.27 inches. 27th and 28th, Fayetteville, N. C., 6.25 inches; Pilot Point, Tex., 3.00 inches in forty-five minutes.

Largest monthly rain-falls.—Fort Barrancas, Fla., 14.28 inches; Fayetteville, N. C., 12.75; Pike's Peak, 12.15; Corsicana, 11.50; Shreveport, 10.23; Saint Mark's, 9.73; New Orleans, 9.17; Okalooska, La., 8.86; Savannah, 8.69; Clarksville, Tex., 8.37; Quitman, Ga., 8.00; Alta, Cal., 7.73; Deadwood, Dak., 7.69; Fort Sill, Ind. T., 6.93; Mount Washington, 6.79; Colfax, Cal., 6.56; Mobile, 6.42.

Smallest monthly rain-falls.—Indio, Mammoth Tank, and Yuma, Cal., Burkes, Ariz., and Edinburg, Tex., none; Tucson, Ariz., and Albuquerque, N. Mex., 0.02 inch; Prescott, Ariz., and La Mesilla, N. Mex., 0.03 inch; Laredo, Tex., 0.04 inch; Phœnix and Camp Grant, Ariz., and El Paso, Tex., 0.07 inch; Camp Verde, Ariz., 0.10 inch; Camp Apache, Ariz., 0.12 inch; Wickenburg, Ariz., and Fort Davis, Tex., 0.13 inch; Yuma, Ariz., 0.15 inch; Mojave, Cal., 0.22 inch; White Water, Cal., 0.30 inch; Florence, Ariz., 0.33 inch; Pembina, Dak., 0.34 inch; Tecoma, Nev., 0.35; Yankton, Dak., and Anaheim, Cal., 0.37 inch; Dodge City, Kans., 0.40 inch; La Crosse, Wis., 0.42 inch; Rio Grande, Tex., 0.43 inch; Saint Paul, Minn., and S. Vallejo, Cal., 0.45 inch; Santa Fé, 0.48 inch; Kingston, Can., 0.51 inch; Marquette, Mich., 0.53 inch.

Hail.—Red Bluff, Cal., 7th, 10th; Umatilla, Oreg., 13th; Winnemucca, Nev., 4th, 14th; Pioche, Nev., 4th; Boise City, Idaho, 19th; Virginia City, Mont., 29th, during 7 minutes hail fell to the depth of ½ inch, storm one-half mile wide and about ten miles long; Fort Garland, Colo., 2d, 12th, 14th, 22d, 23d; Fort Preble, Me., 25th; Fort Independence, Mass., 10th; Fort McPherson, Nebr., 21st; Fort Union, N. Mex., 14th, 15th, 16th, 22d; Fort Niagara, N. Y., 10th; West Point, N. Y., 18th; Fort Concho, Tex., 8th; Fort Douglas, Utah, 20th; Fort Fred. Steele, Wyo., 8th, 14th, 20th; Thomasville, Ga., 15th; Mount Sterling, Ill., 9th, two miles northwest of station hail fell to the depth of 4 inches; Highland, Ill., 9th, 14th; Great Bend, Kans., 30th, 8:20 a. m., very heavy hail storm, accompanied by a strong N. wind, unsheltered cattle stampeded, many small birds killed, much foliage cut from trees, young orchards badly damaged, and nearly all windows on northern exposures were broken; Holton, Kans., 6th; Independence, Kans., 6th, 8th; Wellington, Kans., 21st; Okalooska, La., 14th, 15th; West Waterville, Me., 26th; New Market, Md., 15th; Emmittsburg, Md., 17th, 18th; Covington County, Mississippi, 15th, very severe hail-storm, stones as large as goose eggs, shingles on houses split to pieces, fowls killed, gardens and orchards ruined; Oregon, Mo., 6th, 9th; Springfield, Mo., 29th; Kansas City, Mo., 7th, 29th; Genoa, Nebr., 9th; Freehold, N. J., 3d, 7th, 18th; Vineland, N. J., 19th; Flushing, N. Y., 24th; Fallsington, Pa., 3d, 9th, 20th; Cincinnati, 2d; Ashwood, Tenn., 16th, 9 p. m., six miles south of station very severe hail-storm, stones as large as hens' eggs, precipitation so heavy that they could be gathered up the following morning, great damage done to corn-fields, width of storm about three miles; Aiken, S. C., 15th, 17th; Fort Gibson, Indian T., 6th; Leavenworth, 6th, 29th; Dennison, Tex.,

15th; San Antonio, Tex., 15th, 22d; Graham, Tex., 30th; Uvalde, Tex., 23d; Concho, Tex., 8th; Saint Mark's, Fla., 15th; Corsicana, Tex., 15th, very severe hail-storm, stones 3½ inches in circumference, much damage to gardens and windows, birds killed; Saint Louis, 14th, violent hail-storm, stones size of hens' eggs, much damage to windows, total damage in vicinity $10,000; Logansport, Ind., 25th; Memphis, Tenn., 14th; Albany, N. Y., 15th; New London, Conn., 17th; Shreveport, 15th, 6:45 p. m., severe hail-storm, stones size of turkeys' eggs, corn and cotton very much damaged, width of track seven miles, length eighteen; Arlington, Tex., 16th, stones of unusual size, some weighing 5 ounces; Ennis, Tex., 4:30 p. m., terrific hail-storm, some stones 5½ inches in circumference, fruit crop badly damaged; Terrell, Tex., 16th, terrific hail-storm, stones size of goose eggs; Leesville, Cantwell County, Texas, 16th, stones as large as hens' eggs, breaking windows and destroying crops; Navasota, Grimes County, Texas, 14th, considerable damage to corn and cotton; New Orleans, 16th, 5:30 to 7:30 p. m., heavy thunder and hail storm from the west, hail-stones 1 to 5 inches in circumference, rainfall 2.82 inches, doing much damage to glass and crops, "during the storm a duck, of a species known as the 'blue rail', rarely seen in this city, though occasionally met with in the marshes along the Gulf Stream more than 100 miles south of here, fell to the pavement dead, having its back and wings covered with a thick coating of ice."

Rainy days.—The number of days during which rain or snow has fallen varies as follows: New England, from 12 to 17; Middle Atlantic States, 7 to 17; South Atlantic States, 8 to 15; Key West, 1; Gulf States, excepting Texas, 8 to 11; Texas, 2 to 13; Ohio Valley and Tennessee, 9 to 16; Lower Lake region, 12 to 19; Upper Lake region, 6 to 11; Upper Mississippi Valley, 7 to 10; Missouri Valley, 5 to 13; Red River of the North, 5 to 7; Eastern Rocky Mountain slope, 5 to 8; Rocky Mountains, 1 to 16, and on Pike's Peak, 20; Western plateau, 9 in Idaho to 11 in Nevada and Utah, to 1 and 0 in Southern Arizona; California, 6 to 12; coast of Oregon and Washington Territory, 18.

Cloudy days.—The number varies from 8 to 18; Middle Atlantic States, 9 to 14; South Atlantic States, 5 to 9; Gulf States, 1 to 10; Lower Lakes, 8 to 15; Upper Lakes, 4 to 10; Ohio Valley and Tennessee, 5 to 10; Upper Mississippi Valley, 2 to 9; Lower Missouri Valley, 7 to 11; Eastern slope, 0 to 9; Rocky Mountains, 0 in Southern New Mexico to 15; Western plateau, 7 to 12, to 0 in Southern Arizona; Pacific coast, 5 in southern to 17 in northern portion.

Snow fell in the different districts as follows: New England, 1st to 7th, 9th to 19th, 25th, 27th, 28th, 29th; Middle Atlantic States, 1st to 7th, 11th, 12th, 13th, 15th, 17th, 18th, 19th, 25th, 27th, 30th; South Atlantic States, Lenoir, N. C., 19th, on mountains; Ohio Valley, 2d, 3d, 4th, 5th; Lower Lakes, 1st to 5th, 10th, 11th, 13th, 15th; Upper Lakes, 1st, 2d, 3d, 4th, 5th; Upper Mississippi Valley, 1st, 2d, 3d, 28th, 29th; Dakota, 2d, 8th, 9th, 16th, 23d; Rocky Mountains, 1st, 3d, 5th, 6th, 8th, 9th, 12th, 13th, 14th, 15th, 16th, 20th, 21st, 22d, 23d, 28th, 29th, 30th; Nevada, 2d, 4th, 5th, 7th, 8th, 11th, 12th, 20th, 21st; Utah, 8th, 20th, 21st; California, Yreka, 14th at station, 10th, 19th, low down on foot-hill; Los Angeles, 5th, 11th, tops of mountains covered with snow; British Columbia, New Westminster, 16th. The largest total monthly snowfalls at stations in the Sierra Nevadas are reported by the observers of the Central Pacific Railroad Company as follows: Emigrant Gap, 28 inches; Cisco, 45 inches, and Summit, 45.25 inches.

Depth of snow on ground at end of month.—Pike's Peak, 72 inches; Mount Washington, 6 inches; Mount Desert, Me., about 1 foot in the woods; Rowe, Mass., 6 to 12 inches in the woods; Dunbarton, N. H., in drifts; Woodstock, Vt., in drifts; Red Bluff, Cal., snow on coast range.

Droughts.—Dallas, Tex., 19th, most severe that has been experienced in this section for thirty years; on many plantations wheat is not more than one foot high and is heading out; fears are entertained of a famine in corn and oats; so far vegetables are a total failure; "the high and dry winds that have prevailed for three weeks are still blowing, with no moisture in the air and not a cloud to be seen in the heavens;" the drought covers all that portion of the State lying upon a line of Denison and San Antonio, including every county west of it, and an average of two tiers east; in some portions of this territory people are hauling water for drinking purposes a distance of from three to six miles; the larger streams are all of them lower than can be remembered. Fort Gibson, Indian T., 21st, vegetation greatly retarded; stock, excepting sheep, suffering very much. Fort Dodge, Iowa, 30th, vegetation very backward for want of rain. Corsicana, Tex., 2d, small grain suffering; 14th, much damage has resulted to the grain crops. Indianola, Tex., 8th, crops suffering very badly; very little rain has fallen in the past three months. Grand Haven, Mich., 24th, crops suffering considerably for want of rain. Yankton, Dak., 30th, wheat suffering. Kanab, Utah, 2d, ground and grass suffering very severely, cattle dying on ranges; 8th, grass withering; 14th, cattle still dying; 30th, no rain, everything drying up.

Floods.—Forsyth, Ga., 17th, heavy rain, doing great damage to cultivated fields by washing. Thomasville, Ga., 15th to 17th, much damage to farms, highways and railroads, trains stopped four days by washouts. Fayetteville, N. C., 28th, very heavy rainstorm, caused the breaking away of a dam outside city limits, one railroad and three street bridges swept away, and a large woolen factory almost entirely ruined; much

damage to private property. Deadwood, Dak., 21st, 22d, several houses washed away. Omaha, Nebr., 8th, 9th, railroad tracks along the flats submerged; smelting and refining works partly flooded. Fort Sill, Indian T., 22d, creeks impassable. Corsicana, Tex., 22d, all highway bridges within a radius of thirty miles swept away; large numbers of cattle and horses drowned; railroad trains abandoned on the Texas Central for thirty-six hours. Shreveport, La., 15th, houses flooded.

For March the following total monthly rainfalls were received after the issue of the review; Dakota—.10 inch at Fort Totten; 25, Fort Buford. Montana—.14, Fort Benton; .19, Fort Keogh; 1.85, Blackfeet agency; 1.86, Fort Logan; 2.77, Fort Ellis. Idaho—2.12 at Fort Lapwai. Washington Territory—1.24 at Fort Colville; 2.10, Fort Townsend; 13.70, Bainbridge, I; 23.83, Neah Bay. California—.07 at San Buenaventura; .55, San Gorgonio; .60, Campo; 19.28, Camp Gaston. Arizona—.00 at Fort Mojave; trace at Camps Apache and Verda; .05, Prescott; .18, Camp Lowell; .40, Camp Bowie; .48, Yuma; .60, Camp McDowell; .85, Camp Grant. New Mexico—.32 at Silver City.

RELATIVE HUMIDITY.

The average percentage of relative humidity for the month ranges as follows: New England, from 58 to 71; Middle Atlantic States, 50 to 76; South Atlantic States, 55 to 75; Key West, 68; Gulf States, 54 to 74; Ohio Valley and Tennessee, 50 to 62; Lower Lake region, 59 to 71; Upper Lake region, 59 to 69; Upper Mississippi Valley, 47 to 56; Lower Missouri Valley, 52 to 59; Red River of the North Valley, 59 to 75; Eastern Rocky Mountain slope, 45 to 54; Rocky Mountains, 35 to 58; Western plateau, 35 to 52; Pacific States, 35 to 76. High stations report the following, not corrected for altitude: Mount Washington, 86; Pike's Peak, 60 per cent.

WINDS.

The prevailing winds at the Signal Corps stations are shown by the arrows, flying with the wind, on Chart No. II. The maximum velocities, in miles per hour, have been given in the description of the movements of areas of low and high pressure. On Mount Washington the highest velocity of the month, NW. 182 miles, was recorded on the 1st.

Total movements of the air.—The following are the largest monthly movements recorded at the Signal Corps stations, viz.: Pike's Peak, 14,958 miles; Cape May, 13,591; North Platte, 12,994; Thatcher's Island, 11,512; Dodge City, 11,421; Cape Lookout, 11,346; Sandy Hook, 11,221; Breckenridge, 10,788; Wood's Holl, 10,662; Kittyhawk, 10,488; Fort Sill, 10,369; Indianola, 10,309; Barnegat, 9,959; Fort Stevenson, 9,563; Boston, 9,466; Cape Henry, 9,281; Cape Hatteras, 9,090. On the summit of Mount Washington a continuous record has not been obtained. The smallest are La Mesilla, N. Mex., 1,234 miles; Visalia, Cal., 2,491; Roseburgh, Oregon, 2,501; Nashville, 2,605; Deadwood, 3,035; Tucson, 3,050; Augusta, 3,124; Lynchburgh, 3,279; Virginia City, 3,395; Olympia, Washington T., 3,432; Uvalde, Tex., 3,454; San Antonio, Tex., 3,751; Graham, Tex., 3,785; Los Angeles, 3,823.

Local storms.—As low-pressure area No. IV passed eastward over Virginia on the 3d, a "tornado occurred at Brown's Summit, N. C., doing a large amount of damage." As low-pressure area No. VIII moved eastward over the central Mississippi Valley, during the afternoon and evening of the 14th, tornadoes occurred at Collinsville, Madison County, Illinois, and at Pocahontas, Hardman, County, Tennessee. Professor Nipher, in the monthly bulletin of the Missouri weather service, states that "in the Mississippi bottom, a few miles east of Saint Louis, several tornadoes, unaccompanied by lightning, rain, or hail, were developed (at least four), the tracks of three of which intersected in the village of Collinsville, Ill.," and that a "careful study of these has been made, and the result will be published in detail." The one at Collinsville "passed through the town at 2:45 p. m., taking a zigzag course in a general direction from WNW. to ESE; width of path about 1,200 feet and length about three-quarters of a mile; the storm lasted about two or three minutes, destroyed about sixty buildings and injured several persons; in the cemetery nearly every stone was leveled; total loss about $50,000." At Pocahontas another "struck the town about 9 p. m., taking a course east of north, track about a quarter of a mile wide, storm lasting thirty seconds; it either demolished or unroofed all the buildings (which were of wood) in the village, and the roaring of the storm was heard miles away. The black cloud and accompanying noise were distinctly seen and heard from Hatchie Bridge, a few miles east of Pocahontas, and at 10:40 p. m. a cyclone (tornado) crossed the track of the Memphis and Charleston Railroad at a point about ten miles east of Pocahontas, where the storm did not last over fifteen or twenty seconds (at this point the track was about 1,000 feet wide), three houses were blown away, others were more or less damaged, and a house-roof and some furniture were carried a distance of three miles." As low-pressure area No. X passed eastward over the Southern States on the 15th and 16th, tornadoes occurred at Dallas,

Tex., and Walterborough, S. C. The following notes, chiefly newspaper extracts, are to hand: "Dallas, 15th, 1 to 2 p. m., cloudy, with three distinct strata of clouds moving easterly, southerly and northwesterly, falling temperature and barometer; at 2 p. m. a murky, cone-shaped mass of vapor arose west of the north horizon, and swiftly moved southward;" * * * "the roar of the scudding volume presaged the storm;" * * * "it was preceded by hail and followed by heavy rain, which continued intermittingly to flood the streets of Dallas for two hours. The hail-stones were flattish-oblong, two to six inches in circumference, one to two inches across and three-fourths to one and one-half in thickness. The black, green-rimmed cone, gradually changing from perpendicular to horizontal, rose and fell in its motion like a monster wave as it sped with its apex pointing south. Before reaching the city the storm-scud parted in an apparent effort to change its course to the westward, the main part veering to the southeast and the other assuming the shape of a waterspout, twirling south of west. The course of the main cloud, which evidently shot upward before reaching the city, is not known; but subsequent developments indicate that the scud again parted, one portion going due east and expanding and the other taking a southwesterly course, assuming the shape of an inverted funnel, gradually lowered until it struck the ridge dividing Ten-Mile and Five-Mile Creeks, seven miles south of Dallas, * * * where it made a conjunction, near Greer's farm, with the body which helped to form the tornado, after which it suddenly changed its course to northeasterly along the valley of Five-Mile Creek." Another report says: "The angry visitors, one traveling westerly from Trinity River, the other easterly toward the river, were not more than 300 yards wide until they collided near the Greer farm; when united they attained the width of three-fourths of a mile; the contact was preceded by rapid, vivid and blinding lightning, and followed by three deafening crashes of thunder. The force of the wind was terrific." * * * "The cyclone (tornado) having spent its force at the Belt place, the storm took its original course southward." Again: "The motion of the funnel-shaped body which first separated from the cone northwest of Dallas, and also of the other body which afterward separated from the main scud east of Dallas, was rotary from southeast to northwest, or from right to left, until they collided at Greer's farm. After conjunction the bodies moved as one mass northeastward; but its motion was completely reversed (?), the whirl (?), as is evidenced by the *débris* and partially destroyed fencing, being from northwest to southeast. After the storm a dead sparrow was picked up, the head of which was completely encased with ice. The track of tornado along Five-mile Creek was about eight miles long and two (?) in width; near Lisbon fifteen houses were completely demolished, six others and many out-houses damaged, and about twenty-five persons (ten seriously) more or less injured; fencing was destroyed for a distance of eight miles." The tornado that "traversed the southern portion of South Carolina on the evening of the 16th was almost as violent in Alabama. It swept across the State from Otto, through Lee County, Alabama, tearing down houses and uprooting trees, and passed into Georgia. At Otto the cyclone (tornado) approached in a circular cloud that was seen two miles off, and came with a deep, humming sound. The cloud appears to have rebounded from the earth at intervals. Loss heavy; fields washed smooth by heavy rains. Railroad traffic toward Alabama from South Carolina was stopped on two roads, the tracks being under water for hundreds of yards." The tornado "passed through the center of Walterboro, S. C., about 4 p. m.; its approach was heard for about three minutes and the storm lasted two minutes; the storm (wind) came from the south about a minute, then shifted to northwest, with new fury; * * * the destruction commenced about one mile south of the village, * * * and some farms were desolated to the east of us; it was followed by terrible thunder-storms all night and deluge of rain next day; it demolished about one-half of the dwellings and every (seven) church; in eastern portion of town trees and ruined houses were massed together in every direction, and all the streets and landmarks totally obliterated; six persons killed, five severely injured, and a number of others cut and bruised. The destruction was accomplished in less than two minutes." At Oakley, about forty miles ENE. of Walterborough, "all the houses occupied by negroes were leveled, one negro killed, and many injured; similar casualties are reported from various points along the track of the tornado." On the 27th, at 1 p. m., a very severe storm occurred at Pilot Point, Tex., "sweeping buildings, roofs, trees, fences, &c., in every direction, raising a church 20 feet from the foundation and causing a total destruction of it; maximum measured velocity of wind, NW. 64 miles; rainfall from 1 to 1:45 p. m., 3 inches."

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily weather indications, with the telegraphic reports for the succeeding twenty-four hours show the general percentage of omissions to be 0.9 per cent., and of verifications to be 82.9 per cent. The percentages for the four elements are, for the weather 88.3; wind direction, 84.6; temperature, 81.1; barometer, 77.6. The percentages of verifications by geographical districts are: New England, 81.8; Middle States, 87.2; South Atlantic States 82.0; East Gulf States,

85.5; West Gulf States, 81.9; Lower Lake region, 83.2; Upper Lake region, 81.8; Tennessee and the Ohio Valley, 84.4; Upper Mississippi Valley, 81.5; Lower Missouri Valley, 80.1; Northern Pacific coast region, 78.4; Central Pacific coast region, 83.6; Southern Pacific coast region, 90.5. Of the 3,665 predictions that have been made, 132, or 3.6 per cent., are considered to have entirely failed; 109, or 3.0 per cent., were one-fourth verified; 554, or 15.1 per cent., were one-half verified; 526, or 14.4 per cent., were three-fourths verified; 2,334, or 63.9 per cent., were fully verified, so far as can be judged from the tri-daily weather maps.

Cautionary signals.—One hundred and ninety-two cautionary signals were displayed during the month, of which 128, or 66.7 per cent., were justified; 96 cautionary off-shore signals were displayed, and of these 92, or 95.8 per cent., were justified as to direction; 80, or 83.3 per cent., were justified as to velocity. Of the cautionary off-shore signals 50 were changed from cautionary. Two hundred and eighty-eight signals of both kinds were displayed, of which 208, or 72.2 per cent., were fully justified. The above does not include signals ordered at 47 display stations, where the velocity is only estimated and not measured. Eighty-four cases were reported of winds of 25 miles or over where signals were not ordered.

NAVIGATION.

Stage of water in rivers.—In the table on the right-hand side of Chart No. III are given the highest and lowest readings of the Signal Corps river gauges for the month, with the dates. The Missouri rose above the danger point at Omaha on the 9th. Excepting the Savannah and Red, the rivers reached their lowest points at or near the close of the month.

Ice on lakes, rivers, &c.—*Missouri*—Fort Hale, Dak., 14th, first steamboat passed up river. *Red River of the North*—Fort Pembina, Dak., ice breaking up and moving; 12th, river free of ice; 14th, first steamer passed the fort going south. Pembina, Dak., 2d, teams continue to cross on the ice; 3d, rapid rise in river; 8th, ice moving; 10th, ice moved out, but gorged one-fourth mile below station; 11th, ice gorge moved out; 12th, navigation opened, much floating ice; 13th, first boat of season departed; 19th, first boat of season arrived. *Mississippi*—Saint Paul, 21st, first steamboat arrived. *Hudson*—Albany, N. Y., 1st, schooner arrived from New York City, first through boat of season; 2d, river clear of ice; 4th, first passenger boat from New York City. *Connecticut*—Lunenburgh, 25th, ice passed out. *Kennebec*—Gardiner, Me., 3d, ice broke below bridge and moved down about 40 yards; 5th, river clear for one mile below bridge; 10th, river open, having been closed for nine days in April; 11th, ice came down from Augusta. *Penobscot*—Bangor, Me., 24th, ice passed out at 10 a. m.; navigation resumed. *Lake Superior*—Duluth, Minn., 28th, first boat of season departed. *Lake Michigan*—Chicago, 1st, navigation opened; 29th, first vessel arrived from Lake Huron. *Green Bay*—Escanaba, Mich., 4th, ice in bay; 11th, ice cracking; 25th, first boat of season arrived and reported having been twenty-four hours in breaking her way through the ice in the harbor; ice moving out very rapidly; navigation opened. Portage Point, four miles from Escanaba, 10th, ice moving out. *Grand Traverse Bay*—Northport, Mich., 14th, ice moving, harbor partly clear; 15th, ice all driven up the bay, harbor clear; 21st, thin ice in harbor; 26th, first vessel arrived from Chicago; 27th, second steamer arrived; 29th, first vessel from Milwaukee. *Mackinac Straits*—18th, ice broken up between old Mackinac and Mackinac Island; 21st, boats from Lake Huron can reach Point Saint Ignace, the north passage being open and the shores free of ice; Mackinac Island, docks free of ice. *Lake Huron*—Alpena, Mich., 5th, first boat of season arrived; 11th, Thunder Bay River clear of ice. Port Huron, 3d, steamer Milton D. Ward made first trip from this port, being first vessel out on the lake; navigation opened. *Saint Clair River*—Port Huron, 10th to 15th, river full of floating ice. *Detroit River*—Detroit, 1st, floating ice; 2d, first steamer left for Cleveland. *Lake Erie*—Toledo, Ohio, 6th, first boat of season arrived. Propeller Enterprise, at Buffalo, 24th, from Saint Clair River, 19th, reported lake almost free of ice until within a few miles of Buffalo, when an immense field of rotton ice was encountered. Buffalo, 26th, ice in bay too solid for vessels to force their way through to the lake. *Niagara River*—Buffalo, 5th, river frozen over; 7th, river open; 16th, floating ice; 22d, much floating ice, first steamer of season arrived; 26th, ice drifting in a compact field across the entrance of the harbor, completely obstructing navigation. Fort Niagara, 28th, 29th, 30th, floating ice in river. *Welland Canal*—Saint Catherine's, Ont., 21st, water let into canal. *Lake Ontario*—Oswego, 9th, first vessel of season arrived; 14th, first vessel of season departed. First steamer of season down the lake from Kingston to Cape Vincent on the 19th, 41 days later than last year. Madison Barracks, 9th, loaded teams crossed bay on ice; 15th, last team crossed; 26th, bay clear of ice, navigation open. *Lake Champlain*—West Charlotte, Vt., 9th, teams crossed ice, which had continued for 53 days; 19th, ice moving a little; 23d, ice moving with north wind, lake has been covered with ice for 81 days; 24th, ferry-boats crossed. Burlington, Vt., 23d, ice breaking up; reference to records extending over a period of sixty years shows but

one other instance where the lake remained so long closed as this year; 24th, first boat of season crossed lake. Plattsburg Barracks, 27th, 28th, ice disappeared. *Saint Lawrence River*—Montreal, 16th, ice moving; 23d, channel free of ice, steamer left Boucherville for Montreal. Quebec, 16th, first outward bound steamer left port. *Magdalen Islands*—28th, steamer Albert arrived at Picton, bringing first mail of season from these Islands, reports winter moderate, field ice left early, and very little ice to be seen in the Gulf.

High tides.—Cape Lookout, N. C., 10th, 19th; Atlantic City, N. J., 18th, flooding meadows, and submerging about six miles of telegraph line. Barnegat, N. J., 17th. Gloucester, Mass., 18th, two tidal waves, first at 12:30 p. m., and the second at 4. p. m., raising water along the wharves about two and one-half feet; vessels aground. Indianola, 23d, 24th, tide flooding streets to an average depth of 10 inches; in lower portion of town water 2 feet deep. Galveston, 23d.

Change of channel in Missouri River.—On the 12th the bar on Yankton side of channel appeared to have increased during late rise, and steamers were compelled to finish loading nearly a mile below city.

TEMPERATURE OF WATER.

The *temperature of water*, as observed in rivers and harbors, with average depth when observations were taken, are given in table on chart No. II. Observations were interrupted at the following places on the dates indicated: on account of ice, noticed under navigation, at Alpena, 1st to 10th; Buffalo, 5th and 6th; Burlington, 1st to 23d; Detroit, 1st; Escanaba, 1st to 25th; Marquette, 1st to 21st; water too rough, at Cleveland on the 3d, 4th, 10th, 11th, 15th, and 17th; loss of thermometer at Augusta, 29th and 30th, at Galveston, 7th to 30th, Toledo 26th to 30th, and San Francisco, 1st to 30th. Reports to hand since printing of table; Norfolk, maximum temperature, 63°; minimum, 48°; depth, 22 feet. Punta Rassa, maximum temperature, 80°; minimum temperature, 70°; depth, 12 feet.

ATMOSPHERIC ELECTRICITY.

Thunder-storms.—1st, Pennsylvania, Texas, Louisiana, Alabama, Tennessee, Georgia; 3d, Ohio, Nevada; 4th, Tennessee, California, Colorado; 5th, Colorado, Nebraska; 6th, Kansas, Nebraska, Arkansas, Dakota, Illinois, Iowa, Missouri, Nebraska, California, Indian Territory, Tennessee; 7th, Alabama, Georgia, Missouri, California; 8th, Alabama, Kansas, Missouri, Nebraska, Indian Territory, Texas, Dakota; 9th, Illinois, Indiana, Iowa, Kentucky, Louisiana, Mississippi, Missouri, Tennessee, Texas, Dakota, Alabama; 10th, Alabama, Florida, Iowa, Canada, Maryland, North Carolina, Ohio, Pennsylvania, Virginia, West Virginia, Georgia; 11th, Kansas, Ohio; 12th, Colorado; 13th, Kansas, Kentucky, Louisiana, Mississippi, Missouri, Ohio, Texas, California, Indian Territory; 14th, Louisiana, Utah, Alabama, Florida, Georgia, Illinois, Indiana, Kansas, Kentucky, Missouri, North Carolina, Ohio, Texas, Colorado, Tennessee; 15th, Virginia, Alabama, Illinois, Louisiana, Maryland, Mississippi, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Texas, Florida, Georgia, New Jersey; 16th, Georgia, Alabama, Florida, Iowa, Mississippi, North Carolina, Pennsylvania, Tennessee, Texas, Louisiana, South Carolina; 17th, Georgia, Florida, North Carolina, Pennsylvania, Virginia, South Carolina; 18th, North Carolina; 19th, Idaho; 20th, Kansas, Nebraska; 21st, Texas, Kansas, Nebraska, Dakota; 22d, Kansas, Texas, Indian Territory, Dakota; 23d, Nebraska, Kansas, New Jersey, Texas, Indian Territory; 24th, Kansas, Wisconsin, Indian Territory, Texas; 25th, Arkansas, Florida, Indiana, Kansas, Mississippi, Ohio, Texas, Louisiana; 26th, Canada, Florida, Iowa, Louisiana, Mississippi, Missouri, Ohio, Texas, Colorado; 27th, Georgia, Florida, Illinois, Kansas, North Carolina, Ohio, Pennsylvania, Texas, Colorado, Indian Territory, Iowa, Michigan, Wisconsin, New York; 28th, Kansas, New York, Canada, Florida, Massachusetts, Missouri, Nebraska, New Jersey, North Carolina, Pennsylvania, Virginia, Mississippi, Alabama; 29th, Massachusetts, Nebraska, Wyoming Territory, Connecticut, Indiana, Kansas, Michigan, Missouri, North Carolina, Colorado, Georgia; 30th, Nebraska, Arkansas, Kansas, Massachusetts, Missouri, New Jersey, North Carolina, California, Colorado, Indian Territory, Texas, Virginia.

Auroras.—2d, Nora Springs, Iowa; 7th, Fallsington, Pa.; 8th, Starkey, N. Y., Fallsington, Pa.; 11th, 12th, and 13th, Mount Forrest, Can.; 14th, Pembina, Alpena, Eastport, and Mount Forrest, Can.; 19th, Eastport, Bangor, Gardiner, Orono, and Portland, Me., Burlington, Woodstock, West Charlotte, and Newport, Vt., Springfield, Westboro, Waltham, and Rowe, Mass., Southington and New Haven, Conn., Freehold, South Orange, Atco, Moorestown, Linden, Somerville, and Princeton, N. J., Woodstock, Md., Catawissa, Pa., Starkey, Hector, North Volney, Waterburgh, Albany, Oswego, Rochester, Buffalo, and Erie, N. Y., Mount Forrest, Can., Ruggles, Ringgold, and Cleveland, Ohio, Riley, Ill., Cresco, Iowa, Alpena, Mich., Beloit, Embarrass, and Manitowoc, Wis.,

Duluth, Minn., and Pembina, Dak.; 20th, Cornish, Me., Mendon and Fall River, Mass. Contoocookville, N. H., Ardenia, N. Y., Woodstock, Vt., and Wautoma, Wis.; 23d, Ardenia, N. Y.; 25th, Woodstock, Md.; 26th, Clarksville, Tex., Cambridge, Mass., regularly looked for at 8 p. m.; none seen at that time; 19th, between 8 and 9 p. m., auroral light seen between the clouds; suspected on the 20th at 9 p. m.; cloudy on 3d, 4th, 5th, 7th, 10th, 11th, 13th, 15th, 17th, 18th, 19th, 25th to 29th; some clouds, 2d, 14th, 24th; moonlight, 1st, 2d, 6th, 30th.

Telegraphic communication interfered with by atmospheric electricity.—Santa Fé, N. Mex., 15th, 17th, and 22d; Colorado Springs, Colo., 11th; Pike's Peak, 23d; Fort Sill, Ind. T., 8th, communication stopped and instruments cut out; Umatilla, Oreg., 30th; Cape Hatteras, 10th, 16th, 18th, 30th; Mason, Tex., 15th; Pembina, Dak., 8th.

Ground currents.—Pike's Peak, 10th, line heavily charged.

OPTICAL PHENOMENA.

Solar halos.—1st, Alabama, Nebraska, Ohio. 2d, North Carolina, Georgia. 3d, Georgia, California, Utah. 4th, Montana, Texas, Michigan, Massachusetts. 5th, Michigan, Ohio. 6th, Indiana, Ohio, Michigan. 7th, Indiana, Connecticut, Michigan, New Jersey, Ohio, Pennsylvania. 8th, Iowa, Missouri, Minnesota. 9th, Indiana, Nevada, Montana, Ohio, Michigan, New Hampshire, New Jersey, New York. 10th, Florida, Minnesota, Maine, New Hampshire. 11th, Dakota, Minnesota, Nebraska. 12th, Illinois, Indiana, Iowa, Utah, Texas, Wisconsin, Minnesota, Ohio, Michigan. 13th, Iowa, Ohio, Maine, Massachusetts, New Hampshire, New York. 14th, Ohio, Connecticut, Mississippi. 16th, Illinois, Indiana, Texas, Missouri, Ohio, New Jersey, Pennsylvania. 17th, Iowa, Ohio. 18th, California, Utah, Nevada, Iowa, Georgia, Missouri. 19th, Iowa, Michigan, Ohio, New York, Pennsylvania. 20th, Alabama, Indiana, Iowa, Florida, Missouri, Ohio, North Carolina, Michigan, New York. 21st, Iowa, Connecticut, New Jersey, New York. 22d, Maine, Michigan. 23d, Connecticut, New York, Maine, New Hampshire, New Jersey. 24th, Minnesota, Connecticut, Missouri, Nebraska, New York, Pennsylvania. 25th, Connecticut, Indiana, Minnesota, New York, Maine, Massachusetts. 26th, Mississippi, Iowa, Minnesota, Tennessee, Michigan. 27th, Iowa, Minnesota, North Carolina, Georgia, Virginia, New York, Pennsylvania. 28th, California, Iowa, Tennessee. 29th, Iowa, Minnesota, Ohio, Virginia, Massachusetts, New Hampshire, New Jersey, New York. 30th, Connecticut, Iowa, Ohio, Massachusetts, Mississippi, New Jersey.

Lunar halos.—1st, Colorado, Ohio, Maryland, Missouri, Nebraska, Virginia, Vermont. 2d, Nebraska. 3d, California, Utah, Nevada, Idaho, Dakota, Michigan, New Jersey, Georgia, New Hampshire. 4th, Connecticut, Indiana, Nebraska, Kansas, Texas, Mississippi, Michigan, Ohio, Massachusetts, Georgia. 5th, Indiana, Colorado, Wisconsin, Tennessee, Kansas, Missouri, New Jersey, Georgia, New Hampshire. 6th, Iowa, Dakota, Virginia, Georgia, New Hampshire. 7th, Dakota, Minnesota, Wisconsin, West Virginia, Michigan, Missouri. 8th, Indiana, Mississippi, Wisconsin, Tennessee. 9th, Indiana, Texas, Maine. 10th, Wisconsin, Massachusetts. 12th, Tennessee. 17th, Dakota. 18th, Ohio. 22d, New York. 23d, Wisconsin. 24th, Massachusetts. 25th, Indiana, Minnesota, Tennessee, Ohio. 26th, Iowa, Missouri, Kansas, Michigan. 27th, Iowa, Indian Territory, Dakota, Missouri, Massachusetts, New York, Pennsylvania, Virginia, North Carolina. 28th, Illinois, Nevada, Dakota, Kansas, Michigan, Indiana, Tennessee, New York, Ohio, Virginia. 29th, Illinois, New Mexico, Kansas, Texas, Minnesota, Wisconsin, Tennessee, Missouri, New York, Georgia. 30th, Utah, Nevada, Indian Territory, Texas, Indiana, Maine, Michigan, Missouri, Virginia, Georgia, New Hampshire, Connecticut, Massachusetts.

MISCELLANEOUS PHENOMENA.

BOTANICAL.—*Alabama*—Green Springs, in bloom, 10th, tulip tree, 25th, laurel. *California*—Alameda County, 17th, the prospect of good crops is unusually favorable; one of the best growing springs ever known; haying has commenced; orchards are overloaded with fruit, and the thinning out must be resorted to in order to prevent the trees from breaking down; vineyards promise to yield very abundantly. *Connecticut*—New London, in bloom, 30th, apple, currants, dandelion, 23d, elm; budding, 20th, elm, horse-chestnut, 22d, lilac, sugar maple, 23d, pear, wild cherry, birch, peach, and hickory; leafing, 23d, berberry bush; 6th, grass starting. *Dakota*—Pembina, 9th, commenced sowing wheat. *Delaware*—Middleton, 24th, there is every prospect for the largest peach crop ever grown in this section. New Castle County, 24th, prospects of an average peach crop. Kent County, 24th, an enormous crop of peaches is anticipated. *Florida*—Milton, 15th, plenty of new Irish potatoes in market. *Georgia*—Harris County, 18th, all crops are doing well. Newton County, 18th, cotton planting is progressing quite rapidly. Baker County, 18th, cotton planting finished. Talbot County, 18th, peach crop diminished about one-half, apples about one-third. Lowndes County, 18th,

early cotton and vegetables damaged some by the recent frost, corn uninjured. Thomas County, 18th, cotton slightly damaged by frost. Miller County, 18th, corn crop well advanced for the season; oat crop promises a good yield. August, 21st, farmers planting cotton. *Idaho*—Boise City, in bloom, 2d, cherry, 3d, pear, 9th, apple. *Illinois*—Louisville, in bloom, 27th, red-bud; leafing, 27th, forest trees. Cairo, in bloom, 1st, peach. *Indiana*—Vevay, in bloom, 11th, blue flag, flowering almond, japan quince, 22d, apple, pear, cherry, wild plum, and all flowering shrubs. *Iowa*—Guttenburg, 30th, plowing for corn, all small grain sowed, forest trees very backward in budding. Muscatine, in bloom, 24th, plum, cherry, and dandelions; 1st, cherry buds swelling, blue grass looks quite green, wheat all sown. *Kansas*—Independence, in bloom, 10th, apple, 25th, dewberry, 27th, rasberry, 30th, blackberry; 30th, forest trees in leaf, wheat growing rapidly. Topeka, in bloom, 6th, plum, 9th, flowering almond, 10th, pear, 25th, apple. *Louisiana*—Okaloosa, 30th, corn, 3 to 6 inches high. *Maryland*—Queen Anne's County, 24th, peach trees in fine condition. *Massachusetts*—Waltham, in bloom, 14th, dazel, 22d, skunk-cabbage, 28th, white elm, 29th, willow, 30th, alder, aspen; leafing, 30th, lilac and gooseberry. *Michigan*—Detroit, in bloom, 22d, red maple, 24th, white poplar, 30th, forsythia; season very backward. Port Huron, 4th, farmers report much damage to winter wheat by the snow and frost which have recently occurred. *Minnesota*—Breckenridge, in bloom, 28th, wild plums; leafing 22d, elm and willow; 13th, grass starting; 27th, wheat 4 inches high. *Mississippi*—Fayette, in bloom, 20th, whortleberry; 30th, crops in good condition. *Missouri*—Springfield, 2d, potatoes up; 10th, peas up; 22d, corn up; 30th, wheat in fine condition. Saint Louis, 30th, Prof. F. E. Nipher, in the bulletin of the Missouri weather service, states that "the wheat crop is generally reported as very promising; fruit, and particularly peaches, considerably injured." *Nebraska*—Omaha, 20th, grain is all sowed and is growing finely; the plowing of corn ground has commenced, and planting in some sections. *New Hampshire*—Contoocookville, in bloom, 27th, trailing arbutus, 30th, elm; 30th, fields beginning to look green, farmers commencing spring work. *New Jersey*—Linden, 22d, plowing, planting potatoes. *Nevada*—Winnemucca, leafing, 1st, sage brush and shade trees. *New York*—Palermo, in bloom, 24th, spring beauties, 26th, hyacinths, 27th, blood-root, 30th, cowslips; 21st, commenced plowing. *North Carolina*—Fayetteville, in bloom, 9th, dandelions and peas; 9th, radishes for table use. *Ohio*—Norwalk, 30th, wheat looks well, fruit prospect very poor, no corn planted yet, spring very backward. *Pennsylvania*—Fallingston, in bloom, 15th, maple, 30th, cherry and wild flowers. Litchfield, 25th, forest trees budding. *Tennessee*—De Kalb County, 19th, wheat crop the largest and finest that has been known in this section for many years, the prospects for all grain crops are reported to be particularly bright throughout the State, in Eastern Tennessee the fruit crop has not been seriously injured by the recent cold weather. *Texas*—Clarksville, 30th, oats and barley very promising; corn and cotton doing well. *Vermont*—West Charlotte, in bloom, 21st, May flowers. *Virginia*—Red Hill, 5th, season very cold and backward, wheat small, winter oats killed, grass, slow growth, some peaches and cherries killed; spring oats and millet mainly saved, but no signs of sprouting, because too cold and dry; but little winter wheat killed; garden peas up for some time, but not growing much. *West Virginia*—Morgantown, in bloom, 6th, apple, 21st, cherry, 22d, dogwood, 23d, peach. *Wisconsin*—Madison, in bloom, 19th, sugar maple; leafing, 26th, horse chestnut, sugar maple, mountain ash, elm, lilac.

BIRDS.—*Geese*—Southington, Conn., 3d; Monticello, Iowa., 11th; West Waterville, Me., 2d; Waltham, Mass., 10th, 15th; Corning, Mo., throughout month; Palermo, N. Y. 8th; Chambersburg, Pa., 16th; West Charlotte, Vt., 13th; Embarrass, Wis., 20th; Fort Gibson, Ind, T., 5th; Bismarck, Dak., 30th; Red Bluff, Cal., 4th; Pembina, Dak., 1st; Oswego, N. Y., 3d; Cairo, Ill., 7th; Creswell, Kans., 5th; Oregon, Mo., 12th; Brookhaven, Miss., 26th; Clear Creek, Nebr., 10th; Woodstock, Vt., 13th; Chicago, 10th. *Swallows*—Southington, Conn., ; New Corydon, Ind., 28th; Holton, Kans., 11th; Woodstock, Md., 22d; Cornish, Me., 26th; Waltham, Mass., 23d; Fayette, Miss., 2d, Plattsmouth, Nebr., 29th; Genoa, Nebr., 8th; Waterburg, N. Y., 20th: Palermo, N. Y., 28th; Moorestown, N. J., 23d; North Volney, N. Y., 10th; Flushing, N. Y., 27th; Norwalk, Ohio, 25th; Catawissa, Pa., 10th; Egypt, Pa., 18th; Litchfield, Pa., 25th; West Charlotte, Vt., 14th; Dover Mines, Va., 29th; Embarrass, Wis., 14th; Wytheville, Va., 9th; New London, Conn., 24th; Great Bend, Kans., 7th; Fall River, Mass., 2d; Oregon, Mo., 22d; Contoocookville, N. H., 29th; Jacksonburg, Ohio, 13th; Wautoma, Wis., 21st. *Robins*—West Waterville, Me., 9th; Cornish, Me., 9th; Rowe, Mass., 9th; Genoa, Nebr., 8th; Brookville, Pa., 10th; Strafford, Vt., 9th; Ashland, Wis., 10th; Breckenridge, Minn., 4th, 19th; Oswego, N. Y., 1st; New London, Conn., 22d; Great Bend, Kans., 28th; Creswell, Kans., 17th; Clear Creek, Nebr., 1st; Eastport, Me., 13th. *Martins*—Dover, Del., 9th, 10th, 12th; Cornish, Me., 26th; New Bedford, Mass., 8th; Genoa, Nebr., 9th; Palermo, N. Y., 5th; Weldon, N. C., 9th; Brookville, Pa., 10th; Embarrass, Wis., 14th; Leavenworth, Kans., 5th; Burlington, Vt., 23d; Nora Springs, Iowa, 16th; Oregon, Mo., 6th; Clear Creek, Nebr., 1st; Walnut Grove, Va., 27th; Wautoma, Wis., 22d; Yankton, Dak., 12th. *Blackbirds*—Monticello, Iowa, 5th, 14th, large flocks; Cornish, Me., 12th; Rowe, Mass., 9th; Northport, Mich., 26th; North Volney, N. Y., 7th; West

Charlotte, Vt., 7th; Ashland, Wis., 20th; Embarrass, Wis., 10th; Breckenridge, Minn., 4th, 19th; Great Bend, Kans., 4th; Oregon, Mo., 5th. *Cranes*—Monticello, Iowa, 6th; Fayette, Miss., 18th; Corning, Mo., throughout the month; Genoa, Nebr., 9th; Dover Mines, Va., 11th; Creswell, Kans., 2d; Oregon, Mo., 2d; Clear Creek, Nebr., 10th. *Meadowlarks*—Monticello, 9th, 16th; Cornish, Me., 24th; Northport, Mich., 19th; Thornville, Mich., 12th; Palermo, N. Y., 11th; North Volney, N. Y., 8th; Embarrass, Wis., 1st; Breckenridge, Minn., 2d; Oregon, Mo., 16th; Contoocookville, N. H., 26th. *Pigeons*—Monticello, Iowa, 1st, large flocks; Jacksonburg, Ohio, 20th. *Bluebirds*—Cornish, Me., 12th; Rowe, Mass., 9th, 20th; Brookville, Pa., 10th; Atlantic City, N. J., 23d; Creswell, Kans., 26th; Oregon, Mo., 8th; Wautoma, Wis., 23d. *Cuckoo*—Fayette, Miss., 13th; Fayetteville, N. C., 21st. *Woodpeckers*—Monticello, Iowa, 2d; Cornish, Me., 21st; Brookhaven, Miss., 14th; Jacksonburg, Ohio, 26th; Woodstock, Vt., 23d. *Crows*—Monticello, Iowa, 2d; Embarrass, Wis., 10th; Breckenridge, Minn., 4th, 19th; Great Bend, Kans., 12th; Brookhaven, Miss., 22d. *Mockingbirds*—Independence, Kans., 25th; Tabor, Iowa, 27th; Emory Grove, Md., 9th, 15th, 21st; Oregon, Mo., 24th; Starkey, N. Y., 14th. *Bluejays*—Rowe, Mass., 3d; Great Bend, Kans., 28th; Creswell, Kans., 26th. *Bittern*—Great Bend, Kans., 25th. *Brants*—Fort Madison, Iowa, 30th; Holton, Kans., 19th; Corning, Mo., throughout month; Clear Creek, Nebr., 10th. *Nighthawks*—Palermo, N. Y., 6th; Great Bend, Kans., 28th; Oregon, Mo., 22d. *Birds of Paradise*—Uvalde, Tex., 14th. *Hummingbirds*—Fayetteville, N. C., 21st; Ringgold, Ohio, 23d. *Quail*—Monticello, Iowa, 23d; Brookhaven, Miss., 20th. *Owls*—Oregon, Mo., 1st. *Orioles*—Cornish, Me., 28th; Fallston, Md., 30th; Fayette, Miss., 15th; Oregon, Mo., 25th; Walnut Grove, Va., 27th. *Sparrows*—Rowe, Mass., 11th, 13th, 16th; Waltham, Mass., 16th; Ringgold, Ohio, 1st; West Charlotte, Vt., 7th; New London, Conn., 22d; Great Bend, Kans., 2d; Contoocookville, N. H., 10th. *Ducks*—Monticello, Iowa, 7th; Northport, Mich., 13th; Corning, Mo., throughout month; West Charlotte, Vt., 9th; Embarrass, Wis., 6th; Pembina, Dak., 5th. *Pelicans*—Corning, Mo., throughout month. *Swans*—Corning, Mo., throughout month; Genoa, Nebr., 11th.

MISCELLANEOUS.—*Potatoe bugs*—Vevay, Ind., 30th, in large numbers. *Lizards*—Monticello, Iowa, 1st; Dover Mines, Va., 9th. *Ground squirrels*—Monticello, Iowa, 16th. *Snakes*—Dover Mines, Va., 20th; Oregon, Mo., 20th; Clear Creek, Nebr., 26th. *Honeybees*—Embarrass, Wis., 5th; Uvalde, Tex., 27th, swarming. *Butterflies*—Monticello, Iowa, 13th; New Bedford, Mass., 30th; Weldon, N. C., 25th; Embarrass, Wis., 5th; Breckenridge, Minn., 23d; New London, Conn., 21st. *Houseflies*—Monticello, Iowa, 10th; Breckenridge, Minn., 7th; Cresswell, Kans., 16th. *Humblebees*—Dover Mines, Va., 13th; Embarrass, Wis., 22d; Oregon, Mo., 21st. *Grasshoppers*—Monticello, Iowa, 19th; Chattanooga, Tenn., 19th, in large numbers, apparently brought by the recent high SW. winds; Yankton, Dak., 11th, first appeared.

FISH.—*Shad*—Ardenia, N. Y., 21st, first caught.

Meteors—Santa Fé, N. Mex., 17th, large numbers, making a brilliant display. Anna, Ill., 17th, 8:40 p. m., path NE. to SW. Vevay, Ind., 1st. Topeka, Kans., 18th, 8:30 p. m., very brilliant meteor, passing from E. to W., altitude about 30°; 24th, 10:30 p. m., passed from SW. to NE., burst when about 20° below Castor and Pollux. New London and Spirit Lake, Iowa, 9th, very brilliant meteor, "apparently descending in Southeastern Wisconsin." Fort Dodge, Iowa, 1st. Woodstock, Md., 6th, 19th, 21st, 22d. Thornville, Mich., 20th. Brookhaven, Miss., 12th. Fayette, Miss., 19th, 26th, 29th. Corning, Mo., 24th. Atco, N. J., 3d, elevation 30°, path NE. to SW. Freehold, N. J., 19th. Princeton, N. J., 10th, 11 p. m., moving SSE. near horizon. Waterburg, N. Y., 12th. Starkey, N. Y., 20th. Weldon, N. C., 13th, 9 p. m., 30° NE. of zenith. Fallsington, Pa., 26th. Morgantown, W. Va., 12th, 9:55 p. m., very brilliant meteor, about 5° above horizon, passing from NE. to SW., disappeared within 1° of horizon. Louisville, Ky., 11th, 8:30 p. m., moving from NE. to NW.

Polar bands.—New Corydon, Ind., 7th, 9th, 19th, 28th. Guttenburg, Iowa, 8th. Gardiner, Me., 1st, 17th. Fayette, Miss., 30th. Freehold, N. J., 16th. Wytheville, Va., 2d, 15th. Bismarck, 28th.

Prairie and forest fires.—Stevensville, Mich., 25th, woods all on fire, one house burned. Bridgeman, Mich., 25th, all the available force are out fighting forest fires, which threaten great destruction. Pike's Peak, 19th. Fort Gibson, Ind. T., 4th, extensive, 5th, 11th. Bismarck, 7th, extensive. Yankton, 1st, 3d, 4th, 10th, 11th, 12th, 13th, 27th, 28th. Pembina, 11th, 13th, 17th. Cape Hatteras, 20th to 30th. Afton, Iowa, 5th. Fort Dodge, Iowa, frequent during month. Creswell, Kans., 1st, 2d, 4th, 12th, 14th to 19th, 25th, 26th, 28th. Independence, Kans., 1st to 29th. Genoa, Nebr., 16th. Wytheville, Va., 2d, 3d, 13th, 22d, 23d, 26th, 27th. Embarrass, Wis., 21st. Wautoma, Wis., 18th to 24th.

Mirage.—Duluth, 15th, 17th. Newport, R. I., 2d. Olivet, Dak., 1st, 16th, 19th. Great Bend, Kans., 19th. Frankfort, Mich., 20th.

Zodiacal light.—Colorado Springs, Colo., looked for, but not observed, on 1st to 6th, 8th to 27th; no observations on the 7th, 27th to 30th. Pike's Peak, looked for, but not observed, from 1st to 30th. Southington, Conn., 12th, 14th, 20th, 21st, 23d. Iowa City, Iowa, observed on six evenings. Cambridge, Mass., regularly looked for at 8 p.

m.; observed on the 8th, 12th, 14th, 20th; suspected, 21st, 22d; hindered by clouds or moon-light, 1st to 7th, 9th to 11th, 13th, 15th to 20th, 23d to 30th. Fall River, Mass., 21st, 23d. Rowe, Mass., 8th, 20th. Contoocookville, N. H., 7th, 12th, 14th. Atco, N. J., 12th, 20th, 22d. Waterburg, N. Y., 22d, 23d. Palermo, N. Y., 1st, 8th, 12th. Wytheville, Va., 4th, 12th, 13th, 18th, 19th, 20th, 21st, 22d. Mount Washington, regularly looked for from 1st to 30th, but not observed.

Earthquakes.—November, 1878, Unalaska Island, Alaska, 12th, at 2:30 a. m., slight shock reported. *March*, 1879—United States Naval Hospital, Yokohama, Japan, 4th, 4:44 p. m., shock lasting 45 seconds, 7 p. m., shock lasting 20 seconds; 10th, 4:35 p. m., shock lasting 50 seconds; 16th, 9:32 p. m, shock; 18th, 9:49 a. m., light shock. On March 22d, at 12:35 p. m., an earthquake occurred in Northwestern Persia, "taking a direction" from Tabreez to Zendjan and Mianeh; at the latter place (situated in latitude 37° 27′ N., longitude 47° 43′ E.) several strongly built houses were thrown down, while the villages of Tark and Manan were totally destroyed, with a reported loss of about 1,100 lives. *April*—San José, Costa Rica, 3d, 11:25 a. m., feeble shock; 4th, 11:44 a. m., two strong shocks, with an interval of 5 to 7 seconds; 9th, 11:15 a. m., somewhat strong shock lasting about 20 seconds, 11:34 a. m., more feeble shock. Puntarenas, Costa Rica, 4th, 2 p. m., strong shock. Alajuela, Costa Rica, 9th, 11:07 and 11:25 a. m., shocks were felt.

Sunsets.—The characteristics of the sky at sunset, as indicative of fair or foul weather, for the succeeding twenty-four hours, have been observed at all Signal Corps stations. Reports from 131 stations show 3,894 observations to have been made, of which 49 were reported doubtful; of the remainder, 3,288, or 85.5 per cent., were followed by the expected weather.

Sun spots.—The following record of observations, made by D. P. Todd, assistant, has been forwarded by Prof. S. Newcomb, U. S. N., Superintendent Nautical Almanac, Washington, D. C.:

Date April, 1879.	No. of new		Disappeared by solar rotation.		Reappeared by r rotation.		Total number visible.		Remarks.	
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.		
11th, 2 p. m.	1	3	0	0	1	3	1	3	Faculæ	Observations were also taken on the 1st, 2d, 3d, 8th, 9th, 25th, 26th, 27th, 28th, and 29th, at 2, 3, or 4 p. m, but not any spots were seen.
12th, 2 p. m.	0	0	0	0	0	0	1	3	Faculæ	
5 p. m.	0	0	0	0	0	0	1	3	Faculæ	
15th, 2 p. m.	0	11	.....	.....	.....	.....	1	14	Many of the spots small	
21st, 4 p. m.	0	0	0	0	0	0	1	1		
22d, 4 p. m.	0	0	0	0	0	0	1	1		
23d, 2 p. m.	0	0	0	0	0	0	1	1		
24th, 2 p. m.	0	0	1	1	0	0	0	0		

Mr. John W. James, Riley, Ill., examined the sun on the 13th, and found near its southeast margin a large spot; 15th, one group of four large spots, extremely irregular; 19th, three spots of previous group disappeared, leaving a large one, estimated at 11,600 miles in diameter. Mr. William Dawson, Spiceland, Ind., examined the sun on the 2d, 5th, 6th, 7th, 24th, 26th, 28th, 29th, 30th, and observed no spots; 11th, five small spots and prominent faculæ, all together, near the east edge of the sun's disk; 12th, sixteen spots in one group, faculæ not so prominent; 13th, nine spots, one group, several of the spots seen on the 12th appeared to be united, forming one large spot; 16th, twenty-five spots, one group, three spots very prominent, seven others not quite so, atmosphere very poor; 18th, two large spots, close together, nearly south of the center and about one-third the way from the center to the south edge of the sun's disk; 20th, seven spots, one group, one spot visible with small opera-glass; 21st, 22d, 23d, one spot on each day. Professor Gustavus Hinrichs, Iowa City, Iowa, reports having observed one group of two very large and several small spots from the 12th to the 22d. Mr. F. Hess, Fort Dodge, Iowa, examined the sun from the 12th to the 22d, observing spots. Mr. David Trowbridge, Waterburg, N. Y., examined the sun on the 1st, 6th, 8th, 11th, 24th, 26th, 29th, observed no spots; 12th, one spot near eastern edge of sun's disk, evidently brought into view by rotation; 14th, one group of four spots; 16th, group still visible, one large spot and three smaller ones; 19th, one large spot, well defined; 20th, spot seems to be smaller; 22d, same spot still visible; 23d, observation obstructed by clouds. Mr. H. D. Gowey, North Lewisburg, Ohio, examined the sun as follows: 16th, two spots near eastern edge of sun's disk; 18th, one spot; 19th, one spot; 21st, one spot; 22d, one large spot, well defined, near west limb of sun; 23d, disappeared by solar rotation.

United States Signal Corps telegraph lines.—The following letter explains itself:

CAPE HENRY, VA., *April* 6, 1879.

To the Chief Signal Officer of the Army, Washington, D C.

SIR: Inclosed herewith I have the honor to forward copies of telegrams sent and received during the wreck of schooner James M. Vance, which ran ashore two miles north of this station on March 31, 1879. * * * Captain and crew numbered six in all. The vessel struck at 9:50 a. m., heading directly for the beach, swinging around broadside to the shore, in which position she remained, near high-water mark. * * * A severe gale from the north prevailed during the night, when she lost both anchors and chains and jib and foreboom. The schooner was first observed by the sergeant in charge about 8:30 a. m., fifteen or eighteen miles from shore; as soon as she struck Private Paxton was sent to open wreck-station abreast of vessel, and life-saving crew No. 1 notified by telephone. Wreck-station was opened within thirty minutes. The telephone was used with success in notifying life-saving crew, consuming not more than one minute of time. The captain of schooner and crew were landed safely by life-saving crew No. 1. Vessel will prove total loss.

Very respectfully, your obedient servant,

J. H. BOKEL,
Sergeant Signal Corps, U. S. A.

[Sixteen inclosures.]

NOTES AND EXTRACTS.

[*From Nature, February* 27, 1879.]

A new society has been created at Paris for æronautics. It is styled "Académie d'Ascensions Météorologiques," and a museum is being fitted up and will be opened in March for public inspection. It contains all the apparatus devised for constructing or directing balloons or taking meteorological observations in the air.

[*From the Popular Science Monthly.*]

In London the seven weeks ending January 18, 1879, was a period of very low temperature, and the registrar-general, in his reports, institutes a comparison between the mortality of those seven weeks and the seven weeks immediately preceding them. The result shows that the average weekly number of deaths in the cold period exceeded by 481 the average number in the period of moderate temperature, the annual rates of mortality being equal to 26.8 and 19.8 per 1,000, respectively. Among persons under twenty years of age the increased mortality due to cold did not exceed 2.8 per 1,000 living, and the excess between twenty and forty was only 1.3 per 1,000; between forty and sixty years the excess was 8.7 per 1,000; between sixty and eighty it was 54.4, and among persons over eighty years of age the excess was equal to 173 per 1,000 per year.

[*From Nature, March* 6, 1879.]

From the third annual report of the forest meteorological stations of Germany, being the report for 1877, we learn that this system of inquiry into the influence of forests

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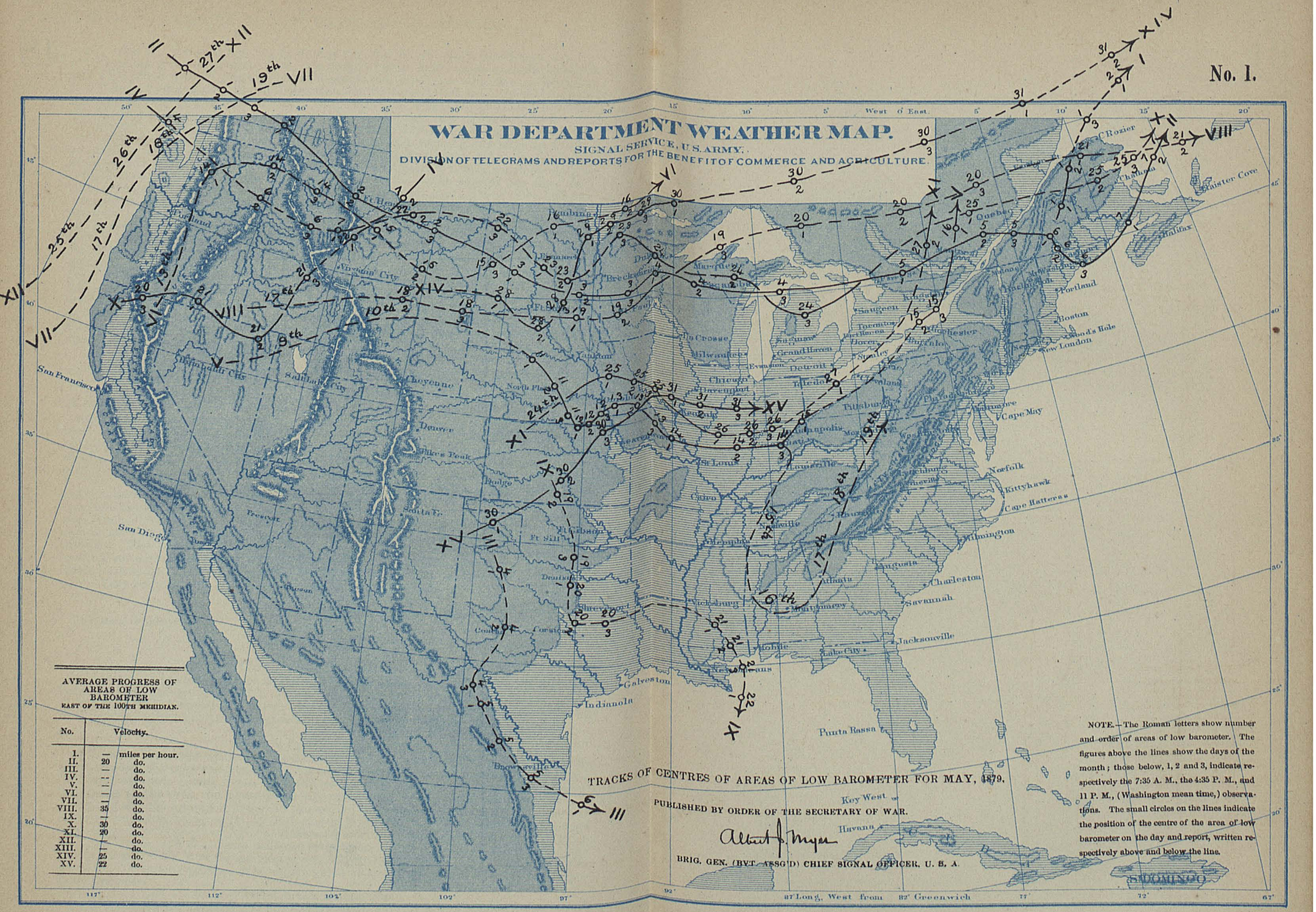
No. 1.


WAR DEPARTMENT WEATHER MAP.
SIGNAL SERVICE, U.S. ARMY.
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.
AVERAGE PROGRESS OF AREAS OF LOW BAROMETER EAST OF THE 100TH MERIDIAN.
No. Velocity.
I. — miles per hour.
II. 20 do.
III. — do.
IV. — do.
V. — do.
VI. — do.
VII. — do.
VIII. 35 do.
IX. — do.
X. 30 do.
XI. 20 do.
XII. — do.
XIII. — do.
XIV. 25 do.
XV. 22 do.
TRACKS OF CENTRES OF AREAS OF LOW BAROMETER FOR MAY, 1879.
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
Albert J. Myer
BRIG. GEN. (BVT. ASSG'D) CHIEF SIGNAL OFFICER, U. S. A.
NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7:35 A. M., the 4:35 P. M., and 11 P. M., (Washington mean time,) observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.
87 Long. West from 82 Greenwich

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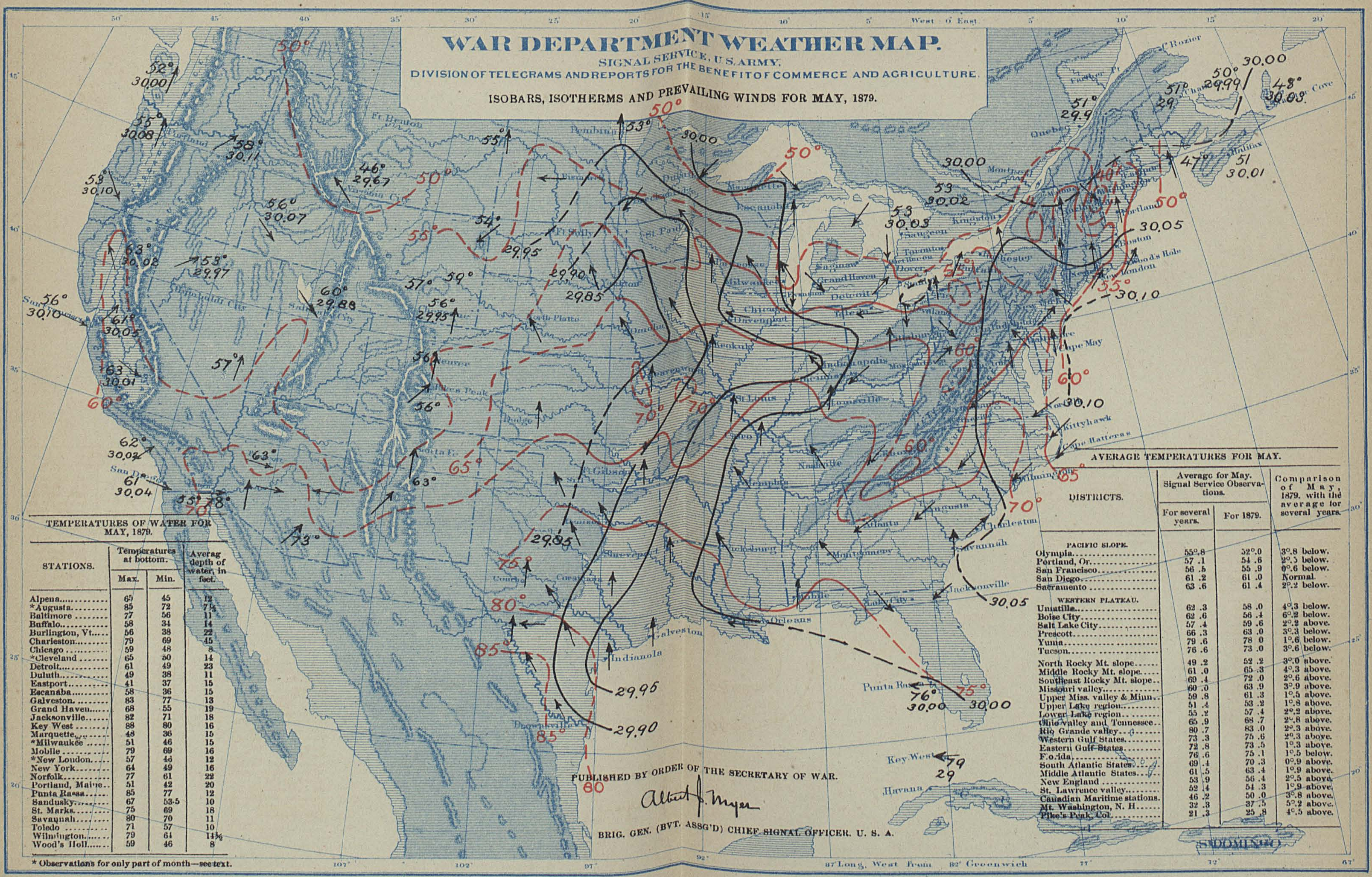
No. II.



TEMPERATURES OF WATER FOR MAY, 1879.

STATIONS.	Temperatures at bottom.		Averag depth of water, in feet.
	Max.	Min.	
Alpena	65	45	12
*Augusta	85	72	7⅓
Baltimore	77	56	11
Buffalo	58	34	14
Burlington, Vt	56	38	22
Charleston	79	69	45
Chicago	59	48	8
*Cleveland	65	50	14
Detroit	61	49	23
Duluth	49	38	11
Eastport	41	37	15
Escanaba	58	36	15
Galveston	83	77	13
Grand Haven	68	55	19
Jacksonville	82	71	18
Key West	88	80	16
Marquette	48	36	15
*Milwaukee	51	46	15
Mobile	79	69	16
*New London	57	46	12
New York	64	49	16
Norfolk	77	61	22
Portland, Maine	51	42	20
Punta Rassa	85	77	12
Sandusky	67	53.5	10
St. Marks	75	69	18
Savannah	80	70	11
Toledo	71	57	10
Wilmington	79	64	14½
Wood's Holl	59	46	8

* Observations for only part of month—see text.

AVERAGE TEMPERATURES FOR MAY.

DISTRICTS.	Average for May. Signal Service Observations.		Comparison of May, 1879, with the average for several years.
	For several years.	For 1879.	
PACIFIC SLOPE.			
Olympia	55°.8	52°.0	3°.8 below.
Portland, Or.	57 .1	54 .6	2°.5 below.
San Francisco	56 .5	55 .9	0°.6 below.
San Diego	61 .2	61 .0	Normal.
Sacramento	63 .6	61 .4	2°.2 below.
WESTERN PLATEAU.			
Umatilla	62 .3	58 .0	4°.3 below.
Boise City	62 .6	56 .4	6°.2 below.
Salt Lake City	57 .4	59 .6	2°.2 above.
Prescott	66 .3	63 .0	3°.3 below.
Yuma	79 .6	78 0	1°.6 below.
Tucson	76 .6	73 .0	3°.6 below.
North Rocky Mt. slope	49 .2	52 .2	3°.0 above.
Middle Rocky Mt. slope	61 .0	65 .3	4°.3 above.
Southeast Rocky Mt. slope	69 .4	72 .0	2°.6 above.
Missouri valley	60 .0	63 .9	3°.9 above.
Upper Miss. valley & Minn.	59 .8	61 .3	1°.5 above.
Upper Lake region	51 .4	53 .2	1°.8 above.
Lower Lake region	55 .2	57 .4	2°.2 above.
Ohio valley and Tennessee	65 .9	68 .7	2°.8 above.
Rio Grande valley	80 .7	83 .0	2°.3 above.
Western Gulf States	73 .3	75 .6	2°.3 above.
Eastern Gulf States	72 .8	73 .5	1°.3 above.
Florida	76 .6	75 .1	1°.5 below.
South Atlantic States	69 .4	70 .3	0°.9 above.
Middle Atlantic States	61 .5	63 .4	1°.9 above.
New England	53 .9	56 .4	2°.5 above.
St. Lawrence valley	52 .4	54 .3	1°.9 above.
Canadian Maritime stations	46 .2	50 .0	3°.8 above.
Mt. Washington, N. H	32 .3	37 .5	5°.2 above.
Pike's Peak, Col	21 .3	25 .8	4°.5 above.

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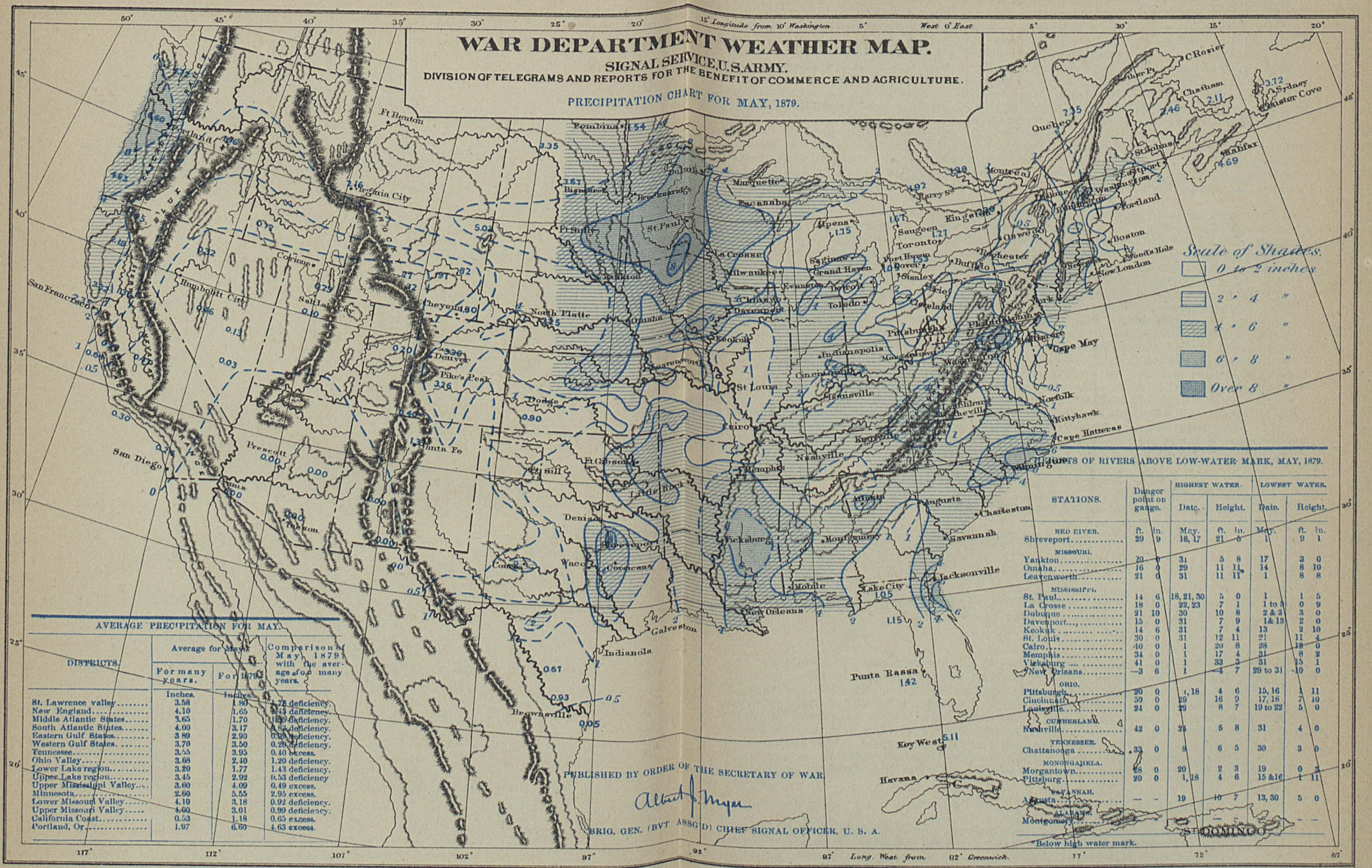
WAR DEPARTMENT WEATHER MAP.

SIGNAL SERVICE, U. S. ARMY.

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

PRECIPITATION CHART FOR MAY, 1879.



AVERAGE PRECIPITATION FOR MAY.

DISTRICTS.	Average for May: For many years.	Average for May: For 1879.	Comparison of May, 1879, with the average of so many years.
	Inches.	Inches.	
St. Lawrence valley	3.58	1.80	0.78 deficiency.
New England	4.10	1.65	2.43 deficiency.
Middle Atlantic States	3.65	1.70	1.95 deficiency.
South Atlantic States	4.00	3.17	0.83 deficiency.
Eastern Gulf States	3.89	2.90	0.99 deficiency.
Western Gulf States	3.70	3.50	0.20 deficiency.
Tennessee	3.55	3.95	0.40 excess.
Ohio Valley	3.68	2.40	1.20 deficiency.
Lower Lake region	3.20	1.77	1.43 deficiency.
Upper Lake region	3.45	2.92	0.53 deficiency.
Upper Mississippi Valley	3.60	4.09	0.49 excess.
Minnesota	2.60	5.55	2.95 excess.
Lower Missouri Valley	4.10	3.18	0.92 deficiency.
Upper Missouri Valley	4.00	3.01	0.99 deficiency.
California Coast	0.53	1.18	0.65 excess.
Portland, Or	1.97	6.60	4.63 excess.

HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, MAY, 1879.

STATIONS.	Danger point on gauge.		Highest water. Date.	Highest water. Height.		Lowest water. Date.	Lowest water. Height.	
	ft.	in.	May.	ft.	in.	May.	ft.	in.
RED RIVER.								
Shreveport	29	9	16, 17	21	5	1	9	1
MISSOURI.								
Yankton	20	0	31	5	8	17	3	0
Omaha	16	0	29	11	11	14	8	10
Leavenworth	21	0	31	11	11	1	8	8
MISSISSIPPI.								
St. Paul	14	6	18, 21, 30	5	0	1	1	5
La Crosse	18	0	22, 23	7	1	1 to 3	0	9
Dubuque	21	10	30	10	8	2 & 3	3	0
Davenport	15	0	31	7	9	1 & 13	2	0
Keokuk	14	6	31	7	4	13	2	10
St. Louis	30	0	31	12	11	21	11	4
Cairo	40	0	1	20	8	28	19	0
Memphis	34	0	1	17	4	31	8	2
Vicksburg	41	0	1	33	3	31	15	1
New Orleans	—3	6	1	—4	7	29 to 31	-10	0
OHIO.								
Pittsburgh	20	0	1, 18	4	6	15, 16	1	11
Cincinnati	50	0	29	16	9	17, 18	7	10
Louisville	24	0	29	8	7	19 to 22	5	0
CUMBERLAND.								
Nashville	42	0	24	6	8	31	4	0
TENNESSEE.								
Chattanooga	33	0	8	6	5	30	3	0
MONONGAHELA.								
Morgantown	28	0	20	2	3	19	0	3
Pittsburg	20	0	1, 18	4	6	15 & 16	1	11
SAVANNAH.								
Augusta	—	—	19	10	7	13, 30	5	0
ALABAMA.								
Montgomery			—	—	—	—	—	—

*Below high water mark.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

Albert J. Myer

BRIG. GEN. (BVT ASSG'D) CHIEF SIGNAL OFFICER, U. S. A.

on weather and climate now includes fourteen stations, scattered over a region extending over 7° of latitude and 5° of longitude, the stations being at heights ranging from 10 to 3,051 feet above the sea. The instruments and observations have been planned on satisfactory and comprehensive principles, and in a few years results eminently *ad rem* may be looked for. In the mean time the thermometric observations point to highly important results. Each station has three sets of thermometers for air temperature, similarly protected—one set in the wood, the second set high up in the crown of a tree, and the third set in an open space outside the wood, while earth-thermometers are placed both in the open and in the wood, on the surface of the ground, and at depths of 6, 12, 24, 36, and 40 inches. The results show in every case a lower air temperature inside the wood as compared with the open country outside, the mean difference amounting to 1°.3. As regards the temperature of the surface of the ground, the mean deficiency in the wood shaded by the trees is 2.5°, an amount which gradually diminishes with the depth to 2° at 48 inches, the lowest depth observed. It would be a problem of great interest to ascertain how deep this cooling of the earth's surface extends when it is screened by trees from solar and terrestrial radiation.

The meteorological observations made at the hydrographic office at Pola during 1878 have been issued, with a full abstract for the year, showing the hourly means of pressure, temperature, and wind-velocity. The most prevalent winds by far are from the quarter of the compass from east-northeast to southeast, these comprising nearly half the winds of the whole year, to which there is to be added a small secondary maximum of west-northwest winds. The wind falls to its daily minimum velocity at 5 to 6 a. m., and rises to the maximum so early as noon, hours all but coincident with the daily maximum and minimum temperature. From the three years' observations now available from Pola, it is seen that in common with seaside stations of the middle and higher latitudes, the a. m. maximum of pressure occurs later in winter than in summer, in contradiction to inland places, where it occurs much earlier. Pola being in latitude 44° 52′ north, and thus within the belt to which Rikatscheff drew attention some time ago, as characterized by the occurrence, or tendency toward the occurrence, of a third maximum of pressure a little after midnight during the cold months of the year, it is interesting to note that four out of the nine individual Decembers, Januarys, and Februarys show the occurrence of this third maximum, which also appears in the general means of December and January for the three years. The amount of this third maximum is very small, and the evidence yet adduced is not sufficient to determine whether it is a real increase of atmospheric pressure or merely an apparent increase due to undetected instrumental errors.

Published by order of the Secretary of War.

ALBERT J. MYER,
Brigadier-General (Brevet Assigned), Chief Signal Officer, U. S. A.

PAPER 40.

MONTHLY WEATHER REVIEW, MAY, 1879.

INTRODUCTION.

In compiling the present review the following data, received up to June 14, have been made use of, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at 122 Signal Service stations and 12 Canadian stations, as telegraphed to this office; monthly journals and means, 131 and 149 respectively, from the former, and monthly means from 13 of the latter; reports from 28 special sunset stations; 225 monthly registers from voluntary observers; 49 monthly registers from United States Army post-surgeons; marine records; international simultaneous observations; monthly reports from voluntary observers in, and the local weather services of, the States of Iowa and Missouri; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

Upon Chart No. II is shown by the isobaric lines the general distribution of atmospheric pressure, as reduced to sea-level, for the month. Compared with the means for May of previous years, the mean pressure for the present month is higher in all the districts, except Florida, from Southern Alabama to Texas, in the Missouri Valley from Yankton to Leavenworth, and at Salt Lake City and Portland, Oreg.; but in these districts it agrees with the average or is very slightly below, the greatest deficiency (0.03 inch) occurring at Punta Rassa. The regions of greatest excesses are in the Northwest

(Bismarck 0.26 above), in California (Sacramento 0.14 above), and over New England, the Middle Atlantic States and Lower Lakes (Mount Washington 0.14 and Albany 0.12). In the remaining districts it ranges above the average as follows: South Atlantic States, 0.08 at Cape Hatteras to 0.00 at Jacksonville; Ohio Valley and Tennessee, 0.09 at Pittsburgh to 0.02 at Memphis; Upper Lakes, 0.10 at Escanaba to 0.05 at Milwaukee; Upper Mississippi Valley and Minnesota, 0.10 at Pembina to 0.02 at Keokuk; Rocky Mountain stations, 0.09 at Santa Fé to 0.01 at Virginia City. In the following description of areas of high and low pressure, the barometer readings when given are as reduced to sea-level, but the deviations from normal relate to pressures not reduced.

The local barometric ranges have been comparatively small, and have varied as follows: California, 0.37 at San Diego and San Francisco to 0.57 at Red Bluff; Western plateau, 0.36 at Pioche to 0.62 at Boise City; Rocky Mountains, 0.32 at La Mesilla, N. Mex., to 0.78 at Virginia City; Gulf States, 0.25 at Key West and 0.40 at Galveston to 0.59 at Graham, Tex., and 0.60 at Montgomery; Atlantic States, 0.55 at Jacksonville to 0.64 at Norfolk, 0.83 at Wood's Holl and 1.00 at Eastport, and in interior, 0.64 at Augusta to 0.74 at Lynchburg and 0.93 at Albany; Ohio Valley and Tennessee, 0.52 at Memphis to 0.82 at Pittsburgh; Lake region, 0.88 at Cleveland to 1.19 at Duluth; the Northwest and Eastern slope of Rocky Mountains, 0.79 at Saint Louis to 1.33 at Breckenridge, 0.87 at Leavenworth to 1.11 at Yankton and 0.94 at Bismarck, 0.99 at Dodge City, 1.05 at North Platte and 0.79 at Deadwood.

Areas of high barometer.—Nine are described below. The average direction of the paths of highest pressure is from the Pacific coast, between latitudes 38° and 45° northeastward to Manitoba and thence east-southeastward to the Atlantic coast.

No. I was central on the morning of the 18th over Minnesota, and moved southeastward over the eastern section of the country during the 2d and 3d. It produced the lowest temperatures of the month in the Lake region, Ohio Valley, Gulf and Atlantic States, and killing frosts in the low lands of some of the Southern States. The following minimum temperatures were observed: On the 1st, at Port Huron, 27°; Oswego, 30°; on the 2d, Pittsburgh, 33°; Knoxville, 38°; on the 3d, Montgomery, 50°; Atlanta, 49°; Augusta, 48°; Charlotte and Kittyhawk, 45°; Washington and Albany, 36°.

No. II appeared on the 2d on the Pacific coast in rear and to the southwest of low pressure area No. II; 4:35 p. m. barometer at Red Bluff 30.23, or 0.32 above the normal; fresh to high northwesterly winds, rapidly falling temperature and clear weather extended eastward to Utah. Maximum velocities: at Winnemucca, W. 46; Salt Lake City, NW. 48; Umatilla, SW. 48 miles. 3d, was central over the Western plateau; pressure at 7:35 a. m. (Washington time) 0.20 above normal at Umatilla, Boise City, and Salt Lake; minimum temperatures, 23° at Winnemucca, 30° at Boise City, 32° at Pioche, and 25° at Virginia City, Mont. 4th, central over Montana, with diminished pressure; minimum temperature at Virginia City, 28°; summit of Pike's Peak, 10°. 5th, central over Dakota, with increasing pressure, and preceded by north to west winds and falling temperature to the Ohio Valley and Lower Lakes. 6th, central over Manitoba, with increased pressure; the lowest temperatures of the month occurred in the Upper Mississippi Valley, with heavy frosts, and cooler northwesterly winds extended over the Middle States. 7th to 9th, moved slowly eastward over the Lake region (with heavy frosts), and New England; light to fresh north winds veering to easterly and clear weather prevailed east of the Rocky Mountains, except over the Northwest, where southerly winds and light rains preceded low areas Nos. IV and V, and along the South Atlantic States, where fresh to high northeast winds and cloudy or rainy weather generally prevailed. Cautionary signals (late) ordered on the North Carolina coast morning of the 7th were justified: Cape Lookout, NE. 40 miles. Cautionary signals (late) ordered on the North Carolina coast on the morning of the 8th and continued to the afternoon of the 11th were fully justified: Cape Lookout, NE. 40 miles; Kittyhawk, NE. 45. On the 11th there was probably an area of low pressure east of Florida; at Punta Rassa the wind rose to NW. 42. 10th to 14th, the highest pressure continued off the Southern New England and Middle Atlantic coasts, with continued northeasterly winds, cloudy and rainy weather in the South Atlantic States; east to southerly winds, clear or fair weather and rising temperature in the Middle States and New England.

No. III appeared on the coast of California on the 6th in rear and to the southwest of low area No. IV, and passed northward on the 7th, followed during the night and morning of the 6th and 7th by cold northerly winds from California to Idaho; during the prevalence of which heavy frosts occurred, doing considerable damage in the low valleys of Central and Northern California; in the Honey Lake Valley, California, and Nevada, "the prospects for a good fruit crop were completely destroyed."

No. IV appeared on the Pacific coast on the 9th and remained almost stationary until the 11th, with generally cool, clear weather west of the Rocky Mountains, except occasional very light rains in Oregon, Washington Territory, and southern portion of Nevada. 12th, it spread eastward, in rear of low area No. X, preceded by diminishing brisk to high northerly winds and clearing weather in Eastern Wyoming and Colorado,

and followed by rising temperature over the Western plateau and interior of the Coast States. 13th, was central over Montana, with clearing weather over the extreme Northwest. 14th, central over the Northwest with diminished pressure. 15th and 16th, moved eastward over the Lake region with clear, pleasant weather; heavy frost was reported in La Crosse County, Wisconsin.

No. V appeared on the coast of California on the 14th as low area No. VI moved eastward into Utah and Montana. 15th, moved northeast to Idaho, preceded by brisk to high westerly winds and clearing weather. 16th and morning of the 17th was central over Idaho and Montana, with low temperatures and frosts in the Upper Missouri Valley. 17th and 18th passed rapidly eastward north of the Lake region and Saint Lawrence Valley, with clear or fair weather in these districts. Brisk to high northerly winds prevailed for a short time on the 17th on Lake Superior, and cautionary signals were ordered for Lake Michigan and Port Huron, but were not justified.

No. VI appeared over the Northwest on the 20th in rear of low area No. VIII, and moved slowly eastward to the Gulf of Saint Lawrence by the 23d. During these days clear or fair weather and northerly, veering to easterly, winds generally prevailed east of the Rocky Mountains, with frosts in the Lake region, New England, and Middle States, while low area No. X approached the Northwest from the Pacific. 24th, it moved southward over the Atlantic States, with winds veering from east to south in the Atlantic and Gulf States as low area No. X moved eastward over the Lake region; at Cape May the minimum temperature was 47°, but ice was reported within five miles of station; frosts occurred southward to Virginia.

No. VII.—On the 22d a general rise in pressure occurred on the Pacific coast in rear of low area No. X. 23d, the pressure fell over California, but rose to the northward and over the Western Plateau. 24th and 25th, highest pressure was over Idaho, Montana, and Wyoming. 26th, over the northwest. 27th and 28th, over the Mississippi Valley and Lake region. 29th and 30th, off the Atlantic coast, followed by southerly winds and rising temperature.

No. VIII appeared north of Lake Superior on the 25th. 26th, moved southeastward over the Lake region and Middle States; lowest temperature of month, 13°, on summit of Mount Washington. 27th, moved southward off the Atlantic coast and joined area No. VII; on this day the maximum velocity of the month, NW. 133 miles, occurred on summit of Mount Washington.

No. IX.—As low area No. XIII moved northward on the 28th the pressure rose over Southern California, reaching the maximum (30.26 or 0.30 above normal) at San Diego at 4.35 p. m. (Washington time), snow fell on the Sierra Nevadas, and "the snow line extended well down to the foot-hills on the Nevada side. 29th, the highest pressure was transferred to Oregon; maximum (30.34) at Portland at 11 p. m. 30th, it moved eastward, and on the 31st was central over Montana and Dakota; barometers, at 11 p. m., at Virginia City and Bismarck, 30.04 or 0.37 and 30.38 or 0.45 above normals, respectively.

Areas of low barometer.—Fifteen have been sufficiently well marked to merit a brief description, and upon Chart No. II will be found the tracks of the centers of fourteen. The general direction of the most important has been easterly.

No. I is a continuation of low areas No. XVI and XVII, described in the April review. 1st, it moved slowly northeastward to the mouth of the Saint Lawrence, with cloudy or rainy weather from Cape Breton to Lake Ontario, and snow in the Province of Ontario. During this day a secondary depression remained over the South Atlantic States, with cloudy and rainy weather. 2d, clearing weather and southwesterly winds in the Canadian maritime provinces, reaching a velocity of 35 miles at Farther Point.

No. II was probably central over British Columbia on the 1st; light rains fell in Washington Territory and Oregon. 2d, central over Montana; barometer at 4 35 p. m. at Virginia City, 29.19, or 0.39 below normal; high westerly and northwesterly winds and gales accompanied the rising pressure along the western slope of the Rocky Mountains from the interior of Washington Territory to Utah, and brisk to high southerly winds and gales, with falling pressure, along the eastern slope from Kansas to Minnesota and Dakota. 3d, moved southeastward to the Upper Mississippi Valley; cloudy and rainy weather extended to the Ohio Valley and Lower Lakes; winds veered to brisk and high northerly along the eastern slope; Cheyenne, NW. 43; Fort Stevenson, W. 50; a light thunder-storm occurred at midnight in Central Texas. 4th, center moved to Lake Michigan, where the winds increased to high westerly; cloudy and rainy weather extended to the interior of the Gulf States and Atlantic coast from North Carolina to Maine; clearing weather during latter part of day from the Ohio Valley and Lake Erie westward, with brisk and occasionally high westerly winds. 5th, center moved to the Saint Lawrence Valley; rain extended over the Canadian maritime provinces, and clearing weather, with brisk westerly winds, prevailed in the Lake region, except continued snow or rain in Northern Michigan. 6th, central over Maine, with diminished energy and fine weather, except fogs or light rains along the Canadian coasts, Saint Lawrence and Richelieu or Sorel Valleys. 7th, moved north-

eastward over the Gulf of Saint Lawrence, with heavy rain, followed by clear weather, in New Brunswick. Cautionary signals ordered on the 3d at Duluth, Escanaba, Milwaukee, and Grand Haven, and on the Atlantic coast from Smithville to Sandy Hook, and on the morning of the 4th from Alpena to Buffalo were very generally justified, except on the New Jersey coast. The following maximum velocities were registered: Duluth, N. 32 miles per hour; Milwaukee, W. 40; Grand Haven, W. 36; Erie, W. 30; Wilmington, SW. 27, and Kittyhawk, SW. 32. Cautionary off-shore signals ordered up at midnight of the 5th were not justified.

No. III developed over Texas on the 4th, and on the 5th and 6th moved down the Rio Grande Valley, with fine weather near the center, but with heavy thunder and hail storms in the West Gulf States. Cautionary off-shore signals ordered at Indianola and Galveston on the afternoon of the 5th were justified:—Indianola, N. 34; Galveston, N. 42; Concho, Tex., NE. 40 miles.

No. IV.—After the passage eastward of high area No. II on the 3d, fresh to brisk southerly winds, with rising temperature and falling barometer, prevailed over the Western Plateau until the morning of the 6th, when the pressure reached 29.67 or 0.35 below the normal at Olympia, Oreg.; during the day the center moved eastward to Montana, followed by a westerly gale, hail and rain in the Columbia Valley. 7th, it passed northward into British America. Maximum velocities: Red Bluff, SE. 40; Umatilla, W. 48.

No. V.—The preceding area was followed over the Pacific States and Western Plateau by high area No. III. On the afternoon of the 9th the pressure was below normal from Nevada to Montana, with westerly winds, to Dakota and Kansas, over which latter region south to east winds prevailed. 10th, lowest pressures over Utah and Nebraska with light rains in Montana. 11th, lowest pressure central over Nebraska, with brisk to high southerly winds and fine weather from Texas to Kansas and Iowa; Fort Sill, SE. 39; northeasterly winds and rain from Northern Michigan to Dakota, and, during the latter part of day, brisk to high northerly winds and gales, with heavy rains, from Southern Dakota to Colorado; Denver, N. 60; Fort Craig, N. Mex., W. 42. 12th, central over Nebraska and Kansas; the general condition remained about the same as the preceding day, except that the northerly winds extended to the interior of Texas and the weather cleared from Dakota to Colorado; on this day the maximum wind velocity of the month, NE. 108 miles, occurred on the summit of Pike's Peak during a blinding snow-storm—this is the highest velocity registered since opening of the station, the next below (102 miles) occurred in December, 1875; North Platte, N. 60. 13th, central over Iowa and Missouri; light rains or thunder-showers extended to the interior of the Gulf States, Ohio Valley, and Lake Erie, and northerly winds with heavy local rains to Northern Missouri. 14th, central depression formed an elongated trough from Missouri to Lake Ontario; cloudy or rainy weather, with northerly winds, from Missouri and Iowa to Ontario, and with easterly winds over Eastern Tennessee and Northern Georgia. Cautionary signals ordered for the Lower Lakes on the morning of this day were not justified. 15th, depression divided into two centers, the northern one remaining over Lake Ontario and the southern one moving toward the Gulf States; thunder-storms from Indiana to Tennessee and interior of North Carolina; continued rain in the Lower Lake region and light rains in the Atlantic States by night. From the 16th to the 19th the lowest pressure remained south of the Ohio Valley with a gradual tendency toward the northeast along the western slope of the Alleghanies; on the afternoon of the 17th a heavy thunder-storm prevailed from Georgia to North Carolina, and on the 18th and 19th heavy rains along the immediate coast from North Carolina to Long Island and in Maryland; otherwise it was only attended by ordinary rains, and on the 19th was dissipated while central over West Virginia. The northern depression over the Lower Lakes moved down the Saint Lawrence Valley on the 16th, with southerly winds and light rains over New England and Middle Atlantic States; a heavy thunder-storm occurred over Maryland; Wood's Holl, SE. 40.

No. VI.—The pressure fell over Northern California and Oregon on the 13th, as high area No. IV moved into Montana, and cloudy and rainy weather, with brisk winds, extended to Idaho. 14th, lowest pressure moved into Montana, brisk west to south winds and clearing weather in Northern California, Nevada, and Utah, but continued light rains in the Columbia and Snake River Valleys. 15th, moved toward Manitoba; brisk to high westerly winds at Umatilla, Oreg., and in Montana, and brisk to high southerly winds from Kansas to Dakota. 16th, disappeared to the north of Lake Superior.

No. VII.—In rear of the preceding area, high area No. V moved northeastward over the Pacific States. 16th, the pressure fell below the normal over Northern California, Oregon, and Nevada. 17th, depression moved northward, with rain along the coast, and cloudy or threatening weather, with fresh to brisk winds, over the Western Plateau and in Western Montana accompanying the formation of a secondary depression, described as area No. VIII, over Southern Idaho and Northern Utah. 18th and 19th, the lowest pressure probably passed to the northward, but cloudy or partly cloudy

weather, with numerous rains and fresh to brisk winds, continued during these days over the Pacific States and Western Plateau.

No. VIII developed on the afternoon of the 17th as stated above. 18th, was central over Wyoming preceded by south to east winds and light rains (increasing to heavy in Northern Dakota) in the Missouri Valley and Black Hills region. 19th, depression divided into two centers, the northern one moving to Lake Superior, with fresh to brisk winds, partly cloudy weather and light rains in the Northwest; the southern one, moving southward over the Eastern Slope, will be considered as area No. IX; a heavy thunder-storm occurred at North Platte, from 8:15 to 9:30 p. m. 20th, moved eastward north of the Lake region, with clear or fair weather, followed by brisk westerly winds in that district. 21st, it passed rapidly eastward over the Gulf of Saint Lawrence, with light rains and brisk winds thence to New England. Cautionary signals ordered up on the Upper Lakes at midnight of the 19th; on the Lower Lakes and along the east coast of New England on the afternoon of the 20th; from Newport to Baltimore on the morning and thence to Smithville on the afternoon of the 21st were justified, except on the Lower Lakes from Erie to Oswego and along the New England coast at Eastport and Portland. Signals were changed to off-shore on the afternoon and midnight of the 21st from Eastport to Baltimore, in advance of high area No. VI, and were justified along the New Jersey coast. Maximum velocities: Escanaba, N. 29 miles; Port Huron, N. 32; Sandusky, N. 35; Wood's Holl, W. 26; Sandy Hook, NE. 30; Norfolk, NW. 34, and Cape Hatteras and Macon, NE. 36.

No. IX was an ill-defined depression, which separated from the preceding area and moved southward to the Gulf of Mexico during the 20th and 21st; it was accompanied over the Southwest by the highest temperatures of the month: Concho and McKavett, 107°, Uvalde and Castroville, 108°, and Brackettville, 109°. Cautionary signals were ordered at Indianola (late) and Galveston on the afternoon of the 20th, but were not justified. Maximum velocities: Indianola (before signal), S. 28; New Orleans, afternoon of the 22d, E. 30.

No. X began to develop slowly over the Sacramento Valley and Northern Nevada during the night of the 20th. 21st, moved slowly eastward to Southern Idaho, with brisk to high winds and occasional light rains. Terrific and destructive hail-storms occurred during the afternoon at Salem and near Sandy, Oreg.; at Salem it "commenced about 6 p. m., lasted over thirty minutes, hail fell to a depth of 2 inches, all sky-lights were demolished; it was not accompanied by high winds and was apparently confined to a narrow belt." The storm between Sandy and Mount Tabor lasted about the same time, "covered the roads to the depth of 9 inches with hail-stones, and must have done great damage to orchards": Pioche, S. 38; Salt Lake City, 4:35 p. m., barometer 29.68, or 0.20 below normal, SE. 17 miles, threatening. 22d, over Montana, preceded by brisk to high southeast winds and thunder-storms in the Upper Missouri and Red River of the North Valleys. 23d, over Dakota and Minnesota, with local rains and brisk to high winds. 24th, over Upper Lakes, with brisk to high winds. 25th and 26th, over Lower Canada. Cautionary signals ordered for the Lake region, at Duluth, on midnight of the 22d, from Marquette to Sandusky, afternoon of the 23d, and thence to Buffalo, afternoon of the 24th, were only justified on Lake Michigan during passage of present area; Grand Haven, SW. 28, and Milwaukee, SW., 30; but were subsequently justified by high winds attending area No. XI. Cautionary signals ordered on the afternoon of the 25th from Macon, N. C., to Boston, and at midnight at Portland, changed to off shore morning of the 26th on coast of New England, were justified, except at Norfolk and Cape Henry. Maximum velocities: Cape Lookout, SW. 32; Cape May, NW. 28; Sandy Hook, SE. 32: Boston, NW. 28.

No. XI developed over Kansas and Nebraska on the 23d and 24th, in southwest quadrant of preceding area. 25th, central over Iowa, followed by gale at North Platte, NW. 60 miles. 26th, central over Illinois; on these days high area No. VIII moved southeastward over the Lake region; this produced a steep barometric gradient, with a large range of temperature and heavy rains or thunder-showers, from Wisconsin to Indiana; during the latter part of the 26th, the pressure increased and storm diminished in energy. 27th, passed northeast over the Lower Lake region with light rains thence to New England. Cautionary signals ordered on the Lakes in advance of preceding area were continued and fully justified. Maximum velocities: Duluth, NE. 34; Escanaba, N. 33; Milwaukee, NE. 34; Port Huron, N. 30; Sandusky, E. 36 and Oswego, NE. 28.

No. XII appeared on the coast of Oregon on the afternoon of the 25th in rear of high area No. VII; 4:35 p. m., barometer at Roseburg 29.80, or 0.24 below normal, and at 11 p. m. light rain had commenced falling. 26th, lowest pressure over Washington Territory; Olympia, 4:35 p. m., 29.67, or 0.34 below normal, after which center passed northward, clearing weather by night at Roseburg, increasing rain at Portland and Olympia. 27th, southerly winds, with rain, continued during the early morning at Portland and Olympia, but changed to northerly with temporary clearing weather as the following depression developed to the southward.

No. XIII developed over Northern California and Southern Oregon on the 27th

cloudy, threatening, and rainy weather from the coast to Utah; thunder-storm at Winnemucca, Nev. On this day a depression began to develop in the Missouri Valley, which will be considered as area No. XIV, as the present area disappeared, probably to the northward, and high area No. X appeared on the coast of California.

No. XIV.—27th, falling pressure in the Missouri Valley. 28th, central over Southern Dakota; 11 p. m., lowest pressure, 29.56, or 0.38 below normal, at Bismarck; southeast to northeast winds and light rain from Wisconsin to Dakota; brisk to high southerly winds and high temperatures southward. 29th, central over Minnesota, with increasing rains and thunder-showers, with hail, at places southward to Missouri, and followed by colder northwest winds southward to Nebraska. 30th, it moved east-northeastward over Canada; high temperatures prevailed throughout the Gulf and Atlantic States, and in Ontario, Can., several cases of sunstroke were reported. Cautionary signals ordered for Lakes Superior and Michigan on the 28th, on Lakes Huron and Erie afternoon of the 29th, and Lake Ontario afternoon of the 30th were justified, except at Duluth, Buffalo, Rochester, and Oswego. Maximum velocities, Marquette, SW. 36; Milwaukee, W. 40; Alpena, SW. 31; Port Huron, SW. 33; Sandusky, SW. 36; Cleveland, S. 36; Columbus, Ohio, S. 36.

No. XV developed during latter part of 29th and morning of the 30th over the high lands of Northwestern Texas. 30th, 4:35 p. m. (Washington time), brisk southerly winds over Texas increasing to high over Indian Territory, with a general temperature of from 90° to 100°; easterly winds and threatening weather in the Lower Missouri Valley; northerly winds over Western Nebraska and Kansas, increasing to NW. 44 miles at Dodge City, and of a temperature ranging from 60° to 72°. Snow fell on the mountains around Denver and Santa Fé, and by morning of the 31st the thermometer fell to 10° on summit of Pike's Peak. From 4 to 10 p. m. several tornadoes swept over portions of Eastern Kansas, Southeastern Nebraska, and Northern and Western Missouri, brief notice of which will be found under the head of local storms. The general direction of these tornadoes appears to have been uniformly northeastward, corresponding with that of the center of depression. Along the immediate northern margin of this track very heavy rain fell during the night of the 30th. 31st, center of depression increased in area with rising pressure and decreasing energy, and by 4:35 p. m. formed an elongated trough extending from Arkansas and Missouri to Southern Michigan, attended by cool and brisk northerly winds over the Upper Lakes, Northwest, and Eastern slope and by southerly winds from the Ohio Valley and Lower Lakes south and eastward. Throughout the day cloudy and rainy weather, with occasional heavy thunder-storms, prevailed from the Southwest to Tennessee, the Lake region, and Iowa. Cautionary signals ordered up in advance of preceding area were continued. Maximum velocities, Detroit, S. 36; Dodge City, NW. 56; cautionary signals ordered for Indianola and Galveston on the afternoon of the 29th were justified; Indianola, midnight of 31st, NE. 39.

INTERNATIONAL METEOROLOGY.

The extra chart distributed with the present monthly review is based on the daily charts published with the bulletin of international simultaneous observations for October, 1877. It has been prepared in accordance with especial instructions from the Chief Signal Officer, and shows the average pressure at sea level, the temperature and prevailing winds for October, 1877, at 7:35 a. m., Washington time as given by the simultaneous observations reported to this office.

On Chart No. IV are shown the probable tracks of storm-centers over the oceans, deduced from data received at this office up to June 2, and in the upper right-hand corner will be found an index to the same. In the upper left-hand corner is a small table giving the approximate wind direction and probable maximum velocities (in miles per hour and meters per second) attending the depressions on the dates named. The following is a brief notice of the same, and also of some storms over the southern hemisphere:

North Atlantic Ocean.—No. I is a continuation of area of low barometer No. IV of the April review; it passed over Newfoundland during the latter part of the 4th; on the 5th strong SW. gales (veering on the 6th to NW.) and very high seas were experienced about 46° N., 40° W.; 6th, SW and NW. strong gales and high seas extended eastward to 30° W., and rapidly falling pressure was reported on the coast of Ireland; on the 7th this depression probably joined area No. X of the April review. No. II appeared on the 7th to the southeast of Newfoundland, and during the night developed into a very severe storm, with winds of hurricane force, about 45° N., 40° W. No. III is a continuation of low area No. VI of the April review; it passed eastward north of Newfoundland on the 9th and 10th, and probably followed the track shown on the chart; on the 12th it was accompanied by heavy rains and southeast winds from 30° to 15° W., and followed by hard NW. gales about 30° W.; 13th to 17th, it moved from the Bay of Biscay to the Baltic. No. IV is a continuation of low area No. VII of the April review. This track is very doubtful from the 12th to 16th, and the storm that was experienced

in mid-ocean on the 17th may have been due to a new depression; 18th, very heavy NW. gales prevailed about 45° N., 40° W., which extended eastward on the 19th to 20° W., as the center approached the Irish coast, where it was preceded by severe SE. gales. No. V developed over the western Mediterranean on the 15th and 16th, in the south quadrant of area No. III, with the center of which depression it apparently united on the 18th. No. VI is a continuation of the low area No. X of the April review; it passed eastward between the Bermudas and Nova Scotia on the 19th; 20th and 21st, it was accompanied by strong gales and heavy rain and squalls, and on the 22d and 23d passed over the British Isles. No. VII is a continuation of low area No. XIV noticed in the April review; it apparently developed off the coast of Nova Scotia on the 23d and moved very slowly eastward as a very severe storm, with hurricane winds and very high seas, on the 24th, 25th, and 26th; 27th it rapidly decreased in energy, and probably moved northward. *South Atlantic Ocean*—On February 27 a very severe storm was probably central about 50° S., 50° W., and moving southeastward; at Montevideo, the lowest pressure of the week occurred on the 24th, with rain and brisk to strong winds. April 8th, 27° S., 29° W., heavy squalls, thunder, lightning, and heavy rain for sixteen hours. *North Pacific Ocean.*—No. I is possibly a continuation of storm-center No. II, Chart IV, March review; it was experienced on February 4 and 5, 1879, as a SSE. to SW. gale in latitude 32° N., barometer 29.65. No. II, February 9, barometric depression (29.85) with SSE. to NW. winds and rough sea. No. III, February 25, depression (29.60) with SE. to SW. winds, showers, and confused sea. No. IV, possibly a continuation of storm-center No. I, Chart IV, April review; it was encountered from March 1 to 4, as an extensive depression, from (barometer 29.58) longitude 176° W. to 168° E., about latitude 38° N., preceded by SE. strong winds and heavy rain and followed by northerly gales, hail, sleet, and high seas; and on March 9 a "very heavy gale from SSW., with high seas," was experienced in 37° N., 149° W. No. V probably shows somewhat correctly the track of a storm from March 15 to 22; it was accompanied from the 16th to the 18th by northeasterly gales in the Straits of Formosa, and on the 21st the barometer at Yokohama fell to 29.59. No. VI, March 29 and 30, SW. gales at Yokohama, and S. to NW. gales in 40° N., 160° E., with heavy rains and rough seas, barometer 29.74. No. VII, April 1, 43° 23′ N., 175° 08′ E., barometer 29.58, NE. strong gales, heavy rain, and rough, cross, turbulent sea. No. VIII, April 4, 45° N., 164° 35′ W., barometer 29.87, SW. fresh gale, considerable rain, rough sea. No. IX, from April 7 to 13 an extensive area of low pressure existed on the coast of Alaska, the barometer at Sitka showing two minima on the 9th and 14th (29.36 and 29.38 respectively), with calms and light rains; on the 7th and 8th westerly gales and hail squalls prevailed in about 42° N., 140° W. *South Pacific Ocean.*—February 8, 1879, 50° 28′ 104° 10′ W., heavy WSW. gale, heavy seas. March 7, 1879, 23° 17′ S., 174° 22′ W., commenced blowing very heavy from E. by N., barometer falling; wind veered to S.; 6 p. m. barometer 28.75, hurricane. March 16, 1879, 36° S., 138° W., gale from SSE., lost sails, &c. *Straits of Sunda.*—Heavy westerly gales and an easterly current of four miles per hour prevailed in these straits from December 7 to 31, 1878, detaining a fleet of about forty vessels, some of them the finest ocean clippers, to the eastward of Sumatra. *Indian Ocean.*—March 20, 1879, bark Sarah Hobart anchored outside Mauritius; had to put to sea in consequence of the approach of a hurricane. She returned on the 29th with loss of a mainmast, mizzentopmast, pump, boats, &c. Mauritius—March 19, 1879, barometer began to fall; 4:33 p. m., wind SE. by E., 24 miles; 20th, 4:33 p. m. barometer, corrected and reduced, 29.443 inches, or 747.85 minimum, wind SE., 51.3 miles, overcast, squally, rain; 21st, 2:15 a. m., lowest barometer, corrected and reduced, 29.032, or 737.3; 5:30 to 6:30 a. m., greatest mean hourly velocity of wind during storm, 80.3 miles; 4:33 p. m., 29.623, or 752.40, NE. by N., 45.5 miles, wind and weather moderating.

Unalaska Island Alaska.—Reports received from the Signal Corps observer at Unalaska contain the following items:

Month.	Temperature.			Relative humidity.	Rainfall.	Days.			Wind — prevailing direction.
	Mean.*	Max.	Min.			Rain or snow.	Snow.	Clear.	
1878.									
November	33.5	48	21	80	3.78	19	16	1	SW. & calm.
December	35.1	45	19	85	10.02	24	15	2	SE.
1879.									
January	34.0	48	20	84	2.88	21	17	1	SW.
February	29.2	44	7	84	1.35	16	9	1	SE.

* ¼ (7+2+4+9+9.)

Gales, &c.—November 8, SE. to SW. gusty gales, veering on the 9th to W. strong gale; 10th, SE. gusty gale. December 3, SE. strong gale; 13th, SE. strong gale; 21st, N. fearful gale, terrific gusts; 22d, N. to NW. gale; 27th, SE. high gale; 28th, terrific gale increasing to storm; 29th, SW. gusty gale; 31st, SE. to E. hurricane in awful gusts, aneroid barometer read 27.84 at 4:20 p. m., having fallen 1.56 inch in nine hours, bay white with foam, rainfall 2.31 inches; all snow on hills gone, and only heavy drifts remain, winter so far unusually mild; at this date last year 27 feet (?) of snow lay on a level. January 21, 1879, SW. gale; 22d, SW., very gusty gale; 27th, fearful gusty gale; 28th, SW. high gusty gale backing to SE. at 9 p. m.; 29th, SE. brisk to high until 3:40 p. m., then SW. hurricane, 8:30 to 11 p. m. terrific gusts rapidly succeeding each other, aneroid barometer at 4:20 p. m. 27.70, lowest reading ever recorded here; 30th, SW., terrific gale moderating. February, gusty gales on the 5th, 6th, and 7th from SE.; and 19th, 20th, and 22d from N., NW., and W.

York Factory, Hudson's Bay, British America.—Observations taken at 7 a. m., 2 and 9 p. m. give the following means; &c.:

Month.	Barometer.			Thermometer.			Prevailing wind.	Total rain-fall.	Number of days.			Mean relative humidity.
	Mean.	Max.	Min.	Mean.*	Max.	Min.			Rain or snow.	Snow.	Aurora.	
1878—June	29.84	30.21	29.40	64.9	100.0	25.0	E.	10.50	11	1	5	70.6
July	29.71	30.19	29.17	73.3	106.0	46.0	NE.	14.80	16	0	3	64.8
August	29.82	30.08	29.40	58.9	91.0	38.0	NE.	4.90	9	0	6	82.1
September	29.88	30.33	29.44	37.1	60.0	26.0	N.	13.63	19	8	7	95.2
October	29.86	30.30	29.18	21.5	39.0	— 2.0	N., NW.	2.41	19	19	11	94.6
November	29.84	30.53	29.22	17.3	35.0	—15.0	S., NW.	0.82	17	17	6	92.2
December	29.97	30.40	29.15	— 6.9	29.0	—28.0	NW.	0.43	20	20	3	82.1
1879—January	30.05	30.69	29.44	—23.6	0.0	—43.0	NW.	0.16	8	8	17	76.2
February	30.00	30.58	29.22	—28.9	— 1.5	—48.0	NW.	0.61	11	11	11	71.5

* $\frac{1}{4}$ (7+2+9+9.)

June, thunder-storms, 10th, 14th, 16th, 20th, 22d, 26th; mirage, 1st, 2d, 7th, 9th, 11th, 15th, 16th, 21st, 22d, 23d, 28th, 30th. *July*, thunder-storms, 4th, 6th, 8th, 22d, 25th, 30th, 31st; mirage, 9th, 14th, 19th, 21st. *August*, mirage, 1st, 9th, 11th, 17th; thunder-storms, 6th, 13th, 14th, 22d; meteors, 10th, 11th, 12th. *December*, solar halos on 10 days; lunar halos on 11 days. *January* 30, ice on river 4 feet 3 inches. *February* 28, ice on river 5 feet 7 inches thick.

Paramaribo, Dutch Guiana, South America.—Observations taken at 7 a. m., 2 and 9 p. m., local time, give the following means, &c.:

Month.	Barometer.			Thermometer.			Prevailing wind.	Total monthly rain fall.	Days on which rain fell.	Mean relative humidity.
	Mean.	Max.	Min.	Mean.*	Max.	Min.				
1878—July	29.99	30.04	29.89	80.6	88.0	75.0	E.	10.28	20	85
August	29.98	30.04	29.93	80.7	89.0	75.0	E.	8.14	21	82
September	29.96	30.01	29.87	83.5	91.0	75.0	E.	1.39	3	71
October	29.91	29.97	29.82	81.5	85.0	78.0	E.	6.12	8	78
November	29.91	29.97	29.83	82.7	92.0	74.0	E.	6.12	8	79
December	29.90	30.10	29.82	80.5	90.0	74.0	E.	10.77	20	84
1879—January	29.93	29.99	29.83	78.6	85.0	73.0	E.,NE.	13.46	23	86
February	29.95	30.00	29.86	79.2	87.0	74.0	E.,NE.	5.07	9	84

* ¼ (7+2+9+9.)

TEMPERATURE OF THE AIR.

The isothermal lines on Chart No. II show the general distribution of the temperature of the air for the month. By a reference to the table of average temperatures upon the same chart it will be seen that the temperature of the present month has been above the average of several years in all the districts except in Florida, Arizona, Nevada, Idaho, and the Pacific Coast States. The minimum temperatures of the month occurred over California on the 7th and 8th during passage of high area No. III; from the Western Plateau to the northwest from the 3d to the 7th during high area No. IV; thence to the Atlantic coast from the 1st to the 3d during high area No. I. The maximum temperatures of the month occurred over California on the afternoon of the 31st; over Western Plateau on the 13th and 14th accompanying low area No. VI; Rocky Mountains on the 2d and from the 21st to the 27th; Southwest, 19th to 21st accompanying low area No. IX; Gulf States, 17th to 28th; South Atlantic States, 25th to 31st; and in the Lake region, Ohio Valley, Middle States, and New England, from the 29th to the 31st.

Minimum and maximum temperatures, respectively, are: For *Maine*—At Eastport, 36° and 63°; Orono, 28°, 88°. *New Hampshire*—Dunbarton, 39°, 90°; Summit of Mount Washington, 13°, 62°. *Vermont*—Burlington, 34°, 89°; Woodstock, 26°, 91°. *Massachusetts*—Boston, 38°, 93°; Rowe, 30°, 82°. *Rhode Island*—Newport, 40°, 76°. *Connecticut*—Southington, 34°, 85°. *New York*—New York City, 40°, 86°; Schroon Lake, 26°, 94°; Albany, 36°, 89°; Buffalo, 33°, 84°. *New Jersey*—Princeton, 29°, 90°; Atco, 45°, 96°. *Pennsylvania*—Near Franklin, 26°, 88°; Pittsburgh, 33°, 93°; Philadelphia, 31°, 91°. *Delaware*—Dover, 48°, 88°. *Maryland*—Baltimore, 43°, 94°; Emmittsburg 31°, 86°. *District of Columbia*—Washington, 36°, 94°. *Virginia*—Snowville, 27°, 86°; Norfolk, 28°, 96°. *West Virginia*—Helvetia, 28°, 88°. *North Carolina*—Murphy, 31°, 89°; Weldon, 51°, 95°; Kittyhawk, 45°, 91°. *South Carolina*—Aiken, 52°, 92°; Charleston, 55°, 88°. *Georgia*—Augusta, 48°, 91°; near Forsyth, 54°, 94°. *Florida*—Houston, 60°, 98°; Key West, 68°, 91°. *Alabama*—Green Spring, 46°, 90°; Montgomery, 50°, 96°. *Mississippi*—Near Brookhaven, 52°, 89°; Vicksburg, 55°, 94°. *Louisiana*—New Orleans, 58°, 86°; Shreveport, 61°, 92°. *Texas*—Pilot Point, 40°, 97°; Eagle Pass, 65°, 116°; Galveston, 64°, 89°. *Ohio*—Westerville, 29°, 91°; Ruggles, 40°, 95°. *Kentucky*—Louisville, 43°, 92°. *Tennessee*—Knoxville, 38°, 91°; Memphis, 50°, 96°. *Arkansas*—Mount Ida, 44°, 88°. *Michigan*—Lansing, 25°, 91°; Ypsilanti, 25°, 90; Alpena, 29°, 86°. *Indiana*—Spiceland, 32°, 89°. *Illinois*—Marengo, 36°, 92°; Anna, 46°, 95°. *Missouri*—Oregon, 38°, 93°; Kansas City, 40°, 93°; Saint Louis, 45°, 91°. *Kansas*—Wellington, 38°, 97°; Leavenworth, 40°, 92°. *Wisconsin*—Neillsville, 26°, 86°; Embarras, 38°, 88°. *Iowa*—Logan, 26°, 88°; Fort Madison, 30°, 93°. *Nebraska*—Plattsmouth, 34°, 91°; North Platte, 34°, 93°. *Indian Territory*—Fort Sill, 50°, 96°. *Minnesota*—Breckenridge, 28°, 81°; Saint Paul, 35°, 86°. *Dakota*—Olivet, 28°, 92°; Fort Stephenson, 29°, 75°. *Colorado*—Pike's Peak, 10°, 41°; Denver, 37°, 90°. *New Mexico*—Santa Fé, 34°, 84°; La Mesilla, 42°, 101°. *Wyoming*—Fort Fred. Steele, 25°, 85°; Fort Fetterman, 30°, 87°. *Montana*—Virginia City,

26°, 72°. *Utah*—Salt Lake City, 35°, 84°. *Nevada*—Winnemucca, 26°, 77°; Pioche, 29°, 78°. *Idaho*—Boise City, 30°, 79°. *California*—Calistoga, 31°, 84°; Red Bluff, 31°, 96°; Los Angeles, 43°, 97°; Mammoth Tank, 64°, 108°; Cisco, 10°, 70°; Campo, 26°, 93°. *Oregon*—Roseburg, 34°, 82°. *Washington Territory*—Olympia, 35°, 76°. *Arizona*—Burke's, 60°, 105°; Grant, 54°, 94°.

Ranges of temperature.—The monthly ranges will appear from an examination of the minima and maxima just given. The greatest daily ranges vary in New England from 19° at Wood's Holl to 36° at Boston; Middle Atlantic States, 22° at Cape May to 33° at Baltimore; South Atlantic States, 16° at Cape Hatteras to 29° at Wilmington and Augusta; Eastern Gulf States, 16° at Key West to 33° at Saint Mark's; Western Gulf States, 17° at Galveston to 47° at Uvalde; Ohio Valley and Tennessee, 25° at Cairo to 38° at Pittsburgh; Lower Lake region, 28° at Erie to 39° at Sandusky; Upper Lake region, 27° at Escanaba to 38° at Chicago; Upper Mississippi Valley, 29° at Davenport to 33° at Saint Paul; Missouri Valley, 27° at Omaha to 36° at Fort Stevenson; Red River of the North Valley, 42° at Breckenridge and 40° at Pembina; Eastern Rocky Mountain slope, 27° at Denison to 47° at Uvalde and 38° at North Platte; Rocky Mountain stations, 21° at Pike's Peak, 36° at Virginia City to 48° at Fort Craig; Western Plateau, 31° at Boise City and 42° at Winnemucca; California, 19° at San Francisco to 37° at Los Angeles; Oregon, 34° at Portland and 35° at Roseburg and Olympia.

Frost, injurious to vegetation, is reported as follows: Gainesville, Ga., 3d, killing cotton on low grounds. Cornish, Me., killed brakes; 24th, killed young clover. Farmington, N. H., 27th, severe, killing all vegetation. Freehold, N. Y., 24th, injured beans. Palermo, N. Y., 23d and 24th, severe, killing leaves on forest trees. Lenoir, N. C., 3d, killing potato-vine tops and tender grape-vines. Litchfield, Ohio, 23d, greatly damaging garden and fruit. Wytheville, Va., 3d, 12 miles from here fruit trees badly frozen; 11th, near low grounds and water-courses very severe; 31st, peach, cherry, apple, strawberry, pear destroyed in some places. Madison, Wis., 6th, injured early barley and vegetables. Grand Haven, Mich., 7th. Calistoga, Cal., 7th, killed grape-vines, tomatoes, apricots; 22d, killed young orange shoots. Yreka, Cal., 27th, apple, peach, pear, cherry killed. Southington, Conn., 27th. Logan, Iowa, 6th, hardest frost in May for 20 years, killed much fruit. Monticello, Iowa, 6th. Dunbarton, N. H., 27th.

Ground frozen.—Rowe, Mass., 3d, frozen; 7th, frost nearly out of ground.

Ice.—Severe frosts, causing formation of ice, are reported as follows: Winnemucca, Nev., 19th, sleet; Dubuque, 6th; Detroit, 1st, 2d; Pittsburg, Pa., 3d, ¼ inch; Cape May, N. J., 24th, ice formed 5 miles from station; Rowe, Mass., 6th, on pond; Clear Creek, Nebr., 6th, $\frac{1}{16}$ inch thick; Waterburg, N. Y., 8th, 9th; Starkey, N. Y., 23d, ¼ inch; Nile, N. Y., 8th, ¼ inch, 22d, 23d, 24th, (27th, ⅛ inch to ¾ inch); Westerville, Ohio, 1st, 2d, 3d, 8th; Norwalk, Ohio, 1st, ⅛ inch, 2d, 3d, 8th, 9th, 22d, 23d; Chambersburg, 3d, 8th, 10th; Catawissa, Pa., 2d, 3d; Coleville, Mich., 3d and 6th, 4 inches and 2 inches, respectively; Snowville, Va., 3d; Campo, Cal., 18th, 20th, 22d, 23d, 24th, very severe black frosts, ice ¼ inch thick, and on 22d ½ inch thick.

PRECIPITATION.

The general distribution of the rain-fall, which includes melted snow, for the month is illustrated as accurately as possible by returns from about 650 stations upon Chart No. III. In the lower left-hand corner of the same will be found a table giving the average precipitation for *May* by districts. It has been below the average in all districts, except Nova Scotia, Tennessee, Minnesota, and the Pacific States. Numerous cases of drought are reported, notice of which will be found under that special heading.

Special heavy rains.—5th, Decatur, Tex., 2.70 inches, and Gatesville, Tex., 4.10 inches in 6 hours, with hail. 6th and 7th, Green Springs, Ala., 3.47 inches. 7th, Saint Augustine, Fla., 3.80 inches. 11th and 12th, Cape Lookout, N. C., 9.97 inches. 12th and 13th, Duluth, Minn., 2.70 inches. 16th, Sandy Springs, Md., 4.28 inches. 17th and 18th, Woodstock, Md., 4.35 inches. 19th, Woodstock, Md., 2.00 inches in 52 minutes. 24th and 25th, Bloomfield, Wis., 3.50 inches. 25th and 26th, Arlington, Ind., 4.75 inches. 25th and 26th, Chicago, Ill., 2.52 inches. 30th, Des Moines, 2.62 inches in 3 hours 3 minutes. 30th, Waterville, Kans., 4.00 inches. 31st, Clear Creek, Neb., 3.22 inches in 25 hours 30 minutes. Numerous heavy rains occurred in connection with the local storms of the 29th, 30th, and 31st.

Largest monthly rain-falls.—Concord, Ia., 8.65 inches; Mesquite, Tex., 8.50 inches; Duluth, Minn., 7.99 inches; Cape Lookout, N. C., 7.96 inches; Sandy Springs, Md., 7.97 inches; Fairfield, Ia., 7.55 inches; Saint Augustine, Fla., 7.36 inches; Saint Paul, Minn., 7.18 inches; Woodstock, Md., 7.00 inches; Portland, Oreg., 6.60 inches; Brookhaven, 6.50 inches; Vicksburg, Miss., 5.95 inches; Davenport, Ia., 5.83 inches; Cape Hatteras, N. C., 5.75 inches; Memphis, Tenn., and Omaha, Neb., 5.53 inches; Breckenridge, Minn., 5.42 inches; Key West, Fla., 5.11 inches; Deadwood, Dak, 5.03 inches; Wilmington, N. C., 5.06 inches.

Smallest monthly rain-falls.—In Southeastern California, Arizona, and Western New Mexico, as shown upon chart No. III, no rain-fall is reported. San Diego, Cal., trace; Kit Carson, Col., 0.02 inches; Pioche, Nev., 0.03 inches; Brownsville, Tex., West Charlotte, Vt., and Mount Sterling, Ill., 0.05 inches; Fort Union, N. Mex., 0.06 inches; Fort Griffin, N. Mex., 0.08 inches; Salt Lake City, Utah, 0.10 inches; Plattsburg Barracks, N. Y., 0.18 inches; Georgetown, Col., 0.20 inches; Los Angeles, Cal., 0.24 inches; Cape May, N. J., and Vernon Centre, N. Y., 0.25 inches; Fort Preble, Me., 0.26 inches; Burlington, Vt., 0.38 inches; Johnstown, Va., 0.50 inches; Montreal, Can., 0.76 inches; Augusta, Ga., 0.84 inches; Albany, N. Y., 0.89 inches.

Rainy days.—The number of days on which rain or snow has fallen is about as follows: New England, 5 to 14; Middle Atlantic States, 4 to 15; South Atlantic States, 9 to 17; East Gulf States, 4 to 11; Western Texas, 1 to 5; Tennessee and Ohio Valley, 7 to 12; Lower Lakes, 8 to 14; Upper Lakes, 7 to 20; Upper Mississippi Valley, 10 to 18; Missouri Valley, 13 to 16; Red River of the North Valley, 9 to 14; Eastern Rocky Mountain Slope, 3 to 8; Deadwood (Black Hills), 13; Rocky Mountains, 2 to 20; Pike's Peak, 6; Western Plateau, 1 to 10; California, 2 to 13; Oregon, 22 and 23; Arizona, 0.

Cloudy days.—The number of days on which cloudiness averaged eight-tenths is as follows: New England, from 1 to 13; Middle Atlantic States, 4 to 10; South Atlantic States, 3 to 19; Gulf States, 2 to 9; Ohio Valley and Tennessee, 3 to 6; Lower Lakes, 3 to 7; Upper Lakes, 6 to 18; Upper Mississippi Valley, 7 to 16; Missouri Valley, 8 to 13; Red River of the North, 12 to 18; Eastern Rocky Mountain Slope, 0 to 4; Rocky Mountains, 1 to 11; Western Plateau, 2 to 8; California, 0 to 16; Oregon, 22 to 25; Arizona, 0 to 4.

Hail.—Red Bluff, Cal., 6th, 21st; Umatilla, Oreg., 6th; Castroville, Tex., 5th; Graham, Tex., 30th, stones weighing 1 oz.; Henrietta, Tex., 31st; Eagle Pass, Tex., 5th, 3 inches in circumference; Corsicana, Tex., 6th, 25th, 30 miles south of city, doing great damage to wheat, cotton, and corn crops, track 1½ miles wide, 8 miles long; Saint Marks, Fla., 7th; Mobile, Ala., 5th; Breckenridge, Minn., 10th; Des Moines, Ia., 29th, severe, stones size of walnuts; Burlington, Ia., 31st; Keokuk, Ia., 13th; Saint Paul, Minn., 12th; La Crosse, Wis., 11th; Milwaukee, Wis., 11th; Toledo, Ohio, 30th; Detroit, Mich., 30th, 31st; Morgantown, W. Va., 14th; Cincinnati, Ohio, 13th, 26th; Indianapolis, Ind., 30th, 6 p. m.; Chattanooga, Tenn., 16th; Smithville, N. C., 17th; Thatcher's Island, Mass., 21st; Fort Wallace, Kans., 16th; Fort Sidney, Neb., 21st, 24th; Fort Union, N. Mex., 5th; Fort Duncan, Tex., 5th, stones very large; Calistoga, Cal., 18th; Olivet, Dak., 24th; Gulf Hammock, Fla., 7th; near Forsyth, Ga., 30th; Mount Sterling, Ill., 3d; Anna, Ill., 26th; Fort Wayne, Ind., 30th; Saint Meinrad, Ind., 25th, 26th, destructive; Cresco, Ia., 3d, 10th, 11th; Fort Madison, Ia., 29th; Boonsboro', Ia., 29th; Holton, Kans., 19th; near Independence, 26th; Topeka, Kans., 19th, 25th, 29th, Manhattan, Kans., 29th, 30th, Gardner, Me., 1st; Orono, Me., 1st; Sandy Springs, Md., 16th; Emery Grove, Md., 15th; Grand Rapids, Mich., 30th; Thornville, Mich., 31st; Oregon, Mo., 12th, 30th; Plattsmouth, Neb., 19th; Ashley, Mo., 13th; Howard, Neb., 12th; Palermo, N. Y., 31st: Highlands, N. C, 27th, heavy; near Ringgold, Ohio, 19th; Bethel, Ohio, 15th; Cincinnati, Ohio, 13th, 26th; McMinnville, Tenn., 21st; Austin, Tenn., 7th; Snowville, Va., 29th, severe; West Charlotte, Vt., 3d; Greenwood, Wis., heavy "stones 2½ inches by 3½ inches were formed"; Neillsville, Wis., 11th; Embarrass, Wis., 10th, 11th; Fort Concho, Tex., 30th; North Platte, Neb., 11th.

Snow fell as follows: Total monthly snowfall at Summit Station, Central Pacific Railroad, 25½ inches; Emigrant Gap, 8 inches, and Truckee, 4 inches. Winnemucca, Nev., 18th, snow fell on surrounding hills; 29th, low down on foot-hills. Denver, Col., 30th, on mountains. Santa Fé, N. Mex., 31st, on mountains. Colorado Springs, Col., 14th, on the Peak. Fort Garland, Col, 31st. Georgetown, Col., snow-fall during month, 40 inches. Deep Creek, Utah, 30th, on mountains. Pioche, Nev., 11th. Santa Fé, N. Mex., 11th, 31st. Pike's Peak, 11th, 12th (heavy), 29th. Fort Sill, Ind. T., 30th. Marquette, Mich., 6th. Mount Washington, N. H., 3d, 4th, 5th. Eastport, Me., 24th.

Depth of snow on ground at end of month.—Pike's Peak, Col., 38 inches; Red Bluff, Cal., snow still remains on summit of mountains; Georgetown, Col., 2 inches; Rowe, Mass., snow remains around edges of pond; Stratford, Vt., snow disappeared on the 20th.

Droughts.—Campo, Cal., driest and coldest May for twenty years; springs drying up. Belvidere, Ill., unprecedented drought from April 10 to May 24. Gulf Hammock, Fla., 31st, crops suffering, especially corn and sugar-cane. Thomasville, Ga., a dry month. Vevay, Ind., 16th, vegetation suffering severely; ground cracking open in many places. Anna, Ill., severe drought has injured strawberries, oats, wheat, &c. Creswell, Kans., 31st, spring grain suffering, timothy grass dying. Gardiner, Me., May was a warm and dry month. Litchfield, Mich., wheat somewhat injured by dry weather. Somerset, Mass., 8th to 18th, vegetation suffering. Near Brookhaven, Miss., 17th, crops injured by drought in middle of month. Virginia City, Mont., the farmers of the Madison and Ruby Valleys, 10 miles from Virginia City, report crops suffering from drought. Vineland, N. J., 21st to 31st. Vernon Centre, N. Y., 31st, grain of all kinds suffering very much. Catawissa, Pa., present month has been exceedingly dry, all vegetation has

greatly suffered. North Lewisburg, Ohio, very dry month. Tarentum, Pa., dry month. Stratford, Vt., driest May for many years. Woodstock, Vt., 31st, very severe in latter part of month. Fort Gibson, Ind. T., 25th to 29th, vegetation drying up, stock suffering. San Antonio, Tex., 28th. Corsicana, Tex., corn and cotton suffering. Indianola, Tex., crops and cattle suffering. Graham, Tex., vegetation suffering. Buffalo, N. Y., 13th. Chattanooga, Tenn., 26th, vegetation becoming parched. Nashville, Tenn., 11th, 12th, 13th. Keokuk, Iowa, advices from adjacent localities in Illinois state that wheat has suffered greatly from drought. West Charlotte, Vt., 31st, severe. Professor Nipher, in the bulletin of the Missouri weather service for May, reported the eastern part of that State suffering greatly from lack of rain and small grain and fruit much injured. Professor Kingston, in the weather review of the Canadian meteorological service, says "the months of April and May were, in the vicinity of Lake Ontario, the driest on record."

Floods.—No important river floods have been reported.

RELATIVE HUMIDITY.

The average percentages of relative humidity for the month ranged as follows: New England, 53 to 84; Middle Atlantic States, 57 to 77; South Atlantic States, 55 to 82; Gulf States, 59 to 75; Ohio Valley and Tennessee, 50 to 61; Lower Lakes, 54 to 64; Upper Lakes, 59 to 75; Upper Mississippi Valley, 54 to 63; Lower Missouri Valley, 58 to 68; Red River of the North, 69 to 71; Eastern Rocky Mountain Slope, 43 to 77; Rocky Mountains, 20 to 44; Western Plateau, 26 to 50; California, 45 to 74; Oregon, 74 to 79. High stations report the following averages, not corrected for altitude: Mount Washington, 81; Pike's Peak, 37.

WINDS.

The prevailing winds, at the Signal Corps stations, are shown by the arrows flying with the wind on Chart No. II. The maximum hourly velocities have been given in the descriptions of the movements of areas of high and low pressure. The highest hourly velocity of the month at Mount Washington was 133 miles from the NW. on the 27th, and at Pike's Peak 108 miles from the NE. on the 12th.

Total movements of the air.—The following are the largest monthly movements in miles recorded at the Signal Corps stations, viz: Pike's Peak, 20,025; North Platte, 13,827; Cape Lookout, 12,753; Dodge City, 12,734; Breckenridge, 11,472; Fort Sill, 10,975; Kittyhawk, 10,631. The smallest movements are: Boisé City, Idaho, 3,555; Visalia, Cal., 3,489; Indianapolis, 3,403; Deadwood, Dak., 3,397; Uvalde, Tex., 3,168; Silver City, N. Mex., 2,940; Roseburg, Oreg., 2,408; Nashville, 2,207; Florence, Ariz., 1,655.

Local storms.—*May* 29, warm, moist, southerly winds, with fair weather, prevailed over Iowa and southward to the Gulf States. About 5 p. m. a hail-storm of great violence passed from the SW. to the NE., through Holt County, Missouri, and then, developing into a tornado, passed eastward through the southern part of Nodaway County, Missouri, for about 16 miles, having a width of 300 to 3,000 feet. It began near Smith, passed south of Barnard and north of Bockolow [Bolockow ?], and was last seen moving toward Conception, but apparently rose and was dissipated before reaching that place. The north side of the track was straight, clean, and well defined; the south side was jagged, looped, and curved. On the same afternoon heavy hail and rain storms occurred in Lawrence County and Riley County, and many other portions of Kansas. *May* 30, lower temperatures prevailed in Missouri and Kansas and the advancing edge of the area of cold NW. winds passing eastward over Western Nebraska and Kansas, was accompanied by severe local thunder and hail storms, and in some places by tornadoes. At 4.35 p. m., Washington time (or 3.15 p. m., local time, on the 97th meridian), an oval area extended for 300 miles from west of Fort Sill to south of Omaha, and having a shorter diameter of about 50 miles; toward this the winds were blowing from all directions, being warm, brisk SW. on the east side and cold, high NW. on the west side. At 11 p. m. this area is represented by a smaller one of low pressure in Southeastern Nebraska and two of converging winds respectively in SE. Iowa and Central Missouri. Severe tornadoes or equivalent local storms occurred between 3 p. m. and 11 p. m., as follows: 1, Scardia, Republic County, Kansas. 2, at 4 p. m., tornado passed 4 miles northwest of Minneapolis, Ottawa County, Kansas, path 10 to 15 miles long, 1,000 feet wide; very violent at Delphos, Ottawa County; in all, 18 persons reported killed. 3, between 6 and 6:30 p. m. tornado passed from Candrey's house, near county line, between Riley and Clay Counties, Kansas, northeastward over or near Stockdale and Randolph, in Riley County; path [30 ?] miles long; very destructive; 3 persons killed. 4, from 7:45 to 8 p. m. tornado passed eastward over Blue Rapids, Irving, and Frankfort, Marshall County, Kansas, and Centralia, Nemeha County, Kansas; very severe at Irving; high winds prevailed to long distances from the central path, which was about 30 miles long; in all, over 30 persons killed and over 50 severely injured. 5, Richardson County, Nebraska, the preceding tornado reported to have reappeared in this county. 6, at 1 p. m. [10 ? p. m.] near Kirksville, Adair County,

Missouri; 1 person killed. 7, between 7 and 9 p. m. at Craig, Holt County, Missouri; this storm was seen by observer at Corning, Holt County. 8, about 6 p. m. tornado seen to form about 2 miles north of Lee's Summit, Jackson County, Missouri; passed near Blue Springs and Oak Grove, and was seen to dissipate near Judge Williams's house; path northeastward, 10 miles long and 100 feet wide; 5 or 6 killed. This same storm was seen by observers at Independence and Buckner, Mo. 9, In Wayne County, and at 9.10 a. m., local time in Appanoose County, Iowa, at a point 15 miles NE. of Unionville, Putnam County, Mo., one killed; (probably a heavy thunder and hail storm rather than a well-developed tornado.)

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily weather indications for May with the telegraphic reports for the succeeding twenty-four hours, shows the general percentage of omissions to be 0.2 per cent., and of verifications to be 82.9 per cent. The percentages for the four elements have been: Weather, 85.8; direction of the wind, 85.2; temperature, 82.6; barometer, 77.9. The percentages of verifications by geographical districts have been: New England, 84.3; Middle States, 85.6; South Atlantic States, 80.4; East Gulf States, 76.6; West Gulf States, 76.7; Lower Lake region, 84.7; Upper Lake region, 87.1; Tennessee and the Ohio Valley, 84.2; Upper Mississippi Valley, 84.1; Lower Missouri Valley, 84.0; North Pacific coast region, 93.1; Central Pacific coast region, 85.4; Southern Pacific coast region, 93.1. Of the 3,790 predictions that have been made, 160, or 4.2 per cent. are considered to have entirely failed; 145, or 3.8 per cent. were one-fourth verified; 580, or 15.3 per cent. were one-half verified; 353, or 9.3 per cent., were three-fourths verified; 2,552, or 67.3 per cent., were fully verified, so far as can be judged from the tri-daily weather maps.

Cautionary signals.—One hundred and seventy-eight cautionary signals were displayed during the month, of which 110, or 61.8 per cent., were justified. Forty-two cautionary off-shore signals were displayed, and of these 30, or 71.4 per cent., were justified as to direction; 17, or 40.5 per cent., were justified as to velocity. Of the cautionary off-shore signals 20 were changed from cautionary. Two hundred and twenty signals of both kinds were displayed, of which 126, or 57.3 per cent., were fully justified. The above does not include signals ordered at 47 display stations, where the velocity is only estimated and not measured. Fifty-four cases were reported of winds of 25 miles or over where signals were not ordered; in only 12 of these cases did the winds exceed 30 miles per hour.

NAVIGATION.

Stage of water in rivers.—In the table on the right-hand side of Chart No. III are given the highest and lowest readings of the Signal Corps river-gauges for the month, with the dates. No case has been reported of the rivers reaching danger line during the month. The Upper Mississippi was lowest during the early part of the month, and the Ohio was lowest during the latter portion of the month. Dubuque, Iowa, 30th, the excellent stage of water in the river brought down a great quantity of logs and gave work to all mills. The Black River, Wis., on the 14th, rose 10 feet, producing the highest water for 10 or 12 years. Pittsburgh, 31st, "on account of low water during past few weeks it has been impossible to float loaded barges down the river."

Ice on lakes, rivers, &c.—Marquette, Wis, 8th, navigation opened; heavy ice reported beyond the Sault Sainte Marie Canal, but not preventing navigation. Buffalo, N. Y., 1st, several vessels forced their way through ice, outward bound; 2d, harbor closed by ice; 5th, ice on harbor 3 feet thick; 7th, ice softening and vessels passing out; 9th, large masses of floating ice passing down Niagara River; 15th, ice firm, navigation suspended; 16th, ice broke up; 20th, no ice observed on lake.

High tides.—Cape Lookout, N. C., very high tide on the 3d.

TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors, with average depth when observations were taken, are given in table on Chart No. II. Observations were interrupted at the following places on the dates indicated: on account of rough water, Cleveland, 25th and 26th; on account of loss of thermometers, San Francisco, 1st to 31st, Milwaukee, 13th to 29th, New London, 16th to 31st, Augusta, Ga., 1st to 4th.

ATMOSPHERIC ELECTRICITY.

Thunder storms.—1st, Maine, Dakota, Georgia, Texas; 2d, Louisiana; 3d, Dakota, Texas, Iowa, Missouri, Illinois, Kansas, Nebraska; 4th, Indian Territory, Texas, Mississippi, Missouri, Ohio, Illinois, Tennessee, Alabama, Arkansas, Nebraska, Ohio, Virginia; 5th, Indian Territory, Texas, Alabama, Maryland, Arkansas, Georgia, Massachusetts, New Jersey, New York, Vermont; 6th, Colorado, Texas, Louisiana, Alabama, Georgia, Connecticut, New York, Arkansas, Mississippi, New Jersey; 7th, Nebraska, Florida, North Carolina, Alabama, Michigan; 8th, Dakota, Florida; 9th, Iowa, Minnesota, Dakota, Missouri; 10th, Dakota, Iowa, Minnesota, Wisconsin, Illinois, Michigan, Pennsylvania; 11th, Colorado, Wyoming, Nebraska, Texas, Florida, Iowa, Wisconsin, Michigan,

Minnesota, Dakota, Illinois, Missouri; 12th, Nebraska, Dakota, Texas, Minnesota, Michigan, Illinois, Missouri; 13th, California, Kansas, Dakota, Iowa, Missouri, Wisconsin, Ohio, Michigan, Pennsylvania, Kentucky, Illinois, Tennessee, North Carolina, Missouri, Alabama, Indiana, Maine, Nebraska, Texas, Vermont; 14th, Colorado, Illinois, Ohio, New York, Tennessee, Maine, Alabama, Indiana, Iowa, Kansas, Michigan, Missouri, Vermont; 15th, Texas, Florida, New York, Pennsylvania, Ohio, Kentucky, Illinois, Tennessee, Georgia, North Carolina, Indiana, Virginia; 16th, Nebraska, Kansas, Texas, Florida, North Carolina, Georgia, New York, Massachusetts, Maryland, Connecticut, New Jersey, Pennsylvania, Vermont, Virginia; 17th, Colorado, Florida, Louisiana, North Carolina, Georgia, Dakota, Nebraska, Kansas, Maryland, New Jersey, Pennsylvania, South Carolina, Virginia; 18th, Louisiana, Florida, North Carolina, Georgia, Virginia, Pennsylvania, Massachusetts, Iowa, Kansas, Maryland, Missouri, Nebraska, New Jersey, South Carolina; 19th, Nebraska, Kansas, Dakota, Iowa, Georgia, Virginia, Maine, Alabama, Illinois, Maryland, Missouri, New Jersey, North Carolina, Ohio, Pennsylvania; 20th, Indian Territory, Florida, Missouri, Michigan, Kentucky, Tennessee, North Carolina, Georgia, Virginia, Vermont, Kansas, New Jersey, Pennsylvania; 21st, California, Nebraska, Dakota, Mississippi, Florida, North Carolina, New Jersey, Virginia, Pennsylvania, Massachusetts, Connecticut, Maine, Maryland, New York, South Carolina, Tennessee, Vermont; 22d, Kansas, Dakota, Texas, Georgia, New York, Iowa; 23d, Dakota, Mississippi, Alabama, Florida, Minnesota, Georgia, Kansas, Missouri, Nebraska; 24th, California, Texas, Iowa, Wisconsin, Michigan, Nebraska, Wyoming Territory, Dakota, Illinois, Indiana, Missouri, Ohio; 25th, Dakota, Iowa, Wisconsin, Illinois, Ohio, Pennsylvania, Indiana, New York, Connecticut, Kansas, Maryland, Michigan, New Jersey, Virginia, West Virginia; 26th, Ohio, Kentucky, Illinois, Indiana, North Carolina, Iowa, Kansas, Michigan, Missouri, New Mexico; 27th, Iowa, Illinois, North Carolina, Kansas, Nebraska, Pennsylvania, South Carolina; 28th, Texas, Minnesota, Wisconsin, Dakota, Illinois, Indiana, Iowa, Michigan, Nebraska, North Carolina, Virginia; 29th, Kansas, Dakota, Minnesota, Iowa, Minnesota, Michigan, Kentucky, Indiana, Illinois, Missouri, Nebraska, North Carolina, Ohio, West Virginia; 30th, Indian Territory, Texas, Mississippi, Iowa, Missouri, Wisconsin, Michigan, Ohio, Illinois, Kansas, Nebraska, New York; 31st, Texas, Iowa, Missouri, Wisconsin, Michigan, New York, Pennsylvania, Illinois, Tennessee, Massachusetts, Arkansas, Indiana, Kansas, Mississippi, Nebraska, Ohio, West Virginia.

Auroras were observed on the following dates: 7th, Starkey, N. Y.; 11th, Vevay, Ind.; 12th, Thornville, Mich.; 13th, Pembina, Dak.; 17th, Pembina, Dak.; 20th, Pembina, Dak., Starkey, N. Y.; 21st, Philadelphia; 23d, Bismarck, Dak., NE., 10 p. m., Eastport, Me., Monticello, Iowa, Gardiner, Me., Woodstock, Vt.; 24th, Newburyport, Mass.; 25th, Bangor, Me., from 10 p. m. until 2.45 a. m., Starkey, N. Y.; 26th, Cambridge, Mass., regularly looked for at 8 p. m., none seen; cloudy on 2d, 3d, 4th, 6th, 7th, 12th, 13th, 16th, 17th, 18th, 19th, 24th, 25th, 27th, 30th; moonlight, 1st, 5th; twilight strong last half of month.

Telegraphic communication interfered with by atmospheric electricity.—Santa Fé, N. Mex., 4th, 26th; Colorado Springs, Colo., 36th; Pikes Peak, Colo., 27th; Saint Paul Minn., 12th.

OPTICAL PHENOMENA.

Solar halos.—1st, Utah, Illinois. 2d, Dakota, Florida. 3d, Utah, Ohio, Michigan, New Jersey. 4th, Ohio, Indiana. 5th, Utah, Missouri, Illinois, North Carolina, Virginia, Connecticut, Iowa, Massachusetts, Nebraska, New Jersey. 6th, Utah, Iowa, Ohio, Illinois, Connecticut, Missouri, New Hampshire, New Jersey. 7th, Iowa, Minnesota, Connecticut, Indiana. 8th, Dakota, Iowa, Wisconsin, Illinois. 9th, Iowa, Illinois, Ohio, New York. 10th, Ohio, New York, Maine, Indiana, Nebraska. 11th, Iowa, Missouri, Indiana, Ohio. 12th, California, Dakota, Iowa, Missouri. 13th, Iowa. 15th, Ohio, Connecticut, Illinois, Nebraska, New York. 17th, Iowa, Ohio, Massachusetts, Nebraska, North Carolina. 18th, Iowa, North Carolina, Massachusetts, New Jersey. 19th, Iowa, New York. 20th, Iowa, Tennessee. 21st, Nevada, Dakota, Iowa, Minnesota, Ohio, Indiana. 22d, Florida, Iowa, Ohio. 23d, Texas, Florida, Iowa. 24th, Nevada, Iowa. 25th, Michigan, Ohio, Indiana. 26th, California, Utah, North Carolina, Nevada, New Jersey, Pennsylvania. 27th, Utah, Nevada, Iowa, Tennessee, California, Indiana, Maine. 28th, Ohio, Dakota. 29th, Dakota, Iowa, New York, New Jersey. 30th, Texas, Iowa, Wisconsin, Illinois, Michigan, New York. 31st, Florida, Alabama, Iowa, Georgia.

Lunar halos.—1st, New York, Illinois, Virginia, Massachusetts. 2d, Iowa, Minnesota, Missouri. 3d, Utah, Kansas, Texas, North Carolina, Virginia. 4th, Dakota, Texas, Ohio, Illinois, North Carolina, Maine, California, Indiana, Maryland. 5th, Texas, Alabama, Florida, Iowa, Ohio, Kentucky, Illinois, Tennessee, Indiana, Pennsylvania, Virginia, 6th, Missouri, Ohio, Virginia. 8th, Michigan. 9th, Michigan. 11th, Texas. 14th, Ohio. Indiana. 23d, Missouri. 24th, Nevada, Texas, Tennessee, Indiana, Illinois. 26th, Nevada, Iowa, Illinois, Massachusetts, Missouri, Texas. 27th, Dakota, Florida, Iowa, Missouri, Kentucky, Illinois, Indiana, Ohio. 28th, Indian Territory, Dakota, Minnesota, Tennessee, Georgia, North Carolina, New Jersey, Rhode Island, Massachusetts, Illinois,

Michigan, Nebraska, New York. 29th, Texas, Tennessee, Georgia, Illinois, Michigan, New Jersey, Virginia. 30th, Texas, Alabama, Louisiana, Missouri, Indiana, Georgia, Maine, Massachusetts, New Jersey. 31st, Texas, Alabama, Florida, Missouri, Georgia, Connecticut, Massachusetts, Pennsylvania.

MISCELLANEOUS PHENOMENA.

BOTANICAL.—*Connecticut*—Southington, in bloom, 8th, sugar maple, 14th, cherry, 18th, pear, apple; New London, in bloom, 10th, wistaria, 12th, lilac, 14th, horse chestnut, maple, elm. *Georgia*—Thomasville, a dry month; oats and wheat all harvested, average crop. Cotton caterpillar observed in three cases in Thomas County during the month. *Illinois*—Louisville, corn, oats, and flax one month later; Peoria, in bloom, 6th, wild cherry; Highland, 14th, first ripe strawberries; 18th, grape vines in bloom; 29th, cut worms damaging corn; 31st, wheat looks poorly. *Indiana*—Saint Meinrad, 20th, grapes in bloom. Arlington, in bloom. 2d, hickory, 19th, walnut, 24th, red and white clover. *Indian Territory*—Fort Gibson, 18th, new Irish potatoes in market. *Iowa*—Nora Springs, in bloom, 2d, cherry, 17th, mandrake. Monticello, 1st, catkins on willow; 12th, farmers commenced cultivating corn; in bloom, 4th, cherry, 11th, lilac, 13th, snowball, showberry. Independence, ripe, 7th, strawberry, 24th, potatoes, 26th, raspberry. Fort Madison, in bloom, 18th, strawberry, black walnut, 7th, locust; 19th, ripe strawberries in market. Prof. Gustavus Hinrichs reported crops at end of month much better than apprehended during the drought of first part of month; corn, equal or above average over two-thirds of State, below average in southwest and northeast; hay and pasture good in northwest and middle portions, below in southwest and east; wheat and oats below average, having suffered most in northwest, southwest, and east. *Kansas*—Independence, blooming, 2d, peas, 15th, hickory, walnut, 30th, catalpa, 31st, flax. Topeka, 5th, yellow rose in bloom. *Maine*—Cornish, leafing, 3d, lilac, 10th birch, maple, poplar, horse chestnut, 11th, forest trees. West Waterville, in bloom, 15th, plum, cherry, 21st, apples. Gardiner, in bloom, 28th, lilac; season more forward than last year. *Maryland*—Emory Grove, in bloom, 20th, rose, 30th, potato; in head, 12th, wheat, 15th, rye; 28th, strawberries ripe; 30th, corn up. *Massachusetts*—Somerset, in bloom, 1st, wild flowers and feverbush, 10th, cherry, 13th, pear, 14th, peach, plum, 17th, apple, 19th, lilac, 24th, quince, 1st, blue violet, cowslip, adder's tongue, anemone, 10th, columbine, 15th, buttercup, 20th, Solomon's seal; 6th, asparagus for table use; 30th, rye in head. Fall River, in bloom, 6th, cherry, 8th, peach, 9th, pear, 12th, strawberry, 14th, apple. Westborough, in bloom, 11th, cherry, 12th, peach, 14th, apple. Springfield, in bloom, 12th, peach, plum, 13th, pear. Rowe, 28th, apple in bloom. Waltham, in bloom, 2d, red maple, 6th, willow, 8th, marigold, dandelion, 10th, anemone, 12th, cherry, 13th, shad bush, white birch, 14th, peach, pear, 16th, gooseberry, blueberry, 17th, sassafras, 18th, apple, 20th, black oak, chokeberry, 21st, lilac, horse chestnut, 25th, buttercup, wild geranium, 29th, barberry, white thorn, 30th, blackberry, 31st, sweet viburnum, black cherry; leafing, 5th, black cherry, chokeberry, barberry, willow, meadow sweet, and sweet viburnum, 8th, horse chestnut, sugar maple, 10th, pear, white thorn, 11th, apple, 12th, white birch, 13th, red oak, red maple, 14th, raspberry, gooseberry, 24th, forest trees. New Bedford, leafing, 2d, lilac, willow, 19th, elm, oak; in bloom, 2d, anemone, 5th, magnolia, 6th, wild strawberry, 8th, peach, 12th, pear, butter cup, 15th, apple, 18th, lily of the valley, 19th, dogwood, 25th, Solomon's seal; ripe, 2d, asparagus. *Michigan*—Litchfield, all small fruit prosperous. Northport, in bloom, 16th, early cherry, 17th, shadbush, plum, wild cherry. Thornville, in bloom, 8th, Juneberry, 9th, cherry, peach, 11th, plum, 12th, poplar; leafing, 2d, elm, willow, apple, 6th, wild cherry, white thorn, 12th, white oak. Hudson, 1st, cherry in bloom. *Mississippi*—Brookhaven, in bloom, 1st, magnolia, 7th, lily; 3d, lily budding; 17th, blackberry ripe. Fayette, in bloom, 7th, black walnut, morning glory; 20th, May apple ripe. *Missouri*—Oregon, in bloom, 1st, Indian turnip, morning glory, shellbark hickory, black walnut, 2d, blue larkspur, 3d, Persian lilac, 5th, sweet shrub, 6th, snowballs, horse radish, 8th, white walnut, 9th, pear, 10th, blue grass, wild cress, sage, 11th, Star of Bethlehem, yellow locust, 12th, flowering locust, 13th, red and yellow raspberries, 14th, Doolittle raspberry, 15th, wild blackberry, 16th, orchard grass, 17th, brandywine raspberry, 18th, rose peony, red clover, 19th, Clinton grapes, 20th, Solomon's seal, beauty of Hebron, early rose potato, 21st, thyme, 22d, Philadelphus, 24th, syringa, curled cress, parsnip, 26th, radish, Canada victor tomato, 27th, rose, scarlet phlox, wild buckwheat, 28th, calistigea, white larkspur, 24th, dogwood, dwarf prairie rose, 30th, May weed; 3d, blue grass heading; 4th, wild strawberry begins to ripen; 14th, farmers cultivating corn; 17th, strawberry begins to ripen, 31st blue grass seed begins to ripen. *Nebraska*—Clear Creek, 13th, farmers planting corn. *New Hampshire*—Dunbarton, 26th, apple in bloom; season very backward. Contoocookville, in bloom, 3d, red maple, 17th, wild strawberry, 24th, apple; leafing, 12th, elm, apple, 27th, concord grape. *New Jersey*—Princeton, in bloom, 4th, cherry, 11th, apple. Atco, in bloom, 6th, apple, 14th, quince; 6th, oak leafing; 22d, rye heading; 23d, strawberry ripe. Flushing, in bloom, 5th, peach, cherry, 6th, plum, apple, pear, 16th, lilac; 12th, trees generally in full leaf. *New York*—Argyle, in bloom, 16th, dandelion. Vernon Centre,

in bloom, 5th willow; budding, 5th, apple, pear, 14th, cherry. Palmero, in bloom, 3d, soft maple, 14th, cherry, flowering currant, 15th, pear, strawberry, 16th, apple, 17th, tulip, flowering almond, 21st, black alder, 22d, butternut, lilac; 2d, began to sow oats; 7th, forest trees leafing; 22d, began planting corn. Starkey, in bloom, 5th dandelion, 10th, strawberry, 12th, cherry, 13th, lilac, 16th, pear, peach, 31st, clover; leafing, 2d, currant, 3d, cherry, 8th, apple, 15th, oak, elm, hickory; 25th, rye heading. Nile, leafing, 10th, forest trees, apple. Waterbury, in bloom, 9th, dandelion, 13th, plum, cherry, peach, 14th, pear, 17th, apple. *North Carolina*—Weldon, 31st, month remarkably favorable for crops; cotton never looked better. Fayetteville, in bloom, 17th, magnolia; 22d, raspberries ripe; 31st, early wheat ready to cut; 5th, strawberry and green pea ripe. *Ohio*—Ruggles, in bloom, 9th, cherry, peach, 12th, apple. Margaretta, in bloom, 5th, cherry, 7th, peach, 9th, pear, apple, wild plum, 12th, lilac. Jacksonburg, 6th, quince in bloom. Cleveland, in bloom, 16th, horse-chestnut, lily. Ringgold, 11th, corn doing very poorly; oats, potatoes, tobacco very backward; grass, fruit, and wheat crops short. North Lewisburg, fair yield of fruit in prospect. Bellefontaine, 11th, apples in bloom, nineteen days later than last year; 14th, corn planting. *Pennsylvania*—Hulmesville, crops very promising. Litchfield, in bloom, 14th, cherry, peach, plum, 23d, apple. *Tennessee*—Chattanooga, in bloom, 5th, strawberry, 8th, Wisteria. *Texas*—Mesquite, early wheat cut on the 6th, but nearly all eaten by birds; wheat birds left on the 15th; they were more numerous, staid longer, and did more damage than ever before; 29th, chinch bug in wheat. Corsicana, 31st, cotton blooming. Indianola, crops backward. *Vermont*—West Charlotte, leafing, 3d, gooseberry, flowering ash, 14th, forest trees; in bloom, 13th, tulip, 14th, cherry, 17th, plum, pear, peach. Woodstock, in bloom, 18th, plum. Lunenburg, in bloom, 15th, plum, 23d, apple. Strafford, in bloom, 15th, cherry, plum, 21st, apple. *Virginia*—Johnsontown in bloom, 4th, dogwood, 12th, rice. Dover Mines, 12th, wheat heading. Walnut Grove, ripening, 22d, wild strawberry; 24th, locust in bloom. Wytheville, 31st, oats, grass, wheat, below the average. *Wisconsin*—Embarras, in bloom, 7th, dandelion, wild plum, 10th, fleur de lis, 13th, apple, 15th, strawberry. Madison, in bloom, 3d, cherry, 5th, strawberry.

BIRDS.—*Bluebirds*—Pilot Point, Tex., 16th. *Bluejays*—Creswell, Kans., 1st. *Bobolinks*—Southington, Conn., 15th; Elmira, Ill., 4th; Monticello, Iowa, 21st; West Waterville, Me., 12th; Rowe, Mass., 10th; Waltham, Mass., 10th; Contoocookville, N. H., 8th; Nile, N. Y., 11th; Vernon Center, N. Y., 9th; Palermo, N. Y., 9th; North Valley, N. Y., 12th; Waterburg, N. Y., 5th; Norwalk, Ohio, 7th; West Charlotte, Vt., 12th; Woodstock, Vt., 10th; New London, Conn., 10th; New Bedford, Mass., 8th. *Bobwhites*—New London, Conn., 16th. *Brants*—Plattsmouth, Neb., 7th. *Catbirds*—Southington, Conn., 7th; Elmira, Ill., 7th; Emory Grove, Md., 9th; Waltham, Mass., 2d; Palermo, N. Y., 26th; New London, Conn., 8th; New Bedford, Mass., 2d. *Cuckoos*—Elmira, Ill., 29th; Northport, Mich., 29th; Vernon Center, N. Y., 14th; Embarrass, Wis., 22d. *Ducks*—Monticello, Iowa, 5th. *Wild Geese*—Plattsmouth, Neb., 7th, a month later than usual; Winnemucca, Nev., 12th; Bismarck, Dak., 26th; New London, Conn., 4th. *Hummingbirds*—Monticello, Iowa, 28th; Emory Grove, Md., 7th; Fallston, Md., 7th; Litchfield, Mass., 10th; Vernon Centre, N. Y., 10th; Palermo, N. Y., 16th; Norwalk, Ohio, 24th; West Charlotte, Vt., 13th; Woodstock, Vt., 13th; Dover Mines, Va., 14th; Embarrass, Wis., 19th; New London, Conn., 2d. *Kingbirds*—Southington, Conn., 6th; Monticello, Iowa, 11th; Rowe, Mass., 4th; Northport, Mich., 13th; Plattsmouth, Neb., 6th; Palermo, N. Y., 9th; Waterburg, N. Y., 12th; West Charlotte, Vt., 15th; Embarrass, Wis., 13th; New London, Conn., 8th. *Ladybirds*—Oregon, Mo., 5th. *Martins*—Creswell, Kans., 8th; Emory Grove, Md., 9th. *Mockingbirds*—Embarrass, Wis., 1st; Creswell, Kans., 6th. *Nighthawks*—Southington, Conn., 15th; Monticello, Iowa, 18th; Creswell, Kans., 22d; Emory Grove, Md., 27th; Waterburg, N. Y., 28th; Fayetteville, N. C., 15th; Woodstock, Vt, 15th; Dover Mines, Va., 7th. *Orioles*—Rowe, Mass., 12th; Waltham, Mass., 6th; Litchfield, Mass., 11th; West Charlotte, Vt., 12th; Southington, Conn., 8th; Vernon Centre, N. Y., 9th; Palermo, N. Y., 10th; New London, Conn., 10th; New Bedford, Mass., 8th. *Orchard Orioles*—North Volney, N. Y., 11th. *Phœbes*—Northport, Mich., 19th. *Pigeons*—Pembina, Dak., 13th. *Quails*—Emory Grove, Md., 3d. *Redbirds*—North Volney, N. Y., 10th. *Ricebirds*—Corsicana, Tex., 9th. *Robins*—Springfield, Mass., 10th. *Golden Robins*—Monticello, Iowa, 5th. *Swallows*—Fort Adams, R. I., 27th; Southington, Conn., 1st; Monticello, Iowa, 4th; Emory Grove, Md., 1st; Nile, N. Y. 11th; Coalville, Utah, 13th; Pembina, Dak., 3d. *Barnswallows*—Northport, Mich., 16th; Argyle, N. Y., 5th; Woodstock, Vt., 4th. *Cherryswallows*—Monticello, Iowa, 10th. *Chimneyswallows*—Northport, Mich., 9th; Woodstock, Vt., 9th. *Thrushes*—Waltham, Mass., 15th. *Wheatbirds*—Mesquite, Tex., 2d. *Whippoorwill*—Monticello, Iowa, 26th; Cresco, Iowa, 1st; Waltham, Mass., 5th; Northport, Mich., 17th; Nirvana, Mich., 4th; Clear Creek, Neb., 16th; Contoocookville, N. H., 4th; Palermo, N. Y., 12th; North Volney, N. Y., 12th; Litchfield, Pa., 12th; Yankton, Dak., 9th. *Woodpeckers*—Emory Grove, Md., 1st. *Red-headed Woodpeckers*—Northport, Mich., 11th. *Wrens*—Oregon, Mo., 1st; Palermo, N. Y., 9th; Norwalk, Ohio, 2d. *Yellowbirds*—Northport, Mich., 20th; Oregon, Mo., 11th; Palermo, N. Y., 12th.

FISH.—New London, Conn., 2d, *shad* in market; Flushing, N. Y., 14th, first *bass* caught.

MISCELLANEOUS.—*Grasshoppers*—Salt Lake City, Utah, 23d, numerous; Pilot Point, Tex., native grasshoppers very thick on prairie; Breckenridge, Minn., 28th; Wellington, Kans., 17th; Emory Grove, Md., 1st, 4th, 22d, to 31st; Contoocookville, N. H., 24th; Bellefontaine, Ohio, 11th. *Seventeen-year locusts*—Leavenworth, Kans., Independence, Kans., 24th; Oregon, Mo., 12th; Plattsmouth, Neb., 27th, in large numbers. *Butterfly*—New London, Conn., 6th. *Nettleworm butterfly*—New London, Conn., 8th. *Colorado beetle*—New London, Conn., 14th. *Fireflies*—Saint Meinrad's, Ind., 12th; Monticello, Iowa, 29th; Independence, Kans., 4th; Fallston, Md., 25th; Oregon, Mo., 22d; Clear Creek, Neb., 25th; Linden, N. J., 30th; Waterbury, N. Y., 31st; Argyle, N. Y., 25th; Bethel, Ohio, 18th; Jacksonburg, Ohio, 20th; Austin, Tenn., 5th; Woodstock, Vt., 29th; Dover Mines, Va., 18th. *Humblebees*—Monticello, Iowa, 2d; Emory Grove, Md., 1st; Northport, Mich., 9th; Vernon Centre, N. Y., 10th; Palermo, N. Y., 10th; Woodstock, Vt., 11th. *Dragon fly*—Monticello, Iowa, 3d. *Snakes*—Monticello, Iowa, 5th; Emory Grove, Md., 3d; Northport, Mich., 15th. *Beetle*—Monticello, Iowa, 9th. *Tree toad*—Monticello, Iowa, 30th; Oregon, Mo, 20th; Palermo, N. Y., 12th. *Potato bug*—Emory Grove, Md., 7th, 9th, 20th to 31st; Litchfield, Mich., 11th, abundant; Mendon, Mass., 31st; Fall River, Mass., 17th; Springfield, Mass., 17th, numerous; Contoocookville, N. H., 30th; Freehold, N. J., 23d, more abundant than last year; Vineland, N. J., 31st; Palermo, N. Y., 20th., Waterbury, N. Y., 22d; Strafford, Vt., 21st. *Ground squirrels*—Emory Grove, Md., 9th. *Honey bee*—Emory Grove, Md., 25th, 29th, 30th, swarming; Jacksonburg, Ohio, 25th, swarming. *House fly*—Emory Grove, Md., 7th; Clear Creek, Neb., 26th; Woodstock, Vt., 31st. *Spotted adder*—Northport, Mich., 15th. *May bugs*—Oregon, Mo., 8th, 9th, 10th; Vernon Centre, N. Y., 10th. *Crickets*—Oregon, Mo., 23d; Contoocookville, N. H., 24th; West Charlotte, Vt., 25th. *Frogs*—Clear Creek, Neb., 17th; West Charlotte, Vt., 14th; Contoocookville, N. H., 4th. *Musquitoes*—Flushing, N. Y., 13th. *Wasps*—Norwalk, Ohio, 8th. *Tadpoles*—Oregon, Mo., 1st, hatching. *Bats*—Monticello, Iowa, 4th; Emory Grove, Md., 4th.

Meteors—New Orleans, La., 4th, 7.55 p. m., observed in eastern sky, brilliant green color, fell from an altitude of 30° deflecting to the north, path marked by train of reddish-yellow light. Saint Marks, Fla., 4th, 8.30 p. m., large and brilliant meteor, in SW., "at an altitude of 5°; it was preceded by a hissing noise and detonated the moment it was seen, presenting the appearance of a roman candle, being visible about 3 seconds." Cairo, Ill., 26th., 8.45 p. m., started from SW. of great bear, altitude of 50°, moved from N. to S., resembled a brilliant ball 5 inches in diameter, with train of light 18 inches long. Indianapolis, Ind., 7th, 24th, 25th. Springfield, Ill., 23d, 24th, 26th, 27th. Holton, Kans., 17th. Topeka, Kans., 16th. Woodstock, Md., 10th, 11th, 13th, 14th, 20th, 21st, 23d. Emory Grove, Md., 12th. Rowe, Mass., 13th. Near Fayette, Miss., 14th, 21st, 24th, 25th. Hector, N. Y., 7th. Fayetteville, N. C., 24th. Bethel, Ohio, 5th. Jacksonburg, Ohio, 20th, 21st, 23d. Princeton, N. J., 29th. Prof. G. Hinrichs reports a "brilliant meteor in the northwest at 5 p. m. of the 10th; detonations of extreme violence marked the end of its path over Dickinson and Emmet Counties, which were heard over a hundred miles in every direction. Two large *meteorites* of the class *syssideres* have thus far been found, weighing 460 and 150 pounds, respectively.

Polar Bands—New Corydon, Ind., 6th, 16th, 20th, 24th, 25th, 26th, 31st. Guttenburg, Iowa, 17th. Gardiner, Me., 4th, 7th, 30th, 31st. Clear Creek, Neb., 26th. Freehold, N. J., 26th. Bellefontaine, Ohio, 17th. Woodstock, Va., 17th. Wytheville, Va., 1st, 6th, 21st, 22d.

Prairie and forest fires.—Bismarck, Dak., 14th. Burlington, Vt., 26th. Morgantown, W. Va., 5th and 6th, on mountains. Yankton, Dak., 5th, E. and W. of station, 14th. Georgetown, Colo., 20th, extensive. Creswell, Kans., 1st to 5th, 18th to 20th. Independence, Kans., 1st to 31st. Emory Grove, Md., 12th to 28th, great damage to property, several lives lost. Oregon, Mo., 7th, 8th. Freehold, N. J., 10th. Atco, N. J., 9th. Starkey, N. Y., 12th. Litchfield, Pa., 8th to 16th, in every direction doing much damage to timber-land. Catawissa, Pa., 9th to 16th. Wellsboro', Pa., 5th to 14th, extensive. Wytheville, Va., 1st., 10th, 11th, 12th. Embarrass, Wis., 30th, destroying 300 acres of timber.

Mirage—Olivet, Dak., 6th, 11th, 18th, 20th, 26th. Breckenridge, Minn., 1st. New London, Conn., 8th, 9th. New Haven, Conn., 15th.

Zodiacal light—Southington, Conn., 8th, 10th, 11th. Monticello, Iowa, 15th, 16th, 20th. Cambridge, Mass., regular, looked for at 8 p. m.; seen on 8th only; clouds and moonlight hindered observations earlier in month than afterwards. Waterburg, N. Y., 8th. Bellefontaine, Ohio, 22d. Wytheville, Va., 8th, 9th.

Earthquakes—Princeton, Cal., 26th, 8.40 p. m., slight shocks. United States Naval Hospital, Yokohama, Japan, March 16, 1879, 9.32 p. m., shock; 18th, 9.49 a. m., light shock.

Sunsets.—The characteristics of the sky at sunset, as indicative of fair or foul weather, for the succeeding twenty-four hours, has been observed at all Signal Corps stations.

Reports from 131 stations show 4,034 observations to have been made, of which 53 were reported doubtful; of the remainder, 3,354 or 84.2 per cent. were followed by the expected weather.

Sun spots.—The following record of observations, made by D. P. Todd, Assistant, has been forwarded by Prof. S. Newcomb, U. S. N., Superintendent Nautical Almanac, Washington, D. C.:

Date—May, 1879.	No. of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	
6—5 p. m.	1	1	0	0	1	1	1	1	Faculæ.
7—3 p. m.	0	2	0	0	0	2	1	3	Faculæ.
5 p. m.	0	0	0	0	0	0	1	3	Faculæ.
8—3 p. m.	0	1	0	0	0	1	1	4	Faculæ.
9—2 p. m.	0	0	0	0	0	0	1	4	Faculæ.
15—4 p. m.	0	0	0	0	0	0	1	4	Veiled spots of faculæ.
16—5 p. m.	0	0	0	0	0	0	1	4	Veiled spots in large groups of faculæ.
20—2 p. m.	0	0	.....	.....	0	0	0	0	

On the 1st, at 4 p. m., 3d, at 3 and 5 p. m., 5th, at 2 p. m., 21st, at 2 p. m., 22d, at 2 p. m., 23d, at 2 p. m., 24th, at 2 and 4 p. m., 25th, at 5 p. m., 27th, at 4 p. m., 28th, at 2 p. m., 29th, at 2 and 4 p. m., 30th, at 2 p. m., and 31st, at 2 p. m., observations were made, but no spots seen. Mr. W. Dawson, of Spiceland, Ind., reports having observed the sun every day, with the following results: No spots on the 1st, 4th, 5th, 6th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22d, 23d, 24th, 25th, 27th, 28th, 30th, 31st. On the 2d, two groups of one and four spots; 7th, one group, four spots; 8th, one group, twelve spots, and prominent faculæ near east point; 9th, one group, eleven spots, one spot near the faculæ of yesterday; 10th, one group, nine spots; 11th, one group, nine spots; 12th, one group, four spots; and on the 13th, the group had dwindled to one little spot. Mr. David Trowbridge, Waterburg, N. Y., examined the sun on 3d, 5th, 6th, saw no spots; 8th, saw group of two, one large, one small, near eastern margin of disc, brought on by solar rotation; 10th, one spot, faint; 11th, 12th, one spot, faint; 14th, 15th, 17th to 26th, 28th to 31st, none. Mr. H. D. Gowey, North Lewisburg, Ohio, observed no spots during month. Prof. G. Hinrichs, Iowa City, Iowa, reports sun's disc "examined on twelve days without seeing a spot."

NOTES AND EXTRACTS.

Mr. Joao Capello writes to Nature as follows: "In Nature of March 6, p. 420, in regard to an appreciation of the meteorological observations of the Hydrographic Office at Pola, appears the following: 'The amount of this third maximum is very small, and the evidence yet adduced is not sufficient to determine whether it is a real increase of atmospheric pressure or merely an apparent increase due to undetected instrumental errors.' We remarked this secondary maximum of the barometer in an investigation of the diurnal variations of pressure at Lisbon, before knowing that Mr. Rikatscheff had written a memoir on this subject, and we can affirm that the said maximum is not due to instrumental errors; the examination which we made was of a series of twelve years of horary observations, taken from a barograph, (photographic system), and we proved as follows: 1st. Not one of the 12 curves of atmospheric pressure, corresponding to the twelve months of December or the twelve months of January, has failed to show the said secondary maximum between the 13th and 15th hours. 2d. The values of the average errors in those hours (13th, 14th, 15th) are smaller than the probable errors of other hours of the day. 3d. In grouping the hourly pressures of clear and calm days of January and of December, during the whole series of twelve years, the maximum in question stands forth more regularly, and is much more developed than in the curves of the mean pressures of the same months. It seems to me that the existence of this secondary maximum, very difficult to explain, and which renders more obscure the explanation of the double diurnal oscillation of the barometer, is demonstrated.'"

[From Comptes Rendus.]

The following extract is taken from a letter of Mr. F. A. Forel: "A cyclonic hurricane passed over Switzerland during the evening of February 20, 1879; I find in the study of the phenomena an indirect proof of a gyratory movement of the atmosphere

which seems to me very convincing. After a very marked calm, which had during the day (February 20) succeeded the southwest wind blowing in our valley since February 16, suddenly a gale of exceptional violence sprang up. Over a track 12 to 20 kilometers (7.4 to 12.4 miles) wide, the hurricane overturned or carried away tiles and window-panes, chimneys, and roofs of houses, isolated trees or entire groves, and shipwrecked upon Lake Leman some fishing boats; the zone of devastation passed quite exactly through Geneva, Lausanne, Fribourg, and Berne. Upon two sides of this zone a comparative calm prevailed; squalls from the southwest on the north side of the storm, and *foeh* (southeast wind) in the valley of the Rhone from Martigny to Vevey to the south of the path of the cyclone. The sudden commencement of gale allowed a quite exact measurement of the velocity of its translation. Here are the approximate figures which I have been able to gather:

Station.	Time of commencement.		Distance from Geneva.		Duration of translation in minutes.	Velocity of translation.	
	Hours.	Minutes.	Kilometers.	Miles.		Meters per second.	Miles per hour.
Geneva	5	45	.....	.....	.....	.....	.....
Morges	6	35	43	26.7	50	14	31.3
Lausanne	6	45	51	31.7	60	14	31.3
Fribourg	8	10	102	63.4	145	12	26.8
Berne	8	50	129	80.2	185	12	26.8

"We have on the other hand a very exact report of the average velocity of the wind at a given point within the area of the phenomena. The anemometer of the Berne Observatory, of which Prof. A Forster has very obligingly sent me notes, indicated as the wind's velocity—

Interval from—	Kilometers per hour.	Meters per second.	Miles per hour.
5 to 6 p. m.	0	0	0
6 to 7 p. m.	2.8	0.8	0
7 to 8 p. m.	5.2	1.4	1.7
8 to 9 p. m.	72.0	20.0	44.7
9 to 10 p. m.	79.2	22.0	49.2
10 to 11 p. m.	83.5	23.2	51.9
11 to 12 p. m.	80.7	22.4	50.1

"Thus during the storm the average velocity of the wind at the Berne Observatory was from 20 to 23 meters per second (44.7 to 51.5 miles per hour), while the velocity of translation of the gale itself was only from 12 to 14 meters per second, (26.8 to 31.3 miles per hour). I see in the comparison of these figures evident proof of a relative movement in the phenomena itself of a partial displacement of air in the middle of the great current of air which moved toward the northeast, and this intense movement could be only a turning movement. The storm of February 20 was then a cyclone, and the devastated zone was the *dangerous side*."

[Note of Mr. E. Nouel, from Comptes Rendus.]

"In a note on the theory of hoar frost and *verglas* (frozen rain), printed in Vol. XI, (1863), of the *Annuaire de la Société Météorologique de France*, page 26, I showed that the great verglas are not due, as is believed, to a rain *above zero* [centigrade], partly freezing by contact with objects whose temperature is below zero, but that they arise from a rain several degrees *below zero* [C.], in liquid state, falling through air *below zero* [C.], and congeal upon the surface of objects, in a continuous manner, through the effect of the surrounding temperature.

"This theory has been twice strikingly confirmed this winter at Vendome. 1st. During the night of January 7 and 8, a storm accompanied by a rain of 23.5 millimeters (0.92 inches) of frozen water, and by a temperature varying between 0° and —1° centigrade (32° and 30°.2 Fahrenheit), caused a *verglas* of about 15 millimeters (0.59 inches) in thickness, which greatly damaged the trees. 2d. The 22d and 23d of January following, a rain which lasted 30 hours scattered over a period of 40 hours, produced a coating of transparent ice, which I estimated at 25 millimeters (0.99 inch), and the temperature of the air was on an average at —2° centigrade (28°.4 Fahrenheit) during all this time.

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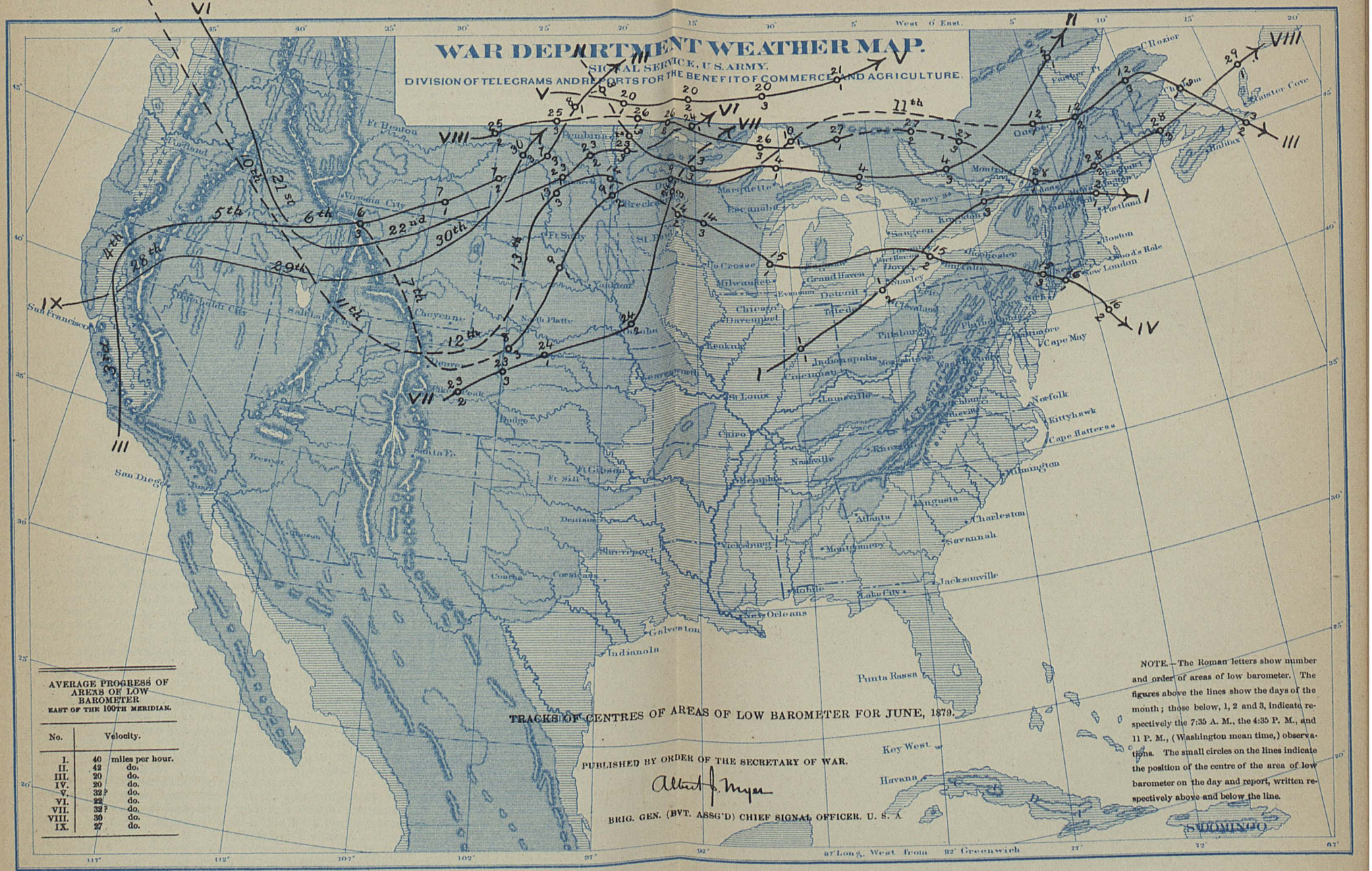
WAR DEPARTMENT WEATHER MAP.
SIGNAL SERVICE, U.S. ARMY.
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.
TRACKS OF CENTRES OF AREAS OF LOW BAROMETER FOR JUNE, 1879.
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
BRIG. GEN. (BVT. ASSG'D) CHIEF SIGNAL OFFICER. U. S. A.
NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7:35 A. M., the 4:35 P. M., and 11 P. M., (Washington mean time,) observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.
AVERAGE PROGRESS OF AREAS OF LOW BAROMETER EAST OF THE 100TH MERIDIAN.
No. Velocity.
I. 40 miles per hour.
II. 42 do.
III. 20 do.
IV. 20 do.
V. 32? do.
VI. 22 do.
VII. 32? do.
VIII. 30 do.
IX. 27 do.
San Francisco
San Diego
Portland
Virginia City
Salt Lake
Cheyenne
Denver
Pike's Peak
Santa Fe
Ft Sill
Ft Gibson
Ft Benton
Pembina
Ft Sully
St Paul
La Crosse
Milwaukee
Chicago
Davenport
Keokuk
St Louis
Cairo
Memphis
Vicksburg
New Orleans
Galveston
Indianola
Punta Rassa
Key West
Havana
Mobile
Montgomery
Atlanta
Augusta
Charleston
Savannah
Jacksonville
Lake City
Wilmington
Cape Hatteras
Kittyhawk
Norfolk
Cape May
Baltimore
Philadelphia
Pittsburgh
Cleveland
Detroit
Grand Haven
Marquette
Escanaba
Toledo
Indianapolis
Louisville
Nashville
Knoxville
Rochester
Oswego
Buffalo
Portland
Boston
Woods Hole
New London
Halifax
Quebec
Montreal
Father Point
C Rozier
Alpena
Duluth
Bismarck
Yankton
North Platte
Shreveport
Corsicana
Cuero
Brecken
Ft Smith
Pembina
Sandusky
Erie
Dunkirk
Oswego
Saugeen
Port Huron
Alpena
Duluth
Minister Cove
SUOMINDO
West 6° East
87° Long. West from 82° Greenwich

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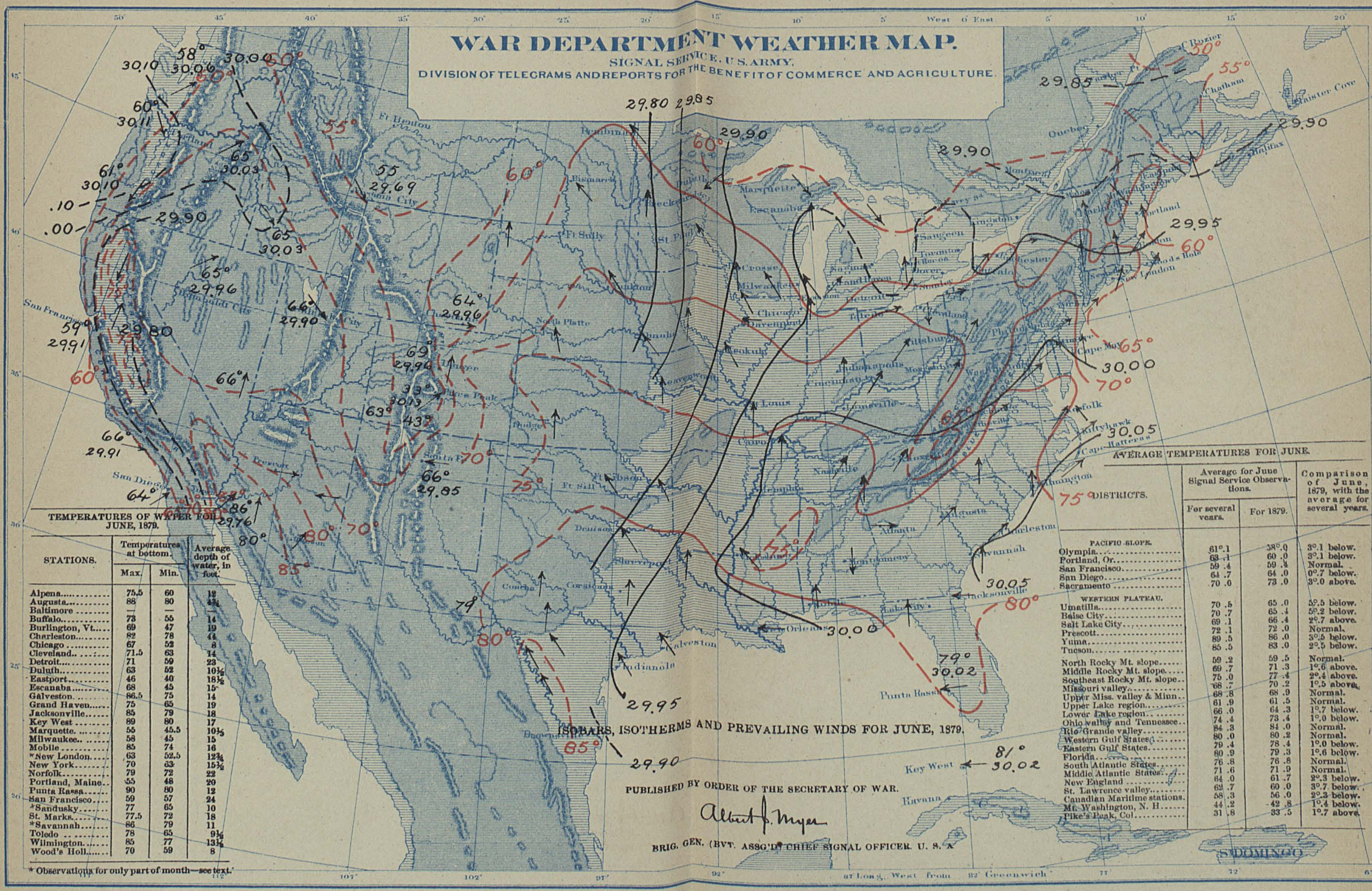
WAR DEPARTMENT WEATHER MAP.

SIGNAL SERVICE, U. S. ARMY.
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.



ISOBARS, ISOTHERMS AND PREVAILING WINDS FOR JUNE, 1879.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

Albert J. Myer

BRIG. GEN. (BVT. ASSG'D) CHIEF SIGNAL OFFICER, U. S. A.

TEMPERATURES OF WATER FOR JUNE, 1879.

STATIONS.	Temperatures at bottom. Max.	Temperatures at bottom. Min.	Average depth of water, in feet.
Alpena	75.5	60	12
Augusta	88	80	4¾
Baltimore	—	—	—
Buffalo	73	55	14
Burlington, Vt.	69	47	19
Charleston	82	78	44
Chicago	67	52	8
Cleveland	71.5	63	14
Detroit	71	59	23
Duluth	63	52	10½
Eastport	46	40	18½
Escanaba	68	45	15
Galveston	86.5	75	14
Grand Haven	75	65	19
Jacksonville	85	79	18
Key West	89	80	17
Marquette	55	45.5	10⅓
Milwaukee	58	45	15
Mobile	85	74	16
*New London	63	52.5	12¾
New York	70	63	15½
Norfolk	79	72	22
Portland, Maine	55	48	20
Punta Rassa	90	80	12
San Francisco	59	57	24
*Sandusky	77	65	10
St. Marks	77.5	72	18
*Savannah	86	79	11
Toledo	78	65	9½
Wilmington	85	77	13⅓
Wood's Holl	70	59	8

* Observations for only part of month—see text.

AVERAGE TEMPERATURES FOR JUNE.

DISTRICTS.	Average for June Signal Service Observations. For several years.	Average for June Signal Service Observations. For 1879.	Comparison of June, 1879, with the average for several years.
PACIFIC SLOPE.			
Olympia	61°.1	58°.0	3°.1 below.
Portland, Or.	63 .1	60 .0	3°.1 below.
San Francisco	59 .4	59 .4	Normal.
San Diego	64 .7	64 .0	0°.7 below.
Sacramento	70 .0	73 .0	3°.0 above.
WESTERN PLATEAU.			
Umatilla	70 .5	65 .0	5°.5 below.
Boise City	70 .7	65 .4	5°.2 below.
Salt Lake City	69 .1	66 .4	2°.7 above.
Prescott	72 .1	72 .0	Normal.
Yuma	89 .5	86 .0	3°.5 below.
Tucson	85 .5	83 .0	2°.5 below.
North Rocky Mt. slope	59 .2	59 .5	Normal.
Middle Rocky Mt. slope	69 .7	71 .3	1°.6 above.
Southeast Rocky Mt. slope	75 .0	77 .4	2°.4 above.
Missouri valley	68 .7	70 .2	1°.5 above.
Upper Miss. valley & Minn.	68 .8	68 .9	Normal.
Upper Lake region	61 .9	61 .5	Normal.
Lower Lake region	66 .0	64 .3	1°.7 below.
Ohio valley and Tennessee	74 .4	73 .4	1°.0 below.
Rio Grande valley	84 .3	84 .0	Normal.
Western Gulf States	80 .0	80 .2	Normal.
Eastern Gulf States	79 .4	78 .4	1°.0 below.
Florida	80 .9	79 .3	1°.6 below.
South Atlantic States	76 .8	76 .8	Normal.
Middle Atlantic States	71 .6	71 .9	Normal.
New England	64 .0	61 .7	2°.3 below.
St. Lawrence valley	62 .7	60 .0	3°.7 below.
Canadian Maritime stations	58 .3	56 .0	2°.3 below.
Mt. Washington, N. H.	44 .2	42 .8	1°.4 below.
Pike's Peak, Col.	31 .8	33 .5	1°.7 above.

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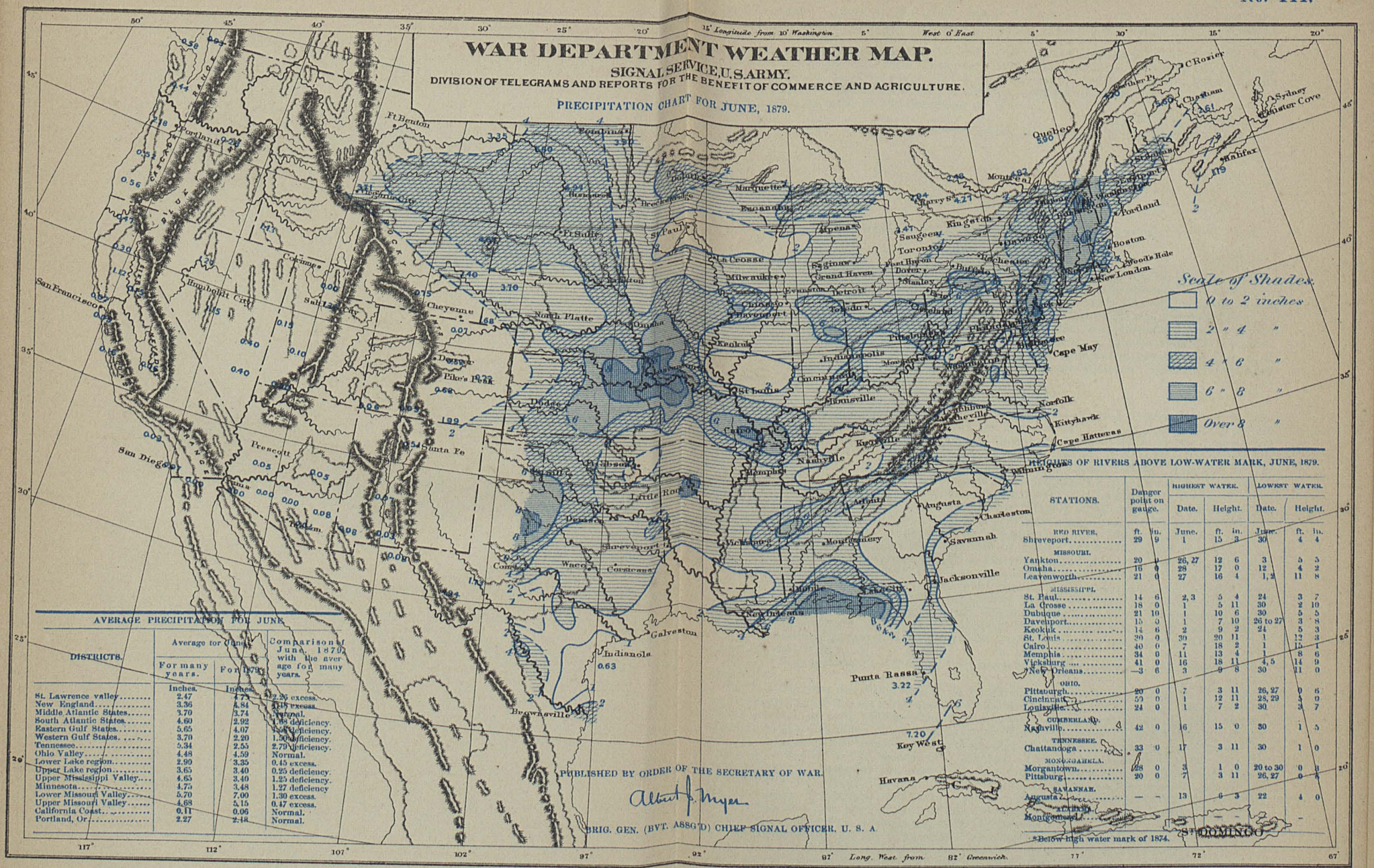
WAR DEPARTMENT WEATHER MAP.

SIGNAL SERVICE, U. S. ARMY.

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

PRECIPITATION CHART FOR JUNE, 1879.



AVERAGE PRECIPITATION FOR JUNE.

DISTRICTS.	Average for June: For many years.	Average for June: For 1879.	Comparison of June, 1879, with the average for many years.
	Inches.	Inches.	
St. Lawrence valley	2.47	4.73	2.26 excess.
New England	3.36	5.81	2.45 excess.
Middle Atlantic States	3.70	3.74	Normal.
South Atlantic States	4.60	2.92	1.68 deficiency.
Eastern Gulf States	5.65	4.07	1.58 deficiency.
Western Gulf States	3.70	2.20	1.50 deficiency.
Tennessee	5.34	2.55	2.79 deficiency.
Ohio Valley	4.48	4.59	Normal.
Lower Lake region	2.90	3.35	0.45 excess.
Upper Lake region	3.65	3.40	0.25 deficiency.
Upper Mississippi Valley	4.65	3.40	1.25 deficiency.
Minnesota	4.75	3.48	1.27 deficiency
Lower Missouri Valley	5.70	7.00	1.30 excess.
Upper Missouri Valley	4.68	5.15	0.47 excess.
California Coast	0.11	0.06	Normal.
Portland, Or.	2.27	2.18	Normal.

HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, JUNE, 1879.

STATIONS.	Danger point on gauge.		Highest water. Date.	Highest water. Height.		Lowest water. Date.	Lowest water. Height.	
	ft.	in.	June.	ft.	in.	June.	ft.	in.
RED RIVER.								
Shreveport	29	9	1	15	3	30	4	4
MISSOURI.								
Yankton	20	0	26, 27	12	6	3	5	5
Omaha	16	0	28	17	0	12	4	2
Leavenworth	21	0	27	16	4	1, 2	11	8
MISSISSIPPI.								
St. Paul	14	6	2, 3	5	4	24	3	7
La Crosse	18	0	1	5	11	30	2	10
Dubuque	21	10	1	10	6	30	5	5
Davenport	15	0	1	7	10	26 to 27	3	8
Keokuk	14	6	2	9	2	24	5	3
St. Louis	30	0	30	20	11	1	12	3
Cairo	40	0	7	18	2	1	15	1
Memphis	34	0	11	13	4	1	8	6
Vicksburg	41	0	16	18	11	4, 5	14	9
New Orleans	—3	6	3	9	8	30	11	0
OHIO.								
Pittsburgh	20	0	7	3	11	26, 27	0	6
Cincinnati	50	0	1	12	11	28, 29	3	0
Louisville	24	0	1	7	2	30	3	7
CUMBERLAND.								
Nashville	42	0	6	15	0	30	1	5
TENNESSEE.								
Chattanooga	33	0	17	3	11	30	1	0
MONONGAHELA.								
Morgantown	28	0	3	1	0	20 to 30	0	8
Pittsburg	20	0	7	3	11	26, 27	0	4
SAVANNAH.								
Augusta	—	—	13	6	3	22	4	0
ALABAMA.								
Montgomery				—	—		—	

* Below high water mark of 1874.

"Several observers have addressed to the academy (sessions of day January 27 and February 3), notes on the great *verglas* of January 22 and 23. Messrs. Nasse and Godefroy have joined thereto (*Comptes Rendus*, p. 192 and 244) a theory as to its formation. This theory is only a reproduction of that which I had conceived on occasion of a like phenomenon December 25, 1860, and which I published in the *Annuaire de la Société Météorologique* in 1863. It appears that it has remained unknown to physicists, whose attention has been awakened only this year by the exaggeration itself of the phenomenon, which has assumed proportions, unheard of until now."

Published by order of the Secretary of War.

ALBERT J. MYER,
Brigadier-General (Brevet Assigned), Chief Signal-Officer, U. S. A.

PAPER 41.

MONTHLY WEATHER REVIEW, JUNE, 1879.

INTRODUCTION.

In preparing this review the following data, received up to July 14, have been used, viz: The regular tri-daily weather charts, containing the data of simultaneous observations taken at 122 Signal-Service stations and 12 Canadian stations, as telegraphed to this office; monthly journals and means, 127 and 145, respectively, from the former; reports from 37 sunset stations; 204 monthly registers from voluntary observers; 37 monthly registers from United States Army post-surgeons; marine records; international simultaneous observations; monthly reports from voluntary observers in, and the local weather services of, the States of Iowa and Missouri; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

Upon Chart No. II is shown by the isobaric lines the general distribution of atmospheric pressure, as reduced to sea-level, for the month. The general pressure on the Atlantic and Gulf coasts has been normal or slightly below, while in the interior for the Lakes, Mississippi Valley, Tennessee and Ohio Valley, it has been considerably above the normal, reaching nearly 0.05 above on the Upper Lakes. As might be expected, from the frequency of storm paths traversing it, the Northwest was somewhat below the normal. The Pacific coast averaged nearly 0.04 below.

The local barometric ranges have been comparatively small, and have varied as follows: Pacific coast, 0.15 at San Diego to 0.40 at Roseburg, Oreg., and 0.56 at Red Bluff; Western Plateau, 0.57 at Winnemucca to 0.78 at Salt Lake; Rocky Mountains, 0.45 at Santa Fé to 0.67 at Virginia City; Summit of Pike's Peak, 0.31; Gulf States, 0.24 at Key West to 0.47 at Montgomery, 0.42 at Galveston and 0.58 at Corsicana; Atlantic States, 0.42 at Jacksonville, 0.41 at Cape Lookout, 0.75 at Cape May, 0.77 at Newport, and 0.68 at Eastport, and in the interior, 0.55 at Augusta, 0.71 at Lynchburg, 0.88 at Albany; summit of Mount Washington, 0.85; Ohio Valley and Tennessee, 0.86 at Columbus to 0.52 at Memphis; Lake region, 0.69 at Oswego to 1.07 at Milwaukee and 0.95 at Duluth; Northwest and Eastern slope of Rocky Mountains, 0.71 at Saint Paul to 1.15 at Breckenridge and 0.73 at Deadwood; 1.06 at North Platte, 0.96 at Dodge City, and 0.89 at Fort Sill.

Areas of high barometer.—Of these, four have been sufficiently marked to merit a description.

No. I.—The area described as No. IX in the May review was central in Minnesota on the morning of the 1st; barometers at Bismarck 30.47, Breckenridge 30.39, or 0.50 above normal at each station—the highest barometer reported during the month. Moving nearly due south it was central over Western Kansas on the morning of the 2d. Its course thence was SSW., being central in Western Texas at midnight. By morning of the 3d it had passed into Mexico. This area was accompanied by the minima temperatures for the month for the entire Rocky Mountain slope, Missouri and Rio Grande Valleys, Western and Eastern Gulf, Tennessee, the western portion of Upper Lakes, Mississippi and Ohio Valleys. A minimum temperature of 31° was reported at Pembina the morning of the 1st and at Cheyenne of 32° the 2d. The maximum temperatures on these dates, of 96° at Boston on the 1st, 103°.5 at Los Angeles, 100° at Sacramento on the 2d, and 109° at Visalia on the 3d, in connection with low areas Nos. I and II, are especially noticeable. Frosts, not severe, were reported in Iowa on the 1st and 2d, and ice an eighth of an inch thick in central Wisconsin on the 2d, but no damage resulted to crops. The following high winds accompanied this area: On the 1st, Escanaba, 28 miles; Chicago, 26; Milwaukee, 25; Cleveland, 25; Galveston, 28; 1st and 3d, Indianola, 36 miles. Cautionary signals were hoisted on the morning of the 2d at New Orleans, Mobile, and Saint Mark's, but are not justi-

fied by reports yet received, a maximum wind of 19 miles being reported from New Orleans. This area caused a severe "norther" in the Gulf of Mexico, from which four vessels were shipwrecked at or near Santa Ana, Mexico.

No. II.—This area advancing from the Northwest, central at midnight of the 5th at Pembina, was north of Duluth on the morning of the 6th; Duluth, barometer 0.28 above normal. Moving S. of E. on the morning of the 7th it was central over Northern Michigan; Escanaba, barometer 0.34 and Alpena 0.30 above normal. Thence moving SE. it was over Lake Erie the morning of the 8th; Erie and Cleveland, barometers 0.28 above normal, and by midnight had passed off the Jersey coast. This area was accompanied by the minima temperatures for the month for Eastern Michigan, Lower Lakes, Eastern Ohio Valley, Middle Atlantic and New England States, except Connecticut. The following minima were reported: 6th, Pembina, 32°; 7th, Parry sound Sound, 31°; 8th, Rockliffe, 32°. The 40° isotherm of minima temperatures included on the 6th Northern Minnesota and Northern Michigan; 7th, Michigan, parts of Wisconsin, Northwestern Pennsylvania, Western New York, and northern portion of New England. Light snow-storms were reported from Northern New England and Canada night of the 6th and morning of the 7th, injuring crops. On the 7th damaging frosts were reported from Central Wisconsin and Northern New England. Light frosts (6th-9th) were reported variously from Iowa, Michigan, Ohio, and nothern portions of Pennsylavania, New Jersey, New York, and New Eengland. Cautionary signals were hoisted on the morning of the 6th on the Lower Lakes from Port Huron east to include Oswego, all of which were fully justified, the winds attaining velocities ranging from 25 miles at Buffalo to 32 at Toledo. Winds exceeding 25 miles, for which no signals were hoisted, were reported as follows: Morning of the 6th, Milwaukee, 29 miles; afternoon of the 6th, Escanaba, 28; Alpena, 28. The advance of this area in conjunction with low area pressure No. II induced the very high winds experienced on the Middle Atlantic coast during the 6th, which are given in connection with that area.

No. III.—This area followed sharply the low area pressure No. IV, and showed itself central near Lake Winnepeg, Manitoba, the morning of the 16th; Duluth, barometer 0.18 above the normal; by midnight the barometer was 0.32 above the normal at Duluth, north of which the pressure was then central. Moving slowly SE., it was central over Lake Superior during the 17th, and by the morning of the 18th was between Escanaba and Marquette; the barometers reading, respectively, 0.47 and 0.45 above the normal; the isobar of 0 40 above the normal then included parts of Minnesota and Michigan and all of Wisconsin. Keeping the same general direction, on the morning of the 19th it was central over the southern part of Lake Huron, and on the morning of the 20th in central Maryland, thence it moved south with slowly diminishing pressure, passing off the Carolina coast on the morning of the 21st. The lowest minima temperatures reported were 16th, Marquette, 49°; 17th, Marquette, 37°; Escanaba, 38°; frosts in Wisconsin, Pennsylvania, and Ohio; 18th, Saugeen 39°; frosts in New Jersey and Ohio; 19th, Saugeen 38°; frosts in New York and Maine. The lowest temperatures for the month accompanied this area in Connecticut and in the South Atlantic States. In West Virginia frost was reported 60 miles west of Wytheville on the 19th and 20th. A portion of the cautionary signals (fully justified) which were hoisted for the low area pressure No. IV were lowered the morning of the 16th, somewhat early, as high winds from the high pressure continued at Escanaba afternoon 16th, 26 miles, Grand Haven 28, and 26 at midnight. Brisk winds were also reported at midnight on the Atlantic coast. Maxima: Sandy Hook, 28; Cape May, 26; and Cape Hatteras 25 miles. On the morning of the 17th cautionary signals were hoisted somewhat late on the North Carolina coast and offshore on the Jersey coast. Maxima velocities had been reported at Cape Henry, 27, at Kittyhawk, 33, Cape Lookout, 25, and Cape May, 28 miles. The signals were lowered at noon on the Jersey coast, justified as to direction, with a velocity of 24 miles reported at Sandy Hook. The Carolina signals, having been generally justified, were lowered the afternoon of the 17th. Midnight maxima velocities of 28 miles at Sandy Hook and 25 at Cape Lookout were reported, followed by 28 miles at Cape Lookout and 26 at Cape Henry on the following morning. The winds continuing brisk on the Caorlina coast, cautionary signals were hoisted on the morning of the 19th as far south as Cape Lookout, where a velocity of 30 miles, preceding report, and 28 at that time had been reported. These signals were lowered at midnight of the 20th, having been fully justified; NE. winds from 25 to 62 miles being reported from the various stations.

No. IV.—This area first appeared on the Southern Pacific coast the morning of the 22d; Los Angeles barometer, 0.03 above the normal. Its course was almost due north and by the morning of the 23d the Red Bluff barometer was 0.23 above the normal. The rain in Oregon of the 21st, following low area No. VI, continued during the 22d and 23d, with fresh westerly winds, while fresh to brisk westerly winds, with no precipitation, were reported from California during the 22d. By the morning of the 24th the center had passed into British Columbia.

Areas of low barometer.—Upon Chart No. I are shown the tracks of the centers of nine

areas. The greater number of the storms have passed NE., through Dakota and Minnesota into Manitoba or Canada, and no center has passed south of the Ohio Valley. The maximum temperature in New England and Middle Atlantic States occurred during the advance of low areas No. I on the 1st and 2d, and No. VIII on the 27th to 30th. The advance of area No. VIII was also marked by the highest temperatures for the month in the Upper River valleys and the Lakes. In the Gulf and South Atlantic States the highest temperatures were reported during the progress of area IV.

No. I is a continuation of low area No. XV, described in the May review. Central in Indiana on the morning of the 1st, it moved during the day northeastward, reaching at midnight the Saint Lawrence Valley, whence its course east left its center the morning of the 2d on the Maine coast. At this time there was an elongated trough of low pressure extending from Nova Scotia to Alabama, between high area No. I and a probable high area off the South Atlantic coast, rain and fresh NW. winds in Tennessee and Ohio Valley, fresh to brisk SW. winds with fine weather on the Middle and South Atlantic coasts. This trough, moving east, by the afternoon of the 2d had induced brisk winds on the North Carolina and New Jersey coasts, where cautionary signals were ordered from Sandy Hook to Cape Lookout, somewhat late for Cape May and Kittyhawk, where 28 and 27 miles had been respectively reported. Light rains along the Atlantic coast and the precipitation in advance of depression No. II kept the pressure nearly stationary during the 3d, with continued brisk to high southerly winds along the Carolina and Jersey coasts. On the 4th low area No. II, changing its course to the NE., the wind changed to the NW. and permitted the lowering of the signals on the Jersey coast in the morning and on the Carolina coast in the afternoon. These signals were justified by velocities ranging from 25 to 32 miles.

No. II.—The center of this area, which was in Manitoba the morning of the 3d, following a SE. course reached Duluth by midnight, where the barometer had fallen from 0.09 above the normal to 0.23 below. Light local rains prevailed during the day in Minnesota and Dakota. Its course was then east, passing over Lake Superior during the day; it was central at midnight of the 4th near Rockliffe. Heavy rains prevailed during the day in New England, and light rains in the Upper and Lower Lakes. During the forenoon of the 5th the depression disappeared, passing into the Gulf of Saint Lawrence. No signals were ordered for the primary depression, which generally showed little energy. A subsidiary area developing from the rear of the low trough on the 6th was, however, characterized by the highest winds of the month for the Canadian and New England coasts. The pressure rose rapidly in the Saint Lawrence Valley from morning to midnight of the 5th (0.29 above a normal rise at Toronto), leaving at midnight a small depression over Michigan (from 0.04 to 0.07 only below the normal), with gentle to brisk winds, partly cloudy weather along the lakes, light local rains to the northwest, and heavy local rains in Pennsylvania, with clear fine weather in Ontario. On the morning of the 6th an abnormal barometric fall of 0.22 was reported from Toronto, and an abnormal rise of 0.24 at Escanaba—the advance of high area No. II. The increased depression then covered Lake Ontario, over which the barometer was 0.20 below the normal. Cloudy weather then prevailed from Michigan east, to include New England, with brisk west and south winds in Lower Lake region and Missouri, and light local rains, except heavy rain at Pittsburgh. Cautionary signals were at once ordered for Lakes Ontario and Erie in connection with this depression and high area No. II, which were justified as shown elsewhere. By the afternoon of the 6th the secondary depression following the course of the primary area was central over Maine, the Portland barometer reading 0.33 below the normal. An abnormal barometric fall of from 0.08 at Atlantic City to 0.21 at Portland, together with the rapid advance of high area No. II, had induced strong winds off the Maine (maximum 29 miles), Carolina (maximum 29 miles), and Jersey coasts, with a maximum of 52 miles at Cape May. Cautionary signals were ordered from Smithville along the coast northward, to include Eastport, Me., and continued on the Jersey and Carolina coasts until the afternoon of the 7th, and were lowered at New England stations from midnight of the 6th to afternoon of the 7th, somewhat early for Boston and Portland. The Jersey coast signals were changed to off shore at midnight of the 6th, and Lewes and Eastport likewise changed on the morning of the 7th. These signals were all justified by succeeding N. to W. winds, of velocities ranging from 26 to 40 miles. By the morning of the 7th the storm was central in Saint Lawrence Bay. Velocities of 55 and 50 miles were reported from Father Point at the morning and afternoon reports of the 7th, with a maximum velocity of 66 miles at 7 a. m. Several vessels were badly injured in the Saint Lawrence River on the 7th, and one dismasted near Cape Ann in a squall the night of the 6th.

No. III.—This area first appeared on the 3d on the South Pacific coast, the San Diego barometer at the afternoon report reading 0.10 below the normal, the isobar of 29.90 including all of Southern California. Its course was north, and by midnight of the 4th it was central in the Upper Sacramento Valley. On the 5th, changing its course to the east, it was central at midnight in Southwestern Idaho, the barometer yet being below the normal on the Central and North Pacific coast. Strong NW.

winds and consequent damage to three vessels were reported off San Francisco. Passing through Southern Idaho on the 6th, its center appeared to be in Western Wyoming at midnight of the 6th. At this time the line of 0.20 below the normal included all of Colorado and the depression divided. Its southern edge, in passing through Utah, induced exceedingly high winds, a train being blown from the Utah Western track west of Salt Lake City on the afternoon of the 6th, killing one person and wounding one. The maximum velocity for the month occurred that day at Salt Lake City, 34 miles SE., and at Pioche 40 S. Following an ENE. course, the main depression was central in Western Dakota on the afternoon of the 7th. Bismarck barometer 0.32 below the normal, when brisk to high winds and partly cloudy weather were reported from the Northwest, Upper Missouri, and Mississippi Valleys. Cautionary signals were ordered for Duluth (late), Marquette, Escanaba, and Milwaukee, which were lowered on the 8th at Milwaukee, the rest on the 10th. They were not justified, as the depression in Central Dakota at midnight of the 7th moved northward, and on the morning of the 8th had passed into Manitoba. The secondary depression commenced with this area during the 7th, passing over the main Rocky range, included by midnight all of Colorado and Western Kansas in the isobar of 0.20 below the normal. During the 8th the area remained nearly stationary in Kansas, but by the morning of the 9th was central in Nebraska, at which time there was a low barometric trough extending from Northern Texas to the Canada line. The main center traveling northeast, was by midnight central near Duluth; barometer 0.40 below the normal, while violent wind, hail, and rain-storms prevailed in Kansas, doing great damage. Hailstones at Easton, Kans., reported 11 inches in circumference, and at Wichita weighing 12 ounces. The wind at Leavenworth attained a velocity of 48 miles S., and 2.49 inches rain-fall in four hours and ten minutes, and 4.30 inches at Saint Joseph in twenty-four hours, ending 3 p. m. the 9th, were reported. The town of Delphi, Ottawa County, Kansas, reports thirty-two buildings destroyed, two persons fatally injured and fourteen others hurt. Hailstones fell weighing from 12 to 14 ounces. Glasgow, Asheville, Lawrence, Stanton, Easton, Kickapoo, and Beloit, Kans., were also reported seriously damaged during same day by similar storms. Numerous thunder-storms were reported. During the day heavy rains fell in the Mississippi and Ohio Valleys and on the Upper Lakes. On the morning of the 10th the center was over Lake Superior and passed into Canada. Signals were hoisted at Alpena and for Lake Michigan at midnight of the 9th and lowered the morning of the 10th. They were justified, except Alpena.

No. IV.—This depression appeared on the Oregon coast before the preceding area had entirely disappeared. Its course was SE. through Oregon, Idaho, and Utah during the 10th and 11th, on which days moderate rains fell on Pacific coast as far south as Visalia, and over the Northern and Middle Plateau districts. During the 12th it moved slowly E. through Northern Colorado; easterly winds and heavy rains prevailing in the Missouri Valley. Central at midnight in Western Kansas, thence it followed a direction E. of N. during the 13th, and at midnight was east of Bismarck; barometer 0.29 below the normal. Cautionary signals were then ordered for Lake Superior and part of Lake Michigan. On the morning of the 14th, moving easterly, it was central in Minnesota, and in the afternoon in Western Wisconsin; La Crosse barometer 0.50 below the normal, with the abnormal line of —0.40 including Minnesota, Eastern Iowa, Wisconsin, and part of Michigan, with heavy rains and brisk S. to E. winds. Signals had been ordered for the rest of Lake Michigan in the morning, and followed for the remaining lake stations during the afternoon. These signals were ordered in ample time, and were justified by wind ranging from 26 to 35 miles, except at Port Huron and Detroit, where, however, a NW. wind of 24 miles prevailed. Continuing its course S. of E., it was central over Lake Michigan the morning of the 15th; Milwaukee barometer 0.59 below the normal, the lowest reported during the month. The isobar of 0.50 below the normal at this time covered the greater part of the Upper Lakes. Brisk southerly winds then prevailed along the Middle Atlantic coast, and rainy weather was reported from Lower Lakes, New York, and New England. At noon cautionary signals were ordered on the Atlantic coast from Eastport south to include Smithville. During the day heavy rains, with N. to E. winds, prevailed in New England; brisk southerly winds on the Middle Atlantic coast, while the wind on the Upper Lakes changing to N., with clearing weather, allowed the signals for Superior to be lowered, followed by the other lake signals on the morning of the 16th, when the storm center had reached Connecticut. The center moved SE. off the coast the afternoon of the 16th, with brisk N. and NW. winds prevailing from Maine to South Carolina. Signals were then lowered on the Atlantic coast, all having been justified by velocities from 25 to 36 miles, except Eastport, where NE. 19 miles was reported.

No. V.—This area was at no time central in the United States. Central near Lake Winnepeg the morning of the 20th, it moved easterly and disappeared on the 21st, being probably NE. of Lake Superior that morning. Gentle to fresh southerly winds, with considerable rains, were reported from Northern Texas to Lake Superior. The

lowest barometer was reported from Pembina a. m. of 20th, 0.25 below the normal. No signals were ordered.

No. VI.—This area was first shown by the barometer falling below the normal on the North and Central Pacific coast on the 20th. Moving SE. during the 21st from Northwestern Oregon to Central Idaho; Boise barometer 0.31 below the normal at midnight; it was followed during that and the succeeding day by fresh westerly winds and rain in Oregon. On the 22d, following a nearly NE. course, it passed through Northern Utah and Wyoming, and by morning of the 23d was central in Eastern Dakota, light rains having been reported in Montana and Northwestern Dakota. Thence it moved NE., being central in Northwestern Minnesota at midnight of the 23d, heavy rains and thunder-storms prevailing in its rear in the Northwest and Upper Missouri Valley. At no time was any rain reported in front of its path. By the morning of the 24th it had passed into Manitoba.

No. VII.—This depression probably had a common origin with No. VI. Central on the afternoon of the 23d in Eastern Colorado. It moved slowly to the northeast, and on the afternoon of the 24th was central in Western Iowa; Omaha barometer 0.25 below the normal, and thence northerly by midnight to Eastern Minnesota. Heavy rains were reported from the Mississippi and Missouri Valleys, with brisk southerly winds from the Mississippi Valley and Upper Lakes. By the morning of the 25th the storm center had passed NE. beyond our stations. No signals were ordered, and but one station (Alpena) reported a wind (26 miles) which would have justified a display.

No. VIII.—This area first appeared in Northwestern Dakota on the afternoon of the 25th, and moving nearly easterly was central east of Pembina, barometer 0.16 below the normal, followed by moderate rainfall and fresh westerly winds in the Upper Missouri Valley. During the 26th its course was nearly easterly, and on the morning of the 27th its center was in Canada, north of Lake Huron, rain and fresh to brisk southerly winds having been reported in the preceding twenty-four hours from the Upper and Lower Lakes. During the 27th fresh to brisk S. to W. winds, with light rain-fall, was reported from the Lower Lakes and New England, while the course of the area through Canada is uncertain. On the morning of the 28th it was central in Northern Vermont; Montreal barometer 0.32 below normal, at which time brisk SW. winds prevailed on Middle Atlantic coast, with generally clear weather, except rain on North Carolina coast. During the day heavy rains fell in the Middle Atlantic States, and a violent local storm was reported from Baltimore, where it did much damage. Cautionary signals ordered at noon were lowered during the afternoon on the Carolina and Jersey coast. Though hoisted somewhat late for the Carolina coast, they were justified by winds ranging from 28 to 40 miles. The depression moved NE., becoming deeper, and on the morning of the 29th disappeared into the Gulf of Saint Lawrence, the barometer at Sydney being 0.42 below the normal, while the abnormal line of —0.30, extending itself south to include the Jersey coast, brisk SW. winds continued on the Carolina coast. Cautionary signals were hoisted on the morning of the 29th on the Carolina and off-shore on the Jersey coast and lowered at midnight. The signals were justified by winds ranging from 29 to 36 miles.

No. IX.—This area appeared on the Middle Pacific coast on the morning of the 28th and following a course generally NE. crossed the northern parts of California, Nevada, Utah, and Wyoming, reaching Central Dakota the morning of the 30th. Thence its course was nearly north, and at midnight of the 30th it was central in Northwest Dakota, the barometer at Bismarck being at that time 0.36 below the normal. Its progress was marked by gentle winds without precipitation on the 28th. On the 29th light rains prevailed in Northern Montana, followed on the 30th by heavy rains in the Northwest and Upper Missouri Valley, with brisk to high southerly winds in the Upper Missouri and Mississippi Valleys. Generally clear weather prevailed during the 30th on the Upper Lakes, with brisk S. to E. winds not sufficient to require signals.

INTERNATIONAL METEOROLOGY.

Three charts of international meteorology are issued with this review: No. IV and two for November, 1877, which are not numbered. On the first are laid down the tracks of centers of low barometers and drawn the lines of equal precipitation. On the second are charted the lines of mean pressure and temperature and the force and prevailing direction of the wind at 7:35 a. m., Washington mean time for that month. The two charts are based on the daily charts of the international bulletin.

On chart No. IV are shown the probable tracks of the storm-centers over the oceans, deduced from data received at this office up to July 3, and in the upper right-hand corner will be found an index to the same. The following is a brief notice of the same, and also of some storms over the southern hemisphere:

North Atlantic Ocean.—No. I probably developed on April 23 about 55° N. 40° W.; it was attended by westerly gales and high seas from the 24th to the 26th between 35° and 15° W. and 45° and 55° N., and on latter day moved southeastward off the Irish coast toward France. No. II probably developed over the Bay of Biscay on May 1, after which it moved eastward over the Mediterranean. No. III appeared on the coast

of Portugal on May 7. No. IV appeared to the northwestward of Ireland on May 16, and afterward moved southeastward over Europe. No. V is a continuation of low pressure area No. X, described in the May review. No. VI developed on May 21 and 22 in the southern extremity of low pressure area No. VIII, described in May review; on the 23d it moved northeastward between the Atlantic coast and the Bermudas, attended by heavy rains over latter, and possibly joined the preceding area on the 26th in the neighborhood of Newfoundland. No. VII advanced toward the British Isles from the northwest on May 24, and moved as shown on chart. From the 27th of April to the end of May high pressures prevailed over the North Atlantic between latitudes 40 and 55, with almost an entire absence of high winds, excepting occasional gales attending the storms already noticed. *South Atlantic Ocean.*—Ship Ferris S. Thompson, from San Francisco, 114 days to New York, June 15, reported April 17, 1879, passed Cape Horn; 18th, 3 a. m., heavy SE. gale; first officer washed overboard and drowned; bulwarks badly stove. Bark Lepanto (from Melbourne to New York) passed Cape Horn April 25, 1879, and on the 27th had a strong gale from SSE. to SSW., with blinding snow-storm, lasting 20 hours. *North Pacific Ocean.*—Five tracks are given on the chart, which probably indicate, somewhat correctly, the movement of the principal areas of low pressure over the region covered from March 28 to April 21, 1879. *Indian Ocean.*—February 12, 1879, 41° 23′ S., 64° 48′ E, N. strong, heavy cross sea; 13th, 39° 46′ S., 63° 53′ E., W. strong, squally, heavy sea, shipped much water; 21st, 33° 08′ S., 45° 32′ E., SE. to ENE., heavy gales, cross sea, and rain; 22d, 31° 32′ S., 45° 16′ E., SE. to calm to NNW., heavy gales, heavy sea. A special account published in "La Nature" of the cyclone of March 19, noticed in the May review, will be found under "Notes and extracts."

TEMPERATURE OF THE AIR.

The isothermal lines on chart No. II show the general distribution of the temperature of the air for the month. By a reference to the table of average temperatures upon the same chart it will be seen that the temperature of the present month has been very generally about normal or below the average, except in Missouri Valley, Middle and southeast Rocky Mountain Slope, where it has been from 15° to 27° above. On the immediate North Pacific coast and in the Saint Lawrence Valley it has been from 3° to 3.5° below. The Salt Lake temperature is erroneously reported as *above* on chart No. II. It should read *below*. The following comments on the temperature for the month have been received from special observers: Gardiner, Me., extremely cold and very wet month, 3° below mean of 43 years; rain-fall in excess, 3.76 inches. Contoocookville, N. H., temperature 2° below average for ten years; excess of rain about 2 25 inches. Westborough Mass., "a cold, frosty month." Palermo, N. Y., coldest June since 1859. Riley, Ill., present month 1°.9 below month for 18 Junes past. Coalville, Utah, month 1°.5 colder than average June for fifteen years; June 24 was 3° lower than any day in June during that period.

Minima and maxima temperatures are, respectively, as follows: *Maine*—at Portland, 44°, 93°; Orono, 34°, 87°. *New Hampshire*—Dumbarton, 40°, 92°; Auburn, 32°, 92°; Mount Washington, 15°, 70°. *Vermont*—West Charlotte, 43°, 93°; Lunenburg, 34°, 87°; Woodstock, 32°, 92°. *Massachusetts*—Newburyport, 42°, 97°; Boston, 45°, 96°; Waltham, 40°, 91°. *Rhode Island*—Newport, 49°, 79°. *Connecticut*—New Haven, 46°, 90°; Southington, 44°, 87°. *New York*—Willets Point, 46°, 97°; New York City, 47°, 89°; Plattsburg Barracks, 33°, 84°; Rochester, 36°, 91°; West Point, 45°, 100°. *Pennsylvania*—Milton, 47°, 98°; Franklin, 28°, 88°; Philadelphia, 49°, 93°; Pittsburgh, 39°, 94°; Erie, 42°, 88°. *New Jersey*—Atco, 50°, 98° Vineland, 44°, 94°; Princeton, 42°, —. *Maryland*—Woodstock, 45°, 94°; Baltimore, 52°, 94°. *Virginia*—Wytheville, 45°, 86°; Dover Mines, 55°, 98°; Norfolk, 55°, 96°. *West Virginia*—Morgantown, 39°, 88°. *North Carolina*—Summit of Roan Mountain (elevation 6,367 feet), 42°, 68°; Highlands, 44°, 88°; Weldon, 62°, 98°; Greensboro, 60°, 88°. *South Carolina*—Charleston, 60°, 92°. *Georgia*—McPherson Barracks, 50°, 96°; Savannah, 61°, 96; Atlanta, 54°, 92°. *Florida*—Middleton, 56°, 94°; Fort Barrancas, 60°, 102; Jacksonville, 62°, 96°. *Alabama*—Green Springs, 54°, 88°; Montgomery, 58°, 98°; Mobile, 61°, 96°. *Mississippi*—Vicksburg, 53°, 96°; Fayette, 50°, 90°. *Louisiana*—Shreveport, 56°, 96°; New Orleans, 61°, 91°. *Texas*—Corsicana, 51°, 99°; Mason, 46°, 99°; Galveston, 64°, 94°; Laredo, 56°, 108°; Uvalde, 51°, 104°; Rio Grand City, 100° to 103°, from 12th to 16th; Graham, 44°, 105°; Edinburg, 105°, 14th; El Paso, 57°, 104°. *Ohio*—Westerville, 39°, 93°; Ruggles, 42°, 100°; Cincinnati, 53°, 90°; Toledo, 43°, 91°. *Indiana*—Spiceland, 43°, 90°; Vevay, 58°, 93°; Indianapolis, 47°, 91°. *Illinois*—Riley, 39°, 87°; Stirling, 49°, 94°; Chicago, 43°, 87°; Cairo, 53°, 91°. *Kentucky*—Louisville, 53°, 94°. *Tennessee*—Knoxville, 48°, 92°; Memphis, 54°, 97°. *Arkansas*—Mount Ida, 42°, 96°. *Missouri*—Pierce City, 38°, 98°; Saint Louis, 50°, 95°; Kansas City, 45°, 96°. *Iowa*—Nora Springs, 40°, 92°; Logan, 44°, 92°; Des Moines, 45°, 90°; Keokuk, 47°, 89°. *Nebraska*—Fort Sidney, 29°, 99°; Genoa, 47°, 99°; Omaha, 45°, 93°; Fort McPherson, 36°, 99°. *Kansas*—Wellington, 45°, 98°; Fort Wallace, 52°, 108°; Leavenworth, 46°, 93°. *Indian Territory*—Fort Sill, 47°, 98°; Fort Gibson, 47°, 100°. *Michigan*—Marquette, 32°, 95°; Port Huron, 39°, 90°; Lansing, 45°,

92°. *Minnesota*—Duluth, 39°, 85°; Saint Paul, 44°, 91°; Breckenridge, 39°, 92°. *Wisconsin*—Neillsville, 35°, 91°; Milwaukee, 40°, 85°; La Crosse, 43°, 88°. *Washington Territory*—Olympia, 38°, 76°. *Oregon*—Roseburg, 41°, 84°; Umatilla, 46°, 91°. *California*—Visalia, 46°, 109°; San Diego, 52°, 93°; Red Bluff, 55°, 104°; Los Angeles, 50°, 103°. *Nevada*—Winnemucca, 31°, 94°; Pioche, 37°, 91°. *Colorado*—Pike's Peak, 12°, 52°; Denver, 43°, 95°; Hermosa, 42°, 92°. *Utah*—Coalville, 28°, 90°; Saint George, —, 101°; Salt Lake City, 42°, 94°; Fort Douglas, 40°, 93°. *New Mexico*—Fort Union, 32°, 88°; Santa Fé, 38°, 91; Albuquerque, 80°, 102°; La Messilla, —, 103°. *Arizona*—Camp Apache, 42°, 93°; Yuma, 59°, 101°; Wickenburg, 50°, 103°; Camp McDowell, 45°, 110°; Florence, 56°, 110°. *Idaho*—Boise City, 41°, 93°. *Wyoming*—Cheyenne, 32°, 92°. *Dakota*—Pembina, 31°, 93°; Bismarck, 36°, 91°; Yankton, 38°, 92°. *Montana*—Virginia City, 35°, 82°.

Ranges of temperature.—The monthly ranges will appear from an examination of the minima and maxima just given. The greatest daily ranges vary in New England from 17° at Wood's Holl to 36° at Boston; Middle Atlantic States, 18° at Cape May to 30° at Norfolk and Baltimore; South Atlantic States, 14° at Cape Lookout to 28° at Wilmington and Augusta; Eastern Gulf States, 19° at Key West to 29° at Montgomery; Western Gulf States, 16° at New Orleans and Galveston to 40° at Corsicana; Ohio Valley and Tennessee, 24° at Cairo to 35° at Pittsburgh; Lower Lake region, 24° at Buffalo and Erie to 38° at Rochester; Upper Lake region, 26° at Chicago and Grand Haven to 44° at Marquette; Upper Mississippi Valley, 25° at La Crosse to 38° at Keokuk; Missouri Valley, 32° at Leavenworth to 42° at Yankton; Red River of the North Valley, 35° at Breckenridge to 46° at Pembina; Eastern Rocky Mountain Slope, 33° at San Antonio to 45° at Uvalde and 43° at North Platte; Rocky Mountain stations, 22° at Pike's Peak to 39° at Denver and 44° at Cheyenne; Western Plateau, 32° at Pioche and 37° at Boise City to 43° at Winnemucca; California, 23° at San Francisco to 47° at Visalia; Oregon, 28° at Portland to 41° at Umatilla; Arizona, 43° at Yuma, 47° at Tucson; Washington Territory, 32° at Olympia.

Frosts, injurious to vegetation, are reported as follows: Milwaukee, Wis., 7th, very destructive, vegetables and flowering plants extensively injured; Grand Haven, Mich., 7th, much damage to crops and small fruit; Oswego, N. Y., 7th, much damage reported throughout interior of State; Strafford, Wis., 7th, 8th, killed corn, potatoes, and grapes; Leonardsport, Md., 7th, severe, injuring vegetation in southern part of country; Burlington, Vt., 13th, much damage done to crops in Northern Vermont, in some places fruit ruined; Mount Desert, Me., 9th, heavy, killing vegetation; New Bedford, Mass., 16th, lima beans touched; Westborough, Mass., 19th, enough to touch beans; Thornville, Mich., 7th, killing some corn and potatoes; Wautoma, Wis., 17th, heavy, killing corn, beans, and potatoes, and doing some damage to all kinds of vines; 9th, Coalville, Utah, severe, every bush, bean, and potato-top cut down; 24th, potato-tops all frozen black; everything looks desolate for crops.

Ground frozen.—Burlington, Vt., 13th, to a depth of 1 inch.

Ice formed at Nile, N. Y., on the 7th, 1 inch thick; at Neillsville, Wis., on the 2d, ⅛ inch thick.

PRECIPITATION.

The general distribution of the rain-fall for the month is illustrated as accurately as possible by returns from about 500 stations upon Chart No. III. In the lower left-hand corner of the chart is a table giving, by districts, the average precipitation for June. The excess of rain-fall over the average for a number of years has been greatest in the Saint Lawrence Valley, New England, and the Lower Mississippi Valley. The greatest deficiency occurs in Tennessee, the Gulf and South Atlantic States, over which region numerous cases of drought are reported, which will be noticed under the appropriate heading.

Heavy rains.—2d and 3d, Hulmeville, Pa., 3.10 inches; Fall River, Mass., 1.92 inches in 1 hour. 3d, Mystic, Conn., 2.50 inches; New London, 2.50 inches. 3d and 4th, Dover, Del., 2.80 inches; Auburn, N. H., 3 inches. 4th, Trenton, N. J., 2.80 inches; Atco, N. J., 3.23 inches; Fall River, Mass., 2.80 inches. 5th, Trenton, N. J., 2 inches in 1 hour and 30 minutes. 8th, Savannah, 3.22 inches, (2 inches in 50 minutes). 9th, Saint Mark's, Fla., 5.24 inches; Leavenworth, 2.49 inches; Independence, Iowa, 3.06 inches. 9th and 10th, Gainesville, Ga., 3.50 inches. 10th, Vevay, Ind., 1.35 inches in 1 hour and 30 minutes; Kansas City, Mo., 1.56 inches in 45 minutes; Saint Joseph, Mo., 4.30 inches. 12th and 13th, Bismarck, Dak., 3.43 inches; Waterville, Kans., 2.80 inches; Taber, Iowa, 2.90 inches; Clear Creek, Nebr., 3.01 inches, (2 inches in 25 minutes). 15th, Lynchburg, Va., 1.02 inches in 20 minutes. 19th and 20th, Central City, Nebr., 2.50 inches. 21st, Fort Griffin, Tex., 10.24 inches; Fort Concho, 2.60 inches. 24th, Des Moines, Iowa, 4.80 inches, (2.50 inches in 20 minutes). 26th, Boonville, Mo., 2.80 inches; Brunswick, Mo., 2.50 inches; Dodge City, Kans., 1.91 inches in 90 minutes. 27th, Leavenworth, 3.43 inches; Lexington, Mo., 3.30 inches in about 9 hours; Creswell, Kans., 3.50 inches. 27th and 28th, Cairo, Ill., 4.97 inches, (3 inches in 90 minutes); Anna, Ill., 3.28 inches; Kansas City, 2.62 inches. 28th and 29th, Clinton, Mass., 2.99 inches. 28th,

Norwalk, Ohio, 2.45 inches; Little Rock, Ark., 7.40 inches. 29th, Atlanta, Ga., 2.23 inches; Boston, 2 inches in 30 minutes; Southington, Conn., 1.45 inches in 15 minutes. 28th and 29th, Fort Barrancas, Fla., 4.82 inches.

Largest monthly rain-falls.—Fort Barrancas, Fla., 10.49 inches; Kansas City, Mo., 9.02; Cairo, Ill., 8.70; Saint Mark's, Fla., 8.60; Trenton, N. J., 8.58; Manhattan, Kans., 8.48; Dunbarton, N. H., 8.45; Auburn, N. H., 8.41; Holton, Kans., 8.25; Rome, Mass., 7.90; New Corydon, Ind., 7.33; Anna, Ill., 7.02; in Iowa, at Jefferson City, Madison County, 8.78 inches; near Corydon, Wayne County, 8.43 inches; and Mount Pleasant, Henry County, 8.18 inches.

Smallest monthly rain-falls.—Burkes and Florence, Ariz., Yuma, Cal., Emory Grove, Md., Yorktown, Tex., Coalville, Utah, none; Calistoga, Cal., Albuquerque, N. Mex., Fort Lyon, Colo., trace; Port San José, Cal., 0.02 inches; Los Angeles, Cal., 0.03 inches; Pilot Point, Tex., 0.04 inches; Hermosa, Colo., 0.06 inches; Cheyenne, Wyo., 0.07 inches; Salinas City, Cal., 0.15 inches; Umatilla, Oreg., 0.28 inches; Denver, Colo., 0.32 inches; Olympia, Wash., 0.44 inches.

Rainy days.—The number of days on which rain or snow has fallen varies as follows: New England, 11 to 20; Middle Atlantic States, 7 to 17; South Atlantic States, 5 to 14; Gulf States, 5 to 15; Lower Lakes, 12 to 18; Upper Lakes, 6 to 15; Ohio Valley and Tennessee, 9 to 15; Upper Mississippi Valley, 11 to 17; Lower Missouri Valley, 12 to 13; Eastern Slope, from 7 in Indian Territory to 18 in Western Dakota; Rocky Mountains, from 3 at Denver to 19 at Virginia City; Western Plateau, 5 to 13; Pacific Coast, 1 to 7.

Cloudy days.—For New England the number varies from 6 to 17; Middle Atlantic States, 3 to 11; South Atlantic States, 1 to 9; Gulf States, 0 to 10: Lower Lakes, 6 to 12; Upper Lakes, 5 to 13; Ohio Valley and Tennessee, 1 to 10; Upper Mississippi Valley, 6 to 13; Lower Missouri Valley, 5 to 8; Eastern Slope, 2 to 9; Rocky Mountains, 0 at Denver and Santa Fé to 15 at Virginia City; Western Plateau, 2 to 9; Pacific Coast, 0 to 8.

Hail.—Fort Hale, Dak., 5th; Fort Wallace, Kans., 7th, 19th, 29th; Fort Snelling, Minn., 9th; Fort McPherson, Nebr., 7th, 13th, 25th; Fort Union, N. Mex., 1st; Dover Mines, Va., 19th, 3.30 p. m., terrific storm moved from NNW. to SSE., lasting 3 minutes, covering ground to the depth of — inches; diameter of stones one-half inch; area over which hail fell, 3 miles; gardens and fruit trees greatly damaged; Leavenworth, Kans., 9th, very heavy; 5th, terrific at West Newton, McKeesport, Library, Parker, and other neighboring places in Pa.; Yankton, Dak., 5th, fell on prairie a few miles west of this place; reached an average depth of one foot, while on opposite side of river from there it was 9 inches deep; the path was from SW. to NE., about two miles wide; all crops in its track destroyed; largest stones one-half inch in diameter; Pioche, Nev., 12th; Santa Fé, N. Mex., 1st; Omaha, Nebr., 8th, 10th, 14th; North Platte, Nebr., 7th, 25th; Salt Lake City, Utah, 12th; Leavenworth, Kans., 8th, 9th, 11th, 14th; Deadwood, Dak., 30th; Yankton, Dak., 5th; Davenport, Iowa, 2d; Burlington, Iowa, 14th; Pembina, Dak., 23d; Saint Paul, Minn., 9th; Breckenridge, Minn., 24th; Cleveland, Ohio, 5th; Cincinnati, Ohio, 10th; Philadelphia, 5th; Baltimore, 11th; Burlington, Vt., 4th, 10th; Boston, 29th; Springfield, Mass., 10th, 29th; Fort Lyon, Colo., 26th; Southington, Conn., 29th; Elmira, Ill., 24; Vevay, Ind., 10th; Spiceland, Ind., 3d, 10th; Saint Meinrad, Ind., 10th; Monticello, Iowa, 3d; Independence, Iowa, 9th; Holton, Kans., 11th; Creswell, Kans., 9th; Woodstock, Md., 11th; Owing's Mills, Md., 6th; Waltham, Mass., 5th; Hudson, Mich., 5th; Oregon, Mo., 13th; Kansas City, Mo., 10th; Clear Creek, Nebr., 12th, 25th; Genoa, Nebr., 10th; Contoocookville, N. H., 30th; Atco, N. J., 5th; Vineland, N. J., 5th; Somerville, N. J., 11th; Argyle, N. Y., 30th; Palermo, N. Y., 4th; Nile, N. Y., 26th; Bellefontaine, Ohio, 3d; Cincinnati, 10th; Ringgold, Ohio, 10th; North Lewisburg, Ohio, 5th, 27th; Norwalk, Ohio, 5th; Herman, Mo., 14th, severe hail-storm, course from W. to E., about a mile in width, destroying three-fourths of the crops, uprooting trees, and blowing over a large log barn, stones 1½ inch in diameter fell, some vineyards entirely destroyed; 7th, the hail-storm throughout Northeastern and Central Ohio was more severe than ever known in Delaware County, a perfect torrent of hail, breaking windows and doing other damages, hail reported as large as hen's eggs; 6th, New Market, Frederick County, Maryland; "this neighborhood has again been visited by a most disastrous hail-storm, commencing this afternoon about 1½ o'clock. The wheat crop, in a belt at least half a mile in width, and extending four or five miles in length, is nearly all destroyed."

Snow from cloudless sky.—Summit, Colo., 16th.

Snow fell as follows: Winnemucca, Nev., 16th, heavy. Pike's Peak, 1st, 2d, 13th, 14th, 15th, 16th, 27th, and 28th. Fort Douglas, Utah, 7th, on Wasatch and Ogwoh ranges this a. m. Summit Station, Central Pacific Railroad, 14th and 16th.

Depth of snow on ground at end of month.—Pike's Peak, Colo., the old snow is melting rapidly, and the trail is open for horses to within 100 yards of the station.

Drought.—Summit, Colo., 14th, first rain-fall of 1879. Gulf Hammock, Fla., 30th, still suffering for rain; ground parched; corn crop injured very much. Forsyth, Ga., 30th, water-courses very low; springs and wells failing; corn and cotton seriously damaged

by drought. Thomasville, Ga., 30th, corn injured by drought. Okaloosa, La., 30th, corn crop seriously injured by drought. Fallston, Md., 30th, gardens and crops suffering from drought. Emory Grove, Md., no rain during month. Northport, Mich., month very dry, injuring vegetation. Brookhaven, Miss., 26th, very dry; corn suffering. Fayette, Miss., 30th, early corn injured by drought. Fayetteville, N. C., 30th, everything suffering, and in many places vegetables and plants dying. Ringgold, Ohio, 30th, potatoes injured by drought. North Lewisburg, Ohio, very dry month. Chambersburg, Pa., 30th, oats and hay injured by drought. Clarksville, Tex., no rain from May 5 to June 15; corn and oats suffered considerably. Melissa, Tex., 14th., long drought of six weeks, doing much damage to crops. Coalville, Utah, no rain during month; 6th, "terribly drying wind, giving us notice of no crops this year; dust everywhere." Fort Gibson, Ind. T., 19th, drought, vegetation checked, wells drying up. Chattanooga, Tenn., 1st, much damage done to garden products by drought. Augusta, Ga., 25th, "drought is beginning to tell fearfully on crops, especially corn, cotton, and fruit; watermelon vines drying by the acre; crop reported ruined." Sloop Point, N. C., 16th, drought continues very severe. Graham, Tex., 8th, corn suffering greatly; 17th, corn crop an entire failure. Corsicana, Tex., 25th, farmers report very dry weather in adjoining counties; stock suffering. Portsmouth, N. C., 12th, 20th, water for stock very scarce. Kanab, Utah, 3d to 19th; cattle dying; very dusty.

Floods.—New Corydon, Ind., 11th, violent rain; lowlands flooded.

RELATIVE HUMIDITY.

The average percentages of relative humidity for the month range as follows: New England, 68 to 84; Middle Atlantic States, 60 to 79; South Atlantic States, 56 to 75; Eastern Gulf States, 71 to 76; Western Gulf States, 60 to 72; Ohio Valley and Tennessee, 55 to 69; Lower Lakes, 54 to 72; Upper Lakes, 63 to 71; Upper Mississippi Valley, 62 to 71; Lower Missouri Valley, 65 to 67; Red River of the North Valley, 68 to 73; Eastern Slope, 49 to 68; Western Plateau, 21 to 50; California, 30 to 72. High stations report the following averages, not corrected for altitude: Cheyenne, 33; Mount Washington, 88; Denver, 38.5; Pike's Peak, 48; Santa Fé, 20.5; Virginia City, 48.

WINDS.

The prevailing winds at the Signal Corps stations are shown by the arrows flying with the wind on Chart No. II. The maximum velocities per hour have been given in the descriptions of movements of areas of low pressure. On Mount Washington the highest velocity, 120 miles, was recorded from the SW. on the 4th, and also from the NW. on the 6th. The seven daily observations give the following results as to direction during the month: N., 18 times; NW., 92; W., 45; SW., 32; S., 15: SE., 5; E., 1; NE., 0; calm, 2.

Total movements of the air.—The following are the largest monthly movements of the air recorded at the Signal Corps stations: North Platte, 12,786; Cape Lookout, 11,777; Portsmouth, N. C., 11,422; Dodge City, 11,319; Pike's Peak, 10,955; Kittyhawk, 10,577; Breckenridge, 10,297; Cape Hatteras, 10,293; Wood's Holl, 9,270; Umatilla, 8,919; Fort Sill, 8,753; San Francisco, 8,038. The smallest are: Florence, Ariz., 2,212; Nashville, 2,278; Silver City, N. Mex., 2,389; Tucson, 2,520; Lynchburg, 2,525; Visalia, 2,676; Roseburg, 2,836; Uvalde, Tex., 2,947; Indianapolis, 3,077.

Local storms.—Salt Lake City, 6th, severe wind storm; three cars blown from track of Western Utah railway. Violent storm in Dubuque, Iowa, night of 9th; anemometer registered 60 miles when electric circuit was broken; estimated velocity, 80 miles; great damage to property; over 20 buildings unroofed. Cloud burst on Beaver Creek, near Buffalo Gap station, 92 miles south of Deadwood, Dak., on the 12th, drowning eleven persons. There was no warning by a gradual rise of the water. Rain commenced about dark and in a few minutes the whole country was said to be covered with water. The flood subsided as fast as it rose. Severe storms and tornadoes reported from Kansas on the 9th and 10th, mentioned in connection with low area No. III. From Carmi, Ill., a cyclone reported on the 10th, lasting about 15 minutes; several persons were badly injured and buildings blown down. Destructive local storms passed over southern parts of Ohio and Indiana and Northern Kentucky on the 11th, doing considerable damage to crops. One railway depot demolished and trees uprooted. 24th, Des Moines, Iowa, severe, with heavy rain and violent winds; many bridges carried away and great damage done to buildings and crops. Three persons were drowned. 26th, violent storm occurred in Ohio. 28th, a tornado in Baltimore unroofed about fifty buildings and did considerable damage; no person was killed. 27th, Fort Smith, Ark., from NNW.; worst for forty years; blew down several houses, damaged others, and injured crops.

Waterspouts.—New London, Conn., 19th, moved across mouth of harbor six miles from station.

Sand storm.—Visalia, 16th, severest this year.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily weather indications for June with the telegraphic reports for the succeeding twenty-four hours shows the general

percentage of omissions to be 0.8 per cent. and of verifications to be 83.9 per cent. The percentages for the four elements have been: Weather, 87.6; direction of the wind, 87.5; temperature, 81.1; barometer, 79.1. The percentages of verifications by geographical districts have been: New England, 84.9; Middle States, 86.0; South Atlantic States, 79.8; East Gulf States, 80.4; West Gulf States, 81.1; Lower Lake region, 88.6; Upper Lake region, 86 8; Tennessee and the Ohio Valley, 84.9; Upper Mississippi Valley, 83.3; Lower Missouri Valley, 81.2; Northern Pacific coast region, 88.3; Central Pacific coast region, 93.3; Southern Pacific coast region, 95.0. Of the 3,687 predictions that have been made, 167, or 4.58 per cent., are considered to have entirely failed; 105, or 2.85 per cent., were one fourth verified; 517, or 14.02 per cent., were one-half verified; 350, or 9.49 per cent., were three-fourths verified; 2,546, or 69.05 per cent., were fully verified, so far as can be judged from the tri-daily weather maps.

Cautionary signals.—One hundred and seventeen cautionary signals were displayed during the month, of which 103, or 88 per cent., were justified. Fifteen cautionary off-shore signals were displayed, which were all justified as to direction; 9, or 60 per cent., were justified as to velocity. Of the cautionary off-shore signals 6 were changed from cautionary. One hundred and thirty-two signals of both kinds were displayed, of which 112, or 84.9 per cent., were fully justified. The above does not include signals ordered at 47 display stations where the velocity is only estimated and not measured. Seventy cases were reported of winds of 25 miles or over where signals were not ordered.

NAVIGATION.

Stage of water in rivers.—In the table on the right-hand side of chart No. III are given the highest and lowest readings of the Signal Corps river-gauges for the month, with the dates. The Red River at Shreveport fell gradually throughout the month from 15 feet 3 inches on the 1st to 4 feet 4 inches on the 30th. The Missouri at Yankton continued between 5 feet 5 inches and 8 feet 3 inches from the 1st to the 19th, "when the June flood commenced," and the river rose to 12 feet 6 inches by the 26th; at Omaha and Leavenworth the river fluctuated between 12 and 14 feet from the 1st to about the 16th, when it began rising, and reached its highest point (16 to 17 feet) on the 27th and 28th. The observer at Kansas City reports the first head water rise in the Kansas River on the 15th. The Upper Mississippi, from Saint Paul to Keokuk, generally fell, except a slight rise during the last few days at Saint Paul; at Saint Louis it rose from 13 feet 3 inches on the 1st to 16 feet 7 inches on the 9th, continued almost stationary until the 18th, when it began rising, reached 18 feet 5 inches on the 22d, fell to 17 feet 5 inches on the 25th, and afterwards rose to its highest point, 20 feet 11 inches, on the 30th; at Cairo it rose from 15 feet 1 inch on the 1st to 18 feet 2 inches on the 7th, fell to 16 feet 7 inches on the 14th, rose to 18 feet on the 24th, fell to 16 feet 10 inches on the 26th; at Memphis it rose from 8 feet 6 inches on the 1st to 13 feet 4 inches on the 11th, fell to 11 feet 2 inches on the 23d, rose to 13 feet 3 inches on the 26th, and fell to 12 feet 1 inch on the 30th; at Vicksburgh it rose from 14 feet 9 inches on the 4th and 5th to 18 feet 11 inches on the 16th, fell to 17 feet 3 inches on the 23d, and rose to 18 feet 3 inches by the 30th: at New Orleans the changes were slight throughout the month. The Tennessee at Chattanooga and the Cumberland at Nashville continued low and generally falling throughout month, except temporary rises at former place on the 17th and at the latter on the 16th. The Ohio remained quite low and generally falling throughout month; temporary rises occurred at Pittsburgh on the 6th, 7th, and 30th, and at Cincinnati from 10th to 13th. A temporary rise also occurred in the Savannah at Augusta from the 11th to the 13th; otherwise the water remained between 4 and 5 feet above low-water mark. The observer at Fayetteville reports (30th) navigation almost suspended on the Upper Cape Fear River, owing to very low water. The only instance where the water reached the danger point occurred at Omaha from the 25th to the 30th, when the flats were covered and railroad track submerged. The low water at Pittsburgh caused a suspension of navigation, except to boats of the lightest draught, and the observer reported (30th) about 150 acres of coal in barges lying at that place awaiting a rise.

High tides.—Cape Lookout, N. C., 4th, 5th.

Low tides.—Indianola, 16th, 18th.

Tidal wave.—Grand Haven, Mich., 10th, the captain of steamer Flora reports encountering a tidal wave, about 5 a. m., when within 25 miles of west shore of Lake Michigan; the ridge of water was about 7 to 8 feet high; the rough sea reached the east shore of the lake about 11 a. m.

TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors, with average depth when observations were taken, are given in table on chart No. II. Observations were interrupted at the following places on the dates indicated: On account of loss of thermometers, at Baltimore, 1st to 5th instant; at New London, 1st to 4th; at San Francisco, 1st to 23d; and at Savannah, from the 19th to the 29th. The report from Baltimore, received too late for insertion in table, gives the highest temperature 76°, lowest 71°, average depth, 11 feet.

ATMOSPHERIC ELECTRICITY.

Thunder-storms.—1st, New York, Connecticut, Illinois, Iowa, Maine, Massachusetts, Nebraska, New Hampshire, New Jersey, Ohio, Vermont, Colorado, New Mexico, Missouri; 2d, Maryland, New York, Maine, Massachusetts, New Jersey, Ohio, Pennsylvania, Virginia, Connecticut; 3d, Illinois, Massachusetts, New Jersey, Pennsylvania, Iowa, Virginia; 4th, Nebraska, New York, Massachusetts, Michigan, Pennsylvania, Vermont, Wisconsin, Wyoming, Iowa, Virginia; 5th, Maryland, Nebraska, New York, Dakota, Illinois, Indiana, Maine, Massachusetts, Michigan, New Hampshire, New Jersey, Ohio, Pennsylvania, Vermont, Colorado, Iowa, Montana; 6th, Nebraska, Connecticut, Dakota, Illinois, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, Ohio, Pennsylvania, Virginia, Rhode Island; 7th, Kansas, Nebraska, Florida, North Carolina, Dakota; 8th, Minnesota, Dakota, Iowa, Missouri, Nebraska, Pennsylvania, Kansas, Alabama, Florida, Tennessee, Georgia; 9th, Indian Territory, Kansas, Minnesota, Nebraska, Alabama, Dakota, Illinois, Indiana, Iowa, Missouri, New York, Ohio, Vermont, Virginia, Wisconsin, Texas, Florida, Kentucky; 10th, Massachusetts, Kansas, Minnesota, Connecticut, Dakota, Illinois, Indiana, Iowa, Maryland, Michigan, Maine, Nebraska, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Vermont, Virginia, Wisconsin, Kentucky, Rhode Island; 11th, Nebraska, New York, Virginia, Connecticut, Georgia, Illinois, Indiana, Iowa, Maryland, Massachusetts, Missouri, New Hampshire, New Jersey, Ohio, Pennsylvania, Tennessee, Vermont, Kansas, Dakota, Alabama, Michigan, Kentucky, North Carolina, Maine; 12th, Nebraska, New York, Alabama, Connecticut, Dakota, Illinois, Iowa, Kansas, Maine, Maryland, Missouri, New Jersey, Ohio, Pennsylvania, Vermont, Nevada, Texas, Florida, Tennessee, North Carolina, Virginia, Rhode Island; 13th, Dakota, Illinois, Iowa, Missouri, Nebraska, New Hampshire, New York, Virginia, Texas, Mississippi, Indiana, Florida, Massachusetts; 14th, Alabama, Canada, Dakota, Illinois, Indiana, Iowa, Kansas, Michigan, Missouri, Ohio, Wisconsin, Colorado, Nebraska, Indian Territory, Texas, Tennessee; 15th, Nebraska, New York, Rhode Island, Virginia, Connecticut, Georgia, Illinois, Indiana, Massachusetts, Michigan, New Hampshire, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Colorado, Texas, Alabama, Wisconsin; 16th, Kansas, Nebraska, Connecticut, Maryland, Massachusetts, New York, Pennsylvania, Colorado, Dakota, Texas, Mississippi, Florida, Alabama, North Carolina, Virginia, Rhode Island; 17th, Florida, Kansas, Missouri, New York, Texas, Louisiana, Indiana, Georgia, South Carolina; 18th, Indian Territory, Nebraska, Dakota, Missouri, Wyoming, Indiana, Florida, Pennsylvania, New Jersey; 19th, Indian Territory, Kansas, Nebraska, Dakota, North Carolina, Virginia, California, Texas, Florida; 20th, Indian Territory, Georgia, Iowa, Wisconsin, Kansas, Texas, Dakota; 21st, Indian Territory, Dakota, Michigan, New Mexico; 22d, Missouri, New York, Pennsylvania, Kansas; 23d, Nebraska, Iowa, Dakota; 24th, Kansas, Dakota, Illinois, Indiana, Iowa, Missouri, Nebraska, Virginia, Minnesota, Tennessee, North Carolina; 25th, Alabama, Canada, Dakota, Illinois, Indiana, Iowa, Massachusetts, Missouri, Nebraska, New Jersey, North Carolina, Ohio, Pennsylvania, Virginia, Florida, West Virginia; 26th, Kansas, New York, Illinois, Indiana, Iowa, Massachusetts, Michigan, Missouri, Nebraska, Ohio, Pennsylvania, Vermont, Dakota, Alabama, Florida, North Carolina; 27th, Kansas, Connecticut, Dakota, Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Michigan, Missouri, Nebraska, New York, Ohio, Pennsylvania, Vermont, Colorado, Indian Territory, Wisconsin; 28th, Maryland, Arkansas, Connecticut, Indiana, Missouri, Massachusetts, Michigan, Maine, Nebraska, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Vermont, Wisconsin, Colorado, Texas; 29th, Montana, Kansas, Nebraska, New York, Virginia, Alabama, Connecticut, Florida, Massachusetts, New Jersey, Pennsylvania, Virginia, Colorado, Texas, Indiana, North Carolina, Georgia, Rhode Island; 30th, Florida, Massachusetts, Nebraska, New York, Indian Territory, Dakota, Texas, New Jersey.

Auroras were observed as follows: On the 7th, in Iowa, Indiana, Canada, and Maine; 8th and 9th, in northern portion of New England, Michigan, and Dakota; 12th, summit of Pike's Peak and in Iowa; 13th, in New England, as far south as Connecticut; 15th, in Iowa; 16th, in Missouri, at Boonville and Saint Louis, latter being most southerly during month; on the 17th a marked and general display, embracing New England, part of the Middle States, Lake region, Ohio and Upper Mississippi Valleys; the most southerly reports are from Urbana, Ohio, and Chambersburg, Pa. This display, though general, was faint, white and straw being the prevailing colors. Its form was generally a dark segment, surmounted by a luminous arch, from which pale beams occasionally shot upward. It appeared earliest in the northwest, at about 9 p. m., and was not seen in New York and New England until about 10 p. m.; its disappearance occurred at about midnight, being nearly simultaneous for all stations; 18th, in Southern Michigan, New England, Ohio, at Fort Whipple, Va., which latter was the most southerly station reporting; 21st, in New Jersey; 23d, in Maine; and on the 24th, in Massachusetts.

Telegraphic communication interfered with by atmospheric electricity.—Pike's Peak, Colo., 5th; interrupting telegraphic communication, 16th, 29th. Santa Fé, N. Mex., 1st, 21st. Bismarck and Deadwood, Dak., interfering with telegraph line. Mason, Tex., 9th, 12th.

Eagle Pass and Laredo, Tex., 12th, prevented working of line. Graham, Tex., 9th, 19th, interrupting telegraphic communication. Pembina, Dak., 9th, 23d, 30th, interrupting communication. Cape May, 12th, intense on wires. Springfield, Mass., 18th. Winnemucca, Nev., 16th.

OPTICAL PHENOMENA.

Solar halos.—2d, Georgia; 3d, Iowa, Oregon, Minnesota, North Carolina, Texas; 4th, Nevada, Utah, Dakota, Missouri, Iowa, Minnesota, Illinois, Nebraska; 5th, Utah, Minnesota, Ohio, Illinois; 6th, Minnesota, Iowa, Maine, Nebraska, New York; 7th, Minnesota, Nebraska; 8th, Iowa, Minnesota, New York, Connecticut, New Jersey; 9th, Connecticut, Massachusetts, Illinois, Maine, New York; 10th, Utah, Iowa, Minnesota, Massachusetts, New York; 11th, Ohio, New York; 12th, Texas, Iowa, Minnesota, Ohio, North Carolina; 13th, Maine, Illinois, Indiana, Ohio, Texas; 14th, Nevada, Dakota, Minnesota, New York, Maine, Connecticut, Pennsylvania; 15th, Pennsylvania; 16th, California; 17th, Iowa; 18th, Utah, Iowa, North Carolina, Nebraska, Oregon; 19th, Iowa; 20th, Iowa, Wisconsin, Illinois; 21st, Dakota, Ohio; 22d, Iowa, Georgia; 23d, Iowa, Ohio, Kentucky, Tennessee, Georgia, Florida, California; 24th, Iowa, Florida, Kansas; 26th, Iowa, Michigan; 27th, New York, Missouri; 28th, Texas; 30th, Kansas, Missouri.

Lunar halos.—1st, Ohio, Virginia; 2d, Texas, North Carolina; 3d, Nebraska, Utah, Texas, Mississippi, Tennessee, North Carolina; 4th, Oregon, Utah; 7th, Nebraska; 10th, Tennessee; 12th, Ohio, Iowa; 13th, Indiana; 14th, Illinois; 23d, Texas; 24th, Florida, Virginia; 25th, Missouri; 26th, Iowa, Indiana, Florida; 27th, Texas, Iowa, New York, Florida, Ohio; 28th, Indian Territory, Nebraska, Utah, Texas, Louisiana, Virginia, Idaho; 29th, Indian Territory, Utah, Wisconsin, New York, Kansas, Missouri; 30th, Alabama, Wisconsin, Florida, Kansas.

Mirage.—Breckenridge, Minn., 21st; Duluth, Minn., 17th; Oswego, N. Y., 24th; Cape May, 6th.

MISCELLANEOUS PHENOMENA.

BOTANICAL.—Pembina, Dak., 5th, lettuce and radish in market; 18th, wild strawberries ripe; 20th, asparagus and new potatoes in market. Breckenridge, Minn., 24th, wheat and oats heading. Chattanooga, Tenn., 25th, peaches ripening. Augusta, Ga., ripening, 4th, blackberries; 7th, figs; 21st, peaches and tomatoes; cotton blooming, 11th. Calistoga, Cal., wild flowers seeding fourteen days later, and grapes in bloom three weeks later than last year. Houston, Fla., ripe, 1st, watermelons; 10th, tomatoes. Milton, Fla., ripe, 1st, peaches; 15th, apples; 20th, green corn in market. Augusta, Ill., in bloom, 21st, elder; 22d, chestnut; 25th, corn tasseling. Manitowoc, Wis., 30th, crops look well. Professor Hinrich, in the Iowa weather service, reports the condition of the crops as follows: "Corn, about 5 per cent. below average on western slope, also, in middle, north, and western southwest; 5 to 10 per cent. above, down the Upper Des Moines and Raccoon and southwest to Page and Decatur Counties; from 3 to 6 per cent. above between Turkey and Cedar Rivers, and equal to average in the north and middle. Wheat from 20 to 40 per cent. below average in middle east, from 10 to 20 per cent. in middle north, and on western slope, except in Plymouth County, where grasshoppers have almost completely destroyed the crops." Hay and pasture have improved during month. Arlington, Ind., in bloom 23d, elder. Vail, Iowa, 30th, all small grain very thin, nearly all headed out, corn doing well, prairie grass very light. Nora Springs, Iowa, 25th, raspberries ripening. Independence, Iowa, 30th, crops looking very well. Holton, Kans., 30th, continued rain injuring wheat. Creswell, Kans., 13th, oats heading. Independence, Kans., 15th, blackberries ripe. Brookhaven, Miss., 12th, cotton blooming; corn tasseling from 7th to 26th. Clear Creek, Nebr., 24th, wheat headed. Statesville, N. C., 30th, wheat and oat crops very good, cotton and corn very promising. Fayetteville, N. C., 6th, corn tasseling.

Harvesting.—Fort Gibson, Indian Territory, 24th, oats; Uvalde, Tex., 4th, grain; Breckenridge, Wis., 11th, hay; Wytheville, Va., 21st, wheat; grain and grass both light; Highland, Ill., 11th, first wheat; Vevay, Ind., 17th, wheat; crops excellent; Arlington, Ind., 21st, harvesting begun; Guttenburg, Iowa, 26th, wheat; Fort Madison, Iowa, 26th, wheat; Creswell, Kans., 10th, harvesting begun; 29th, fall wheat cut; Independence, Kans., 9th, wheat; Fallston, Md., 23d, wheat; Ashley, Mo., 16th, wheat; crops good; 30th, oats, yield light; Fayetteville, N. C., 5th, wheat harvesting general; crop very good; Ringgold, Ohio, 30th, wheat crop very good; Jacksonburg, Ohio, 9th, barley; 21st, wheat; North Lewisburg, Ohio, 30th, harvest begun; Bethel, Ohio, 20th, wheat, injured by fly; Wooster, Ohio, 26th, wheat.

Rot.—Highland, Ill., slight rot in grapes appeared on 14th, but on 30th seemed to have disappeared.

BIRDS.—*Geese*—Cairo, Ill., 27th, wild geese going south.

MISCELLANEOUS.—*Grasshoppers*—Winnemucca, Nev., 2d, myriads invaded town from the north; 4th, in great numbers; 5th, a few still in vicinity; 9th, swarm passed in easterly direction; 15th, 29th, a few seen. Salt Lake City, 2d, reported to be in large numbers on east and west "bench lands." Yankton, Dak., 8th, dense swarms, moving SW.; 26th, moving southward. Fort Fetterman, Wyo., 14th, "myriads of grasshop-

pers cover ground." Clear Creek and Genoa, Nebr., from 24th to 29th. Iowa, 30th, "grasshoppers have done much damage in the northwest of State, and even down to Woodbury County." *Locusts*—Fort Stephenson, Dak., disappeared on 24th. Augusta, Ga., 19th, first appearance. Independence, Kans., disappeared on 25th. Emory Grove, Md., 20th to 23d. Oregon, Mo., locusts continued in full force until 18th, when they began dying rapidly. Plattsmouth, Nebr., appeared May 27, and on June 11 developed to immense numbers, depositing eggs; 18th, dying off rapidly; 21st, almost disappeared. Cincinnati, Ohio, first heard, 24th. Norwalk, Ohio, 13th: Melissa, Tex., 2d, in abundance. Coalville, Utah, 30th, flying S. and SE., very high.

Meteors.—Leavenworth, 12th, from N.-NE. at elevation of 45° to 50°; in falling curved towards the NE. for about 20° and then exploded with a loud noise, scattering in all directions; appeared to be about 6 inches in diameter and was exceedingly bright. At Larned, Kans, a brilliant meteor was observed on the evening of the 18th, a few moments after sunset, remaining visible about eight or ten seconds; position 25 or 30 degrees above horizon, with "no apparent motion, consequently it must have been approaching the earth directly in the line of spectators"; apparent diameter, 1½ degrees; tail irregular and nearly perpendicular to horizon, length about 20 degrees, breadth about 30 degrees. 25th, on Cut Creek, 24 miles west of Alamosa, Colo., shortly before sunrise, large pear-shaped meteor "fell straight down from vicinity of Jupiter; it threw out sparks plainly visible in broad daylight; seemed to strike the ground not more than half a mile away; color, pale white."

Earthquakes.—It is reported that the recent earthquake at Virginia City, Nev., was not felt in the lower levels of the mines in that region.

Polar bands.—Cape Hatteras, 17th. Wytheville, Va., 1st, 13th, 15th, 16th, 18th, 21st.

Prairie and forest fires.—Los Angeles, Cal., 2d. Colorado Springs, Colo., 25th; mountain fires in SW. Cape Hatteras, N. C., 24th. Summit, Colo., 30th, during most of month three large forest fires have been raging from 10 to 20 miles south of this place, and are advancing rapidly east under strong winds. Johnsontown, Va., 22d.

Zodiacal light.—Colorado Springs and Pike's Peak, Colo., looked for each day but not observed. Lynchburg, Va., 7th, 10th, 12th, 16th. Mount Washington, looked for each day, none observed.

Earthquakes.—January 8, 1879, Amoy, China, 9.47 p. m., shock; 30th, at Colima, Mex., between 10 and 11 a. m., strong shock during which the fish in the lake rose to the surface in great numbers. February 2, Tokio, Japan, 10.10 p. m., shock. April 4, 3.36 a. m., strong shock at Zi-Ka-wei and Nankin, China. United States Naval Hospital, Yokohama, Japan, April 9, 2.30 a. m., light shock; 14th, 9.20 a. m., light shock; May 10, 11.18 p. m., light shock. The Colonist, published at St. George's, Bermuda, of May 28, reports "a rather heavy shock of earthquake there on the afternoon of Sunday, the 28th? (probably the 25th), at 5.30 p. m. Two chimneys and walls were thrown down. Reports from St. Croix, St. John, Porto Rico, and Tortola all mention heavy shocks at those places about the same hour; at latter place a house was badly damaged." San José, Costa Rica, May 29, 6.30 p. m., severe shock; 30th, 1.30 a. m., severe shock; these shocks seemed to be general throughout the republic; in San José, Alajuela, and Grecia buildings were damaged. At Punta Arenas a violent thunder-storm prevailed at the hour of the first shock; light shocks were also felt at Aspinwall and Panama on the 29th. On June 11, earthquake shocks were felt in Canada and reported as follows: Montreal, "9.58 p. m., sharp shock felt all over city, accompanied by a sharp rattle, as of near thunder; it seemed to pass from N. to S." St. Johns, Quebec, night, "heavy shock of earthquake, accompanied by a rumbling sound."

Ocean current.—"Lieutenant Commander Crownenshield, United States steamer Portsmouth, at Port Royal, May 25, from Hampton Roads, reported having found the Gulf Stream exceptionally near the coast and running at an unusually high velocity. At Capes Lookout and Hatteras it was less than three miles from the shoals and so strong and swift as to carry the ship fifty-six miles to northeastward during a calm of fourteen hours, or at a rate of four knots per hour."

Sunsets.—The characteristics of the sky at sunset as indicative of fair or foul weather for the succeeding 24 hours have been observed at all Signal Service stations. Reports from 126 stations show 3,774 observations to have been made, of which 40 were reported doubtful; the remainder, 3,082, or 82.6 per cent. were followed by the expected weather.

Sun spots.—The following record of observations, made by D. P. Todd, assistant has been forwarded by Prof. S. Newcomb, U. S. N., Superintendent Nautical Almanac Washington, D. C.:

Date—June, 1879.	No. of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	
4—3 p. m.	1	5	0	0	0	0	1	5	Faculæ.
4 p. m.	0	0	0	0	0	0	1	5	Faculæ.
5—3 p. m.	1	3	0	0	1	3	2	8	Faculæ.
7—2 p. m.	0	0	0	0	0	0	0	0	
8—4 p. m.	0	0	0	0	0	0	0	0	Faculæ.
6 p. m.	0	0	0	0	0	0	0	0	Faculæ.
9—4 p. m.	1	4	0	0	0	0	1	4	Faculæ.
10—2 p. m.	0	0	0	0	0	0	1	1	Spot circular and well-defined.
4 p. m.	0	0	0	0	0	0	1	1	
26—2 p. m.	1	5	0	0	.....	.....	1	5	
27—2 p. m.	0	0	0	0	0	0	1	4	
28—2 p. m.	0	4	0	0	0	0	1	8	
30—2 p. m.	0	2	0	0	0	0	1	10	

Observations were also made on the 2d at 3 p. m., 12th at 2 p. m., 13th at 2 p. m., 14th at 2 p. m., 15th at 6 p. m., 17th at 2 p. m., 18th at 3 p. m., 20th at 3 p. m., 21st at 2 and 5 p. m., 23d at 2 and 4 p. m., and on the 24th at 3 p. m., but no spots seen at those hours. Mr. Wm. Dawson, of Spiceland, Ind., reports the following observations: 3d, 7th, 8th, 9th, 11th, 12th, 14th, 16th, 17th, 19th, 20th, 23d, 24th, 25th, no spots; 4th, three spots, one group, about half way from the center to north edge; 5th, four spots, one quite prominent; 10th, two spots, about 9′ from east edge; 27th, fourteen spots in one group, 4 quite prominent, near center of southeast quadrant; 29th, thirty spots, one group, 4 spots very prominent; 30th, thirty-seven spots in one large group, one spot large, part of group much compressed, one spot and large faculæ very near east edge of sun. Mr. David Trowbridge, Waterburg, N. Y., "observed the sun on the 5th, 6th, 7th, 8th, 9th, 10th, 13th, 14th, 15th, 16th, 17th, 19th, 20th, 22d, and 24th, no spots; 29th and 30th, a group of three toward the western margin; July 1, only two spots in the group." Mr. F. Hess reports "at Alamosa, Colo., observed sun's disc (through a glass with a power of 50) on June 2, 3, 4, 6, 7, 8, 9, and 10, and saw no spots; on the 5th at 6 a. m., distinctly saw small, perfectly round and intensely black spots about equidistant between upper and lower limb and about one-third the sun's diameter from the 2d (following) limb; at noon it had disappeared; on the 20th at the headwaters of Alamosa Creek, about 4 p. m., saw two large oblong spots near the northeastern limb; 27th, same place, morning, two groups, upper one composed of two large spots and lower one of three smaller spots; 28th, headwaters of San Juan, eight spots in two groups, and there seemed to be a number of others which his glass did not resolve into distinct spots; 30th, same place, morning, eight spots in two groups. Prof. Gustavus Hinrichs, "no sun spots were seen, but the sun was examined on 12 days only." Observations were made at Fort Whipple, Va., between 10 and 11 a. m., each day, but no spots seen.

NOTES AND EXTRACTS.

The following account of the cyclone at Mauritius, mentioned in the May review, is taken from La Nature of May 10: "The cyclone burst on the island (Reunion) during the night of March 20 to 21, with exceeding violence, which abated only during the forenoon of the 22d. The barometer at 12:30 p. m., March 21, had fallen to 727 millimeters (28.62 inches), one of the most marked depressions observed in a great number of years. On the morning of the 20th the mercury had already touched 750 millimeters (29.88 inches). * * * Thirty-five persons perished, buried under the ruins of their dwellings or drowned. Many were wounded. The greater part of the public buildings and private residences are more or less damaged." It further states that 21 ships, putting to sea at the instance of the captain of the port, were saved. Three vessels were dismantled or lost, but the crews were saved. Great damage was done to growing crops, roads, quays, &c. The cyclone raged with much less force at Mauritius than at Reunion.

[*From Nature, June* 12, 1879]

The Paris Academy of meteorological ascents has inaugurated the series of its ærial ascensions. The first took place at St. Mandes and the second at Arcueil on the occasion of opening the Ecole Laplace. The ascensionists propose to take photographs

from the car in order to ascertain the position of the balloons and make a verification of the laws of barometric height. The original idea of this difficult operation may be attributed to Laverrier. Each of the ascents will be followed by the publication of diagrams and scientific results obtained.

[*From the American Journal of Science and Arts, July*, 1879].

Prof. Elias Loomis, in his eleventh paper of "Contributions to Meteorology," gives the results of his study of the winds on the summit of Mount Washington compared with the winds near the level of the sea, and "abnormal storm paths," based upon the published records of the United States Signal Service. In the investigation of the first subject he "selected all those cases in which the direction of the wind on Mount Washington differed at least 90° from that at each of the stations, Burlington, Boston, and Portland, Me. The number of these cases was 507. Three-fifths of these occurred when the wind on Mount Washington was from W. or NW., and over four-fifths when it was from one of the points, N., NW., W. or SW. At the same time the wind at the low stations was generally from S., SE., E., or NE." As the table and details of this work were considered too voluminous for publication, he "adopted a different standard of selection, and took all those cases in which the barometer at Portland, Me., fell as low as 29.6 inches. The total number of these cases was 89," occurring from October, 1872, to March, 1877. "It is noticed that for several observations preceding the minimum pressure the surface winds generally were from S., SE., E., or NE. (assumed for convenience to be the east quarter), and that about the time of minimum pressure the wind changed to N., NW., W., or SW. (assumed for convenience to be the west quarter). On the summit of Mount Washington a similar change of wind is sometimes noticed, though not invariably. The average of the pressures of the center of those low areas in which the wind on Mount Washington changed to the east quarter was 29.47, and in which no such change occurred the average was 29.47. In a comparison of cases in which an area of low pressure passed over New England, when the barometer at Portland, Me., did not fall to 29.6 inches, it was found that during the continuation of seven-eighths of them the wind on Mount Washington did not at any time blow from the east quarter. He, therefore, thinks we are justified in inferring the following conclusions:

"1st. In a majority of those cases in which an area of low barometer passes over New England attended by the usual system of circulating winds at the surface stations, this system of circulating winds does not extend to the height of 6,000 feet.

"2d. When the depression of the barometer is unusually great, this system of circulating winds extends to the greatest height.

"3d. When, during the progress of an area of low pressure, a system of circulating winds reaches to the summit of Mount Washington, the change of wind to the east quarter usually begins at the surface stations eleven hours sooner than it does on the summit of that mountain; and the change back from the east to the west quarter usually begins at the base of the mountain five hours sooner than on the summit."

In the study of the second subject he selected those cases in which storm paths deviated most from the average course (easterly), and separated them into two classes, one containing those cases in which the direction was most northerly and the other those in which it was most southerly. On comparing these classes the following results are arrived at: In storms moving toward the north the average course was 20° east of north; the average depression below the mean at the center of low area was found to be 0.26 inch greater at the last than at the first observation; the average temperature on the north side of low area was 9°.5 below the mean and on the south side 14°.7 above; the average velocity of the south winds was 10 per cent. greater than that of the north winds; the average rain-fall in eight hours within the low areas was 6.89 inches. In storms moving toward the south the average depression at the last observation was somewhat less than at the first, and less than half what it was at an intermediate date; the average temperature on north side was 12° below the mean and on south side 17° above; the average velocity of the north winds was about double that of the south winds, and the average rain-fall was only 0.57 inch. In both classes the average humidity on the north side was nearly the same, but on the south side it was 88 per cent. in the former and 71 in the latter. He therefore considers that "the most remarkable circumstance which characterizes these two classes of storms is the difference in the rain-fall;" "that this appears to be the general characteristic of those storms which originate near the Gulf of Mexico," and that "the south wind is warm, moist, and pushes northward with great force." The principal object had in view was to determine, if possible, the reason why these storms pursued so unusual a path. In those moving northward the center of low pressure moved nearly toward the center of the rain area, and "this coincidence seems to favor the conclusion that in a great storm the condensation is an efficient cause which controls the movements of the winds;" but in those moving southward "the storm-center did not generally follow the rain areas, but moved away from it," and "in these cases the facts seem to show that the rain-fall exerted no appreciable influence upon the course of the storm or upon the

fall of the barometer." In several cases the sky was entirely cloudless at every station on the south side of the low area. "This evidence appears to me to show that heavy and extensive precipitation does not invariably precede the first formation of depression areas, and accompany their expansion, as has been claimed. These depression areas increased in intensity when the rain-fall was nearly zero, and while the sky on the south side was not generally overcast with clouds, but in several cases was almost entirely clear. In the United States depression areas do not generally begin with extensive precipitation, but the rain-fall is a concomitant after the system of circulating winds has become pretty well established. The depression of the barometer is the result of a system of circulating winds, and the most frequent cause producing such a system appears to be two or more areas of high pressure at a considerable distance (frequently 1,400 miles) from each other. Differences of temperature and of humidity are also important agents in producing and sustaining such a system of winds. When a system of circulating winds has been formed over a large extent of country, there almost invariably results a fall of rain; and if the rain-fall is abundant, and extends over a large area, it becomes a very important agent in modifying the direction and force of the winds. The principal question still remains undecided: Why did the storms in Table No. II pursue a course so nearly from south to north and those in Table No. III a course nearly from north to south? The average course of storm paths appears to be determined mainly by the average system of circulation of the atmosphere near the earth's surface, and occasional departures of storm paths from this average track appear to be mainly due to causes which render the general movement of the atmosphere at such times different from the average movement."

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ALBERT J. MYER,
Brigadier-General (Brevet Assigned), Chief Signal Officer, U. S. A.

PAPER 42.

List of boards of trade, chambers of commerce, and other organizations, apart from those directly connected with agriculture, which had, on June 30, 1879, appointed permanent committees to confer with the Chief Signal Officer of the Army.

Name of organization.	State.	Committee.
Chamber of Commerce	New York	Edward Hincken, F. B. Thurber, George W. Blunt, James S. T. Stranahan, James H. Frothingham.
Board of Trade, Buffalo	New York	A. Richmond, G. S. Hazard, J. H. Vought.
Board of Trade, Detroit	Michigan	Theodore P. Hall, James Flynn, A. G. Hibbard.
Board of Trade, Chicago	Illinois	C. H. Adams, Chas. Counselman, W. S. Crosby.
Produce Exchange, Toledo	Ohio	E. F. Browne, H. D. Walbridge, S. C. Reynolds.
Board of Trade, Boston	Massachusetts	N. Spooner, T. Gaffield, J. Cummings, E. H. Sampson, E. Howes.
Board of Trade, Milwaukee	Wisconsin	J. L. Hathaway, J. B. Merrill, E. M. Peck.
Chamber of Commerce, Duluth	Minnesota	Chas. F. Johnson, Dr. V. Smith, M. J. Forbes.
Board of Trade, Baltimore	Maryland	Andrew Reid, R. W. Cator.
Board of Trade, Cleveland	Ohio	R. K. Winslow, R. T. Lyon, J. C. Sage.
Chamber of Commerce, Charleston	South Carolina	E. H. Frost, W. P. Hall, F. W. Dawson.
Chamber of Commerce, Memphis	Tennessee	B. J. Semmes, T. H. Allen, W. P. Proudfit.
Board of Trade, Oswego	New York	J. L. McWhorter, A. H. Failing, W. R. Hosmer.
Committee appointed by mayor, Rochester.	New York	G. Schofield, J. Siddons, H. S. Hebard.
Board of Trade, Portland	Maine	C. H. Farley, M. H. Rich, Wm. Senter.
Board of Trade, Mobile	Alabama	Hon. P. Hamilton, T. Henry, esq., F. G. Bromberg.
Chamber of Commerce, Wilmington	North Carolina	A. H. Van Bokhelen, G Harriss, W. L. De Rossett.
Board of Trade, Indianapolis	Indiana	Hon. J. C. Fletcher, Samuel Kingan, H. C. Wilson.
Chamber of Commerce, Saint Paul	Minnesota	R. O. Sweeney, D. R. Breed, M. N. Kellog.
Merchants' Exchange, Saint Louis	Missouri	J. A. Scudder, R. M. Scruggs, T. G. Conant, G. L. Joy, Jos. Brown, G. H. Rea, J. W. King, D. R. Francis, J. W. Kauffman.
Board of Trade, Davenport	Iowa	J. M. Dalzel, F. W. Angell, C. E. Beiderbecke.
Board of Trade, La Crosse	Wisconsin	W. W. Jones, D. A. McDonald, David Austin.
Cotton Exchange, New Orleans	Louisiana	J. I. Noble, J. J. Stewart, J. Lorber.
Chamber of Commerce, New Haven	Connecticut	Hon. H. G. Lewis, J. T. Platt.

List of boards of trade, chambers of commerce, &c.—Continued.

Name of organization.	State.	Committee.
Chamber of Commerce, Cairo	Illinois	W. P. Halliday, P. Cuhl.
Board of Trade, Cincinnati	Ohio	D. B. Pierson, J. A. Scarlett, J. Dexter.
Board of Trade, Albany	New York	E. A. Durant, jr., J. H. Reynolds, C. B. Tillinghast.
Board of Trade, Dubuque	Iowa	Dr. A. Horr, J. S. Hetherington.
Meteorological Committee, Springfield.	Massachusetts	E. W. Bond, H. C. Lee, J. G. Benton, E. Ingersoll, S. D. Brooks, A. P. Stone.
Meteorological Committee, Newport	Rhode Island	S. C. Bailey, S. W. Macy, B. Finch, T. Cogeshall, L. P. Clarke, S. H. Norman, S. Powell.
Chamber of Commerce, Cincinnati	Ohio	W. S. Munson, A. Erkenbrecher, H. Goepper.
Board of Trade, Nashville	Tennessee	J. D. Plunkett.
Cotton Exchange, Savannah	Georgia	C. M. Holst, A. L. Hartridge, E. M. Green.
Cotton Exchange, Nashville	Tennessee	J. F. Wheeless.
Merchants' Club, Omaha	Nebraska	J. E. Boyd, G. H. Collins, O. H. Ballou, W. Stephens.
Chamber of Commerce, San Francisco.	California	J. W. Raymond, C. A. Low, W. W. Dodge.
Meteorological Committee, Jacksonville.	Florida	F. Jordan
Polytechnic Society of Kentucky, Louisville.	Kentucky	J. L. Smith, J. D. O'Leary, S. G. Stevens.
Meteorological Committee, Indianola	Texas	Dr. H. Rosencrans, W. P. Milby, H. J. Huck.
Cotton Exchange, Mobile	Alabama	W. H. Gardner, J. A. McCaw, A. Proskauer.
Merchants' Exchange, Baltimore	Maryland	W. G. Atkinson, W. G. Loud, O. M. Vesper.
Board of Trade, Omaha	Nebraska	T. Gibson, C. F. Goodman, D. S. Barriger.
Maritime Exchange, Philadelphia	Pennsylvania	E. K. Stevenson, J. S. Waln, G. W. Griffin.
Chamber of Commerce, Los Angeles	California	Dr. J. P. Widney, J. de Barth Shorb, I. W. Lord.
Meteorological Committee, Sandusky.	Ohio	J. O. Moss, R. B. Hubbard, C. N. Ryan.
Cotton Exchange, Norfolk	Virginia	W. H. Peters, G. L. Arps, H. S. Reynolds.
Chamber of Commerce, Astoria	Oregon	A. C. Kinney, C. L. Parker, J. H. Robb.
Committee appointed by mayor, New London.	Connecticut	James Fitch, E. A. Delaney, R. M. Waterman, Leonard Smith, C. W. Woodbridge, G. T. Marshall, H. S. Bartlett.
Coal, Iron, and Manufacturers' Association, Chattanooga.	Tennessee	E. M. Wight, W. P. Rathburn, J. T. Hill, B. Lowe.

PAPER 43.

Lake disasters for the year ending June 30, 1879.

JULY, 1878.

1.—Steamer Java was disabled in gale outside Chicago.
Schooner Delaware went ashore on Pilot Island; released; slightly damaged.
Schooner Nipper ran aground in Saint Clair River; released without damage.
Schooner Mary lost mainmast and schooner Ketcham maintopmast in gale on Lake Michigan.
Tow-barge Lathrop's mast was destroyed by lightning at Alpena.
3.—Steam-barge Fayette was damaged by fire at Michigan City; loss, $4,000.
5.—Schooner J. D. Sawyer was seriously damaged by fire at Chicago.
7.—Tug Ontario had upper works destroyed by fire on Lake Superior; loss, $1,000.
Tug Queen was slightly damaged by fire at Oconto.
14.—Schooner Jessie McDonald suffered slight damage by fire at Kingston.
16.—Steamer Clara, in ordinary at Windsor, sunk; raised.
Barge Paragon sunk while lying in Bear Creek, near Dresden; total loss; value, $1,000.
17.—Schooner Pauline, lumber, sprung a leak on Lake Michigan.
Schooner Topsy lost jib-boom in a gale on Lake Michigan.
Steamer Armstrong was slightly damaged by fire at Ogdensburg.
Schooner Annie Mulvey, coal, sprung a leak on Lake Erie.
19.—Schooner Penokee sprung a leak in the Welland Canal.
Steam-barge Anna Smith was slightly damaged by fire at Detroit.
Tug Collingwood was destroyed by fire five miles from Byng Inlet; value, $8,000.
20.—Yacht Ina capsized in a squall on Milwaukee Bay; one man lost.
Schooner Walhalla had mainsail split in a squall on Lake Michigan.
Schooner G. Sherman was leaking badly in the Sault Ste. Marie.
Schooner Little Belle lost jib-boom in gale on Lake Michigan.
Steam-barge Robertson struck a rock in Byng Inlet and sunk in ten feet of water; total loss; value, $18,000.
Scow Monitor lost foremast in gale on Lake Michigan.

21.—Schooner Persia lost main-boom in gale on Lake Michigan.
In a gale on Lake Erie J. G. McGrath lost mainmast; schooners John S. Mott, Bailey, Corsican, and Sasco lost canvas.
21.—Propeller Delaware ran aground at Milwaukee; released without damage.
Schooner North Star had mainmast split in a gale on Lake Michigan.
Schooner B. W. Folger lost staysail and had mainsail badly split in gale on Lake Ontario.
Schooner Mountaineer went ashore in a gale at Port Elgin, Ont.; total loss; value $1,500.
Schooner Mary Gormley had mainsail split in gale on Lake Ontario.
Tug Castle lost one of the cribs of a raft in gale on Lake Saint Clair.
Schooner C. H. Johnson ran aground at Racine; released without damage.
Steam-barge Nahant ran aground at Milwaukee; released without damage.
Schooner Comanche ran aground in Detroit River; released without damage.
Barge Scotia, lumber, water-logged in Lake Huron; lost 20,000 feet of lumber.
Schooner W. R. Taylor, lumber, put into Port Colborne leaking.
Tug Effie L. was slightly damaged while towing a vessel at Cleveland.
22.—Propeller Lawrence became disabled in machinery on Lake Michigan.
Schooner A. S. Morey sprung a leak on Lake Erie.
Propeller Plymouth struck bottom in Saint Clair River, causing slight leak.
Schooner Mary Battle, lumber, went ashore on Pêche Island; released without damage.
Yacht Qui Vive went ashore at Hyde Park; released, leaking.
23.—Schooner Jennie Mueller sprung a leak on Lake Michigan.
Schooner Maria Martin, coal, sprung a leak on Lake Erie.
Schooner Perry Hannah sprung a leak on Lake Michigan.
Canal-boat H. R. Preston, laden with ashes, foundered near Oswego. The Morning Star, Evening Star, and Rising Star, in the same tow, were brought into port leaking.
24.—Barge George D. Russell, coal, put into Detroit leaking.
Schooner James C. King passed Detroit with maintopmast gone.
25.—Yawl of schooner Jesse Hoyt swamped in river at Milwaukee.
Steamer Emerald sprung a leak at Detroit.
Schooners Peoria and American arrived at Chicago leaking.
Steam-barge S. W. Snook became disabled in machinery on Lake Michigan.
26.—Schooner Australia arrived at Milwaukee, leaking.
Schooner Pilgrim arrived at Chicago, leaking.
Schooner Portage, coal, foundered outside Toledo; total loss; value, $3,000.
Schooner Henry Rooney lost jib-boom by striking against a building at Toledo.
Steamer Menomonee went ashore between Bois Blanc and Round Islands; released without damage.
Schooner Northumberland, grounded on Point Abino, Lake Erie; released; leaking; center-board damaged.
27.—Schooner Huron sprung a leak and lost some canvas in gale on Lake Erie.
Schooner Gracie M. Filer lost foregaff in a blow on Lake Michigan.
Tug William Scott sunk while lying in ordinary at Detroit; raised.
Schooner New Dominion missed stays and went on the rocks opposite Sun Rock light; released with 3,000 bushels lost.
29.—Schooner Timothy Baker was slightly damaged by fire at Toledo.
Schooner Reed Case, in tow, ran aground in Saint Clair River; released without damage.
30.—Schooner C. G. Breed laden with cinders, was aground at Cleveland; released; leaking.
31.—Steamer Champlain ran aground at Grassy Island; released without damage.
Steamer C. J. Magill was slightly damaged by fire at Cleveland.

AUGUST, 1878.

3.—Schooner Davidson went ashore at Mackinaw City; released without damage.
4.—Schooner Lyman Casey put into Port Colborne with some spars and canvas gone.
Schooner Hattie Howard broke from her moorings in blow, at Toronto, and carried away topsail-yard of schooner Craftsman.
5.—Barges Argonaut and Russell ran aground at Chicago; cleared without damage.
6.—Tug O. B. Green was slightly damaged by fire at Chicago.
Schooners C. A. King, James Platt, and Stockbridge were damaged in canvas in gale on Lake Michigan.
Propeller Arabia became disabled in machinery off Point Aux Barques.
7.—Tug Welcome sprung a leak at Milwaukee.
8.—Steam-barge Petrowville, laden with coal, sunk at Henderson; raised.
Schooner George H. Wand sprung a leak and lost canvas and gaff in a squall on Lake Michigan.

8.—Schooner Glen Cuyler was struck by a squall and capsized off Ellison Bay; a sailor named Berry Larson was drowned; schooner righted.
Schooner J. A. Travis dragged her anchors in a gale at Ellison Bay, and went ashore; released.
Schooner Gallatin, coal, put into Oswego with spars and canvas gone.
Schooner Kate Kelley had mainsail split in gale on Lake Ontario.
Yacht Franklin was dismasted in a gale on Lake Michigan.
9.—Propeller Dean Richmond ran into and damaged seriously barges Noquebay and Advance at Chicago.
The catamaran Girofle-Girofla was found ashore and water-logged at Sodus Point; released.
A fishing-boat containing two men capsized in gale near Mackinaw; men rescued.
10.—Scow Monitor sprung a leak and water-logged on Lake Michigan.
11.—Schooner Mont Blanc, corn, put into Detroit leaking.
13.—Propellor Colorado ran ashore near Cheboygan; released without damage.
Steamer City of Concord was disabled in machinery near Duncan City.
Schooner Mantenee sprung a bad leak in a gale, near Manitowoc.
Steam-barge Mayflower sprung a leak from striking a sunken pile near Monroe and sunk; raised.
Schooner Donaldson was struck by lightning at Manitowoc and slightly damaged.
14.—Schooner El Tempo lost jib in a squall on Lake Michigan.
Schooners R. B. Hayes, M. E. Tremble, and Naiad ran aground at entrance of Racine Harbor; released.
Scow Magdalena was driven ashore in a gale off South Haven; released.
15.—Tug J. H. Martin was damaged slightly by fire at Port Huron.
Schooner Starling, coal, ran ashore at Weller's Bay, west of Presque Isle; released.
Schooner Australian lost main gaff and had canvas damaged in gale on Lake Michigan.
16.—During storm at Detroit the schooner Brooklyn broke adrift and collided with steamer City of Detroit; both slightly damaged.
Schooner Fleetwing had foretopmast head destroyed by lightning at Cleveland.
Schooner S. B. Conklin lost mainsail in a gale on Lake Erie.
18.—Propeller Java sprung a leak caused by breaking of shaft near the wheel and sunk off Point Au Sable, Lake Michigan; total loss; value, $100,000.
Steamer Grace Grummond was disabled by breaking shaft in Detroit River.
19.—Schooner Arcturus lost canvas and had foretopmast broken in a squall on Lake Michigan.
Schooner Mears, coal, put into Chicago leaking.
Schooner Reed Case, ore, sprung a leak on Lake Erie.
20.—Tug Ransom was disabled in machinery at Chicago.
Schooner City of Manitowoc went ashore at Ellis Bay, Anticosti; released, leaking badly.
Propeller Oscar Townsend, ore, put into Cleveland with a broken shaft.
Schooner Morning Star was damaged $800 by fire at South Bay City.
Steamer Dunlap was disabled in machinery at Alpena.
21.—Schooners George L. Wren and Maggie Dall reported leaking at Chicago.
22.—Schooner Orkney Lass put into Milwaukee leaking.
Tug Shields was disabled in machinery at Chicago.
Propeller Annie Young was slightly damaged by fire at Buffalo.
23.—Propeller Annie Laurie was disabled by breaking of rudder on Lake Michigan.
24.—Schooner Lincoln Dall lost foretopmast and canvas in a gale on Lake Michigan.
Schooner Winne Wing had canvass damaged in a gale on Lake Michigan.
Steam-barge Lincoln, grain, was disabled in machinery off Kenosha.
Schooner Alice Richards lost some canvas in a gale on Lake Michigan.
Schooner Holmes lost davits and yawl crushed in a gale on Lake Michigan.
Schooner Niagara put into Chicago with canvas gone; lost in a gale on Lake Michigan.
Schooner Norman, lumber, sprung a leak in a gale on Lake Michigan.
On account of breaking of tow-line two scows in tow outside Chicago were driven ashore and went to pieces.
Schooner Grace Murray was slightly damaged by collision with an unknown schooner off Sheboygan. The cook, Nicholas Diegels, was knocked overboard and drowned.
Schooner Sweetheart and barge City of Grand Haven were slightly damaged by collision on Lake Michigan.
Schooner Hammond lost mainsail and had other canvas damaged in gale on Lake Michigan.
Schooner Surprise was blown aground near Saint Clair Flats; released.
Schooner Reindeer lost fore and main sails and schooner Havana foretopmast in gale on Lake Michigan.

25.—Propeller Scotia, salt and chemicals, put into Milwaukee leaking.
Scow A. M. Freeman ran ashore in trying to enter Black River Harbor; total loss.
Schooner S. P. Ely had main-boom broken and canvas damaged, and schooners Ella Norton and Cyprian lost canvas in gale on Lake Erie.
Barge Pelican, which broke adrift from steam-barge Egyptian, was found leaking off Point Au Sable.
26.—Propeller Trader had standing rigging and forestay destroyed by fire, caught from smokestack.
27.—Tug H. B. Minton ran aground on Green Island Shoals in thick weather; released.
28.—Schooner Minnehaha reported at Manitowoc with fore and main masts destroyed by lightning.
Barge German sprung a leak in a squall off Alpena, and lost portion of deck-load of telegraph poles.
Schooner Clipper City put into Chicago, leaking, with canvas gone and broken jib-boom.
Schooner Geo. H. Warmington ran aground on a reef in Lake Huron; released.
29.—Schooner Alida J. Rogers, oats, went ashore on Waugoshance Island; released.
31.—Schooner Glenifer put into Milwaukee with broken center-board.
Steamer Marine City ran ashore on Detour Reef; released.

SEPTEMBER, 1878.

2.—Steamer John A. Dix was partially destroyed by fire at Milwaukee; loss, $5,000.
Tug Mystic sank at her dock at Windsor; raised.
Scow Saunders water-logged off Lexington, Mich.
Scow Wake-up, lumber, was driven ashore in gale off Port Hope; total loss; value, $1,000.
Scow-brig J. M. Hill had foremast damaged by lightning at Manistee.
3.—Yacht Carv capsized near Saint Joseph, Mich., and drifted ashore; released.
Schooner J. P. Ward, lumber, sprung a leak and sank off Little Au Sable; recovered with masts gone and otherwise damaged.
4.—Propeller Saint Albans ran ashore on Light House Point, Cheboygan; released.
Steamer Joseph L. Hurd ran ashore on Bois Blanc Island; released.
5.—Steam-barge N. Mills, lumber, became disabled in machinery off Long Point.
Tug Okoura was destroyed by fire at Wiarton Dock; value, $2,500.
7.—Propeller City of Traverse ran ashore near South Harbor Pier, Chicago; released.
The cabin of schooner M. L. Breck was destroyed by fire at Toledo.
Steam-barge L. Gilbert sprung a leak while unloading, during a gale at Sauble Lake Huron.
8.—Schooners H. W. Sage and Imperial, in tow, were run aground off Pêche Island; released.
Schooner David Sharpe, laden with railroad ties, capsized off Grand River; rescued.
Scow Waubousie sprung a leak at Port Huron.
9.—Schooner H. B. Rathburn sprung a leak and was driven ashore at Port Burwell, Ont.; total loss; value, $2,800.
Schooner Emma A. Nicholson arrived in Detroit with fore and main masts gone; lost in gale on Lake Erie.
Tug City of Alpena was disabled by loss of rudder at Oscoda.
Schooner Mary B. Hale, corn, ran aground near Alpena; released.
Schooner Mary, cordwood, sprung a leak and capsized on the east side of Lake Michigan in a gale.
Steamer Sheboygan was disabled by breaking of one of the pins of the walking-beam, off Racine.
Schooner Mount Blanc arrived at Chicago with loss of canvas and spars.
Schooner Athenian lost jib-boom in a gale on Lake Michigan.
Schooner Maggie, tan-bark, went ashore at Port Frank, near the Chantry Islands; total loss; value, $900.
Tug Edwin Eddy was damaged by fire at Detroit.
12.—Schooner Mary Anne, wood, sprung a leak in a gale, outside Chicago.
Schooner Starling went ashore at Vermillion during severe gale; released; badly damaged.
Barges Genesee Chief, Almeda, Lathrop, and Lightguard, lumber, broke adrift from steam-barge East Saginaw in a gale on Lake Huron; the Lathrop water-logged and the Lightguard went ashore; all recovered in badly damaged condition.
Schooner Mary Alice was driven ashore in a gale, at Pike's Creek; released.
Scow Champion went ashore at Pike's Creek; released.
The scows Fearnaught and Johanna went ashore near Belle River; released.

13.—Schooner Gallatin was badly damaged by being struck by one of the cribs of the Port Dalhousie waste-weir, which gave way in a severe storm.
Steam-barge Pearl was struck by barge Tempest and breaking from her fastening went ashore in a severe storm at Painesville, Ohio; released.
Schooner Geo. H. Wand went ashore in a gale at Sand Beach; total loss; value, $7,500.
Schooner Maggie Thompson arrived at Milwaukee with broken center-board.
Steam-barge Egyptian arrived at Milwaukee with a broken main-gaff.
Schooner Norman lost anchor and chain and mizzen-sail in a gale on Lake Huron.
Schooner Hibernia, lumber, capsized in a gale in Kingston Harbor.
Schooner Saint Andrew went ashore in a gale at Ashtabula, Ohio; released.
14.—Barge Northerner and schooner Richard Winslow ran aground at Chicago; released.
Schooner Wm. Jones, lumber, was towed into Grand Haven leaking.
Schooner M. R. Goffe sank in Saint Clair River; raised.
Schooner Canadian, wheat, went ashore on Nine Mile Point, Lake Ontario. leased.
Schooner E. P. Dorr, coal, went ashore near Charlotte, N. Y.; released.
Schooners Saveland, J. I. Case, and Porter lost portions of canvas and spars in a gale on Lake Michigan.
Schooner York State was swept from her moorings by a freshet and driven ashore at Ashtabula, Ohio.
15.—Schooner John Bean, jr., put into Milwaukee with mainmast gone.
Schooner Cuba put into Sheboygan leaking, with foremast and canvas gone.
16.—Steamer Heath became disabled in her machinery at Saugatuck.
Propellor Canisteo sprung a leak at Cleveland, caused by striking against a pier.
Schooner D. Provost arrived at Cleveland with portion of canvas gone.
Barge Sunshine sprung a leak in a gale near Tawas, Mich.
Schooner H. T. Kent lost jib-boom by being towed against a bridge at Chicago.
19.—Schooner S. B. Pomeroy was towed into Cheboygan leaking badly.
Schooner S. J. Roeder, shingles, arrived at Sheboygan leaking badly.
Schooner U. S. Grant went ashore near Pent Water, Mich.; total wreck; value, $2,500. The mate, Christian Hansen, and a seaman, Frederick Lawson, were drowned.
Schooner Gypsey had mainmast splintered by lightning at Montague, Mich.
20.—Schooner David Vance arrived at Milwaukee with foretopmast sprung, and schooner Maria Martin with mainsail split.
Schooners Bessie Boalt, Mystic, D. R. Martin, Adriatic, M. E. Packard, Sardinia, Geo. L. Seaver, O. R. Johnson, and Maggie Thompson, all lumber laden, lost portions of their canvas in gale on Lake Michigan.
Schooner Dobbins arrived at Port Huron with square sails gone and the remainder damaged.
Schooner Mary Ludwig went ashore near Racine; released.
Schooner Marion W. Page lost gaff and yard and had canvas torn in a gale on Lake Erie.
Schooner Otonobee lost mainsail in a gale on Lake Huron.
Schooner G. W. Perry lost foremast in gale on Lake Huron.
Schooner Picton lost topmasts, gaff topsails, jib-boom, and had canvas damaged in a squall on Lake Erie.
Schooner Bessie Barwick ran aground near mouth of Belle River; released.
21.—Schooner Clayton Belle arrived at Chicago with jib-boom gone and rudder disabled.
Schooner Charlotte Roab had foremast and foretopmast splintered by lightning near Milwaukee.
Steam-barge Saginaw was disabled by breaking shaft on Lake Erie.
Tug Gem was damaged by fire at Cleveland; loss, $500.
22.—Schooner Henry Folger sprung a leak on Lake Michigan.
Schooner Elgin, wheat, lost bowsprit and jib-boom in a gale on Lake Michigan.
23.—Propeller City of Montreal, sundries, went ashore on Presque Isle; released, damaged.
Steamer Huron went ashore between Escanaba and Fayette; released, slightly damaged.
24.—Schooner Jas. G. Mastin was seen anchored off Amsterdam with fore and main masts gone.
Scow J. B. Prince, wood, sprung a leak and lost fore and main sails in a gale near North Bay.
Schooner Metropolis reported at North Bay leaking, with portion of canvas gone.
Schooner Eagle Wing broke center-board crossing Saginaw Bay.
Schooner Sailor Boy put into Detroit with foresail gone.

24.—Schooner Fleetwing ran aground on a reef in Platte Bay, Lake Michigan; released.
Schooner Gifford was damaged by fire at Cleveland; loss, $300.
Steam-barge Fred. Kelly and consort, Warner, each lost foresail, and the Warner sprung a leak in a gale on Lake Huron.
Tug Hector was disabled in machinery at Detroit.
25.—Schooner S. Bates parted cables at Sheboygan and was damaged by drifting against pier.
Schooner Maid of the Mist went ashore at Nine Mile Point; total wreck; value, $1,000.
Schooner Franklin went ashore in a gale near Ahnapee, Wis.; released.
Schooner Erastus Corning lost all canvas in a gale off Manitowoc, Wis.
Schooner Jane Bell put into Two Rivers, Wis., with canvas damaged.
Steam-barge S. C. Baldwin lost foremast in gale on Lake Michigan.
Schooner Eliza Day lost small boat and portion of canvas in gale on Lake Michigan.
Scow E. K. Kane, brick, went ashore at Harrisville, on Lake Huron; total wreck; value, $1,000.
Schooner Sea Bird, bark, went ashore at Austin Reef, during severe gale; released.
Schooner Algerine lost some canvas and sprung a leak in a gale on Lake Huron.
26.—Barge Jessie Linn ran aground at Chicago; released, leaking.
Schooner John Burt arrived at Milwaukee with foremast and portion of canvas gone.
Schooner Kingfisher lost canvas in a gale on Lake Michigan.
Schooner Buena Vista was brought into Milwaukee leaking, with foresail, jibs, and main-boom gone.
Schooner Trial put into Milwaukee leaking.
Schooner William Aldrich lost small-boat in a gale on Lake Michigan.
Schooner H. Rand had center-board broken in a gale on Lake Michigan.
Schooner T. S. Skinner was towed into White Lake, Mich., with both masts gone.
Schooner Three Belles lost portion of canvas in a gale on Lake Michigan.
The steam-barge Alaska had mast damaged by lightning on Lake Michigan.
Schooner J. W. Hutchinson went ashore in a gale at the South Manitou; released leaking badly.
Schooner Collingwood lost mainmast in a gale on Lake Michigan.
Schooner Driver lost greater portion of canvas in a gale on Lake Michigan.
27.—Schooner M. E. Tremble was picked up on Lake Michigan leaking badly and damaged in canvas and spars.
Schooner Belle Laurie put into Ahnapee with topmasts and portion of canvas gone.
Schooners Laura Bell, Pride of Sheboygan, and Walhalla put into Milwaukee badly damaged in canvas.
Schooner Slaike lost fore-boom in gale on Lake Michigan.
Schooner Annie Torrince put into Sheboygan leaking.
Tug American Eagle was disabled at Chicago by breaking shaft.
Steamer Milton D. Ward was disabled at Detroit by broken shaft.
A fishing-boat sunk in gale off Two Rivers, Wisconsin.
Schooner John Minor put into Port Huron leaking badly, with foresail gone.
Schooner Hunter sunk at dock, South Frankfort, Michigan; raised.
Barge McGruder sprung a leak and water-logged by striking an old wreck near Belle Isle, Detroit River.
28.—Schooner Stronach damaged schooner Transit by collision on Lake Huron.
29.—Tugs Monitor and Ewing were disabled in machinery on Lake Michigan.
Schooner Geo. St. Adams, wheat, ran aground near Turtle Light; released.
30.—Schooner Athenian passed Port Huron with mainsail gone.
Schooner Edward Blake broke center-board on Lake Erie.

OCTOBER, 1878.

1.—Schooner Oliver Clulver, lumber, went ashore near Kenosha; released.
Schooner H. B. Moore, lost jib-boom by collision at Chicago.
Propeller Portage struck against and crushed small-boat of schooner Watertown at Chicago.
Schooner D. E. Bailey lost jib-boom by fouling with schooner H. C. Richards at Chicago.
Propeller B. W. Blanchard collided with scow Mary Garrett near Harson's Island, knocking out mainmast and causing her to sink; propeller ran aground; both rescued.
3.—Schooners Guido Pfister and Sheboygan each lost a jib on Lake Michigan.
Schooner America put into Chicago with broken center-board.
Steam-barge Manitoba had shaft damaged and wheel broken by striking a sunken wreck in Bear Creek.

4.—Schooner San Jacinto, grain, was dismasted near head of Lake Michigan during gale.

5.—Schooner Carlingford put into Chicago with loss of foregaff and portion of canvas.
Schooner A. A. Moss arrived at Detroit leaking badly.

6.—Schooner W. Bates capsized and went ashore near Holland, Mich.; total wreck; value, $1,000.
Schooner Canadian, stone, sprung a leak and sank in Lake Ontario; released.

7.—Ferry-boat Agnes broke down and went ashore at Muskegon, Mich.; released, slightly damaged.
Propeller Cleveland put into Erie disabled in machinery.
Propeller Scotia ran aground near mouth of river at Bay City after taking on cargo.
Barge Kean sprung a leak at Bay City after taking on cargo.

8.—Schooner Gypsey, wood, put into Milwaukee leaking badly.
Schooner E. L. Coyne, coal, lost greatest portion of canvas in a gale on Lake Huron.
Schooner Skylark broke center-board outside Chicago.
Schooner N. W. Grant went ashore in a gale at Oswego; released.
Schooner S. A. Wood went ashore in a gale at Cleveland.
Schooner Floretta sprung a leak in the Welland Canal.
Steamer Dove was disabled at Bay City by breaking shaft.

9.—Schooner Hungarian lost foresail and two jibs in gale on Lake Michigan. Schooner Allegan lost nearly all canvas in same gale.
Schooner Tempest went ashore in trying to enter harbor at South Haven in a severe gale; total loss; value, $3,500.
Schooner Manzanilla put into Port Colborne with nearly all sails gone.
Schooner J. S. Miner, lumber, went ashore in a gale near old Presque Isle light; total loss; value, $900.
Schooners Fayette Brown, Hattie Johnson, and J. R. Bentley were damaged in canvas and schooner John Burt had bulwarks carried away in a gale on Lake Huron.
Schooner D. P. Dobbin lost jib-boom in a gale near South Manitou.
Propeller Russia lost foretop-mast in a gale on Lake Erie.
Schooner Nellie King lost foremast in gale on Lake Erie. Propeller Jay Gould had bulwarks damaged, and steam-barge S. E. Sheldon lost mainsail in same gale.
Propeller Lake Breeze was damaged by collision with dock at Texas Landing.
Schooner W. W. Grant went ashore in gale at Oswego; released.
Barge Frempe went ashore near Whitefish Point, Lake Superior; released.

10.—Schooner Spry put into Milwaukee with mainmast sprung.
Tug Crusader was destroyed by fire near Cheboygan, Mich.; value, $5,800.
Schooner C. L. Johnston had mainmast damaged and lost foresail near Grand Haven.
Schooner Bolivia lost jib-boom and schooner H. G. Cleveland mainsail in squall on Lake Michigan.

11.—Schooner Alice M. Beers went ashore at Grand River, Lake Michigan; released.
Tugs Johnson and John Gregory were disabled in machinery at Chicago.
Schooner Arendal arrived at Milwaukee with center-board gone.
Schooner Montgomery arrived at Detroit, leaking; barge C. O. D., lumber, sprang a leak and water-logged and lost foremast, while being towed near Grand Haven, in a gale. Barges Irish and Rapids, in the same tow, were disabled from loss of canvas.
Schooner Theo. Voges ran aground near Sugar Island, Lake Huron.
Schooner C. L. Johnson put into Grand Haven with foresail gone and mainsail split.
Propeller Juniata and steam-barges Ketcham, Wetmore, and Brunette grounded at Chicago; released.
Schooner Kate Richmond went ashore near Ashtabula; released; leaking badly.

12.—Schooner Mary McVey went ashore on one of the Manitou Islands; total loss; value, $9,000.
Propeller Jay Cook was disabled in machinery in Detroit River.
Schooner Ontario, lumber; sprung a bad leak at Alpena.
Schooner Speed arrived at Milwaukee, leaking badly.
Schooner Lookout lost jib-boom by collision at Chicago.
Schooner Nellie Hunter arrived at Kingston with foremast gone.
Propeller Olean was disabled by breaking wheel on a sunken wreck in Niagara River.
Tug W. A. Moore was disabled by breaking crank-pin in Saint Clair River.
Scow Flora went ashore in gale at South Haven, Michigan; total loss; value, $1,000.

13.—Schooner H. G. Cleveland had foresail split in gale near Straits of Mackinaw.
14.—Propeller Badger State went ashore near Mackinaw City; released.
Barge D. K. Clint arrived at Cleveland with fore and main masts gone.
15.—Tug Brockway was disabled in machinery in Detroit River.
Schooner Alice B. Norris lost a jib and foresail split in gale on Lake Michigan.
Tow-barge Brunette, ore, ran aground in a gale near Bois Blanc Island; released.
Schooner Monticello lost foremast and canvas in a gale on Lake Michigan.
Schooner Elvina, salt, sprung a leak, lost fore rigging and had mainsail split in gale on Lake Michigan.
16.—Schooner J. P. Ward was run ashore near Muskegon to prevent her from sinking; leaking badly; released.
Tug Fred and Will was destroyed by fire on Lake Superior; value, $2,500.
17.—Schooners Cortes and Bolivia each lost jib-boom in gale on Lake Michigan.
Schooner Emma C. Hutchinson was disabled on Lake Michigan by damage to rudder-stock.
Arrived at Chicago damaged: scow Two Fannies, mizzen-topmast gone and jib-topsail split; schooner Mystic, foretop-mast and foretop-mast head gone; schooner E. J. McVey, main gaff broken and canvas damaged; schooners Lavinda and W. H. Dunham, canvas damaged; schooner Emeline, canvas damaged and center-board gone.
Steam-barge V. Swain, passed Detroit with foremast broken.
Schooner J. I. Case, arrived at Marine City with broken center-board.
18.—Propeller Russian arrived at Milwaukee with foremast gone.
Schooner Lizzie A. Law, salt, ran aground at Bay City; released.
19.—Arrived at Chicago: Schooner Groton, mainsail gone; schooner F. B. Stockbridge, foregaff broken and jib split; schooner Charlotte Raab, jib-boom and staysail gone; schooner John Bean, jr., mainsail gone; schooner J. G. Worts, lost 100,000 feet of lumber; schooner Queen City, lost two jibs.
Propeller Cuba ran aground at Bay City; released.
Schooner Hannah Butler arrived at Oswego with loss of main and stay-sail booms, three jibs, small boat, and davits.
Schooner Mary Jarecki lost foretop-mast and foretop-mast head in gale on Lake Huron.
Schooner Julia went ashore near Charlotte in gale.
20.—Steam-barge Interocean became disabled in machinery at Cleveland.
Steam-barge East Saginaw was disabled by breaking shaft on Lake Huron.
Scow Two Katies water-logged and went ashore at Bailey's Harbor; total loss; value, $1,500.
Scow H. Young sprung a leak in Lake Erie.
Propeller John Pridgeon, jr., and schooner Annie N. Peterson ran aground at Chicago; released.
Schooner Vanderbilt, lumber, sprung a leak on Lake Michigan.
Scow Louisa arrived at Detroit with portion of canvas gone.
21.—Transfer steamer Great Western was disabled in machinery at Detroit.
Schooner Lake Forest broke anchor-stock and tow-post at Chicago.
Scow Hunting Boy went ashore near Sturgeon Bay; total loss; value, $1,500.
Schooner Coral went ashore near White Lake; released.
22.—Steamer Evening Star was disabled in machinery at Port Huron.
Tug Hector was damaged slightly by fire at Bay City.
Schooner H. G. Cleveland, salt, leaking badly at Mackinaw City.
Steam-barge D. N. Rust and consort, H. R. Newcomb, ran aground at Cleveland; released.
Schooner Ida H. Keith sprung a serious leak near South Manitou.
Tug Fanny Tuthill was disabled in machinery entering Cleveland Harbor.
23.—Schooner Algerine, iron-ore, went ashore at Springfield, Pa.; total loss; value, $7,000.
Schooner Sligo went ashore at Saint Helena Island; released.
Propeller Oakland went ashore at Ashtabula; released.
Propeller Alaska broke bilge-pump at Mackinaw City.
Steamer J. C. Clark went ashore at Sombriei, Canada; released.
Schooner Star, wheat, went ashore at Mill Point, Lake Erie; total loss; value, $10,000.
24.—Schooner William Lewis, laid up at Buffalo, sprung a leak and sank; raised.
Steam-barge S. C. Baldwin struck a reef off Whitefish Point, causing a leak.
Schooner Typo went ashore near Eagle Harbor; released.
25.—Schooner Montauk, oats, put into Goderich leaking; schooner E. C. Hutchinson, coal, put into Chicago, leaking badly.
Schooner Otter lost jib-boom, bowsprit, and head-gear by collision outside Chicago.
Schooner R. B. Hayes went ashore at Mackinaw Point; released.

25.—Schooner Ida H. Keith ran aground at Michigan City; released.
Schooner Josephine broke center-board and schooner David Stewart had mizzen-mast sprung in a gale on Lake Erie.
26.—Tug Stevens was destroyed by fire at Ludington; loss, $1,000.
Bark S. B. Pomeroy was disabled off Monostique by loss of rudder.
Steamer Dover sprung a bad leak off Manitowoc.
Propeller Pacific went ashore on Cockburn Island; released, seriously damaged.
27.—A scow, in tow, sunk at Michigan City; raised.
Propeller Conestoga ran ashore on Herson's Island; released.
Steam-barge Oscoda ran aground on Grassy Island; released.
Barge N. M. Standart water-logged and lost rudder and canvas in a gale on Lake Huron.
Schooner Victor, coal, sprung a serious leak on Lake Erie.
Schooner Lilly Hamilton lost anchor and chain, topsail and jib, in gale on Lake Michigan.
Tug Hi Smith, with lighter, went ashore on Tecumseh Reef, Lake Erie, in a gale; total loss; value, $4,000.
Schooner M. C. Cameron went ashore in a gale near Goderich; released.
Schooner Red, White, and Blue lost two jibs and had mainsail split, and scow Iasco lost square-sail in gale on Lake Michigan.
Steam-barge Huron City disabled in machinery and sprung a leak in gale on Lake Erie.
Schooner Northumberland lost foresail, and schooner Mary small-boat and davits, in gale on Lake Erie.
28.—Schooner J. G. McGrath, stone, sprung a leak and sunk twenty miles above Dunkirk; total loss; value, $5,000.
Schooners Presto, Persia, and H. B. Moore went ashore near Grand Haven in a gale; released, seriously damaged.
Schooner Sea Bird arrived at Grand Haven leaking badly; jib-boom and foresail gone.
Steam-barge Jacques Cartier went ashore in gale above Goderich; total loss; value, $2,500.
Scow Faith went ashore in a gale near Point Farm, Lake Huron; total loss; value, $1,000.
Propeller St. Louis broke cylinder near Cleveland.
Schooner Hattie Wells lost foreboom, Bay State foreboom and foresail, and David Vance all canvas, in gale on Lake Erie.
Schooner Gosshawk put into Buffalo with nearly all canvas gone.
Steamer Winslow disabled in machinery on Lake Superior.
Schooner Magic went ashore in gale at Pent Water; total loss; value, $1,000.
29.—Barge Rebecca, stone, sprung a leak and sunk in Saginaw Bay; value, $1,000.
Schooner Geo. Wescott went ashore near Grand Haven; released.
Steamer Geo. L. Dunlop broke rudder-post near Bay City.
Barge Erie went ashore in gale at Hamburg; total loss; value, $4,500.
30.—Propeller Quebec went ashore on Magnetic Shoals, near mouth of Sault River; released.
Schooner Penokee, coal, sprung a leak at Saint Helena.
Schooner Otonabee lost fore and stay sails in gale on Lake Huron.
Schooner S. C. Leighton, coal, went ashore at Point Abino, Lake Erie; released.
Propeller Alpena was disabled by damage to boiler in a gale on Lake Huron.
Schooner Wabash lost mainboom in gale on Lake Erie.
Barge Sault St. Marie went ashore east of Grand Marias; released, badly damaged.
Schooner Norman lost foretop-mast in a squall on Manitowoc Bay.
Schooner Correspondent sprung a leak entering Dunkirk harbor and sunk; total loss; value, $7,000.
Barge Isabella went ashore on Put-in-Bay Island in gale; total loss; value, $1,000.
Tugs E. M. Peck and Mystic were driven ashore on Cockburn Island; released, damaged.
31.—Schooner Brightie arrived at Milwaukee with foregaff broken and foresail torn.
Tow-barge C. G. Meisel, lumber, broke towline and water-logged in gale on Saginaw Bay.
Schooner Asa Childs went ashore during gale, at Muskegon; released.
Schooners Oliver Mowatt, Lady Dufferin, and Wabash each lost an anchor and were damaged in spars and canvas in gale on Lake Erie.
Schooner City of Montreal lost mainmast and pilot-house in gale on Lake Michigan.

NOVEMBER, 1878.

1.—Barge J. H. Rutter went ashore in gale at Cheboygan; released, very much broken up; cargo of 4,600 bushels corn and 1,900 bushels rye lost.

1.—Tow-barge McGilvery was brought into Port Huron water-logged.
Schooner Comanche put into Detroit with foresail gone and bulwarks damaged.
Schooner T. H. Howland arrived at Milwaukee with bulwarks nearly all gone.
Schooner Woodruff went ashore at Whitehall in gale; total loss; value, $1,500. William Phillips, second mate, and William Dunne, sailor, were drowned.
Schooner Graham Bros. went ashore at Biddle Point, Lake Michigan; released.
Schooner J. R. Benson arrived at Cheboygan with masts and canvas gone.
Schooners America, Australian, Elvina, and Montpelier went ashore in gale at Grand Haven; all released, badly damaged. P. H. Cassidy, a sailor on the Australian, was drowned.
Barge Dolphin arrived at Port Huron water-logged and canvas damaged.
Schooner J. G. Worts went ashore at Beaver Harbor; released.
Schooner Lake Forest, corn, went ashore in gale at Hammond's Bay; released, leaking badly.
Schooner Augustus Ford lost foresail, anchor, and sixty feet of chain in gale on Lake Erie.
Propeller S. D. Caldwell, with barge, ran aground at Bay City; released.
2.—A dump scow in tow was capsized on Lake Huron; rescued.
Scow Quickstep went ashore at Washington Island; total loss; value, $1,500.
Schooner James Ganett arrived at Chicago with canvas damaged.
Schooner J. P. March went ashore at Good Harbor, Lake Michigan; total loss; value, $10,000. The captain, John Debbage, second mate, Frank Anderson, sailor, James Murray, and cook, Mary Murray, were drowned.
Schooner Grenada sprung a leak and lost foresail in gale on Lake Michigan.
Wrecker Prince Alfred put into Sand Beach leaking badly.
Schooner J. A. Travis went ashore at Plum Island; released.
3.—Steamer John A. Dix disabled by breaking of crank-pin on Lake Michigan.
Tug W. C. Tillson went ashore at Sturgeon Bay; released.
Schooner Lively went ashore at Sand Beach; total loss; value, $6,000.
Scow Kane went ashore at Port Hope; total loss; value, $1,000.
4.—Propeller Stanicca ran aground in Detroit River; released.
6.—Schooner David Wagstaff was taken in tow on Lake Huron, with most of her sails gone.
Scow Marion Hannah went ashore in gale at South Haven; total loss; value, $1,000.
Schooner C. H. Johnson lost masts in gale on Lake Michigan.
Tug Myrtle, with a lighter in tow, went ashore on Point Pelee Island; released, badly damaged.
7.—Schooner I. P. Card, pig-iron, sprung a leak and jettisoned 100 tons of cargo, on Lake Erie.
Schooner Waucosta, coal, went ashore near Charlotte, Lake Erie; released.
Schooner Corsican broke center-board in rough weather on Lake Erie.
Schooner Winchester, coal, went ashore during gale at Charlotte, Lake Erie.
Schooner A. J. Dewey lost small-boat, and schooner Groton broke center-board, in gale on Lake Erie.
Schooner Michigan twisted rudder-stock in gale on Lake Superior.
8.—Schooner Speedwell, lumber, ashore near Oswego; released; slightly damaged.
Schooner C. L. Johnson arrived at Chicago with main and mizzen masts gone.
Schooner Reed Case arrived at Chicago with anchors gone and canvas damaged.
Schooner Metropolis went ashore at Collingwood; released.
Tug Albatross was seriously damaged by collision with tug Butler at Chicago.
9.—Schooner C. P. Minch passed Port Huron with jib-boom broken and jibs gone.
Schooner H. Fitzhugh, coal, put into Port Colborne leaking.
Schooner Harvey Bissell arrived at Chicago with main top-mast gone.
Schooner Michigan was towed ashore on Fighting Island; released.
10.—Schooner Dobbins lost jib-boom and bowsprit by collision outside Chicago.
Schooner Morning Star arrived at Alpena with sails damaged and center-board broken.
11.—Propeller Saint Albans went ashore on Fox Point Reef; released.
Schooner J. R. Bentley, cargo 360,000 bushels rye, foundered in gale off Chicago and sunk; total loss.
12.—Schooners S. Bates and Lone Star were damaged by collision off Milwaukee.
Schooner Mary A. Gregory lost jib-boom by collision at Chicago.
13.—Schooner Richard Winslow sprung a leak on Lake Erie.
14.—Schooner H. H. Brown ran aground at Cleveland; released.
Schooner Monitor had canvas damaged by fire, caught from burning dock, Green Bay.
15.—Tug Resolute was disabled in machinery in Detroit River.
Propeller Benton ran aground on Russell's Island; released.
Schooner Etna sprung a leak and sunk in Lake Michigan; total loss; value $5,000.

16.—Tug Livingstone put into Milwaukee disabled in machinery.
Barge H. C. Potter ran ashore in fog on Point Au Pelee, Lake Erie; released.
18.—Schooner Granada put into Milwaukee leaking.
19.—Schooner David Vance arrived at Milwaukee leaking.
Schooner H. A. Richmond aground near Bay City; released.
20.—Schooner Eliza Day arrived at Chicago with foremast-head gone.
21.—Scooner Kitty Grant arrived at Chicago with jib-boom gone.
Schooner North arrived at Chicago with jib-boom gone.
Schooner L. W. Perry put into Chicago with bulwarks damaged.
Schooner Seaman ran aground in Saint Clair River; released.
Schooner Christine Nillson put into Chicago with center-board broken.
Schooners Fort, Wilcox, Crostwaithe, and Amsden in tow, ran aground on Peach Island; released.
22.—Tug Hector had upper works destroyed by fire at Detroit.
Schooners Oliver Mitchell and Havana and tug Quayle ran aground in Saint Clair River; released.
Schooner Anandale broke steering-gear during gale on Lake Erie and went ashore near Niagara; released.
Schooner C. Hinckley, grain, lost portion of canvas and had cargo damaged in gale on Lake Erie.
Schooner Flying Dutchman, lumber, went ashore in gale at Walker's Pier, Lake Erie; total loss; value, $1,000.
23.—Schooner Sweetheart, ore, put into Cheboygan leaking.
Schooner Peerless arrived at Oswego with topmasts and jibstays gone and canvas badly damaged.
24.—Propeller Dover put back to Chicago disabled in machinery.
Schooner Chevey Ames, grain, ran aground in Saint Lawrence River; released.
25.—Propeller Lake Breeze was destroyed by fire at Leamington, Ont. One man lost. Value, $5,000.
27.—Lighter Superior sprung a leak and sunk at Bay City; raised.
Schooner John B. Mott, grain, arrived at Detroit leaking.
Propeller Colorado aground near Amherstburg; released.
Schooner B. Folger went ashore near Toronto; released.
Schooner Armenia went ashore near Amherst in gale; released.
28.—Schooner Lincoln Dall put back to Chicago with broken center-board.
Schooner Two Fannies arrived at Chicago with foremast head gone.
Steam-barge Tempest broke crank-pin on Lake Michigan.
Schooner Belle put into Charlotte River with part of rigging and cargo gone.
29.—Schooner Cuba went ashore in gale at Fish Creek, Lake Michigan; released, leaking badly.
Propeller Elmira was destroyed by fire at Danville, Ont.; loss, $10,000.
Schooner Sweet Home, lumber, went ashore near Oswego in gale; total loss; value, $2,000.
Schooner Radical went ashore in trying to enter harbor at Saint Joseph; released.
30.—Schooner Pensaukee ran aground in river at Chicago; released.
Tug Kate Moffat sprung a leak at Sarnia, Ont.

DECEMBER, 1878.

1.—Schooner Ketcham returned to Chicago with foretopmast gone and forebeam sprung.
Schooners Elvina and Lake Forest sunk at Manitowoc; raised.
Schooner Lizzie A. Law arrived at Buffalo leaking.
2.—Steamer Jay Cook disabled by breaking shaft on Lake Erie.
Scow Christina sunk at Port Huron; raised.
Schooner W. H. Dunham put into Chicago leaking.
3.—Schooner A. Mosher sprung a leak at Chicago.
Schooner Stampede arrived at Chicago with main and jib topsails gone.
Schooner Morning Star broke from mooring and went ashore at Oscoda; released, slightly damaged.
4.—Schooner Gamecock lost jib-topsail and flying-jib in gale off Chicago.
6.—Schooner J. A. Holmes went ashore in gale at Grand Haven; released, slightly damaged.
Schooner A. W. Luckey, coal, lost portion of canvas and spars on Lake Erie.
Schooner Amaranth lost small boat and two jibs on Lake Erie.
9.—Steam-barge C. J. Kershaw, grain, went ashore in gale near Cheboygan; released, slightly damaged.
10.—Yacht Idler was driven ashore in gale at Oswego; released.
Dredge Sampson had bow broken in during gale at Oswego.

JANUARY, 1879.

4.—Steamer J. C. Clark was cut through by ice at Sarnia and sunk; raised.
8.—Tug O. B. Green was frozen in at North Side pumping works, Chicago.
9.—Tug Maxon had some sheathing torn off by ice in Menomonee River, Milwaukee.
28.—Ferry-boat Sarnia had her upper works destroyed by fire at Port Huron.

FEBRUARY, 1879.

3.—Schooner A. B. Moore, laden with wheat, was found leaking at her dock at Milwaukee.
11.—Tug Miranda, while lying at her dock at Saginaw City, was destroyed by fire.
Tug International broke her wheel in forcing a passage through ice at Port Huron.
16.—Tug Clara sprung a leak while lying at her dock at Windsor.
22.—Schooner Restless went ashore at Ludington; total loss.

MARCH, 1879.

2.—Tug Andrew J. Smith broke her wheel while cutting through ice in Detroit River.
10.—Steam-barge Sparta ran aground in river at Milwaukee; released without damage.
11.—The vessels Green Bay, Shank, Caledonia, Sigle, Planet, Gertrude, Evergreen, and several others whose names were not learned, were slightly damaged by the breaking up of the ice in river at Racine.
12.—Steam-barge Warrington had most of her upper works destroyed by fire caught from a burning saw-mill at Detroit.
13.—Tug Star burned to the water's edge at Saginaw.
22.—Steamer Golden Eagle sprung a leak in making its way through ice near Put-in-Bay and sunk; released in a slightly damaged condition.
23.—Scow Alaska went ashore at Two Creeks, Lake Michigan, in a gale; released in a damaged condition.
24.—Schooner Joses had a hole broken in her by drift-ice at Holland, Mich., and sunk; raised in a damaged condition.
Tug A. W. Wright sunk at East Saginaw; raised.
Tug H. N. Martin sunk at dock in Cleveland; raised.
26.—Schooner Saveland, wheat, ran aground on the bar at Grand Haven; released without damage
Tug Ed. L. Anthony sunk at Milwaukee; raised.

APRIL, 1879.

1.—The barge Bay City broke from her moorings at Toledo and went ashore 10 miles from Marblehead; total loss.
5.—Propeller Heath went ashore at Saugatuck; released, badly damaged.
10.—Schooners S. Bates and J. A. Travis arrived at Milwaukee with portion of deck-loads gone.
Tugs S. S. Cox and Hannah Sullivan collided in striving for the tow of the scow Forest outside Milwaukee. The scow lost fore and jib booms, and the tug Sullivan was slightly damaged.
Schooner Hetty Taylor arrived at Milwaukee with all her canvas damaged.
Schooner Elida arrived at Milwaukee leaking badly.
Schooner Ironsides dragged her anchor and went ashore during a gale at Carrolton, Wis.; released, slightly damaged.
Schooner Lucy Graham went ashore in gale near Sturgeon Bay; released, leaking badly.
Schooner H. C. Post went ashore in a gale a few miles south of Sheboygan, Wis.; released in a damaged condition.
Schooner Cecilia lost foremast, some canvas and small spars in gale on Lake Michigan.
Fishing schooner Nora was lost in gale on Lake Michigan with her crew, Thomas Nelson, John Larsen, and another man known as Elias.
Schooner Tempest sprung a leak and had mizzen-boom broken and canvas damaged in gale on Lake Michigan.
Schooner C. Michaelson lost some canvas in gale on Lake Michigan.
14.—Schooner Helen Blood lost jib-boom by striking against a bridge at Chicago.
15.—The bark Two Fannies, laden with corn, sprung a leak at Chicago.
16.—Tug Triad had pilot-house and deck burned at Chicago.
The machinery of the tug Tom Brown was slightly damaged by a heavy sea shipped outside Chicago.
17.—Schooner Advance, lumber, put into Milwaukee leaking badly.
18.—Steamer Clinton passed Port Huron disabled on account of broken shaft.
Steam-barge Alcona became disabled at Detroit by breaking her cylinder.
23.—Steam-barge St. Joseph was struck by ice and sunk in Saint Clair River; raised, slightly damaged.

25.—Barge Sampson, laden with wood, was totally destroyed by fire in Detroit River.
Tug Ransom had rudder broken in Detroit River.
26.—Tug O. B. Green was disabled at Chicago by damage to machinery.
27.—Schooner Annie O. Hanson went ashore in a fog between Lincoln and Hamlin on Lake Michigan; released.
Barge Oscar Townsend ran aground in Detroit River; released without damage.
Schooner E. Scoville went ashore during heavy fog near Muskegon; released without damage.
30.—Propellers China, Buffalo, Avon, Cuba, Scotia, and Waverly got stuck in the ice in trying to get out of Buffalo Harbor.
Steam-barge Fred. Kelly put into Port Huron with stern-pipe leaking.

MAY, 1879.

1.—Schooner Bertie Calkins had jib-topsail destroyed by fire caught from a spark at Chicago.
2.—Propeller Cleveland ran aground off Turtle Light; released without damage.
8.—Steamer Clinton went ashore in the Straits of Mackinaw; released without damage.
Propeller Wissahickon ran aground in Lake Saint Clair; released without damage.
9.—Schooner Athenian ran aground in Saint Clair River; released without damage.
Propeller Cuba went ashore on Horse-Shoe Reef, Green Bay; released, slightly damaged.
Schooner H. B. Moore lost jib-topsail in a squall on Lake Michigan.
10.—Steam-barge R. J. Hackett sprung a leak at Cleveland.
11.—Schooner Fellowcraft went ashore near South Point, Lake Erie; released, slightly damaged.
Schooner Russian ran aground in entering Kingston harbor; released, leaking badly.
Barge Leland went ashore at Cathead Point, Lake Michigan; released, slightly damaged.
Schooner Van Straubeuzee went ashore on Boise Blanc Island; released, slightly damaged.
Propellers Winnipeg and China ran aground in the Straits of Mackinaw in a fog; released without damage.
Schooner Contest lost yawl and a chest of tools in a blow on Lake Michigan.
12.—Tug W. B. Castle became disabled in machinery on Lake Huron.
Schooner C. Crawford ran aground in Saint Clair River; released without damage.
Tug Samson ran aground at Bay City; released without damage.
13.—Steam-barge Henry Howard had small boat and part of cabin destroyed by fire at Port Huron.
Schooner Nellie Winlack lost flying-jib in gale on Lake Michigan.
14.—Schooner E. P. Royce lost foretop-mast in a gale on Lake Michigan.
Schooner Mary Nau lost foregaff in a blow on Lake Michigan.
Schooner Geo. L. Wrenn lost mainmast in gale on Lake Michigan.
Schooner General Worth was jammed in the ice at Buffalo and sprung a leak.
15.—Propeller Conestoga grounded at Chicago; released without damage.
Tug Levi Johnson was disabled by breaking her wheel at Kenosha.
16.—Propeller Erie arrived at Milwaukee leaking badly.
17.—Schooner Halstead was found leaking badly after taking on cargo of grain at Chicago.
18.—Steamer John A. Dix became disabled by breaking crank-pin outside Milwaukee.
Steamer Nahant ran aground at the Saint Clair Flats; released without damage.
Propeller Benton ran aground near Walpole Island in a fog; released without damage.
Propeller Champlain went ashore on Thunder Bay Point; released badly damaged.
19.—Steam-barge Moley ran aground in Detroit River; released without damage.
Schooner A. Cobb ran aground at Cleveland; released without damage.
Schooner William Elgin went ashore at Gull Shoal, near Kingston, Ont.; released, slightly damaged.
20.—Tug Frank Tracy ran ashore on a reef near Forestville; released with wheel damaged.
Schooner Orphan Boy put in at Point Saint Ignace with foretop-mast gone.
21.—Schooner Minnie Mueller had her foretop-mast split in a gale on Lake Michigan.
Barkentine Cecilia ran aground on North Harbor Reef, Lake Erie; released, slightly damaged.
Steam-yacht Antelope was disabled by breaking her wheel on Lake Huron.
22.—Propeller City of New York ran aground in Saint Clair River; released without damage.

22.—Bark J. S. Austin ran aground in the river at Bay City; released without damage.
23.—Scow Vampire ran aground in Detroit River; released without damage.
24.—Schooner Harvey Bissell sprang a leak on Lake Erie.
Schooner Halstead had jib-boom destroyed by fire caught from a spark from a tug having her in tow at Chicago.
A raft in tow of tug Gladiator grounded at head of Bois Blanc Island; released without damage.
Steam-barge Sparta broke wheel-chains in Detroit River.
Schooner Mears had mizzen-topmast and schooners Orphan Boy and Sheboygan had maintop-masts splintered by lightning on Lake Michigan.
25.—Schooner Christie had topsail split in a gale on Lake Michigan.
26.—Tug Wilcox broke down in machinery in Saint Clair River.
Steamer Ruby put into Milwaukee with wheel damaged.
Tug Wilcox became disabled in machinery on Lake Saint Clair.
Schooner Seaman went ashore at Presque Isle; released, with most of deck load of lumber lost.
A large raft in tow of tug Owen broke adrift in gale and went ashore on Point Aux Pelee Island; released.
Schooner J. F. Joy ran aground at Bay City; released without damage.
Schooner Pride arrived at Sheboygan leaking.
Schooner New Hampshire was slightly damaged by collision at Toledo.
Schooner Unadilla lost anchor and cable near Texas Landing.
Steam-barge Plymouth ran aground on a reef near Port Crescent; released without damage.
28.—Steamer Bertschy broke two buckets of her wheel at Port Austin.
30.—Schooner J. B. Wilber lost foretop-mast and jib-boom in a squall on Lake Erie.
31.—Propeller Juniata ran aground near Peach Island; released without damage.
Schooner Stafford capsized during a gale off Roberts Landing, Lake Huron; rescued with loss of topmasts.
Schooner San Jacinto, corn, went ashore near Collingwood; released without damage.
Propeller Oswegatchie lost yawl and had smoke-stack bent by roof of railway shed being blown on her during gale at Port Huron.
Schooner Ben. Davis went ashore near Kenosha in a gale; released without damage.
Tug Johnson sunk at Chicago, owing to sea-cock being left open; raised.
Steam-barge Crippen went on the beach in a blow at Manistee; released without damage.
Schooner John Minor had foretop-mast splintered by lightning on Lake Michigan.

JUNE, 1879.

1.—Schooner Asa Childs, lumber, went ashore at Highland Park during gale; total loss; value of vessel, $2,500; cargo, $1,500.
Schooner Fleetwing arrived at Milwaukee with jib-boom and bowsprit gone.
Schooner Slaike lost several thousand feet of lumber in gale on Lake Michigan.
Schooner B. Parsons lost foremast in gale on Lake Michigan.
Schooner Tom Sims, pig-iron, arrived at Chicago leaking badly.
Scow I. N. Forest arrived at Chicago with jib-boom gone.
Schooner Porter lost yard and mizzen gaff in gale on Lake Huron.
Schooner Venus, salt, went ashore in gale on Peshtigo Reef, Green Bay; released.
3.—Propeller Bertchy was disabled by breaking wheel at Bay City.
4.—Tug Witch of the West was disabled by breaking shaft at Bay City.
6.—Steam-barge E. E. Thompson arrived at Chicago with machinery damaged—gale on Lake Michigan.
Steam-barge Nahant, ore, ran aground on a reef near Escanaba; released, leaking.
7.—Seamer Ida was disabled in machinery at Detroit.
Schooner King Sisters sprung a leak at Cleveland.
Tug Ruggles was disabled through damage to boiler at Chicago.
Schooner Cal. Hathaway lost center-board in gale on Lake Erie.
8.—Schooner Isabella Sands arrived at Milwaukee with jib-boom broken.
Steamer V. H. Ketchman, grain, ran aground near Point Edward; released.
Schooner E. P. Beals ran aground at Buffalo; released.
9.—Schooner David Vance lost three yards in a squall in Straits of Mackinaw.
10.—Schooner City of Sheboygan arrived at Chicago with masts splintered by lightning.
Schooner D. A. Van Valkenburg, ore, struck bottom in Sault River and sprang a leak.
Propeller Armenia, corn, went ashore near Salmon Point Lighthouse, Lake Ontario. Released after jettisoning 5,000 bushels of cargo.

11.—Tug Sweepstakes broke down with a large tow in Saint Clair River.
Tug Saint Mary was disabled by breaking wheel on a log at Frankfort, Michigan.
Tug Hiram A. Calvin ran aground outside Toronto; released.
12.—Schooner J. J. Care passed Detroit with jib-boom broken.
Tug Mildred lost wheel at Bay City.
The cargo of propeller Philadelphia was slightly damaged by fire on Lake Michigan.
Tug Harry Sewell was disabled by breaking shaft in Detroit River.
13.—Schooners Chas. Wall and Golden West, in tow, ran aground in Sault River; released.
14.—Yacht Mischief was capsized near Chicago; recovered.
Schooner Albatross ran aground at Bay City; released.
Barge Shiawasser sprung a leak and water-logged at Au Sable.
Schooner Oneida lost mizzenmast in a squall on Lake Erie.
15.—Yacht Dauntless was dismasted in a squall off Chicago.
Propeller Atlantic became disabled and sprung a leak by breaking stern bearings off Point Aux Barques.
Schooner Rutherford lost jib-boom in a squall on Lake Erie.
Barge Superior lost mainmast in gale on Lake Huron.
Scow J. B. Prime lost center-board in gale on Lake Michigan.
16.—Barge Dolphin sprung a leak and water-logged off Cleveland during a gale.
17.—Schooners Sheldon and San Diego, in tow, ran aground in Detroit River; released.
Schooner West Side struck a rock in the Welland Canal and sprung a bad leak.
Schooner Lookout went ashore near Escanaba; released.
Propeller Scotia ran aground at Chicago; released.
19.—Tug Jessie broke down at Courtwright, Canada.
Tug Harrison was disabled in machinery at Chicago.
Steam-barge Egyptian, railroad iron, put into Cleveland leaking badly.
21.—Tug Satellite sprung a leak and sank off Whitefish Point, Lake Superior; total loss; value, $10,000.
22.—Tug Alpena became disabled off Port Hope by breaking check-valve.
Barge Theodore Perry sprung a leak at Sand Point.
23.—Steamer Milton D. Ward arrived at Port Huron disabled in machinery.
Schooner Champion was found to be leaking at Buffalo and 375 bushels of corn damaged.
Tug Jennie Ball lost wheel and broke crank at Frankfort, Mich.
Steamer Keweenaw went ashore near Port Hope, Mich.; released.
Tug Buffalo went ashore at Sand Point, Lake Huron; released, leaking slightly.
Scow Lady Essex sprung a leak near Thunder Bay.
Steam-yacht Antelope run aground on a ledge of rock off Michepecotin Island, and on being pulled off sunk in fifteen fathoms of water; raised.
24.—Steamer Cora Locke was disabled by breaking shaft on Lake Michigan.
Schooner Richard Winslow ran aground in the Neebish Rapids.
25.—Schooner Tilden ran aground at the Saint Clair Flats; released.
Schooners J. H. Mead and Lucy J. Clark ran aground at Chicago.
Schooner L. C. Butts ran aground in Milwaukee River; released after discharging part of cargo.
Steam-barge Jarvis Lord ran aground at Milwaukee; released after discharging part of cargo.
Schooner Helen Pratt ran aground at East Saginaw; released.
26.—Schooner Lumberman arrived at Chicago with foretop-mast gone.
27.—Schooner Three Bells had foretop-mast shattered by lightning at Milwaukee.
Schooner Knight Templar ran ashore at Point Reesios, Lake Michigan; released.
28.—Schooner Golden Fleece ran aground at Saint Clair Flats; released.
Scow German went ashore below Malden, Lake Erie; released.
Tug Sampson and tow of barges ran aground at Malden; released.
Propellor Columbia went ashore on South Fox Island, Lake Michigan; released.
29.—Schooner Negaunee sprung a leak at Escanaba.
Propeller Zealand ran aground near Belle Isle; released.
30.—Steam-barge Raleigh ran aground near Pêche Island; released, slightly damaged.

Recapitulation.

	1878.						1879.						
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Total.
Aground	8	5	8	13	15	....	....	....	2	1	20	19	91
Ashore	6	11	28	41	30	4	....	1	1	8	12	9	151
Capsized	1	2	4	1	1	....	....	....	....	....	1	1	11
Collisions	....	....	1	....	4	....	....	....	....	....	3	....	8
Damaged by fire	9	5	5	3	2	....	1	1	1	2	2	1	32
Damaged by lightning	1	3	5	....	....	....	....	....	....	....	4	2	15
Miscellaneous	15	21	44	63	23	5	1	1	8	6	14	15	216
Destroyed by fire	1	....	1	1	2	....	....	1	1	....	1	....	8
Disabled	3	8	10	20	3	1	....	....	....	3	6	14	68
Dismasted	1	1	8	9	5	1	....	....	....	1	4	5	35
Lives lost	....	....	....	....	3	....	....	....	....	3	....	....	6
Sprung a leak	24	12	21	20	11	3	....	2	....	5	7	6	111
Sunk	4	4	4	6	3	3	1	....	5	1	1	2	34
Water-logged	2	1	5	4	2	....	....	....	....	....	....	2	16

WM. FINN,
Sergeant, Signal Corps, U. S. A.

PAPER 44.

REPORT ON THE WALTERBOROUGH, S. C., TORNADO. BY SERGT. H. J. PENROD, SIGNAL CORPS, U. S. A.

WAR DEPARTMENT, OFFICE OF THE CHIEF SIGNAL-OFFICER,
DIVISION OF TELEGRAMS AND REPORTS FOR THE
BENEFIT OF COMMERCE AND AGRICULTURE,
Washington, D. C., June 12, 1879.

To the Chief Signal-Officer, Washington, D. C.

GENERAL: In compliance with signal order No. 61, office of the Chief Signal-Officer, dated April 21, 1879, I have the honor to submit the accompanying report.

I have endeavored to lay before the Chief Signal-Officer the facts relative to the origin, movements, and effect of the tornado at Walterborough, S. C., on April 16, 1879, as I found them on examination, with such ideas as have naturally suggested themselves to me during the course of my work.

Very respectfully, your obedient servant,

H. J. PENROD,
Sergeant, Signal Corps, U. S. A.

Report on the Walterborough, S. C., tornado of April 16, 1879.

ORIGIN.

From all the reliable information I was able to gather from the surrounding country and from a personal investigation of the point of beginning of the Walterborough tornado, I am satisfied that the tornado cloud, which did so much damage in Colleton and Charleston Counties, in the State of South Carolina, on Wednesday, April 16, 1879, originated in the heavens near the Salkehatchie Swamps which form the head-waters of the Combahee River. This point is 16 miles southwest of Walterborough and about 30 miles due east of the boundary-line between the states of Georgia and South Carolina. In support of this fact I respectfully submit the following statements from gentlemen who saw the cloud form:

Col. Allen C. Izard, a resident of Walterborough, observed the formation of the tornado cloud from his rice plantation on the Combahee River. He says the country at this point is open and unobstructed by pine forests to the westward. The evening

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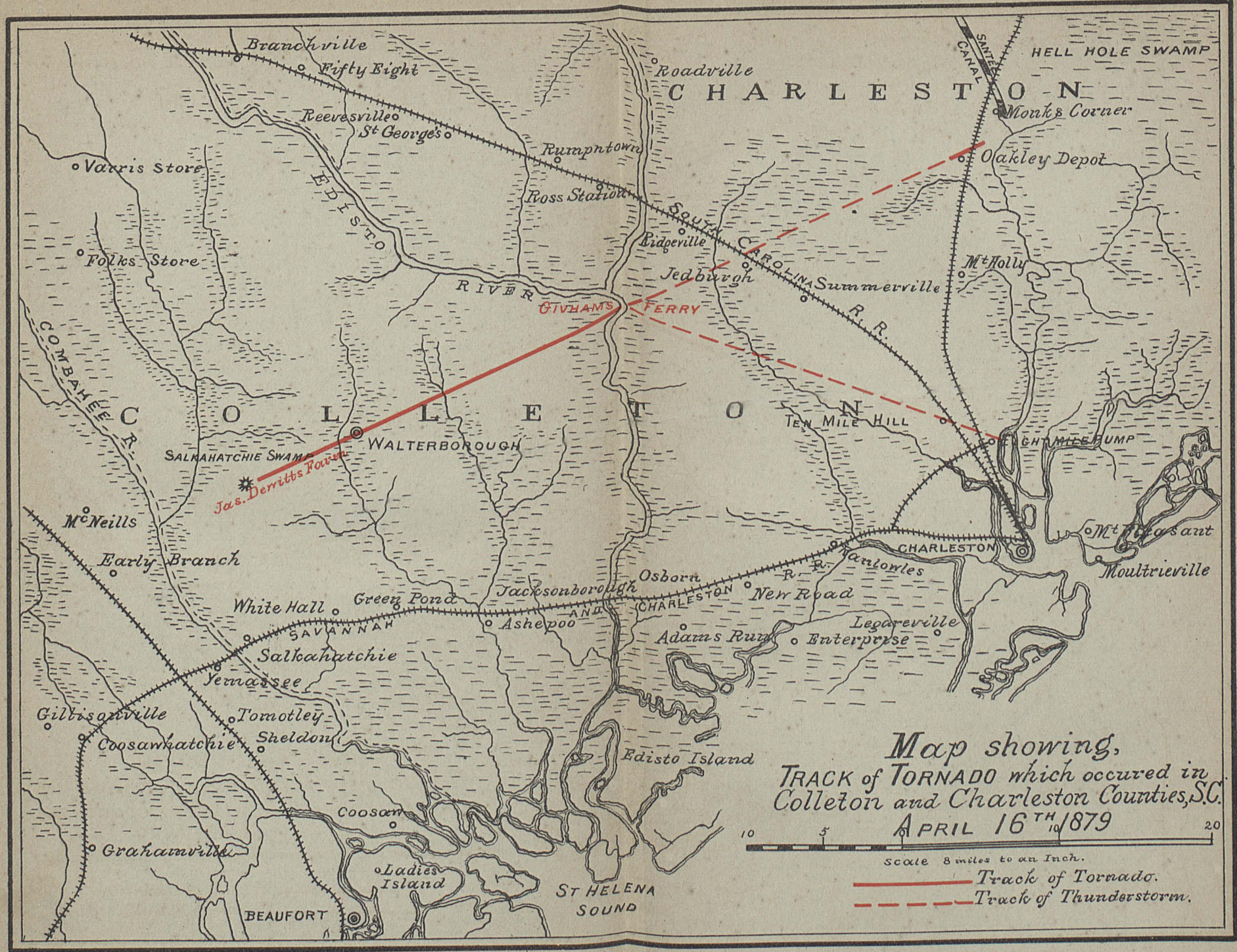
Map showing,
TRACK of TORNADO which occured in
Colleton and Charleston Counties, S.C.
APRIL 16TH 1879
10 5 0 10 20
Scale 8 miles to an Inch.
Track of Tornado.
Track of Thunderstorm.
CHARLESTON
COLLETON
HELL HOLE SWAMP
SANTEE CANAL
Branchville
Fifty Eight
Reevesville
St George's
Roadville
Monks Corner
Oakley Depot
Rumpntown
Ross Station
Varris Store
EDISTO RIVER
SOUTH CAROLINA R.R.
Ridgeville
Jedburgh
Summerville
Mt Holly
Folks Store
GIVHAMS FERRY
COMBAHEE R.
TEN MILE HILL
EIGHT MILE PUMP
WALTERBOROUGH
SALKAHATCHIE SWAMP
Jas. Dewitts Farm
McNeills
Early Branch
CHARLESTON
Mt Pleasant
Moultrieville
Tanlowles
Osborn
Jacksonborough
New Road
White Hall
Green Pond
SAVANNAH AND CHARLESTON R.R.
Ashepoo
Adams Run
Enterprise
Legareville
Salkahatchie
Yemassee
Gillisonville
Tomotley
Coosawhatchie
Sheldon
Edisto Island
Coosaw
Grahamville
Ladies Island
ST HELENA SOUND
BEAUFORT

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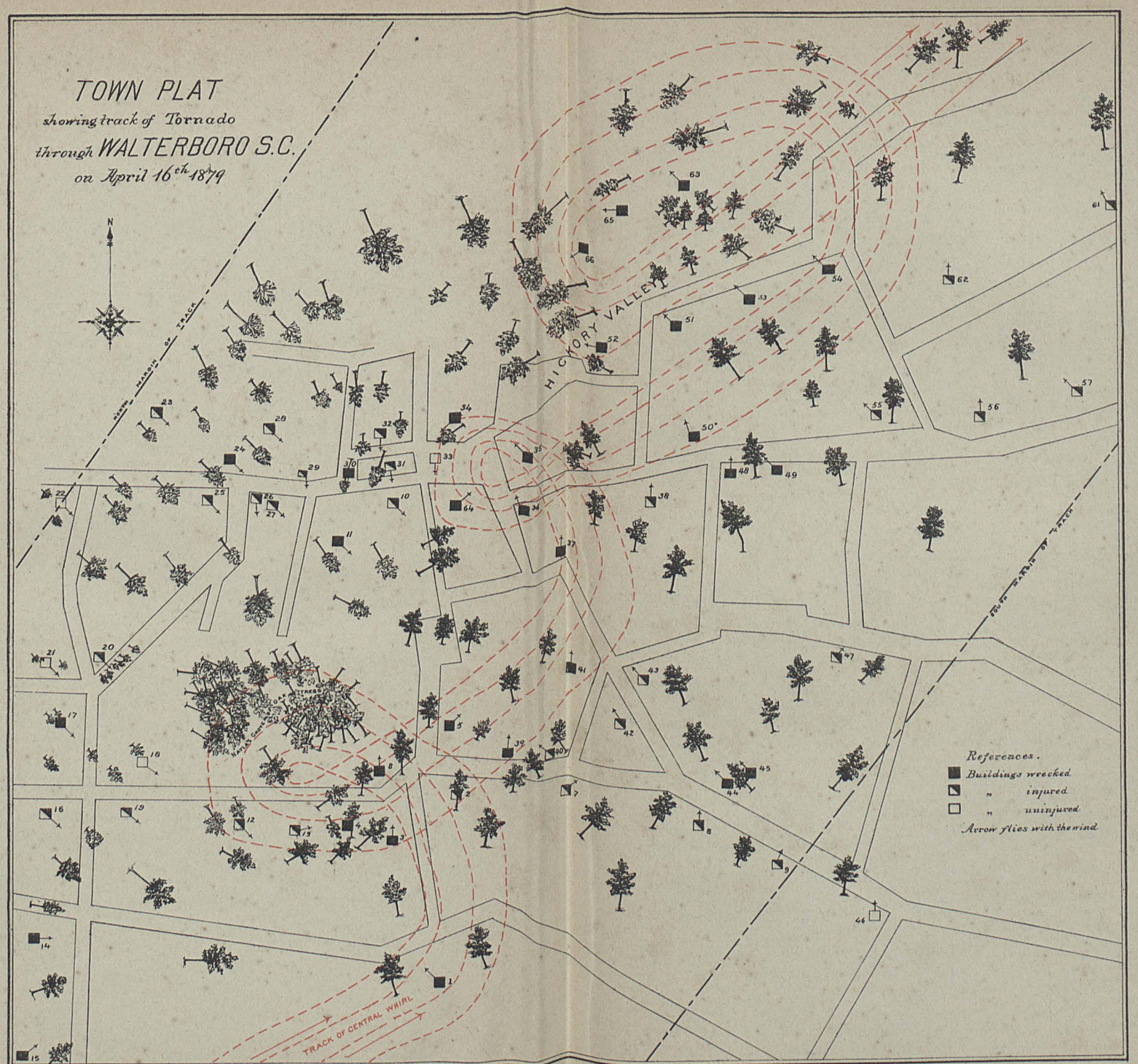
TOWN PLAT
showing track of Tornado
through WALTERBORO S.C.
on April 16th 1879
N
NORTH MARGIN OF TRACK
HICKORY VALLEY
SOUTH MARGIN OF TRACK
TRACK OF CENTRAL WHIRL
References.
Buildings wrecked
" injured
" uninjured
Arrow flies with the wind

was clear and quite warm for the season. Being an ex-United States naval officer, takes quite an interest in cloud formation. He heard no peculiar noise as described by authors on this subject, but attributes this probably to the fact that when he observed it the tornado cloud had not developed fully.

The day had been clear, with no rain. About 3.30 p. m. the cloud was observed forming in the southwest, about 35° from the horizon, clear underneath and separated in the center, the cloud on the left being very dark—black as mud—the one on the right hand not so dark. The right-hand cloud formed the whirl, and seemed to suck the muddy-colored cloud into it. The cloud seemed agitated as though by hurricane winds. Saw wind in it, and knew it was of a dangerous formation, having observed several waterspouts while stationed in Mexican waters before the rebellion. The right-hand cloud furnished the wind, or was the disturber of the quiet atmosphere, while the left-hand cloud, heavily laden with moisture, supplied the moisture, adding fuel to the fire.

At his place of observation there was very little wind, but considerable rain fell the night following the passage of the tornado cloud, accompanied by the heaviest thunder and most vivid lightning he ever experienced. He reports that the rain was very heavy down the river on the rice plantations, and considerable damage was done to crops.

The statement of Colonel Izard was verified by several persons I saw from that section, every one testifying to the formation of the whirl by the two clouds in the same manner described by Colonel Izard. An examination of the country from different points to the southwest, west, and northwest of Salkahatchie Swamps in Hampton County, South Carolina, and across the Savannah River in Georgia shows evidence of heavy rains, but no marks of a tornado track came to my notice.

At White Hall, Yamassee, and other stations along the Charleston and Savannah Railroad, and at McNeil's and other stations on the Port Royal Railroad up as far north as Allendale, heavy thunder storms occurred on the day of the tornado, but at a later hour than when Walterborough was swept away.

At Yamassee an old building was overturned by the southwest wind after 4 o'clock. At McNeil's several trees were blown down about the same time, but this is not unusual, as the trees are sometimes cut half away in boxing for turpentine and a very little wind will fell them.

On my return to Charleston I accidentally met a colored preacher named Charles Moore, who, upon my inquiry, stated that he was near Salkahatchie bridge on the day of the Walterborough tornado, and from him I obtained the following information: He testified that he was near Salkahatchie bridge when the storm came up. (This point is north of where Colonel Izard was located.) It was on the 16th of April, 1879, and about 3 o'clock p. m.; the weather was very hot and no rain had fallen for some time, and the roads were very dry and the sand scorching. During the morning there was a light fog which cleared away before nine o'clock. No clouds appeared until about 2 o'clock p. m. The horse, which he was riding, seemed very restless. At 3 p. m. or probably half past three dangerous-looking wind clouds were observed moving rapidly from the north. Scuds were seen below these clouds moving in every direction possible. Immediately the upper cloud seemed to come down and the two systems of clouds united, accompanied by a terrific crash of thunder; then an immense black mass formed to the southeast underneath the light clouds, and rushed from below at the upper ones with great violence. Frequently the top cloud appeared to be forced upwards, and streaks of a red bronze color were visible above it. It seemed like the clouds rolled over each other in a boiling mass. The witness felt terrified during this scene. Immediately after the two clouds united and passed to the eastward the sky became overcast, and heavy rain fell, accompanied by vivid lightning and terrific thunder. The earth trembled. Heavy rain with strong westerly winds prevailed during the night, clearing up next day. The rain was cold; no hail fell.

In order to obtain as definite information as possible in regard to the formation of the tornado cloud, I exhibited to him plates showing the different classifications of clouds as given by Howard, and without hesitancy he stated that the north cloud resembled cirro-stratus and the south cloud cumulo-stratus.

No damage was done in the swamps or pine timber-land by the tornado cloud until it touched the earth at James Dewitt's farm, located in the "pine barren" eight miles southwest of Walterborough and midway between that village and Salkahatchie Swamp.

Before we examine the movement and effect of the tornado let us look at the conditions that surrounded that beautiful town previous to this disaster, and ascertain, if possible, the cause of the disturbance of the elements.

Waterborough, the county-seat of Colleton County, South Carolina, is situated in the "pine barren" region of that section on a sandy ridge of tertiary formation, probably 30 feet above the lowlands or swamps which surround it on the east and west, and a little north of west from Charleston, S. C., in an air line 45 miles.

On the day of the tornado, up to the hour it occurred, and for three weeks previous thereto, no rain had fallen through the section of country over which this storm passed,

and from all accounts the people were suffering because of the need of rain, and, on the day of the catastrophe, rain had fallen all around the tornado track, leaving a belt of country where no rain had fallen. The tornado belt from the Salkahatchie Swamp northeast to the Edisto River was hemmed in by condensing vapor on all sides, and the hot noonday sun pouring its rays down on the sandy plain would seem to point to one prime factor in the formation of a condition favorable to storm development, viz, the great power of the sun's rays, the extreme dryness of the air, and the small conducting power of the sand, thus causing the accumulation of heat on the surface. The air resting on this hot sand gave rise to ascending currents. The air consequently flowed towards these heated places from different sides, and the different currents meeting, whirling masses were put in motion. No barometric or thermometric readings could be obtained through this section, therefore I append the readings of the barometer and thermometer, percentage of humidity, direction, and velocity of wind per hour, and state of weather on that day at Charleston, S. C., Augusta, and Savannah, Ga., Wilmington and Charlotte, N. C., our nearest signal stations which surround the tornado belt, showing a tranquil condition of the atmosphere.

Observations taken at Charleston, S. C., April 16, 1879.

Time of observation.	Barometer.	Thermometer.	Humidity.	Wind.		State of weather.
				Direction.	Velocity.	
7 a. m.	29.871	67	79	S.	1	Cloudy.
7.24 a. m.	29.871	67	79	N	1	Cloudy.
11.49 a. m.	29.828	70	80	E.	4	Cloudy.
2 p. m.	29.792	72	85	S.	10	Cloudy.
4.24 p. m.	29.736	71	90	S.	8	Cloudy.
9 p. m.	29.820	65	89	SE.	6	Light rain.
10.49 p. m.	29.830	65	89	SE.	6	Heavy rain.

Mean daily barometer	29.826
Mean daily temperature	67°.2
Maximum temperature	72°
Minimum temperature	64°
Rain-fall, inches	1.12

Barometer at this station fell slightly during the day with light, gentle and fresh variable winds, changing from south to north between 7 and 7.24 a. m., veered to east by noon, then around to south by 2 p. m., and continued in this direction until after the tornado occurred at Walterborough, when it veered to southeast. Light showers occurred from 4 a. m. to 6.30 a. m. and from 10 to 10.20 a. m. General rain set in at 8.30 p. m., and fell continuously throughout the night and next day to 12.30 p. m. Total rain-fall after tornado, 4.97 inches.

Observations taken at Augusta, Ga, April 16, 1879.

Time of observation.	Barometer.	Thermometer.	Humidity.	Wind.		State of weather.
				Direction.	Velocity.	
7 a. m.	29.870	62	100	N.	4	Heavy rain.
7:16 a. m.	29.870	62	100	N.	4	Heavy rain.
11:41 a. m.	29.803	65	89	S.	4	Cloudy.
2 p. m.	29.768	65	84	N.	4	Light rain.
4:16 p. m.	29.700	65	100	SE.	4	Light rain.
9 p m.	29.700	64	78	N.	4	Threatening.
10:41 p. m.	29.701	63	89	N.	4	Threatening.

Mean daily barometer	29.759
Mean daily temperature	63°.7
Maximum temperature	66°
Minimum temperature	59°
Rain-fall, inches	1.91

At this station very heavy thunder-storm from 3:30 to 10 a. m., and light rain from 12:30 p. m. to 7:10 p. m. During the afternoon a heavy thunder-storm occurred. The thunder seemed low to the earth and was preceded by an abundance of vivid zig-zag lightning. Heavy rain-fall during the twelve hours. Amount, 1.93 inches.

Observations taken at Savannah, Ga., April 16, 1879.

Time of observation.	Barometer.	Thermometer.	Humidity.	Wind.		State of weather.
				Direction.	Velocity.	
7 a. m	29.854	68	79	S.	1	Cloudy.
7:19 a. m	29.852	68	79	S.	2	Cloudy.
11:44 a. m	29.799	82	67	S.	6	Cloudy.
2 p. m	29.743	83	64	SW.	14	Cloudy.
4:19 p. m	29.704	76	82	S.	14	Light rain.
9 p. m	29.819	67	89	SE.	9	Heavy rain.*
10:44 p. m	29.769	67	89	SE.	10	Heavy rain.*

*Thunder-storm.

Mean daily barometer	29.809
Mean daily temperature	71°.2
Maximum temperature	84°
Minimum temperature	65°
Total rain-fall, inches	2.31

At this station the barometer fell steadily until 4:35 p. m., then rose one-tenth of an inch by 9 o'clock, with still higher temperature; wind light during the morning, increasing to fresh in the afternoon, variable in direction from southwest to southeast. At 3:31 p. m. a heavy thunder-storm prevailed, and continued throughout the night and part of next day, clearing up after 2 p. m., followed by northwesterly winds and sudden fall of temperature. Total rain-fall, 6.12 inches.

Observations taken at Wilmington, N. C., April 16, 1879.

Time of observation.	Barometer.	Thermometer.	Humidity.	Wind.		State of weather.
				Direction.	Velocity.	
7 a. m	29.894	64	83	SW.	4	Cloudy.
7:31 a. m	29.897	66	79	SW.	5	Cloudy.
11:56 a. m	29.888	68	79	NE.	4	Light rain.
2 p. m	29.858	68	74	SE.	10	Threatening.
4:31 p. m	29.799	66	89	E.	4	Heavy rain.
9 p. m	29.869	64	49	W.	9	Light rain.
10:56 p. m	29.811	64	94	SE.	5	Light rain.

Mean daily barometer	29.872
Mean daily temperature	65°
Maximum temperature	72°
Minimum temperature	63°
Rain-fall, inches	1.75

Light showers fell at this station during the morning from 11:30 a. m. to 12:30 p. m., with wind gentle from the northeast.

Threatening weather at 2 p. m.; wind southeast. Between this and 4:31 p. m. the wind backed to east, and heavy rain began at 4 p. m., with variable winds blowing from every point of the compass, the temperature falling slightly.

Rain ended on the following day at 3 p. m.; a light shower occurring, however, from 8:30 to 9:30 p. m.

Observations taken at Charlotte, N. C., April 16, 1879.

Time of observation.	Barometer.	Thermometer.	Humidity.	Wind.		State of weather.
				Direction.	Velocity.	
7 a. m	29.785	60	94	S.	6	Light rain.
7:20 a. m	29.787	60	94	S.	4	Light rain.
11:45 a. m	29.760	60	94	SW.	11	Light rain.
2 p. m	29.665	66	84	SW.	5	Cloudy.
4:20 p. m	29.605	66	79	SE.	4	Cloudy.
9 p. m	29.635	61	94	S.	6	Cloudy.
10:45 p. m	29.601	61	88	S.	1	Cloudy.

Mean daily barometer	29.680
Mean daily temperature	62°
Maximum thermometer	67°
Minimum thermometer	59°
Rain-fall, inches	0.80

At this station rain set in at 6:10 a. m., and continued until 1:40 p. m., with a maximum temperature of 67° during the day; winds gentle and fresh from a southerly direction and slightly falling barometer.

An examination of the War Department weather-map issued from the office of the Chief Signal-Officer at 7.35 a. m., on April 16, 1879, the day on which destructive storms occurred, shows an area of low pressure central in the Lower Mississippi Valley moving northeastward towards the coast of North Carolina, producing heavy rains and frequent thunder-storms throughout the Southern States. High barometer with northerly winds prevailed over the Upper Lake region and northwest, with low temperatures—below freezing point at some places. Off the coast of Florida, to the eastward, another high pressure prevailed with temperatures in the seventies with winds from a southerly direction and a high percentage of relative humidity. The weather in the Carolinas was influenced by this "low," and its approach was forewarned by the timely display of cautionary signals. The sergeants in charge of the stations in this section all predicted foul-weather sunsets on the 15th of April. See what happened in the next eight hours.

The low of the morning became lower and moved northeastward to Tennessee, while the high pressure from the northwest with low temperature (Cairo 49°) forced its way around the spur of the Alleghany range of mountains into the South Atlantic States, coming in contact with an atmosphere heavily charged with moisture drawn from the warm Gulf Stream by the prevailing southerly winds, and suddenly lowering the temperature. The result is before us in the shape of terrific thunder-storms and tornadoes.

MOVEMENT AND EFFECTS.

As before noted, the tornado cloud descended to the ground at Mr. James Dewitt's place (eight miles southwest of Walterborough), which is a small farm of probably twenty acres, in a state of cultivation, and surrounded by pine-timber forests on either side. The country is perfectly level between this point and Salkehatchie Swamp, eight miles distant in a southwesterly direction, where the cloud was seen to form.

From all the turpentine hands interviewed in this section, I could get no trace of the descent of the cloud before reaching this point. One particular fact I desire to specially note is that this tornado cloud struck in a region of country where tornadoes quite frequently pass, in fact the beginning of this is not more than a half mile distant from where one struck in 1866, and passed to the northeastward through the pine-lands two miles north of Walterborough. Marked signs are everywhere visible in this region of destructive storms, and from what information I could gather from the people residing throughout this section of country, numerous tornadoes of the same destructive character as the one under investigation have developed and passed on their journeys of desolation through this same country, which is principally made up of "pine barren," sandy soil, and numerous swamps. No reliable data to verify, as to dates, the statement above given could be obtained, but it is quite certain that tornadoes passed through the pine-land in the years 1860, 1866, and 1870.

During my travels through the country, I frequently asked the negroes living there, if this Walterborough tornado had passed through their section would much notice have been taken of it, and I invariably was answered, "no." I am quite sure had the storm passed north or south of Walterborough little notice would have been taken of it by the public at large. But the hand of God directed otherwise.

Mr. Dewitt testifies: "Had been very warm and no rain for three weeks; was out with family planting cotton when the storm came up in southwest; heard the roaring in the woods, like cars running over a bridge, getting louder and louder as it approached. Wife said: 'Let us go into the house.' All ran in except myself; saw the cloud coming over the tall pines; observed it descend to the ground in the skirt of the woods, one-fourth of a mile below the house. It was of a blackish-yellow cast; awful looking; whirled around and around when it got into the field; clouds above me ran in every direction; thought the revolving whirl was about one hundred yards wide; ran out of its road in a southeasterly direction; saw my pear-trees go up in the whirl; a few large drops of rain fell as the cloud approached. Immediately after the heavy wind the most terrific thunder-storm I ever experienced prevailed, and heavy rain continued until next day. Do not think the destructive wind lasted three minutes. No hail was observed."

Men working in the turpentine farms to the north and south of this region, at a distance of two miles, were not aware of the destructive wind at this point, but stated that heavy thunder-storms occurred with them. No sensible winds due to the tornado at Dewitt's were felt by them.

Upon examination of the ground and surroundings where the cloud first struck, I found the trees in the skirt of pine timber to the southwest of the house broken off first at the tops, then half way down, then twisted off at the butts, and uprooted, showing the gradual descent of the cloud to the earth on an inclined plane of about 45°. The width of destruction at this point is about 250 yards, but it spread to at least 400 yards as it reached the field below the house. The whirl removed the clap-

board roof from the side of the house which faced the south, and carried boards and rafters to a distance of 300 yards to the northeast. The building was badly injured. One out-building built of poles of light timber was torn to pieces and the household goods carried away. Mr. Dewitt's wife and eldest daughter, out of a family of five persons, were slightly injured by the falling building. All the fences in the line of track were scattered far and wide, and in the sandy fields traces of the whirl were not obliterated by the heavy rains. I examined carefully the ground and rubbish at this point in order to ascertain, if possible, on which side of the track the most destruction had taken place, and I am free to say that it was on the south side. The upward under-current on this side is everywhere marked by old trees that were lying on the ground before the storm, and which were moved to northern side and center of track. Masses of sand, leaves, and tree-tops were washed up against an old pine tree lying with its top to the northeast and butt to the southwest in the open field near the center of tornado track.

On the north side of the track no washing-up of this description could be discovered.

Passing from Dewitt's to the pine-timber land the trees lie in whirls from right to left on the ground, in every direction possible in the center of the track, but on the margin to the south the mean direction is from the southwest, while on the north margin the under trees lie from the north, the top layers coming down from northwest and west, respectively. A great many trees are broken off near the top on the northern side of the track, while those felled on the south side were uprooted. Trees lying from an easterly direction were rarely found. The track remained about the same width through the pine-timber lands of Basil O'Brien and H. H. Hyatt on its road to the farm lands of Mr. Thomas Boodle, four miles distant. Cattle grazing in the line of track were literally torn to pieces by the storm.

When the whirlwind touched Mr. Boodle's farm to the north of his residence it widened to 500 yards in the open fields, and on passing north of his residence swept everything before it, injuring his house, which was on the south margin of the track, and tearing to pieces his fences and outbuildings. Loss, $200.

Following the track it was found to pass through the farm of Mr. Fender adjoining; across the Blue House Road, where its width was estimated to be 500 yards; then through the great swamp running west of Walterborough—this swamp must be over a mile wide—crossing the old Green Pond Road about one mile southwest of the village. At this point three houses occupied by colored people were destroyed and blown away, but no one was injured. It seems miraculous how the inhabitants escaped with their lives. The road crosses the track north and south. The ground was not scraped by the storm-cloud, as observed at Dewitt's. A greater number of trees were blown off high up and less uprooted, which fact points to a slight rise of the cloud in this section.

The tornado passed on, traversing a small swamp to the east, cutting a path some 600 yards in width. On emerging from the timber it entered the open fields of Mr. F. G. Behrie, to the southwest of Walterborough, near a point where a new road has been cut through the pine-timber land. In these sand fields, which are covered with a few tall pines and a scrub-oak underbrush, the storm gained new energy. The scrub-oaks were found skinned of their bark and leaves down to within a foot of the ground, caused by the thrashing they received from the whirling sand.

While it was in these sand fields of Mr. Behrie, most of the people in Walterborough beheld the approach of the mighty storm which was to reduce that beautiful town—the summer homes of the wealthy planters of Ashapoo and Salkehatchie—to a mass of ruins and desolation.

Walterborough contained a court-house, jail, two hotels, a number of law offices, a dozen stores, one academy, seven churches, and about ninety dwellings, besides the large complement of kitchens, negro cabins, barns, stables, and other outbuildings found in an old Southern town. The churches and academy were totally destroyed, and of the whole number of dwellings some sixty, with their accompanying outbuildings, were torn to pieces and strewn to the four winds of heaven. Loss, $200,000.

The approach of the tornado was as sudden as its effects were disastrous. The day was a lowering, cloudy, sultry one, with hardly a breath of air to stir the green leaves about the sandy streets of the town, or sway the rose bushes, which bloomed in nearly every yard. Almost all the inhabitants had finished dinner, and most of them were about their houses. The profound quiet and tranquillity of a summer day in a Southern country town pervaded everything. Only the crowing of a cock, the sleepy chirping of a bird, or some occasional village noise disturbed the silence. A dark cloud was observed moving up from a direction somewhat west of south, and very soon afterward came a gust of wind and a terrible sound, universally described as resembling the rushing of many trains of steam-cars. Those who looked toward the cloud saw the green tops of the tall trees in the woods tossing about like troubled waves; the earth seemed to tremble, and the houses, which were almost without exception built of wood, shuddered as if endowed with life and sense.

Hasty movements were made by the people to shut doors and windows against the

storm, and families, as if by instinct, huddled together. Some houses were felt to twist and shake. Persons in others were instantly enveloped in darkness and masses of *débris*. At once the rain fell in torrents. Those whose houses stood the blast were horribly astonished on opening their doors to see a vacancy where but a minute before buildings stood. At least five thousand trees in the village were scattered in every direction. The roar of the wind was such that the tremendous crash itself was heard by no one, except Major Burbridge, of the many persons I interviewed in Walterborough. One gentleman, who was looking from his piazza at the time, saw large trees fall in his front yard, but heard no more sound than if they had been feathers. He says that they were not dashed to the ground, but went over slowly as if they had been undermined.

Every person with whom I conversed, and they were legion, described the approaching tornado cloud as two clouds converging into each other—one very low, on the ground, of a dark, muddy color, from the southeast, and the other one from the northwest, lighter in appearance and resembling rising fog. No dashing up or down of the clouds was observed, as far as I could learn, but from descriptions given me by colored people who were in the open fields on the southern portion of the village and had an unobstructed view of its approach, I am led to believe that the two clouds formed the whirl, the dark, muddy one from a southerly direction, and the lighter one, resembling fog, from a northerly direction.

On the supposition, then, that the base of the whirl was circular, and after obtaining statements of a great many persons who observed the cloud on its different sides, and by stepping off the ground and discarding statements of persons who observed its approach while they were influenced by fear, besides taking careful note of the manner in which trees were twisted off and laid on the ground, I am of the opinion that the whirl did not exceed 100 yards in width, while the inrushing current from either side measured 400 yards, making a track through the town of about 900 yards in width.

Col. Archibald Campbell, county surveyor, gives me this measurement besides the direction of tornado track from Dewitt's to the Edisto River, N. 59° E. or E. 31° N. From the descriptions given me by persons located at different points and on different sides of the track, and from the lucky manner in which some few houses in the neighborhood of the council-chamber, in the center of the town, escaped being torn to pieces, besides taking into consideration the way in which the trees are prostrated on either side of the track, while houses farther from the center of a direct line drawn from the point of the tornado's entrance to that of its exit were torn down, it seems that the whirl made several gyratory movements as it passed through the village. Judge Farmer and F. G. Behrie, esq., two eminent lawyers of the Walterborough bar, went over the ground with me, and they expressed the same opinion.

The greatest destruction in the town occurred in the central portion and on the southern side of the track. This southerly current had an upward tendency and carried with it everything of a movable nature. Roofs were torn from houses, carried into the whirl, and after being revolved in the vortex, were dashed to the ground on the north side of the path.

Pieces of timber showing exactly these antics were hard to discover, so many buildings having been demolished and their fragments mixed together, but the identity of one piece of timber from the Episcopal Church was beyond dispute, and how it was thrown to where it was found (in a direct line over tops of houses) was a mystery to all who saw it. It was a heavy piece of timber, 6 by 6, 40 feet long, weighing 600 pounds. The Episcopal Church was near the center of the track, and from this point to that at which the stick was found (in Mrs. Henderson's yard) is a distance of 440 yards in a direction W. 10° N.

Having followed the storm from its formation to its entry into the village without casualties, we are led to the following death list in Walterborough:

Mrs. Dr. George M. Rivers (white).
Mr. Philemon Saunders (white).
Mrs. Liddy Ford (colored).
Mrs. Jackson Grant (colored).
Mrs. Jeanette Washington (colored).
Mrs. Judy Perry (colored).
Two grandchildren of John Scott (colored).

Total deaths in Walterborough 8, and 30 injured, out of a population of 1,200 people, 500 whites and 700 colored.

In the above list will be seen the name of the esteemed wife of Dr. George M. Rivers. She was buried in the ruins of her home, and lived but an hour after her extrication.

Philemon Saunders, a young man who had called on Dr. Rivers for a prescription for his young wife, to whom he had been married but one week, met his death in the same ill-fated house. Miss Anna Rivers, Major Oswald, and Dr. Rivers, who were in the house at the same time, were more or less injured, Miss Rivers seriously.

The following statement is made by Mr. Behrie:

"We have read of storms at sea, and have witnessed one that swept along the southern coast in 1876, when the billows of old ocean were lashed into fury. We have heard and read of hurricanes and tornadoes that have swept over the torrid regions of the earth, and which have been described in vivid colors by competent witnesses, but we must say that we have never read nor heard of one that surpassed in fury or shortness of duration of actual destruction than that which passed through the old town of Walterborough, in Colleton County, and State of South Carolina, on the afternoon of the 16th of April, 1879. About 3.45 p. m. of that day, with scarcely any premonitory signs, except the lowering clouds in the southwest, with a '*low-moaning sound*,' so often described by sailors as the precursor of storms, the violence of the tempest burst upon the southeastern portion of our town, and gyrating in its movements to the north, then west, then south with lightning speed, it laid prostrate more than three-fourths of our beautiful town, and left homeless more than that proportion of its inhabitants.

"The writer, who was an eye-witness to the scenes that occurred in his part of the town (where the first shock struck), was in his garden a few minutes before the tragic event that was destined to become historical, and strike terror to many hearts and desolation to many homes. He observed the rising clouds in the southwest, but did not anticipate any disastrous result. The clouds looked strange, having a dark gray hue, tinged with a light purple edging. He retired to his piazza, which faces south, and remained there awaiting the result of the squall, as he supposed it would be, and to watch its effect on his fencing. His wife called his attention to the low moaning sound previously mentioned, and asked him to come into the house. He waited until he saw Dr. George M. Rivers's fence go down and house totter, when he hastily entered his own house (in dining-room), and slamming the door, forcibly hurried his wife and three of his children from this room into the interior of the house; while returning to the dining-room, was deterred by his little daughter clinging to him and begging him not to leave her. This little instance saved his life, for in another moment he beheld a blank space where the dining-room had stood, it having been completely swept away, and a path of blankness, so to speak, met his sight on every side. He hurried his wife and children into the front of the house, and returned to remove his aged mother from her sick-room just in time to save her from destruction. As soon as he had returned to the front of the house (the parlor) he closed the door and rushed out of the front of the house. In this short time the tornado had veered or circled around and swept away the other wing of the house, and all to the north and west presented a ruinous waste.

"The writer does not think that more than a minute transpired in which the destruction was complete and the tornadic force had exhausted its violence. Thunder, lightning, and rain (some say hail in different parts of town) continued during the evening and night. Terror reigned supreme. Seven churches, all in the town, were completely destroyed, and have 'left no trace nor track' to mark their site except level ruins, which can hardly be recognized as the temples dedicated to the worship of God. It seems a strange providence that not a place of worship is left in our town, and it seems that we have been God-forsaken, though we may not rebel against the inscrutable ways of the Creator or attempt to account for His ways of dispensation. The beauty of Walterborough has departed in the almost total destruction of its noble trees, which were the admiration of its visitors. The aged oaks that once 'reared their lofty heads to Heaven's high dome,' and the tall pines that have stood many storms may be seen strewn on the ground, and lying in every conceivable direction, so gyratory was the prostrating tempest."

The time given by Mr. Behrie (3.45 p. m.) is considered as the correct time at which the tornado struck Walterborough, his clocks, afterward found in the ruins, indicating that hour.

The following statement is from Maj. John W. Burbridge, an old resident merchant of Walterborough. He observed the tornado from the piazza of his store, which faces south, and is located on the north side of the track. The storehouse is one story, built of very heavy timbers spread over considerable ground, heavy laden with supplies of all kinds, and at the time of the blast was open, all of which taken into consideration seems to account for the store's escape. Houses that were tightly closed, as will be shown hereafter, suffered most by the wind. Major Burbridge says:

"Day opened with a light, southeast wind, and become very sultry. No rain had fallen for some time. About 2 o'clock p. m. clouds began to come up in the southeast, southwest, and all around to northwest; those to the southeast and northwest grew black, and between 3 and 4 o'clock the cloud to the southwest had a yellowish white appearance, with a greenish tinge on the bottom edge. At my point of observation the wind was from southeast and very light. I calculated that the rain would come from northwest, which is usual for summer storms. I think there was thunder in the northwest. About 4 o'clock I heard a very unusual noise, seemingly coming from the south. It was such as I had never before heard, and was terrific. Looking south, I saw, approaching us, a square, perpendicular column of what looked like falling water, and

extending from the earth to the clouds above; the sides appeared perpendicular, the mass approaching with great velocity. I remarked, 'Something terrible is coming!' The street at our store runs east and west. An empty cart was standing in front of the door, the tail end of the cart facing east, and shafts lying on the ground. A puff of wind from the west ran the cart back some 75 yards, forcing it through a strong picket-fence. About this time pine trees on a lot a little to the east of opposite to my position were felled. I think I heard them fall, but after that I heard nothing but one continued roaring of wind. The noise of the approach of the storm (before mentioned) sounded like rushing of numerous trains of cars. I heard no more of it after trees began to fall. The wind continued in its first course for a few seconds only, when it shifted to the north and returned with increased force and violence. It drove in our north window, a window below, and one in the gable above, prostrated the largest oak in the town, and nearly every tree around the store. The store is a single story, has a piazza to the south and an office at the east end of the piazza. I was standing near the office door. Two empty dry goods boxes on the piazza were undisturbed. Toward the end of the wind, I was covered with wet sand and washed up leaves, which so thickly filled the air that I could not have seen 20 feet—for a few seconds I could not see at all. My daughter and her two children were at my house, about 300 yards south of my position. She saw the clouds, and describes them in the same manner as above. The trees on my lot fell from east to west. Duration of wind, about half a minute. At the store the trees fell mostly from north to south."

The following is a correct list of houses, churches, &c., destroyed and damaged, with such brief notes in connection therewith as have been suggested to be of interest. (The numbers designate their location in the path of tornado, as shown on the appended map of town-plat.)

No. 1.—Residence of Dr. Geo. M. Rivers, with three out-buildings entirely destroyed.

No. 2.—Residence of F. G. Behrie, esq., almost a complete wreck, and uninhabitable; the out-buildings, eight in number, completely demolished; trees leveled. The stable, a large building, contained a horse, and was barred up. The horse escaped with slight bruises. A remarkable occurrence took place on these premises, to wit: one of the chimneys of the house was snapped off in the middle, and the broken portion set down in the vicinity without a single brick being disturbed. A small store-room was tilted up by the storm, and left at an angle of 45°. Heavy articles of furniture were hurled through the sides of the house and carried one hundred yards. This was the second house in Walterborough struck by the tornado, the family being saved almost miraculously. Mr. Behrie accounts for the non-destruction of the center of the building by the fall of a large wahoo (species of elm) tree on the rear of the building, acting as a stay to that part; also to the fact that he threw open the central passage doors to allow a free course for the wind.

No. 3.—Walterborough academy entirely destroyed. This point is known for being visited by strokes of lightning, the tall pines near the buildings having been struck three times in the past ten years.

No. 4.—Residence of Hon. Robert Fishburne and two out-buildings ruined. It was located near the central whirl, and, from information obtained from its inmates, its movement from foundation was probably due to the following causes.

The first southerly blast of wind which swept away Dr. Rivers's house and the academy, blew down the trees to the east end of the House and carried away the roof. An eddy at once formed around the premises, in a movement contrary to that of the hands of a watch, sweeping with hurricane force and lifting or forcing the house bodily from its foundation to the ground, the eastern portion being demolished and left resting on the fallen trees. The building was moved seven feet at the southwest end and five feet at the southeast corner. Builders estimated the weight of the building to be 150,000 pounds. Relying upon those figures as correct, the velocity of wind required to move building is 150 miles per hour.

No. 5.—The house of Miss Pinckney, with three outbuildings, totally destroyed, and every tree torn up by its roots. On these premises Jeannette Washington was crushed beneath the falling timbers, dying shortly after her extrication.

No. 6.—Premises of Maj. John W. Burbridge. (See his report.)

No. 7.—Residence of Lucien Bellenger, on the southern portion of town, unroofed by a southwest wind and two outbuildings carried away and demolished, the *débris* being scattered in a northerly direction.

No. 8.—Residence of Col. J. S. Glover completely unroofed. Four outbuildings destroyed.

No. 9.—Mrs. Croskey's house, adjoining Mr. Glover, was badly injured.

No. 10.—Col. Charles E. Miller had his residence partially injured by the northwest wind. Trees in his yard lie from the northwest.

No. 11.—Residence of Henry M. Neyle, almost a total wreck, only one room being habitable. His fine grove of oaks to the south of his house was destroyed, as was everything about the premises. The place contained about five acres, and the trees on the

ground must number at least 500, twisted and whirled in every describable direction, the top layers being from the northwest. No one injured.

No. 12.—Residence of Judge C. B. Farmer. Had house badly shattered and all of his outbuildings carried away from the south side. His fine garden of choice trees and exotics, to the care of which he devoted much attention, presents a sad spectacle. Trees fell from north and west.

No. 13.—Residence of Mrs. A. Frasier partly crushed by a falling tree at west end. House unoccupied at time of storm.

No. 14.—House of John Scott entirely destroyed; one child killed and another badly injured.

No. 15.—House of Margaret Burns; complete wreck.

No. 16.—Residence of Joseph Edward Glover, jr., United States commissioner, situated on the northern side of track. House badly damaged by high northwest wind. He stated to me that the day was very warm, not a breath of air; the approaching cloud was very black, and the noise resembled that of a prairie fire carried forward by a high wind. The destructive force did not last sixty seconds; the floor beneath him shook. He lost several outhouses, many fine trees, and all his fencing.

No. 17.—Methodist Church (white). Complete wreck; leveled to ground by northwest wind.

No. 18.—Residence of Mrs. C. E. Godfrey. Trees and fencing destroyed; house unhurt. A remarkable instance of Divine interposition was the preservation of the home and the lives of two aged ladies in this house, Miss Susan P. Webb, aged ninety-eight years, and Mrs. Eliza L. Godfrey, age ninety years. They were bed-ridden. In every direction, and within a few feet of this dwelling, the mighty oaks and other trees that surrounded the house were literally strewed on the ground.

No. 19.—House of Jasper Rice badly shattered; outbuildings, trees, and fencing destroyed.

No. 20.—J. M. Klein's store. House shattered, and trees and fencing prostrated by the northwest wind.

No. 21.—Dr. E. Wilson's place. Little damage done; felled trees lie from northwest.

No. 22.—Residence of Hon. C. G. Henderson. Few tall trees blown down by high northwest wind. His daughter was playing the piano at the time of the tornado. The roar was so loud that the music of piano was drowned; roared like cars were running overhead.

No. 23.—Residence of Mrs. D. S. Henderson. Rear of house slightly injured; fencing down. The tallest trees near the house broken off high up by northerly wind, while farther toward the street trees were uprooted, showing the downward tendency of the current on the north side of track.

No. 24.—Residence of C. H. Farmer. House and outbuildings totally destroyed. Mr. Farmer had a foot badly injured by falling timber.

No. 25.—Store of A. Wichman, mayor. Building slightly damaged; fencing gone, and outbuildings overturned by the northwesterly wind. A curious incident at this point is reported: A large four-horse lumber wagon, weighing 3,500 pounds, was lifted over a 6-foot fence and carried 60 feet from its original position. A negro states that he heard the wagon chains rattling, and upon looking around saw the wagon carried over the fence. After the storm the wagon was found under a fence which had been blown on it and held fast by a falling tree.

No. 26.—"Commissary for the sufferers"; injured but little.

No. 27.—Residence of A. Wichman, mayor, slightly injured; some outbuildings destroyed. Trees fell from northwest, a large number being broken off high up.

No. 28.—Residence of C. P. Fishburne injured slightly. Trees fell from northwest.

No. 29.—Dr. Charles Witzell's office. Little damage.

No. 30.—Market-house. Building crushed by a tree falling from the north.

No. 31.—Maj. J. W. Burbridge's store. Damage slight. In the street in rear of the building was one of the largest oaks in town. It was uprooted by the north wind and dashed to the ground without any person in the store at the time knowing of its fall. A horse belonging to a customer was killed by the falling trees.

No. 32.—Residence of Col. A. C. Izard. House badly wrenched. One room on the east end was shattered by a falling tree. The street scene presents a clean appearance, the fallen trees having been cut out of the highway by the citizens, and the rubbish either removed or piled on each side of the street.

No. 33.—Town council chamber—center of village. It seems miraculous how this building escaped, as it is a light frame structure, when but across the street and not 100 yards distant strongly built churches and houses were dashed to pieces.

No. 34.—Residence of Clarence Lucas, esq. Dwelling almost a wreck; roof gone and trees prostrated. As viewed from Rev. E. E. Bellinger's residence to the northward, it will be observed some of the trees fell with a northeasterly wind, showing the margin of the central whirl on the north side, it having but a second before brought down the Episcopal church, from the southeast.

No. 35.—Saint Jude's Episcopal Church. This fine Gothic structure was torn to pieces and demolished by the gyration of the central whirl.

No. 36.—The African Methodist church is so complete a wreck that little or no trace of it was left.

No. 37.—Residence of Dr. B. P. Fishburne. Dwelling and outbuildings totally destroyed. Buggy standing in yard violently hurled against the Episcopal church some 150 yards distant in a direction little west of north.

No. 38.—Residence of R. L. Fraser. House badly shattered; chimneys all down; roof carried in a northerly direction; one outbuilding totally demolished.

No. 39.—House belonging to Mrs. Pinckney demolished, and scattered to the northward.

No. 40.—Residence of J. K. Terry. "House of refuge." House, which sits quite low on the ground, badly shattered. His outbuildings and fences were destroyed and every tree uprooted by the southeast wind. Mr. Terry (formerly of Elmira, New York) opened his house to the dying and wounded, keeping open house for all who came. The people named his residence "House of refuge." He and Mrs. Terry assisted Mrs. Dr. Rivers from the ruins and had her carried to their residence, where she died shortly afterward.

No. 41.—Lucretia Campbell's dwelling; destroyed.

No. 42.—House of O. P. Williams; unroofed and fencing carried away.

No. 43.—House of Daniel Chaplin; slightly injured and some outbuil .ings and fencing swept away.

No. 44.—Catholic chapel crushed to the earth.

No. 45.—Methodist Episcopal church (colored) same fate.

No. 46.—House of Thomas Richardson outside of destructive winds.

No. 47.—Residence of Ex-State Senator W. F. Myers. House injured. Trees prostrated from southwest.

No. 48.—House on Ford lot destroyed.

No. 49.—Hopewell Presbyterian church (colored) was razed to the ground to the northwestward.

No. 50.—Residence of W. F. Bellinger wrecked; piazza carried away; timber from outbuildings carried and scattered through Klein's inclosure to the north. A piece of scantling from this house was found on Mr. Klein's piazza driven through weather-board, plastering, and chair-board, protruding six inches into the room; distance about 250 yards.

No. 51.—Residence of J. M. Klein; an elegant two-story house, almost a complete wreck. The whole family, eight in nu nber, escaped with slight bruises; roof and pieces of outbuildings carried in a northeasterly direction into Hickory Valley. The door of house opening on the south piazza was forced open by the wind and a bed in one room carried bodily to the ceiling. In another room a marble-top table sitting in the center was taken up bodily, whirled around over the heads of the children in the room at the time, and then dashed to fragments on the floor.

No. 52.—Bethel Presbyterian church, white. This building, once sitting on a sand hill in Hickory Valley, is a complete wreck and presents a curious appearance. Amid the *débris* can be seen the pulpit and pews in their original position, and the crushed organ placed on the top of the ruins as extricated therefrom presents a melancholy spectacle. This was the last of the seven churches destroyed and leaves the people of the town without a place of worship.

No. 53.—Residence of Miss E. Youngblood; house and outbuildings demolished; Miss Youngblood had an arm broken by the falling timbers.

No. 54.—Benjamin Trotty's house demolished.

No. 55.—Residence of W. C. P. Bellinger; outbuildings demolished and dwelling shattered; large oak trees prostrated from southwest.

No. 56.—Residence of E. W. Fraser, esq., clerk of county court; house slightly injured and outbuildings destroyed.

No. 57.—House of Mrs. M. L. Fraser; badly shattered; two rooms unroofed.

No. 58.—Mr. J. D. Edwards' residence; outside of destructive winds; not much injured.

No. 59.—Residence of Major Oswald; inside line of track; not much injured.

No. 60.—House on Holmes lot; little damage.

No. 61.—House of B. Stokes; slightly injured.

No. 62.—House of S. Chaplin; trees prostrated and outbuildings carried away.

No. 63.—Residence of Mrs. Mary B. Webb. This house is located near the center of track. It was one of the finest buildings in the town, and now presents a dilapidated spectacle. The building had a very large brick chimney, 10 by 7 feet, built in its center, which no doubt kept the central portion from being blown away.

No. 64.—Residence of Rev. E. E. Bellinger; demolished.

No. 65.—Residence of Dr. Charles Witzell, next to Mrs. Webb's; total wreck. Heart-rending scenes accompanying the escape of family occurred here. Ladies were entirely stripped of their clothing by the wind.

No. 66.—Residence of Rev. Dr. Jas. B. Dunwoody. The house was closed up, the

family being absent. The ruins present every appearance of explosion, the walls of the house having fallen outward.

The foregoing completes a history of the principal houses, churches, &c., destroyed or injured as indicated on the town plat. The arrows on the map show the direction in which the *débris* was carried.

A large number of houses belonging to colored people, and which were destroyed, are not enumerated, as I found it impossible to correctly locate them on the map of town plat. The Colleton Democrat publishes the total number of houses and outbuildings destroyed as one hundred and ten.

After leaving the town the track did not show the gyratory motion of the central whirl, as I have endeavored to show as occurring in the town, but kept forward in a straight line. It seems that the streets from the west being unobstructed had some influence in producing the gyrations of the whirl out of a direct line in the town, and the open ravine to the north side of Hickory Grove assisted in the same manner. (The dotted red lines on the map of town plat indicate the portions of the track where the whirl was most violent.)

Inquiries were made of persons on both sides of the track, in order to ascertain the change of temperature caused by the inrushing winds, and the information I received shows a sudden fall to have occurred on the north side.

The tornado, on leaving Walterborough, kept on in a straight line toward the Edisto River. On the farm-lands of Mr. Charles Saul 20 head of cattle were killed by falling trees. A large amount of fencing and turpentine trees were destroyed. His residence, being on the outside of track, escaped injury. Passing from Mr. Saul's place, the blast struck the turpentine field of Mr. D. Odum, felling some 45,000 trees. It was in these pines that the body of Benjamin Reynolds was found, he having been killed by a falling tree.

Here the path became narrower and well defined, the path at a distance through the pines presenting a view similar to the first swath cut by a mower through a wheat-field, the trees on the south side lying flat on the ground and in the center scattered and twisted in every conceivable direction. On the north side many trees were broken off high up. Here was a good location to arrive at the mean direction of the different layers of trees, as they lay at some places lapped over each other five trees high. In the center of track in a mass of pines the trees lapped on top of one another as follows:

The first tree fell with a southwest wind; the second from south; the third from south; the fourth from northerly; and the fifth from the west.

On the south side of track the mean direction of the layers were—first tree southwest, second south, and the third southeast.

On the north side of path the mean direction was more difficult to obtain, the trees having been broken off high up. At one point they lapped, first tree north, second northwest, third and fourth southwest.

Not a tree fallen from east was observed except occasionally in the center of the track.

Leaving the farm of Mr. Odum, the storm next struck the plantation of Col. Archibald Campbell, just four miles northeast of Waterborough. Colonel Campbell, being county surveyor, gave me valuable information in regard to distances, he being familiar with every location in the county.

On his farm the tornado track was just 900 yards wide. His house was in the center of the path, and his family felt the full fury of the blast. The Colonel states that it was near 4 p. m., April 16, 1879, temperature high, weather very close, no evaporation taking place, and not a breath of air astir. The clouds before the blast were noticed flying in every direction, and displayed marked signs of high winds, the peculiar character of the clouds forming an indescribable mass. The storm-cloud came from the southwest; was a very dark, muddy-looking column and covered the entire space of track. It moved in rotary circles in its journey of destruction, carrying away all his outhouses, fencing, trees, and three rooms and kitchen of his residence. Loss $1,500. The Colonel relates that his feelings during the passage of the tornado were the most horrible of his life. The following graphic description of the storm is given in a letter to his brother, who is city treasurer of Charleston.

"DEAR BROTHER:

* * * * * * *

"Now the storm.

"Wife and I were sitting on the piazza. I said: 'We are about to have a heavy thunder-storm. See how the clouds above us are flying from every point of the compass, whilst with us a perfect calm reigns, and the heat is intense.' Whilst looking at the wild racing and crossing of the souds above us, I heard a moan from the southwest, beginning very low and rapidly rising. *Such a moan* nothing but the wail of millions of humans could produce. We sat awe-struck! Immediately a black, whirling cloud arose above the horizon and with it, growing louder and louder and more horrible every moment, came the evidence of the power of God. The earth trembled.

We sat watching its advance (the house was closed, expecting an ordinary thunder storm) until the tall pines surrounding us began to wave. In an instant we were in the house, closed the door, and the tornado was upon us. For about two minutes we were wrapped in the darkness of a starless night, with a raging, whirling tempest around us; then light. The mighty storm had passed, leaving ruin and desolation in its track.

* * * * * * *

"Your brother,

"A."

Heavy rain fell immediately after, continuing for twenty-four hours, with some little hail. Two outbuildings occupied by colored families and situated in the open field some 300 yards farther on were torn to pieces and scattered through the swamps in line of track. Colonel Campbell attributes the saving of part of his residence to a grove of wild orange trees which he had planted in front of his house, and which being blown on top of the building kept the wind from tearing it to pieces. Berries from wild orange trees were found in large quantities within two miles of the Edisto River, some ten miles distant, having been carried thither in the whirl. The Colonel, who is familiar with every acre of ground in Colleton County, says he is sure that not a tree of this kind is planted between his house and where these berries were found.

From Colonel Campbell's place sensible winds did not extend two miles and a half southward, where Col. R. S. Bedou resides. Colonel Bedou says that he heard the roaring in the woods to the northwestward, but at his place there was not much wind, only a little from the southwest. The day was markedly sultry. The noise of the passing tornado resembled that of rushing cars; saw two dark clouds right and left, but could not see the ground on account of the trees. There was a little rain before the tornado (no hail), plenty of blinding lightning—the most continuous he ever saw, and he is seventy years of age. He states that the rain-fall was great.

Through the swamps and pines the storm pushed its way some three miles farther, where it struck the plantation of Allison Blocker, esq. Everything about his farm excepting his house was swept away. Farther on, a quarter mile northeastward, in the same opening in the woods, is located the country store of Mr. Gustave M. Blocker. This place was badly used up, the dwelling being entirely demolished, and the fences, outbuildings, and roof of store scattered in the woods. The track at this point was 600 yards wide and well defined. Mr. Blocker, who with his brother and two servants were badly injured, was questioned about the storm. He stated that his location is northeast of Walterborough seven miles. The storm occurred after 4 o'clock p. m. of April 16, 1879; the day was hot and sultry; no air. Sitting on a log in front of the store, he noticed the clouds for an hour flying rapidly in every direction. Then a dark, muddy cloud appeared in the southwest, over Campbell's place. Never saw such a sight before. As it approached he heard the roaring and ran into the house with his family. In a few seconds down came the house on top of him, injuring him severely. No trees were heard to fall; and when he was pulled out of the rubbish was never so surprised as on seeing every tree for miles, both northeast and southwest, lying on the ground, and his buildings, furniture, and fencing gone, with the roof of his store-building. After the blast, rain and hail fell in torrents. The weather had been very dry through this country for some time before, and rain was badly needed. A plank from Mr. Blocker's house 20 feet long was found out in the woods one-quarter mile in a northeasterly direction. Would judge its weight at 200 pounds. Damage to property, $1,500.

Passing on northeasterly the storm carried away the outbuildings and fences of Mr. Richard Breach. Two miles farther on resides Mrs. Sarah Spell, who had her dwelling damaged, fences and outbuildings swept away. From this point to the Wesley African Methodist camp-meeting ground, ten miles from Walterborough, the track narrowed to 450 yards, and the tall pines were leveled to the ground with few exceptions, and from the manner in which the camp-ground tents and church were torn to pieces the tornado force must have gained new energy. The *débris* of the church shows signs of collapse, as part of the roof laid square over the foundation of building, with rubbish underneath. The place is a complete wreck, and the colored preacher, whom I interviewed, estimates the loss at $2,000. Here the son of Stephen Tucker was killed, and several persons injured, by falling *débris*. From this point to Givham's Ferry, on the Edisto River, six miles distant, where the tornado crossed, the width of the track remained about the same, but its force was not so destructive.

Mr. T. S. Rivers was in line of track in this section, and from him I obtained the following information:

Storm came up after 4 p. m.; clouds for an hour previous looked angry, and ran in every direction; was very close, no air astir; saw the big black cloud coming from the camp-ground, and roaring like the noise of a train of cars; saw the tail of the cloud drag on the ground. It moved in whirls with great velocity. As near as he could judge, the cloud was 200 yards wide. Suddenly everything became dark as night, and

hail began falling; next came bushels of sand dashing over him, after which the noise subsided. By the time he wiped his eyes, all was over. The wind was terriffic, and came near lifting him from the ground. For a few moments he could hardly get his breath. It seemed as if he would be sucked up in the whirl. Very heavy thunder followed, and rain fell all night, making the roads through the pine lands and swamps impassable.

At Givham's Ferry, where the tornado crossed the Edisto River, the track narrowed to 400 yards, and little damage was done except to turpentine trees. On the road near the ferry a buggy was badly damaged. The river proper is about 75 yards wide, while the swamps extend nearly a mile on either side. On the river at this point a raft of logs was passing down towards Jacksonborough, and on which James Douglass was injured by a falling tree-top. He was carried to the city hospital at Charleston, where I obtained a statement from him.

He says he was floating a raft of logs down the Edisto River on Wednesday, the 16th of April, 1879. When opposite Givham's Ferry the storm came upon him. The day had been very warm and showery. About half past four awful-looking black clouds were observed approaching from the southwest. He made an effort to get to the shore, but before he succeeded he was struck in the back by a tree-top. The clouds at this time were whirling in every direction like the rapid rolling of dense smoke. The raft was given such a twist that it did not stop until it jammed into the bushes on the eastern side. The wind lasted only a few seconds, but hard rain fell all night and part of next day. On passing to the northeast of the swamp, about one mile to the edge of the pine lands, the cloud rose as abruptly as it came down at Dewitt's.

No peculiarity in the topography of the ground could be noticed at this point of ascent. The same sandy soil, pine barren, and swamps continued to the northeastward. I can attribute the rise of the cloud to no observable cause. Traveling through the country from the Edisto to Somerville and other points on the South Carolina Railroad, where traces of the tornado might be expected, I found no signs of its path, but most every person I met gave account of thunder-storms on the evening of the storm under investigation. The same can be said of that section of country from the railroad at Ridgeville to Oakley Depot, on the Northeastern Railroad.

Oakley Depot is situated northeast from Givham's Ferry 24 miles, in a direct line, and in the course of the tornado. This point is 25 miles north of Charleston, in Charleston County. Here the cloud descended to the earth, about one-quarter mile southwest of the station, crossed the railroad, and ascended a half mile northeast, thus making a sweep on the ground for three-fourths of a mile. After leaving the earth at this point nothing further could be learned of it, inquiry having been made from persons living as far northeastward as Hell Hole Swamp.

At Oakley Depot I obtained the following information from Mr. Jno. McCants, station-keeper:

"I have seen the tracks of tornadoes through our forests, but I never was in the centre of one until the afternoon of April 16, 1879. We had a light shower during the morning, after which the clouds broke and signs of a clear day were visible. About 2 p. m. the clouds began to gather again, and by four o'clock the heavens were obscured by dark, omnious-looking ones, with occasional flashes of lightning and low, distinct thunder. At 5 p. m. the gale in all its fury burst upon us. It seems to have originated and terminated in the open field adjoining the depot. Rain fell in torrents and was accompanied by bright flashes of lightning and loud peals of thunder. Almost immediately with the rain came the wind, which in a few seconds increased to such violence that I doubted the safety of the depot and adjacent buildings. There was an incessant roaring like that of a long train of cars running at full speed, with an occasional report like that of a discharged pistol."

Excepting the depot building, the dwellings, barns, and fencing in the immediate vicinity were demolished. One person was killed and six wounded. Some articles of furniture were found a mile distant. A cart standing at one of the houses was carried 100 yards and broken to pieces against a tree, a tire from one of the wheels being carried 300 yards and deposited in a neighbor's yard. A plow-mould from the same cart was carried 100 yards.

In company with Mr. McCants I visited and examined the track at this point, and found the path 200 yards wide. The cloud came down to the earth in an old field a quarter mile southwest of Mr. McCant's house. Farther on to the southwest the country is swampy and almost impassable, and northeastward the same. No well-defined track could be observed as noticed in the Walterborough region. Here and there for a width of 200 yards a few trees had been twisted off. Very few trees were uprooted. The houses blown down were old, rickety ones built of small poles. These dilapidated buildings were occupied by negro families. By the falling of one a child of Amos Brown was killed. Its body was afterwards found in a hole of water some 50 yards distant.

The blast lasted about a minute and occurred at 5 p. m. Four negro shanties and their household effects were destroyed. Loss estimated at $300.

The southern-bound train passed Oakley at 4.40 p. m. Immediately thereafter, the weather looking threatening, Mr. McCants closed the station-house and barred the shutters inside and then went to his store, some fifty yards distant. After the blast he returned to the depot and found the shutters and windows bursted open. The bolts, one inch wide and one-fourth inch thick, were bent outward, showing plainly the effect of the expansion of the air inside as the vacuum passed over the building. Mr. McCants's son, on hearing the roar of the approaching tornado, ran out of the store, thinking a train of cars had jumped the track and was coming through the houses. A colored man informed me that he heard the noise two miles southward in the swamp, but experienced no wind.

Henry L. Barker, son of Dr. Barker, living two miles northeast of Oakley, in a line toward the ocean near Cooper River, observed the cloud pass over his farm. Its color was like that of copper bronze. He formerly measured rain-fall with a gauge, and estimates four inches to have fallen with this storm. From Givham's Ferry (the point at which the cloud rose) to the southeastward thunder-storms prevailed during the evening. About 5 p. m. some few trees near Ten-Mile Hill, on the South Carolina Railroad, were prostrated, and at 5.20 p. m. the train was caught by the storm between Seven-Mile Junction and Eight-Mile Pump. No serious damage reported at either of the points named.

CHARACTER OF THE CLOUD.

The appearance and shape of the whirling cloud while moving along the earth, as described by different individuals, differ greatly.

Mr. J. C. Lucas, a merchant of Walterborough, gave me the most accurate description of it, and his statement was corroborated by several others. He stated that he was standing on the north side of the track; that the whirl, a perpendicular column about 100 yards in width, was formed by the union of two distinct clouds, one moving from the northwest and another direct from the southeast. The northerly cloud had the appearance of wind, and was of a smoky, yellow cast, and as it approached became paler in color and looked like a snow-cloud, while the southerly one was very dark and muddy-looking, drifting low. At the point where they rolled together in the whirl a mass of tree-tops, leaves, and sand, which were sucked up as the column moved along, were seen.

VELOCITY AND FORCE OF WIND.

It was quite impossible to collect any data upon which to base calculations giving satisfactory results as to the velocity of the wind. In the central portion of the track, where the greatest force was manifested, buildings were not only destroyed, but in many instances literally atomized.

A pigeon-house exposing 24 square feet of surface to the action of the wind, and weighing 1,000 pounds, was carried 80 feet and demolished against a house. By adding to this one-third of its weight for friction, the least possible wind required to move it is 105 miles per hour. It may have been twice that velocity.

A one-story house exposing 200 square feet to the wind and weighing 15,000 pounds, was blown 6 feet and set on the ground. Least required velocity 142 miles per hour.

A church exposing a surface of 1,000 square feet to the wind, and weighing 50,000 pounds, was carried 20 feet from its foundation and demolished. Velocity required, 116 miles.

A house, exposing 360 square feet of surface and weighing 25,000 pounds, moved 20 feet from its foundation. Least required velocity, 136 miles.

Store-room weighing 10,000 pounds, and exposing 128 square feet of surface, tilted to an angle of 45°. Velocity required, 144 miles.

A piece of timber weighing 600 pounds, its greatest surface exposed to the wind being twenty square feet, was carried 440 yards. Least velocity required, 90 miles.

A buggy weighing 150 pounds was carried up in the whirl and the pieces hung on a tree 60 feet high. Distance carried, 300 feet.

Two panels of fence weighing 150 pounds were carried 300 feet.

Weather-board found 6 miles on line of track and recognized by the paint; weight, 6 pounds.

Chicken coop, strong box 4 by 4 feet, found 4 miles distant; weight, 75 pounds.

Hickory tree 54 inches in circumference at butt, weight 3,000 pounds, lifted out of ground and moved up a bank 10 feet.

A cart weighing 600 pounds was carried up in the whirl, torn to pieces, and the tire of one wheel found 1,320 yards distant.

An iron chisel weighing 4 pounds carried 90 feet and driven into a piece of pine timber 2 inches.

Two large hubs of a road wagon, without spokes or felloes, on an iron axle, and weighing 75 pounds, were carried 750 feet.

A basket of books weighing 50 pounds was carried 2½ miles, and was found hanging on a tree with the books intact.
A cart weighing 400 pounds was carried 125 feet and demolished.
Geraniums in pots were found by owner 1 mile from town uninjured.
Buggy left in center of town to be repaired can nowhere be found.
Letters and books found 6 miles distant.
Pieces of matting and dresses found 10 miles away.
Dead sheep found with wool off to the bare hide.
Geese plucked of feathers as if picked by hand.
Birds killed, and none seen in the neighborhood for several days after storm.
Outbuildings turned upside down.
Saw a rooster walk around and crow without a feather on his body.

PROGRESSIVE MOTION OF TORNADO.

The progressive velocity of the tornado in this case is found with some degree of accuracy, assuming that the time given by Mr. Behrie at Walterborough (3.45 p. m.) is correct, as well as the time given by Mr. McCants, at Oakley Depot (5 p. m.). Distance from Walterborough to Oakley is about 42 miles; time of storm, 75 minutes. Assuming, then, that the tornado traveled at the same rate of speed from Dewitt's to Walterborough (8 miles) would make Dewitt's time about 3.30 p. m. Therefore a tornado traveling from Dewitt's to Oakley, a distance of about 50 miles in 90 minutes, would indicate a progressive velocity of 33⅓ miles per hour.

NO RAIN-FALL BEFORE TORNADO.

The tornadoes in Georgia and the Carolinas on April 20, 1875, as also those in Iowa and Illinois on May 22, 1873, likewise the Mount Carmel, Illinois, tornado on June 4, 1877, were preceded several weeks by excessive rain-fall. In this Walterborough tornado the opposite conditions prevailed, namely: no rain for three weeks previous to its occurrence.

ELECTRICAL EFFECTS.

On the night preceding the tornado banks of clouds had been noticed near the southwest from Walterborough, and over which there was frequent reflection of very distant lightning.

During the storm in the village Mr. Behrie and several others described the smell of the air as resembling the scent of burning sulphur.

Four different ladies of Walterborough testify that they observed balls of lightning running along the ground during the tornado, while others saw balls of fire in their houses.

A large tree located on the northern margin of the track, in Dr. Farmer's yard, presents the appearance of having been scorched, one half of the tree-top seems dead and the leaves withered, while the other half of the tree is apparently perfectly sound and healthy. No marks of lightning are visible on the tree's trunk.

On the east end of Mr. Terry's residence a curious spectacle is presented, and which is attributed to heat caused by electrical discharge. The paint, which before the storm had been a pure white, was turned to chromic yellow.

PRECAUTIONS TAKEN BY THE PEOPLE.

I could find no record in the State showing the tracks of the numerous tornadoes that annually traverse it, but they are seemingly more frequent of late years than in olden times, and it is becoming a serious question with the people how to build their houses in order to secure the greatest protection from these storms. In the northern portion of South Carolina storm-rooms are sometimes built by the more intelligent. Rooms of this kind are generally built on the ground floor on the north side of the house, and are constructed of very heavy material. Opening their houses is another precaution practised by many people, and is no doubt a wise plan, as the facts show that every church and dwelling that was tightly closed up suffered most.

SUMMARY.

1. That the tornado was local in its origin.
2. That the weather map issued at the office of the Chief Signal Officer on April 16, 1879, shows a condition favorable for tornado development, viz: area of low barometer in Tennessee moving northeastward with high barometer and cold weather in the Northwest, pressing southward around the spur of the Alleghanies into a region of warm, moist air.
3. That the same weather conditions prevailed on the day of the Georgia and South Carolina tornadoes on March 20, 1875.
4. That everything corroborates the evidence already so abundantly adduced that this Walterborough tornado was a whirlwind of powerful centripetal tendency circling in a direction contrary to that of the hands of a watch.

5. That the tornado cloud was formed in the heavens by opposing currents of cold and warm air.
6. That the most terrific thunder and lightning occurred at the moment the clouds arrayed themselves in combat.
7. That the rain-fall following the tornado was unprecedented, and showed the effect of the rapid mixture of warm and cold air.
8. That the inrushing winds on the north side of whirl had a downward crushing tendency, while the southern winds had an upward lifting motion.
9. That, although no thermometric record could be found, the evidence unanimously shows that previous to the tornado the weather had been very hot, close, and sultry, and that with the passage of the whirl the temperature fell suddenly, especially on the north side of track.
10. That the topography of the country th rough which it traveled was a level sandy soil, "pine barren," and numerous swamps.
11. That its path was continuous for twenty-four miles, then a gap of twenty-five miles where no damage was done, followed by a track three-fourths of a mile in length.
12. That the greatest destruction occurred on the line of central whirl and on the south side of track.
13. That the path of destruction varied from 200 to 900 yards in width.
14. That its direction was east 31° north.
15. That the central cloud (whirl) was 100 yards in width.
16. That articles carried into the vortex were invariably found on the northern side of the central whirl.
17. That the tornado's progressive motion was 33⅓ miles per hour.
18. That the time occupied by destructive winds in passing over a given station was 40 seconds.
19. That sensible winds were not felt three miles from either side of track.
20. That the number of persons killed by the tornado was 11.
21. That the value of property destroyed was $200,000.
22. That buildings thrown open were less damaged than those closed up.

The thanks of the observer are due to Hon. C. G. Henderson, T. G. Behrie, esq., Col. Archibald Campbell, Maj. J. W. Burbridge, Judge C. B. Farmer, Mr. J. K. Terry, and many other respected citizens of Walterborough, S. C., for many acts of courtesy in assisting him in his endeavors to lay before you the facts in relation to one of the most destructive tornadoes that ever visited South Carolina.

I have the honor to be, general, very respectfully, your obedient servant,

H. J. PENROD,
Sergeant Signal Corps, U. S. A.

Washington, D. C., June 2, 1879.

PAPER 45.

List of places for which stations have been requested, but not established on June 30, 1879.

Place.	Applicant.	Date.
Huron City, Mich	Board of Trade, Toledo	Jan. 27, 1871
	Board of Trade, Cleveland	Feb. 19, 1871
	Board of Trade, Detroit	Feb. 19, 1871
Richmond, Va	W. G. Turpin	Apr. 3, 1871
Body Island, N. C	Board of Trade, Norfolk, and resolution of general assembly of Virginia.	Apr. 17, 1871
The Parks of Colorado	E. J. Mallett, late consul-general	May 24, 1871
Staten Island	C. Kentgen, jr	June 9, 1871
	Do	June 20, 1871
Chambersburg, Pa	Hon. J. Scott, United States Senate	June 12, 1871
	Hon. Simon Cameron, United States Senate	June 12, 1871
Watertown, N. Y	L. L. Pratt	June 21, 1871
	Common council, forwarded by mayor	June 21, 1873
	Fred. D. Hills	Mar. 9, 1876
Xenia, Ohio	C. E. Case	June 30, 1871
Port Hope	Board of Trade, Detroit	July 22, 1871
Champaign, Ill. (Illinois Industrial University).	Hon. W. C. Flagg, secretary	July 21, 1871
	Hon. J. M. Gregory, president	Feb. 21, 1872
	E. A. Gastman (chairman meteorological committee, Macon County Fruit-Growers' Association).	Aug. 30, 1874
Niles, Mich	J. B. Fitzgerald, secretary Berrien County Agricultural Society.	July 27, 1871
Louisiana, Mo	W. Stark and R. E. Pleasants	Aug. 3, 1871

PAPER 45.—*List of places for which stations have been requested, &c.*—Continued.

Place.	Applicant.	Date.
Hot Springs, Ark	J. H. Morton, M. D	Aug. 2, 1871
	B. F. Kelley, superintendent	Dec. 10, 1877
Janesville, Wis	J. B. Whiting, M. D., and Rock County Agricultural Society.	Aug. 7, 1871
Hillsdale, Mich	Prof. G. McMillan, secretary of Hillsdale College; Hillsdale County Agricultural Society.	Aug. 6, 1871
Metamora, Ill	Edward Kipp, secretary of Woodford County Agricultural Society.	Aug. 8, 1871
Marietta, Ohio	J. W. Andrews, president Marietta College; Washington County Agricultural Society.	Aug. 10, 1871
Mount Pleasant, Pa. (Mount Pleasant Academy).	W. H. McCreery, acting principal	Aug. 11, 1871
Nebraska City, Nebr	H. K. Raymond, secretary Otoe County Farmers' Club	Aug. 14, 1871
Peoria, Ill	L. J. Colton	Aug. 11, 1871
	W. H. Herron, J. C. Proctor, and 80 others	Mar. 7, 1876
Princeton, Ill	L. J. Colton	Aug. 11, 1871
Mount Moosilauk, N. H	Prof. C. H. Hitchcock	Aug. 16, 1871
	A. F. Clough	Aug. 16, 1871
Catasauqua, Pa	Hon. E. McPherson, Clerk United States House of Representatives.	Sept. 11, 1871
Galena, Ill	D. Wilmot Scott, publisher of the Galena Commercial Advertiser.	Sept. 14, 1871
Columbus, Nebr	J. O. Shannon, secretary Platte County Agricultural Society.	Sept. 5, 1871
Springfield, Mo	John E. Worth, for Greene County Agricultural and Mechanical Society.	Sept. 18, 1871
	A. Milton Lapham	Apr. 6, 1877
Mason City, Iowa	T. G. Emsley, secretary Cerro Gordo County Agricultural Society.	Oct. 6, 1871
Orono, Me. (State Agricultural College).	M. C. Fernald, Maine State College of Agriculture	Oct. 9, 1871
	L. Libbey, postmaster	Feb. 17, 1873
Balize, La., Fort Morgan, Ala., and Waco, Tex.	Agents and captains of Morgan's Steamship Company	Oct. 31, 1871
Fort Randall, Dak	R. J. Percy, for Missouri Valley Telegraph Company	Nov. 9, 1871
Ann Harbor, Mich. (University of Michigan).	Prof. G. B. Merriman	Nov. 28, 1871
Fountain, Colo	R. F. Long, editor El Paso Ranchman	Dec. 4, 1871
Vineyard Haven, Mass	Prof. J. E Hilgard, United States Coast Survey; Daniel W. Stevens and Rev. Thomas Hill.	Dec. 18, 1871
Cape Ann, Mass	Hon. B. F. Butler, M. C	Dec. 19, 1871
Iowa City, Iowa (State University).	John P. Irish	Dec. 14, 1871
	S. J. Kirkwood	Jan. 6, 1873
	A. D. Schenck, first lieutenant Second United States Artillery.	July 3, 1875
Manassas, Va	G. C. Round	Dec. 27, 1871
Quincy, Ill	A. H. Hill, secretary National Board of Trade	Jan. 4, 1872
Dover Point, N. H	John B. Stivens, mayor	Jan. 13, 1872
Wilmington, Del	Board of Trade, Wilmington	Jan. 24, 1872
Additional stations on eastern slope of Lake Michigan.	Hon. H. H. Holt, Michigan legislature	Feb. 11, 1871
Additional stations on mountains of Virginia.	G. C. Wedderburn, secretary Virginia Telegraph Company; L. A. Gobright, Associated Press.	May 17, 1871
Additional stations on western slope of Mississippi Valley.	George P. Plant, W. H. Scudder, R. P. Handy, committee of the Merchants' Exchange, St. Louis.	July 16, 1871
Monomdy Point	R. B. Forbes	Nov. 29, 1871
Cape Cod Light, Mass		
Southwest Pass (Pass à l'Outre), La.	Thornton A. Jenkins, rear-admiral, United States Navy.	Mar. 20, 1871
Staunton, Va	Jed. Hotchkiss, secretary of the Augusta County Fair, Virginia.	Aug. 15, 1871
Christianburg, Va	do	
Bristol, Tenn	do	
Easton, Pa	do	
Harrisburg, Pa	do	
Winchester Va	do	
Towanda, Kans	M. D. Ellis	Feb. 12, 1872
Black Dome, N. C. (Black Mountain).	William Cain	Feb. 12, 1872
Gallitzin and Altoona, on Pennsylvania Central Railroad.	David Peelor	Feb. 17, 1872
Minneapolis, Minn. (University of Minnesota).	William W. Folwell, president	Feb. 21, 1872
Each of the State Agricultural Colleges.	J. B. Bowman, regent of Kentucky University, and others.	Feb. 29, 1872
Northfield, Vt. (Norwich University).	Capt. C. A. Curtis	Mar. 15, 1872
Grand Tower, Ill	A. R. Harris, secretary Mutual Aid and Improvement Society, Saint Louis, Mo.	Mar. 21, 1872

PAPER 45.—*List of places for which stations have been requested, &c.*—Continued.

Place.	Applicant.	Date.
Iuka, Miss	Rev. J. T. Freeman (through Hon. George E. Harris, M. C.).	Mar. 25, 1872
Great Natihalee (Bald Mountain), N. C.	Charles W. Jenks	Apr. 1, 1872
Deposit, N. Y	G. W. Hanford	Apr. 1, 1872
Heilman Dale, Pa	S. P. Heilman	Apr. 1, 1872
Booneville, Mo	J. L. Stevens	Apr. 11, 1872
Fort Wayne and New Albany, Ind.	F. C. Johnson, chairman meteorological committee, Indiana State Board of Agriculture.	Apr. 12, 1872
Maryland Agricultural College.	A. R. Davis, president of board of trustees	Apr. 19, 1872
	do	June 21, 1872
Auburn, Ala. (Agricultural and Mechanical College of Alabama).	William C. Stubbs, John B. Read, W. H. Jennison	May 14, 1872
Ogdensburg, N. Y	Hon. W. A. Wheeler, M. C	May 25, 1872
Plattsburg, N. Y	Hon. John Rogers, M. C	May 23, 1872
Sewance, Tenn. (University of the South).	John L. Cooper (through Prof. Joseph Henry, Smithsonian Institution).	June 10, 1872
	Hon. W. C. Whitthorne; Right Rev. Alexander Gregg, Bishop of Texas; faculty of college, and others.	June 26, 1877
Newark, Del. (Delaware College).	William D. Mackey, secretary of faculty	June 11, 1872
Warsaw, Ind	Marshall H. Parks	June 24, 1872
Beaver City, Utah	Daniel Tyler	July 8, 1872
New Ulm, Minn	Dr. Alfred Muller	July 10, 1872
Evansville, Ind	F. C. Johnson, P. Hornbrook, surveyor of customs; Thomas P. Britton, president Vanderburg County Agricultural Society; John Ingle, secretary Vanderburg Agricultural Society; and Charles H. Butterfield, mayor.	July 13, 1872
	C. H. Butterfield, mayor	Nov. 26, 1873
	H. L. Morrill and citizens of Evansville	Jan. 16, 1874
	T. W. Venemann	May 31, 1875
	J. E. McDonald, United States Senate; B. S. Fuller, M. C; Thomas M. Brown, M. C.; J. M. Shekelford, and Charles Denby.	May 31, 1875
		Apr. 25, 1878
Aiken, S. C	Hon. F. A. Sawyer, United States Senate, and 16 citizens.	July, 16, 1872
	John C. Derby	Sept. 2, 1872
	James Whitall	Mar. 31, 1875
Winona, Miss	A. M. Rafter	July 20, 1872
Entaw, Ala	W. Bird	July 20, 1872
Ithaca, N. Y. (Cornell University)	A. D. White, president, and petition of 75 citizens	Aug. 8, 1872
	Farmers' Club of Ithaca	Nov. 18, 1872
	A. D. White, president of faculty of Cornell University.	Nov. 22, 1872
	Hon. Roscoe Conkling, United States Senate	Jan. 25, 1873
	P. B. Crandell, corresponding secretary of the Farmers' Club.	Feb. 3, 1875
	E. A. Fuertes, department of engineering	Mar. 17, 1875
	E. A. Fuertes, dean	Apr. 17, 1878
	Z. Hazzard Potter	May 7, 1878
	William C. Russell, acting president	Aug. 8, 1878
Carthage, Ill	L. F. M. Easterday, and petition of 105 citizens	Sept. 2, 1872
Kutztown, Pa. (Keystone State Normal School).	A. R. Horne, principal	Sept. 13, 1872
Gainesville, Ga	M. F. Stephenson	Nov. 5, 1872
Some point between Leavenworth and Shreveport.	Steamboatmen's convention, assembled at Cairo, Ill	Nov. 17, 1872
On plains of Western Kansas and regions southward and southwestward.	Kansas State Horticultural Society	Dec. 21, 1872
Dallas, Tex	W. A. Jones & Co., W. C. Connor, and 133 others	Dec. 26, 1872
	G. T. Atkins and 212 others	Nov. 25, 1878
Oil City and Parker's Landing, on the Allegheny River.	Resolution of select council of Pittsburgh, transmitting and approving petition of 46 citizens of Pittsburgh.	Dec. 28, 1872
Greensborough and Brownsville, on the Monongahela.	do	Jan. 10, 1873
Lawrence, Kans. (University of Kansas).	John Frazer, chancellor	Jan. 16, 1873
	Hon. Stephen A. Cobb, M. C., inclosing petition of Alfred Gray, secretary State board of agriculture.	May 6, 1873
Manchester, N. H	Hon. S. N. Bell, M. C., inclosing resolution of New Hampshire State Agricultural Society.	Jan. 21, 1873
Sandwich, Ill	N. E. Ballou (through Commissioner of Agriculture)	Jan. 22, 1873
Detroit, Minn	Daniel Cony	Feb. 2, 1873
Dayton, Ohio (National Soldiers' Home).	Hon. Isaac Strohen	Feb. 11, 1873
	Thomas L. Neal, president, and Thomas D. Davis, secretary, Montgomery County Medical Society.	Feb. 1, 1875
Palatka, Fla	J. F. Stone (through Secretary of the Navy)	Feb. 17, 1873
Put-in Bay, Ohio	H. B. West	Mar. 3, 1873
	H. D. Cooke, Governor District of Columbia	July 17, 1873
	Hon. Charles Foster, M. C., G. W. Dane and citizens, farmers and ship-owners of vicinity.	Feb. 21, 1878

PAPER 45.—*List of places for which stations have been requested, &c.*—Continued.

Place.	Applicant.	Date.
Emporia, Kans	Robert Milliken	Mar. 6, 1873
North and west of Galveston, Tex	Chamber of Commerce (through Hon. John Hancock)	Mar. 6, 1873
Charlottesville, Va. (University of Virginia).	Hon. R. T. W. Duke, M. C	Mar. 2, 1873
Raleigh, N. C	Cotton Exchange, New Orleans, La	Mar. 30, 1873
Columbia, S. C	do	Mar. 30, 1873
	Hon. John Alexander, mayor, transmitting resolution of city council.	June 11, 1873
	Hon. F. A. Sawyer and petition of 58 citizens, and resolution of city council.	Aug. 5, 1873
Columbus, Miss	Cotton Exchange, New Orleans, La	Mar. 30, 1873
Pierce City, Mo	E P. Lingee, president Board of Education	April 9, 1873
Neshanic Mountain, Somerset county, N. J.	J. V. D. Pumyea	April 12, 1873
Vincennes, Ind	W. Hays	June 15, 1873
Cedar Keys, Fla	Hon. Albert E. Willard, mayor, and 16 others	July 7, 1873
	D. L. Yulee, Fernandina, Fla	Feb. 7, 1874
Salina, Kans	Freeman Kingman, secretary of Patrons of Husbandry and Farmers' Club.	July 17, 1873
	Hon. W. A. Phillips, M. C	April 2, 1877
Alleghanies in North Carolina.	George W. Warren, jr	July 26, 1873
Carthage, Mo	E P. Searle and 174 others	Aug. 15, 1873
New Berne, N. C	George W. Nason, jr	Sept. 13, 1873
Port Townsend, Wash. T	J. W. Sweeny, general superintendent of Puget Sound Telegraph Company.	Sept. 30, 1873
	Maj. William G. Morris, special agent Treasury Department.	Mar. 8, 1878
	Thomas P. Minor, president Puget Sound Telegraph Company.	Dec. 16, 1878
	G. A. Weed, mayor of Seattle	Dec. 17, 1878
Mineral Point, Wis	Hon. T. O. Howe, United States Senate; M. M. Strong	Dec. 16, 1873
Latitude 40° 30′, longitude 74° 42′, Somerset County, N.J.	Hon. F. T. Frelinghuysen, United States Senate; citizens of Somerset, Hunterdon, and Middlesex Counties.	Dec. 22, 1873
Carlton, Wis	Edward Bach, farmers and ship-owners of the district	Jan. 10, 1874
	Hon. Philetus Sawyer, M. C.; Edward Bach	Jan. 26, 1874
Fernandina, Fla	Henry Hazen, collector; W. S. Simmons, first-lieutenant United States Revenue Marine.	Jan. 17, 1874
	Hon. S. B. Conover, United States Senate; G. Stark, mayor; Isaiah Winch, president of council, and 22 others	Jan. 19, 1874
	D. L. Yulee	Feb. 7, 1874
Helena, Ark,	Hon. J. L. Alcorn, United States Senate	Feb. 12, 1874
Oakland, Cal. (University of California).	J. West Martin, secretary of Board of Regents	Feb. 12, 1874
Fayetteville, Ark. (Arkansas Industrial University).	Hon. A. S. Prather, trustee	Feb. 17, 1874
Beatrice, Nebr	Hon. P. W. Hitchcock, United States Senate; A. S. Paddock.	Mar. 3, 1874
One or more stations in Arizona.	Charles Denison, M. D	Mar. 16, 1874
Manistee, Mich	Hon. J. A. Hubbell, M. C.; L. T. Estis	Mar. 18, 1874
	T. J. Ramsdell, deputy collector	Apr. 4, 1879
Gorham, N. H	Elias S. Mason	Mar. 30, 1874
Mason City, Mo	J. F. Benjamin, Brown & Sheppard, E. B. Van Vent, and 33 others.	Mar. 30, 1874
Rome, Ga	Thomas J. Perry, chairman meteorological committee, Rome Agricultural, Horticultural, and Mechanical Fair Association.	Apr. 24, 1874
	do	Jan. 21, 1875
	do	Dec. 4, 1875
	Hon. W. H. Felton, M. C	Mar. 31, 1876
	Henry A. Hills, secretary Chamber of Commerce, Rome, Ga.	Mar. 16, 1877
	Thomas J. Perry, secretary, and H. Harpold, president, Chamber of Commerce, Rome, Ga.	July 19, 1878
Kansas City, Mo	Thomas S. Case, postmaster	May 1, 1874
Muscatine, Iowa	J. P. Walton	May 7, 1874
Syracuse, N. Y	N. Graves, mayor; William Kirkpatrick, J. R. Whittock, and J. B. Hill.	May 9, 1874
	Hon. R. H. Duell, M. C	May 11, 1874
Bakersfield, Cal	A. C. Bratton, M. D.; P. D. McClanohon, M. D	May 14, 1874
Palmyra, Wis	John C. Minton	May 19, 1874
Crawfordsville, Ind. (Wabash College).	Col. H. B. Carrington, U. S. A., chairman military science Wabash College.	June 6, 1874
Harbor of Refuge, Sand Beach, Lake Huron.	Maj. G. Weitzel, Corps of Engineers	June 11, 1874
Calais, Me	Hon. Eugene Hale, M. C.; Boardman Bros	June 16, 1874
Fort Thompson, Dak	Col. D. S. Stanley	June 18, 1874
Chatawa, Miss. (College of the Redemptionists Fathers).	Alexander W. Gordon	July 13, 1874

PAPER 45.—*List of places for which stations have been requested, &c.*—Continued.

Place.	Applicant.	Date.
Ellsworth, Kans	Hon. W. A. Phillips, M. C	July 14, 1874
	M. W. Henry	July 21, 1874
Mount Lake, or Bald Knob, Giles County, Va.	Mrs. H. Haupt	July 21, 1874
Camden, N. J. (The River Iron Works).	Wood, Dialogue & Co	July 29, 1874
Bloomington and Decatur, Ill.	E. A. Gastman, chairman meteorological committee Macon County Fruit Growers' Association.	Aug. 30, 1874
Mount Kearsage, Warner, N. H.	John Eaton, commissioner; Hon. N. G. Ordway, Hon. W. E. Chandler.	Oct. 28, 1874
Ceredo, W. Va	S. A. Forbes	Nov. 21, 1874
	Frank Hereford	June 10, 1876
Astoria, Oreg	Hon. John H. Mitchell, United States Senate	Nov. 29, 1874
	do	Jan. 18, 1878
	do	Mar. 30, 1878
	Aug. C. Kinney, secretary Chamber of Commerce	July 20, 1878
	do	Apr. 2, 1879
Fond du Lac, Wis	Hon. C. A. Eldridge, M. C.; J. W. Carney	Dec. 15, 1874
Corpus Christi, Tex	H. Taylor, P. M	Jan. 4, 1875
	do	Jan. 15, 1875
	Hon. G. Schleicher, M. C; William Headon, mayor; R. I. Denny, secretary of city; J. P. Rodney, and 3 others.	Aug. 24, 1876
Lansing, Mich. (Michigan State Agricultural College).	R. C. Kedzie, professor of chemistry, etc	Jan. 12, 1875
Pana, Ill	E. C. Reese, P. M	Jan. 17, 1875
Columbus, Ga	Hon. H. R. Harris, M. C	Jan. 19, 1875
	do	Jan. 20, 1876
Salisbury, N. C	Hon. W. M. Robbins, M. C	Jan. 20, 1875
Hartford, Conn	G. H. Kingsbury, chairman meteorological committee Tolland County Agricultural Society.	Jan. 21, 1875
Oshkosh, Wis	T. Floyd Woodworth, M. D	Jan. 22, 1875
Ames, Iowa (Iowa State Agricultural College).	J. K. Macomber, professor of physics	Jan. 23, 1875
Mount Anthony, Bennington, Vt.	G. W. Robinson	Jan. 27, 1875
Fortress Monroe, Va	Hon. James H. Platt, jr., M. C.; —— Phoebus; —— Watkins, and —— Wright.	Feb. 8, 1875
Afton, Iowa	Hon. James W. McDill, M. C.; N. W. Rowell, W. R. Roberts, and 12 others.	Feb. 17, 1875
Mount Pisgah, Bradford County, Pa	R. Reddington	Mar. 2, 1875
Marysville, Cal	Hon. J. K. Luttrell, M. C.; E. H. Pratt	Mar. 8, 1875
Jacksonville, Ill	Hon. J. A. Logan, United States Senate; G. V. Black, Samuel H. Martin, and H. G. Whitlock.	Mar. 15, 1875
Ironton, Ohio	Albert Lawson, W. T. McQuigg, and 24 others	Mar. 25, 1875
Isle of Shoals, N. H	John R. Poor, J. Albert Walker, John Walker, and 7 others.	Mar. 25, 1875
St. Augustine, Fla	James Whitall	Mar. 31, 1875
	F. T. Dent, lt. col. Fifth Artillery, and 26 others	Dec. 9, 1878
Abingdon, Ill. (Abingdon college).	D. D. Harris, professor of natural science	Apr. 1, 1875
Helena, Mont	W. F. Sanders, Col. John Gibbon, Seventh United States Infantry, and 24 others.	Apr. 1, 1875
Hingham, Wis	Charles Rogers and F. A. Balch, meteorological committee Farmers' Club of Hingham.	Apr. 19, 1875
Three or four additional stations in the interior of Fla.	John P. Wall, M. D	May 6, 1875
Lake Charles, La	William Meyer, assistant postmaster	June 12, 1875
	D. H. Reese, postmaster	Oct. 15, 1877
Tallahasse, Fla	Hon. S. B. Conover, United States Senate, and 41 others	June 12, 1875
Franklin, Idaho	J. Richardson	July 23, 1875
Lenoir, N. C	Clinton A. Cilley, late brevet lieutenant-colonel and acting assistant quartermaster U. S. A.	July 28, 1875
Johnsonville, Tenn., and Decatur, Ala	J. M. Pettigrew, president, and J. S. Toof, secretary of Memphis Chamber of Commerce, and 101 others.	Aug. 15, 1875
Fort Dodge, Iowa	Frederick Hess	Nov. 4, 1875
Friendsville, Ala	James Pool	Nov. 6, 1875
Greencastle, Ind. (Asbury University).	Alexander Martin, president	Nov. 18, 1875
	Hon. O. P. Morton, United States Senate; Alexander Martin, D. D., president of University.	Mar. 7, 1876
Block Island, R. I	Nicholas Ball	Nov. 24, 1875
	Hon. H. B. Anthony, United States Senate; Hon. A. E. Burnside, United States Senate; Hon. B. T. Eames, M. C.; Hon. L. W. Ballou, M. C.	Dec. 18, 1875
Danville, Va	J. R. Winston	Dec. 13, 1875
Delaware Breakwater	William Brockie, president Philadelphia Maritime Exchange; James Welsh, president Philadelphia Board of Trade, and 36 others.	Dec. 15, 1875
	J. E. Jouett, captain United States Navy	Dec. 22, 1875

PAPER 45.—*List of places for which stations have been requested, &c.*—Continued.

Place.	Applicant.	Date.
Delaware Breakwater	William Brockie, president Philadelphia Maritime Exchange, and 29 others.	May 24, 1878
	Maritime Exchange of Philadelphia, Board of Trade and select and common councils of Philadelphia.	Feb. 20, 1879
Cape Henlopen, Del	J. E. Jouett, captain United States Navy	Dec. 22, 1875
Fulton, Ark	Jay Guy Lewis	Dec. 28, 1875
Provincetown, Mass	T. N. Stone, M. D.; J. W. Davis, and 12 others	Jan. 21, 1876
Silver City, Idaho: Walla Walla, Wash. T.; and Baker City, Oreg.	Hon. T. W. Bennett, delegate from Idaho	Feb. 9, 1876
Carson City, Nev	Hon. John P. Jones, United States Senate; Hon. William Sharon, United States Senate; Hon. William Woodburn, M. C.; the governor, and numerous other State officials of Nevada.	Mar. 6, 1876
Pawpaw, Mich	E. E. Rowland	Apr. 3, 1876
Carlisle, Pa	William H. Cooke	May 4, 1876
Fairbury, Nebr	Will W. Watson, civil engineer	May 12, 1876
Sault Ste. Marie, Mich	Samuel B. W. Covell	May 20, 1876
Kelly's Island, Ohio	D. K. Huntington, deputy collector of customs	May 25, 1876
Three Rivers, Mich	John Anable	May 30, 1876
Moffat, Tenn	John Francis	June 29, 1876
University of Missouri	Colonel Rollins, through J. Eaton, Commissioner of Education.	July 17, 1876
Bald Knob, Giles County, Va.	William Terry; Mrs. H. Haupt	Dec. 22, 1876
Stowe, Vt	A. C. Stickney, civil engineer	Dec. 22, 1876
Alfred Centre, N. Y. (Alfred University).	H. E. Coon	Jan. 12, 1877
Anchorage, Ky. (Forest Academy).	Col. J. H. Current	Mar. 31, 1877
Monticello, Iowa	M. M. Moulton, city marshal; F. I. Tryon, mayor; M. W. Herrick, city attorney.	Apr. 15, 1877
Reed's Landing, Minn	T. B. Wilson & Co	June 25, 1877
Ocracoke, N. C	Thomas L. Tilton; M. T. Nelson, and 17 others, shipmasters, pilots, &c.	June 29, 1877
Ripon, Wis. (Ripon College)	Hon. P. Sawyer; C. A. Kenaston, secretary	July 21, 1877
	Professor C. A. Kenaston	Feb. 5, 1878
	do	Feb. 29, 1878
Cheyenne Wells, Colo	L. M. McLane	July 27, 1877
Judsonia, Ark. (Judsonia University).	Hon. A. H. Garland; Prof. Hubert M. Skinner	Aug. 18, 1877
Statesville, N. C	J. H. Wymer, volunteer observer	July 6, 1878
	William M. Robbins, M. C	Nov. 17, 1877
Bar of Saint John's River, Florida.	Franklin Jordan, chairman meteorological committee, Merchants' Union of Jacksonville.	Jan. 28, 1878
The Vista, N. Y. (Catskill Mountains).	Prof. Samuel E. Rusk	Feb. 6, 1878
Algona, Iowa	P. Dorweiler	Feb. 14, 1878
South Pass (The Jetties), Mississippi River.	Thomas C. Anderson, acting collector of customs, New Orleans, La.	Mar. 4, 1878
Thomasville, Ga	D. S. Brandon	Mar. 18, 1878
	Dr. John T. Metcalf	July 16, 1878
Amherst, Mass. (Massachusetts State Agricultural College).	Lieut. C. A. L. Totten, Fourth Artillery, acting signal officer.	Mar. 30, 1878
	W. S. Clark, president	Mar. 30, 1878
Ahnapee, Wis	C. H. Haskins, superintendent Northwestern Telegraph Company.	Apr. 12, 1878
	Hon. T. O. Howe, United States Senate; W. H. Seymour; Charles D. Robinson, and 28 others.	May 23, 1878
	Hon. T. O. Howe, United States Senate, and 24 others	Aug. 5, 1878
Eagle River (north side of Point Keeweenow), Lake Superior.	J. T. Whiting, general agent Lake Superior Transit Company.	May 1, 1878
	Leopold & Austrian, proprietors Lake Superior People's Line of Steamers.	May 2, 1878
"The Jetties," Mississippi River.	J. B. Eustis, United States Senate; James J. Stewart	May 21, 1878
Grayville, Ill	R. W. Townshend, M. C.; J. G. Stokes, M. D	June 7, 1878
Starkey, N. Y	H. L. Jennison	Aug. 8, 1878
Roan Mountain, N. C	J. M. Thornburgh, M. C	July 19, 1878
Mount Mitchell, N. C	R. B. Vance, M. C	Aug. 29, 1878
Charlevoix, Mich	J. A. Hubbell, M. C.; W. A. Smith	Sept. 5, 1878
Carbondale, Ill. (Southern Illinois Normal University).	Robert Allyn, principal; Capt. T. J. Spencer, U. S. A	Oct. 1, 1878
	Hon. J. A. Logan, United States Senate; James Roberts, secretary; G. F. Foster, professor of physics.	Oct. 2, 1878
Seattle, Wash	G. A. Weed, mayor, and 22 others	Oct. 26, 1878
Custer, Dak	E. H. Flynn, telegraph manager	Dec. 31, 1878
South Saint George, Me	Hon. S. D. Lindsey, M. C.; Franklin Trussell	Feb. 6, 1879
Beaufort, N. C	Hon. A. M. Waddell, M. C.; John D. Davis, D. S. Boone, and 87 others, citizens of Beaufort.	Feb. 10, 1879
Fargo, Dak	Hon. G. E. Spencer, United States Senate; Hon. E. Tyler; A. W. Edwards, proprietor of the Fargo Republican	Mar. 3, 1879

PAPER 45.—*List of places for which stations have been requested, &c.*—Continued.

Place.	Applicant.	Date.
Overlook Mountain, N. Y.	James Smith	Mar. 7, 1879
Whitehall, Mich	Francis Smith, C. C. Thompson, P. M., and 41 others	Mar. 29, 1879
Lafayette, Ind. (Purdee University).	Hon. G. S. Orth, M. C	Apr. 14, 1879
Northfield, Minn. (Carleton College).	Hon. William Windom, United States Senate	May 28, 1879
Belton, Tex	Hon. S. B. Maxey, United States Senate; Hon. Richard Coke, United States Senate; S. C. Alexander, and 67 others.	May 28, 1879
Hummelstown, Pa	Hon. J. W. Killinger, M. C	June 10, 1879

PAPER 46.

Observations of the transit of Mercury, May 6, 1878, by Signal Service Assistants and Observers.—The following observations of the transit of Mercury were made by the observers and officers of the Signal Service, in accordance with special order and instructions.

In all cases the observations were made by observing an image of the sun of from 2 to 3 inches in diameter, as cast by a field glass of 2 inches aperture and erecting eyepiece upon a sheet of white paper, held by means of a suitable frame work, 10 or 15 inches behind the ocular.

The watch-times were reduced to Washington Observatory time by means of corrections afforded by the regular telegraphic noonday signal sent from the Observatory over Western Union lines.

The predicted chances of fair observing weather agree well with the actual event, for out of fourteen stations three were wholly unsuccessful and four partly unsuccessful, owing to cloudiness, whence it is fair to estimate that $\frac{3+\frac{1}{2}4}{14}=36$ per cent. of the observations were lost through cloudiness. The corresponding predictions give $\frac{10\times7+3\times3+5}{14}=\frac{84}{14}=60$ per cent. successful or 40 per cent. lost.

Observations of the transit of Mercury, May 6, 1878, as reported to the Chief Signal Officer.

Stations.	Longitude.	Latitude.	Predicted chance for fair weather.	Contacts in Washington time.				Letter number.	Remarks.
			0–10.	1.	2.	3.	4.		
Virginia City	+35° 0′	45° 20′	5	Obscured	Obscured	Obscured	Obscured	2779	
Denver	28° 1′	39° 45′	3	Obscured	Obscured	Obscured	Obscured	2833	
Pike's Peak	27° 58′	38° 42′	3	Obscured	Obscured	Obscured	Obscured	2780	
Fort Richardson	21° 7′	33° 12′	5	.....	.....	.....	.....	.....	
					H. M. S.	H. M. S.	H. M. S.		
Sandy Hook	— 3° 2′	40° 28′	7	Missed	10, 8, 50	5, 33, 21	5, 35, 44	2525	Planet half-way on at 10 h. 7m. 38s.
Barnegat	— 2° 54′	39° 48′	7	Missed	10, 8, 27	Obscured	Obscured	2688	Planet one-third on at 10 h. 5m. 22s.
Atlantic City	— 2° 38′	39° 22′	7	Obscured	Obscured	5, 32, 45	5, 35, 35	2524 2904	
Cape May	— 2° 5′	38° 56′	7	Missed	10, 8, 37	5, 33, 30	5, 36, 12	2781	Planet first seen at 10h. 6m. 4s.
Washington	0° 0′	38° 54′	7	Missed	10, 7, 26	5, 33, 9	5, 36, 14	832 misc.	Planet { well on at 10 h. 6 m. 0 s. on a full diam. 10 h. 9 m. 16 s. half-way off at 5 h. 34 m. 44 s.
Fort Whipple	+ 0° 1′	38° 50′	7	Missed	10, 7, 13	5, 31, 48	5, 36, 3	2509 2870	
Cape Henry	— 1° 3′	36° 56′	7	Missed	Missed	Obscured	Obscured	2598	Record unintelligible.
Norfolk	— 0° 44′	36° 51′	7	Missed	Missed	5, 35, 10	5, 37, 53	2565	Unsatisfactory, through clouds.
Cape Hatteras	— 1° 33′	35° 14′	7	.....	.....	.....	.....	3193	Planet not seen.
Cape Lookout	— 0° 33′	34° 36′	7	(*)	(*)	(*)	(*)	2973	
Wilmington	+ 1° 7′	34° 11′	7	Missed	Missed	5, 29, 32	5, 36, 22	2738 2948	[Should not 29 m. be 34 m.?]
Smithville	+ 0° 58′	33° 51′	7	Obscured	Obscured	5, 32, 15	5, 34, 18	2564	Should probably be 33m. and 35m.
Portsmouth, N. C.	— 1° 30′	35° 30′	7	(†)	(†)	(†)	(†)	2737	
Colorado College, Colorado Springs	+27° 46′	38° 50′	3	Missed	Missed	5, 32, 56–2	5, 35, 49–3	900 misc.	

* Instructions received too late.

† Portsmouth observed the contacts at "watch time," 10 h. 6 m. 30 s.; 10 h. 9 m. 40 s.; 5 h. 38 m. 50 s.; 5 h. 43 m. 0 s., respectively; but not having received Washington telegraphic time-signals, those times cannot be reduced to the common standard.

OFFICE CHIEF SIGNAL OFFICER,
June 6, 1878.

GENERAL: The observations upon the transit of Mercury having been referred to the fact-room for publication in the forthcoming Weather Review for May, I have drawn up the accompanying table of results, and now report it to you, as you may have occasion to communicate it to astronomers in advance of its appearance in our Review.

Very respectfully, yours,

CLEVELAND ABBE,
Assistant, O. C. S. O.

The CHIEF SIGNAL-OFFICER.

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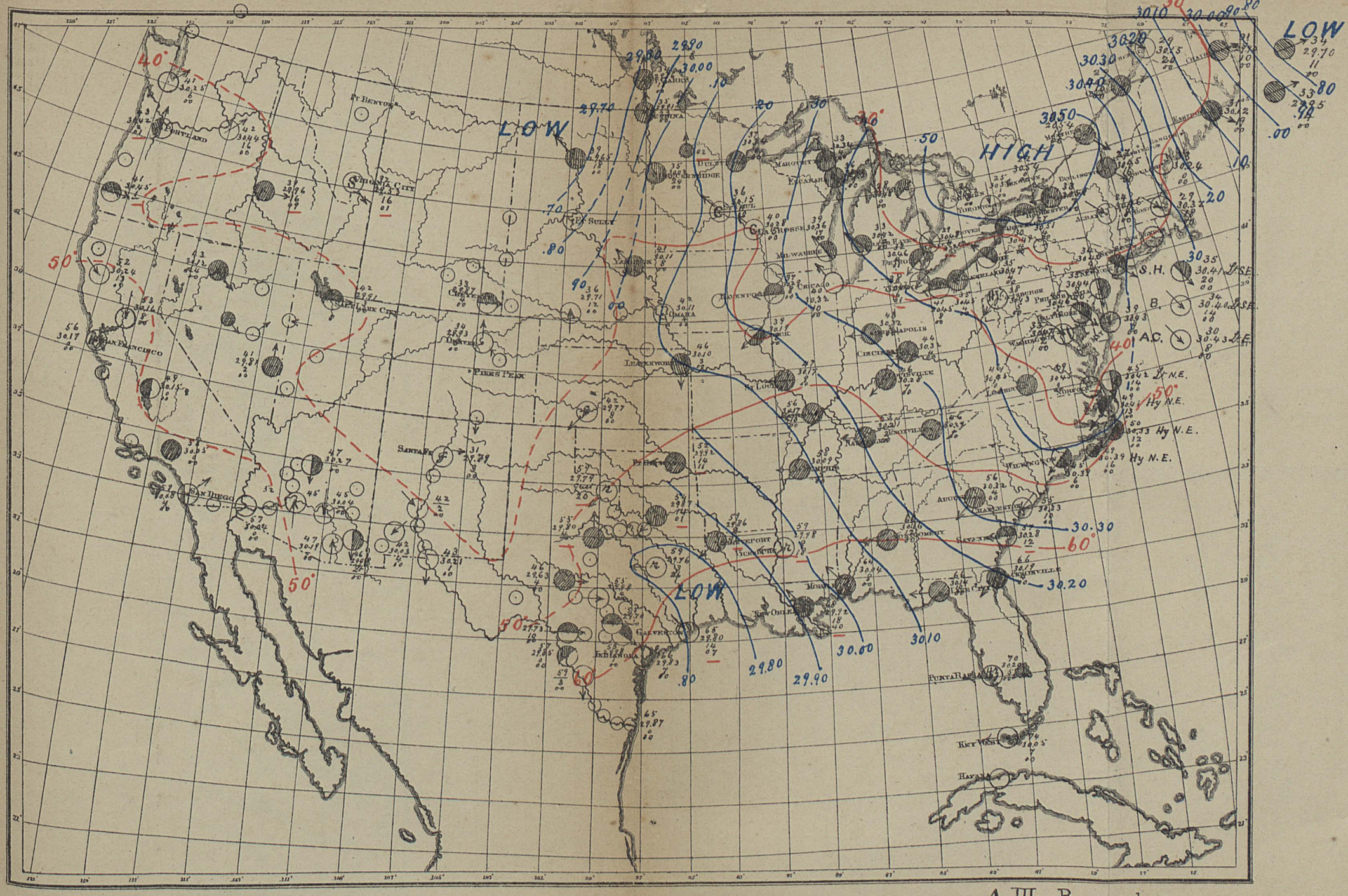
Monday, 11 P. M., (Washington Time,) November 19th, 1877.



A. III. Barometer

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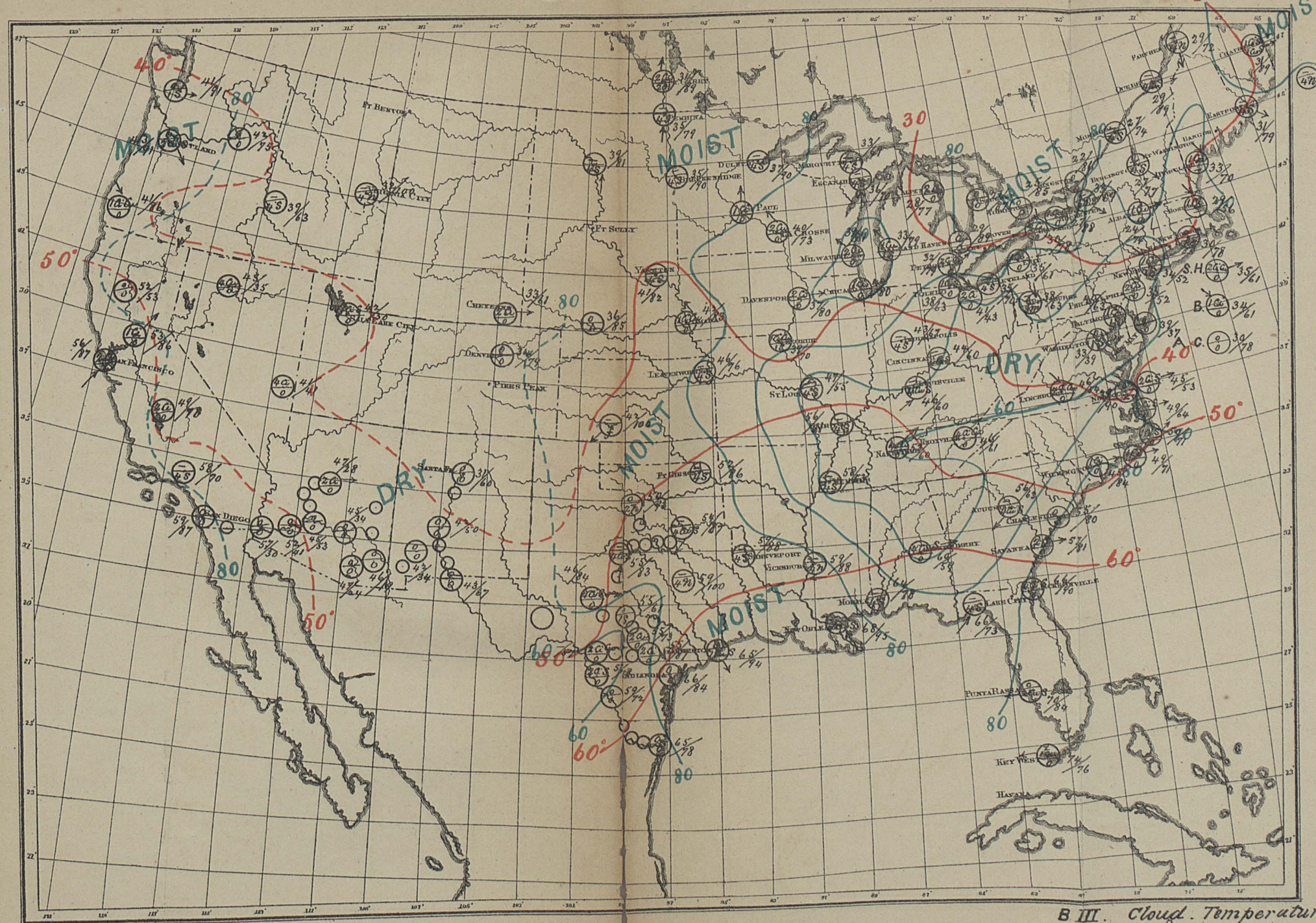

B III. Cloud. Temperature and Humidity.

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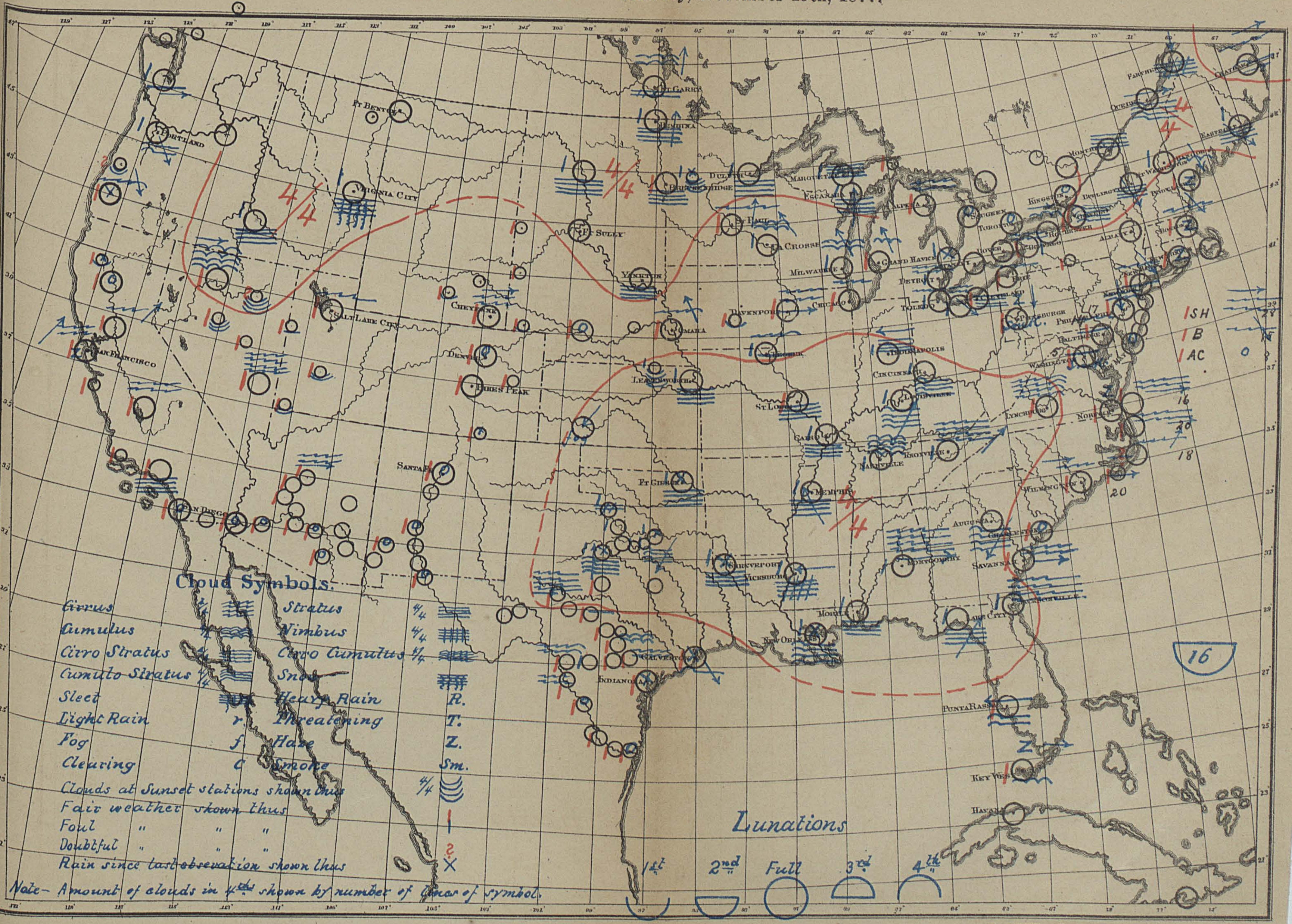
SUNSET CHART. Monday, November 19th, 1877.



C, III Cloud Symbols

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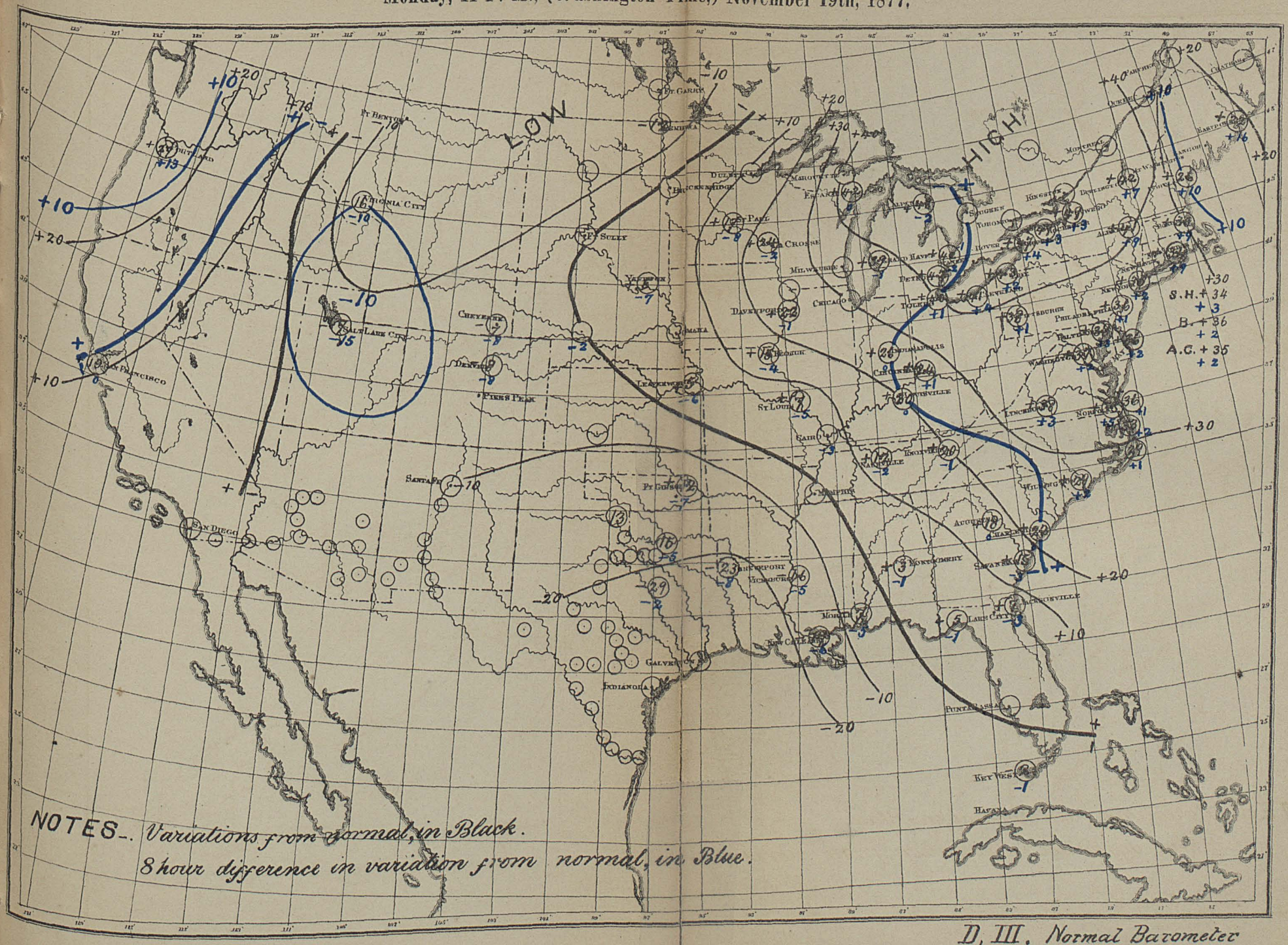

D, III. Normal Barometer

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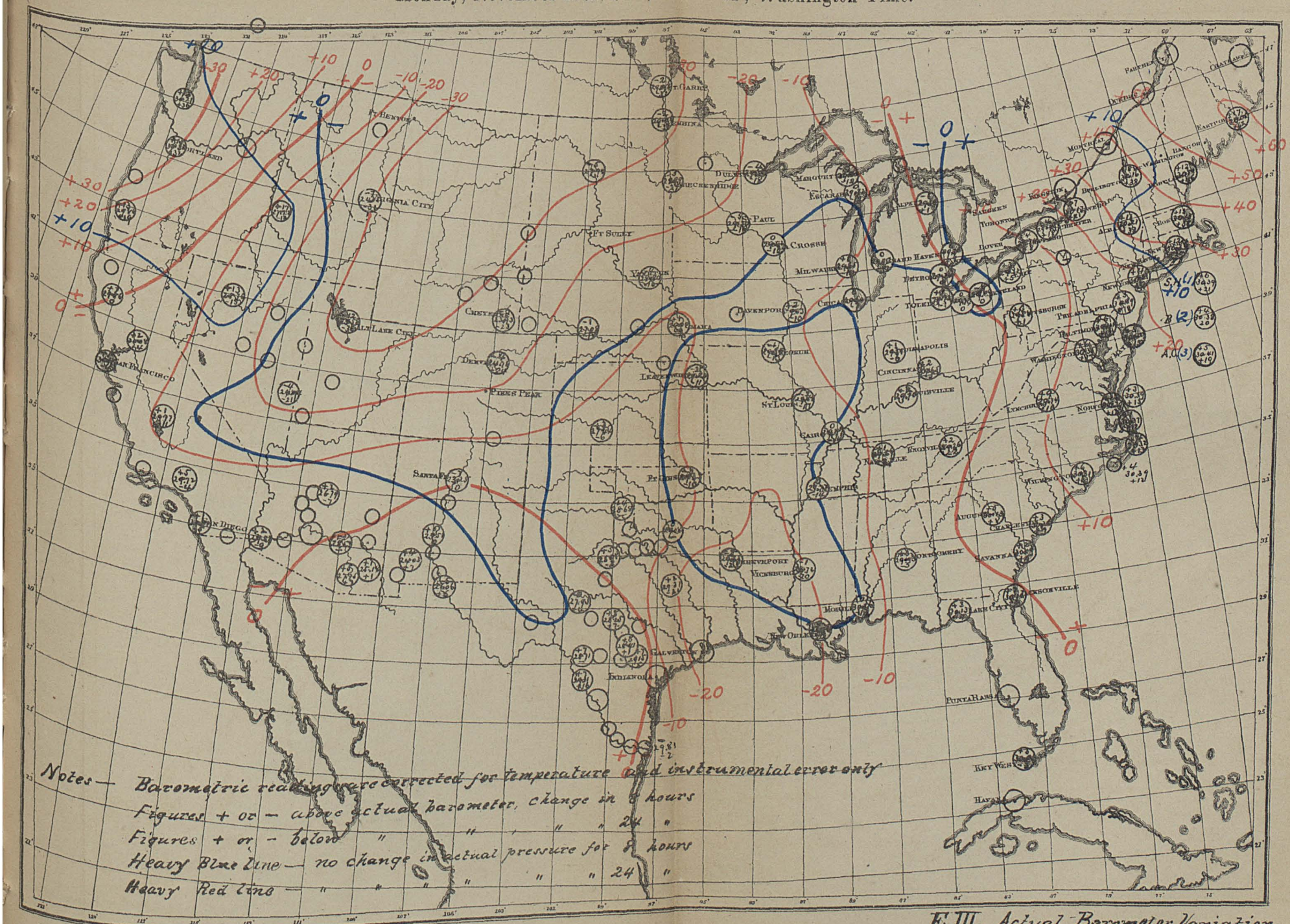
ACTUAL BAROMETER VARIATION.

Monday, November 19th, 1877,—11 P. M., Washington Time.



E, III. Actual Barometer Variation

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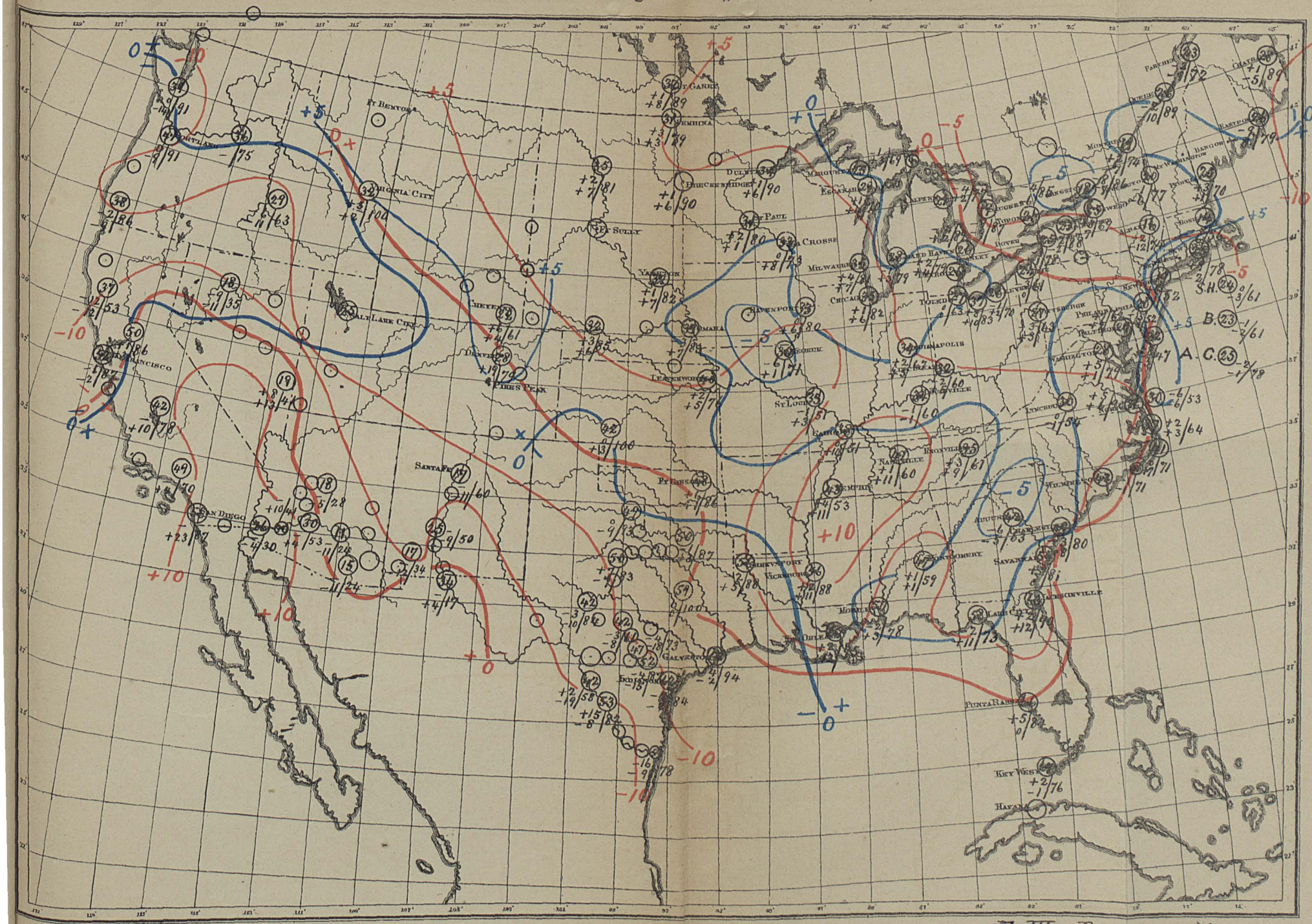

F, III. Dew point Variation.

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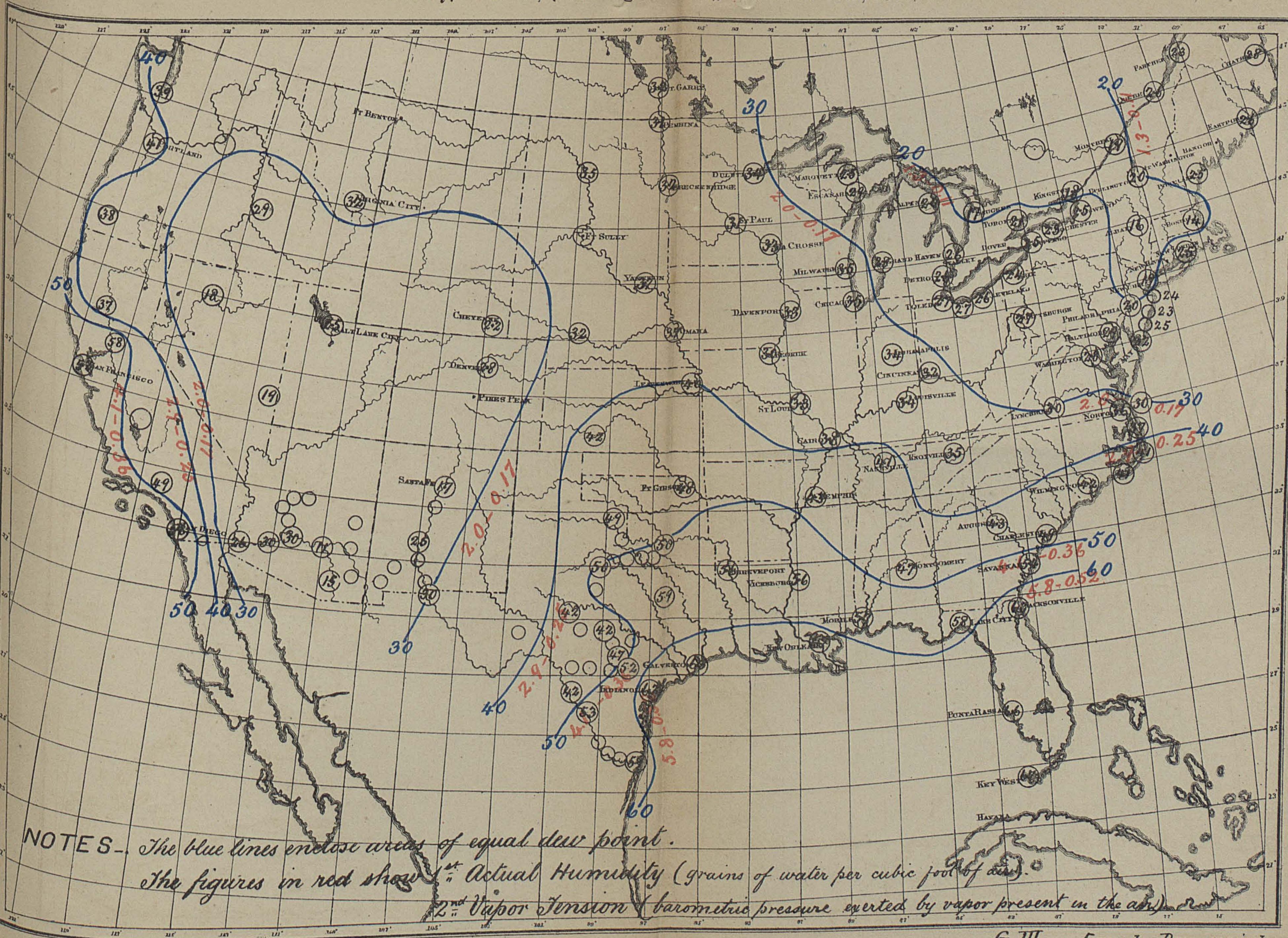
Monday, 11 P. M., (Washington Time,) November 19th, 1877.

(28)



G. III. Equal Dew-point Vapor Tension and Actual Humidity

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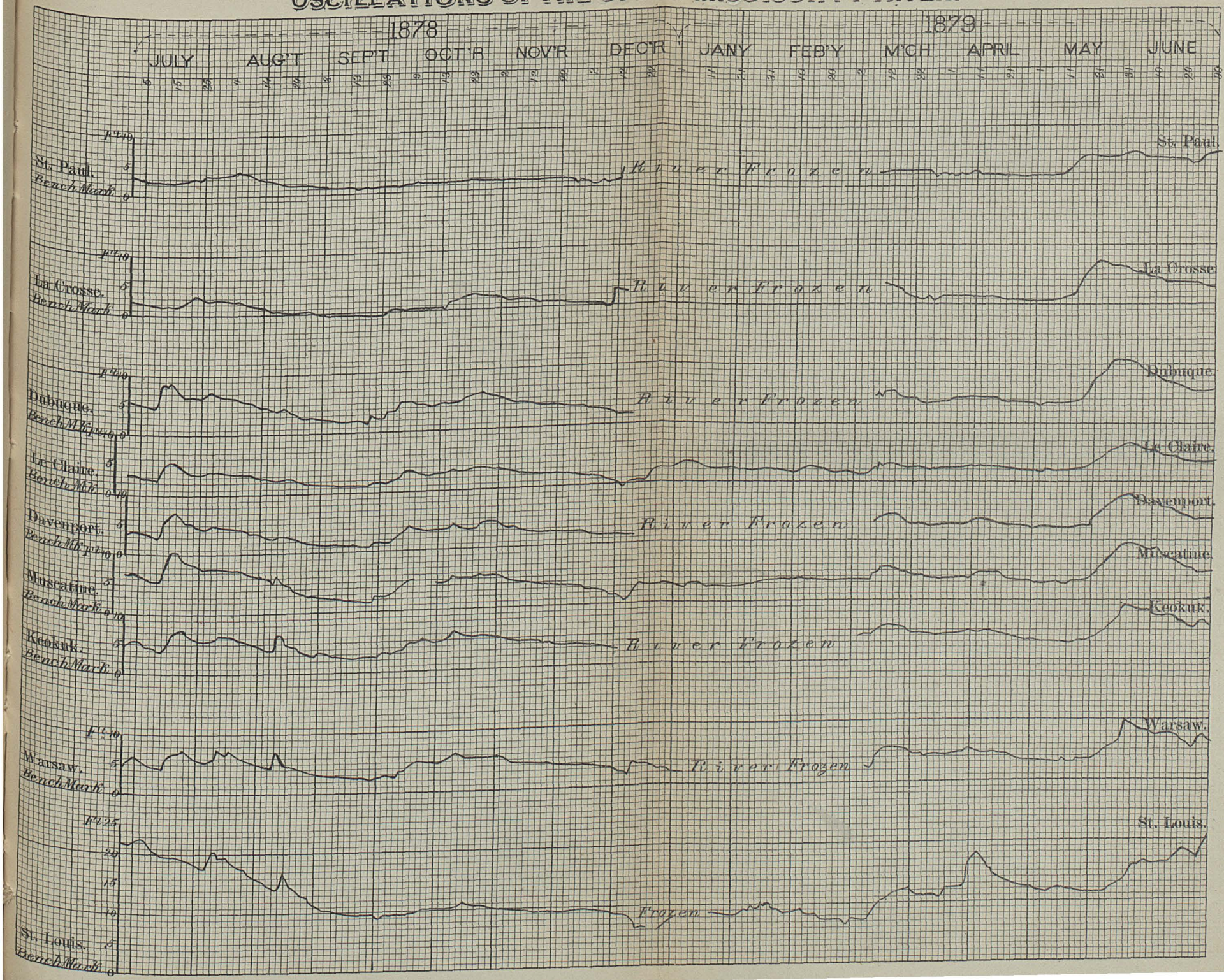
OSCILLATIONS OF THE UPPER MISSISSIPPI RIVER.



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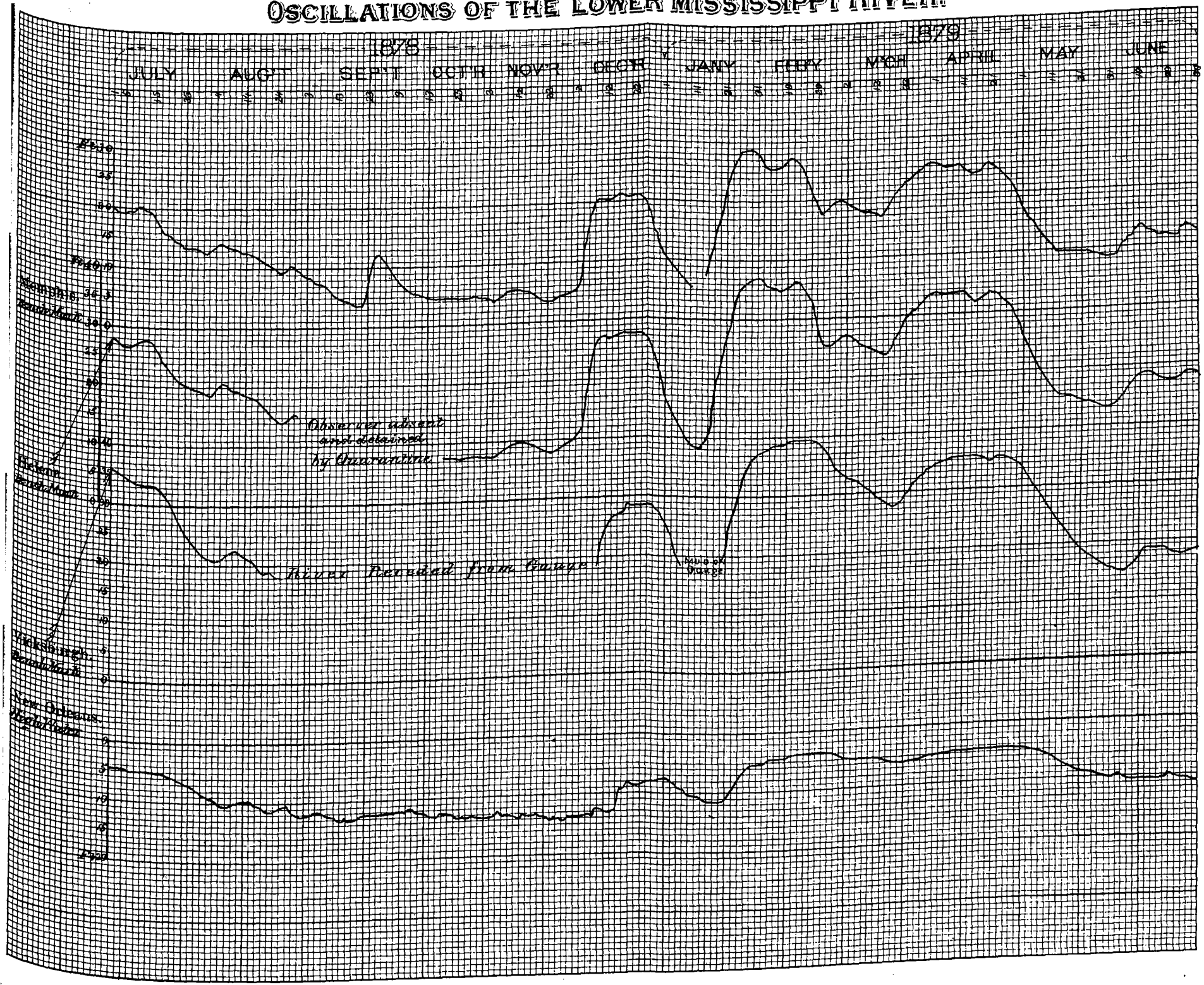
OSCILLATIONS OF THE LOWER MISSISSIPPI RIVER.



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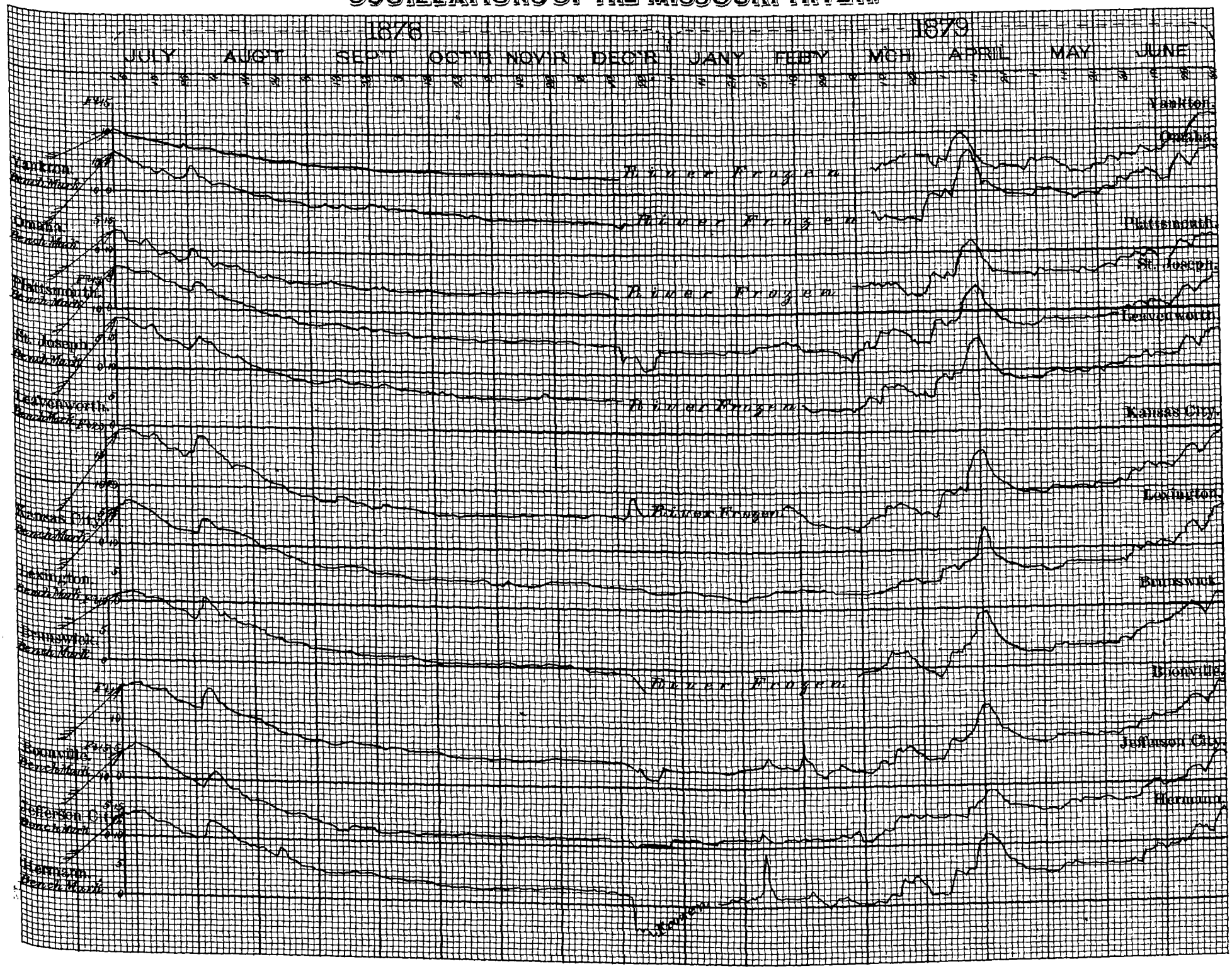
OSCILLATIONS OF THE MISSOURI RIVER.



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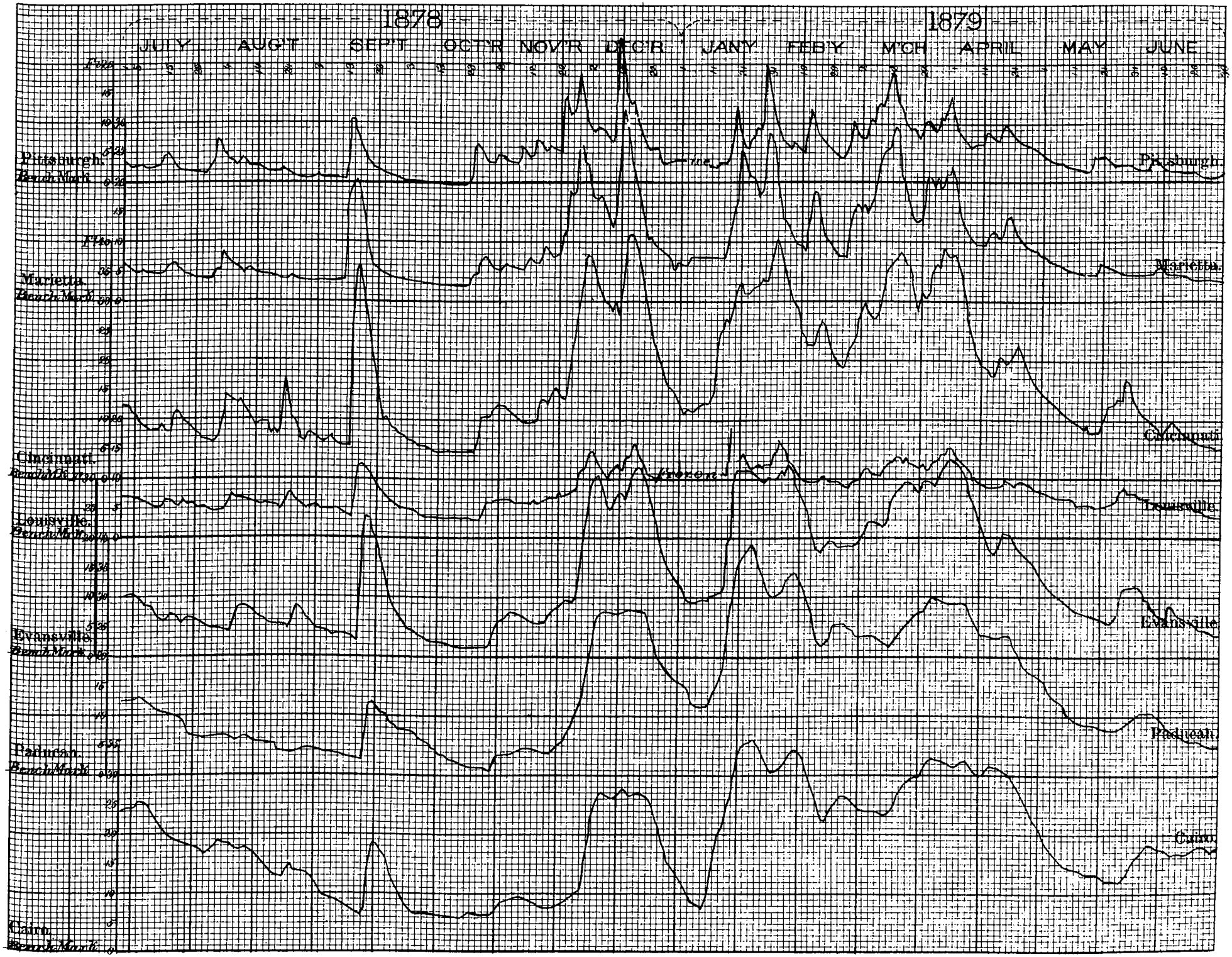
OSCILLATIONS OF THE OHIO RIVER.



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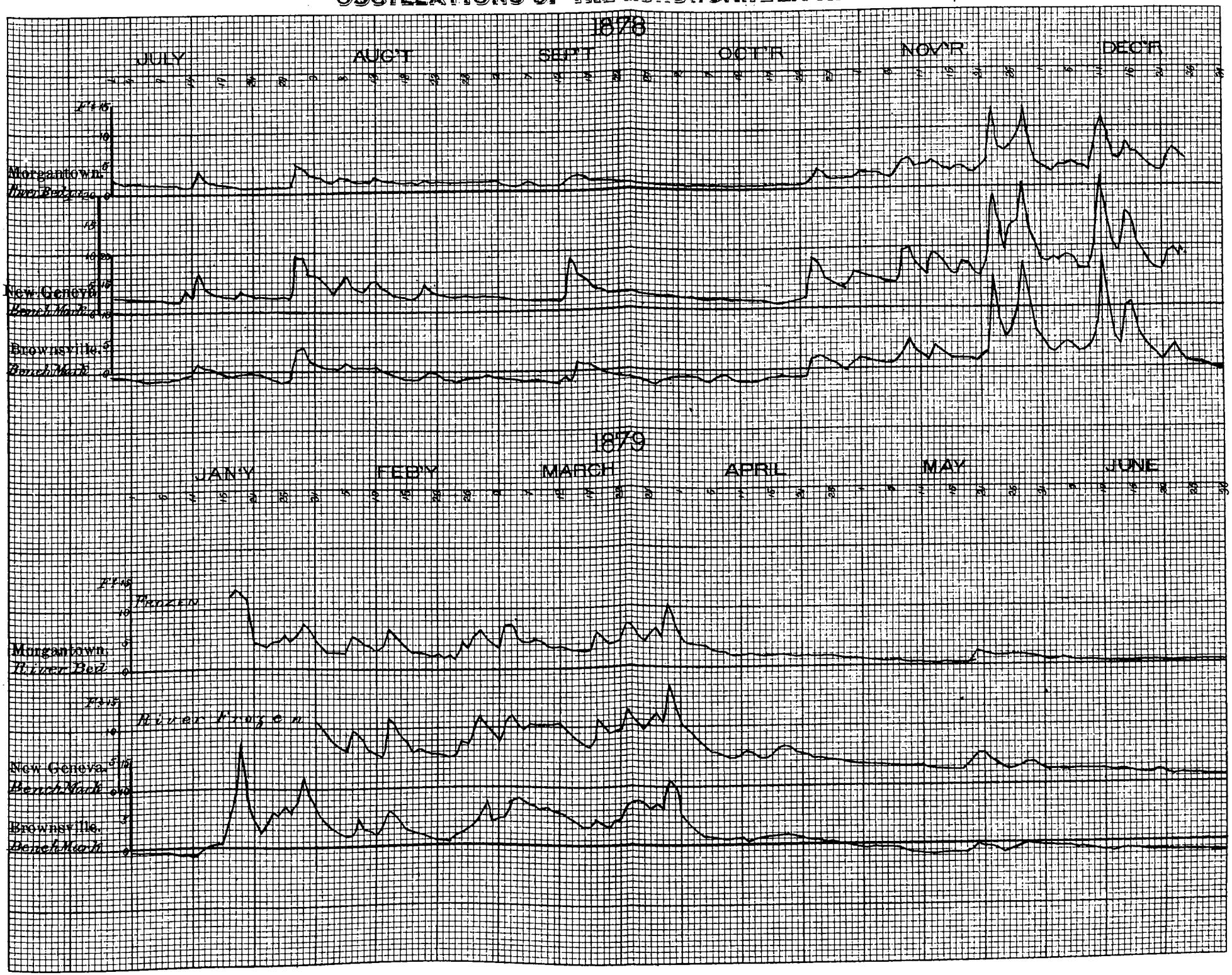
OSCILLATIONS OF THE MONONGAHELA RIVER.



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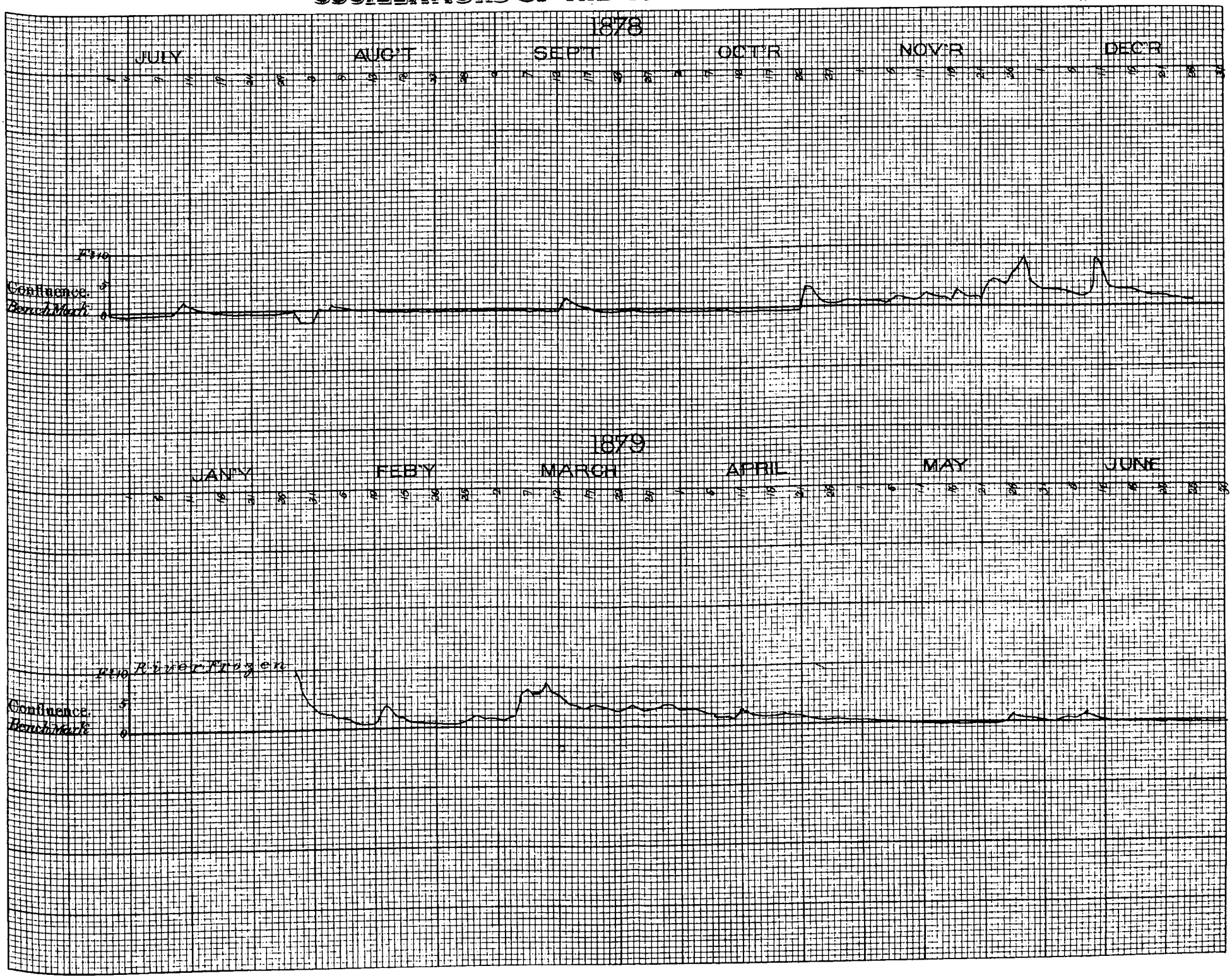
OSCILLATIONS OF THE YOUGHIOGHENY RIVER.



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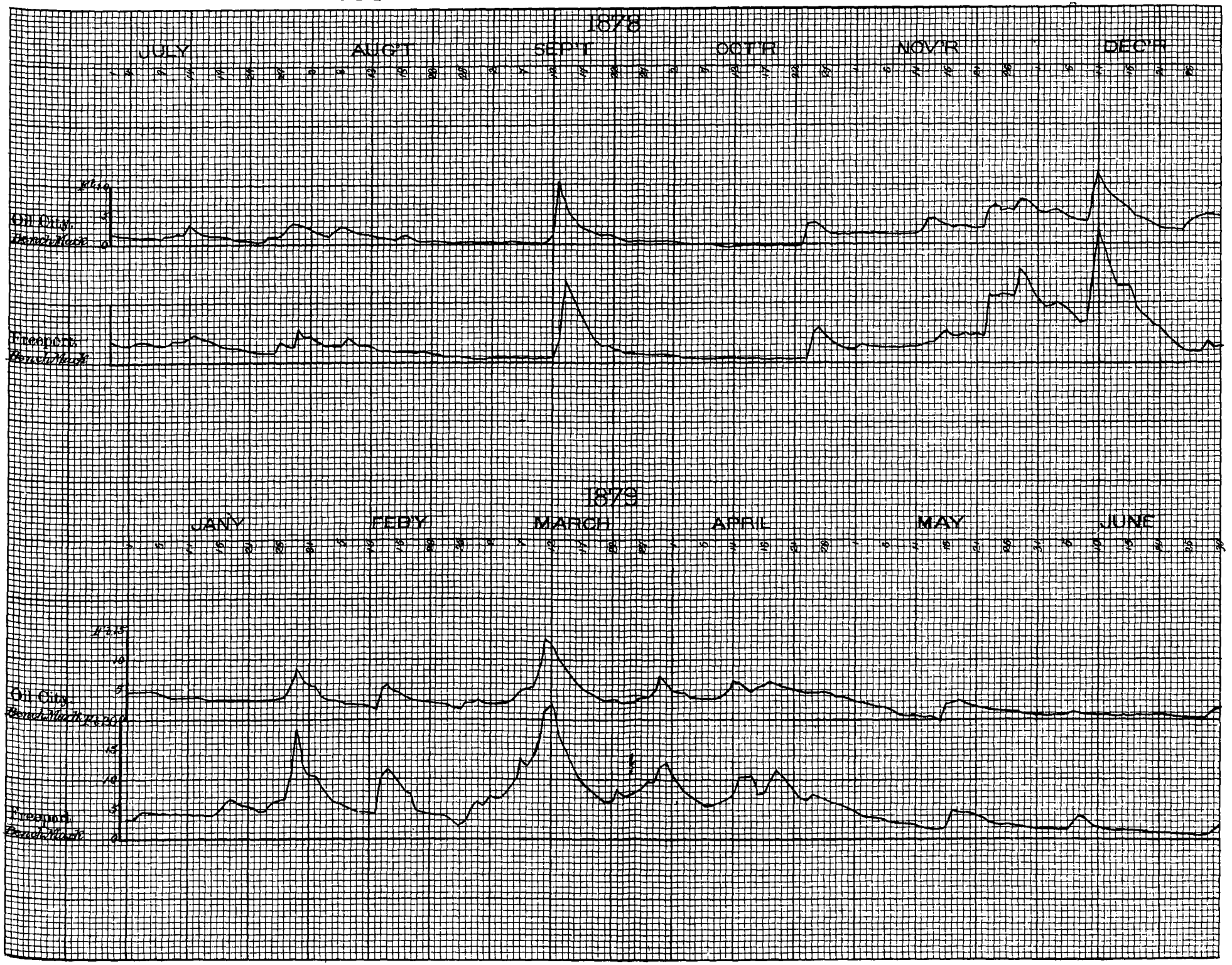
Oscillations of the Allegheny River.



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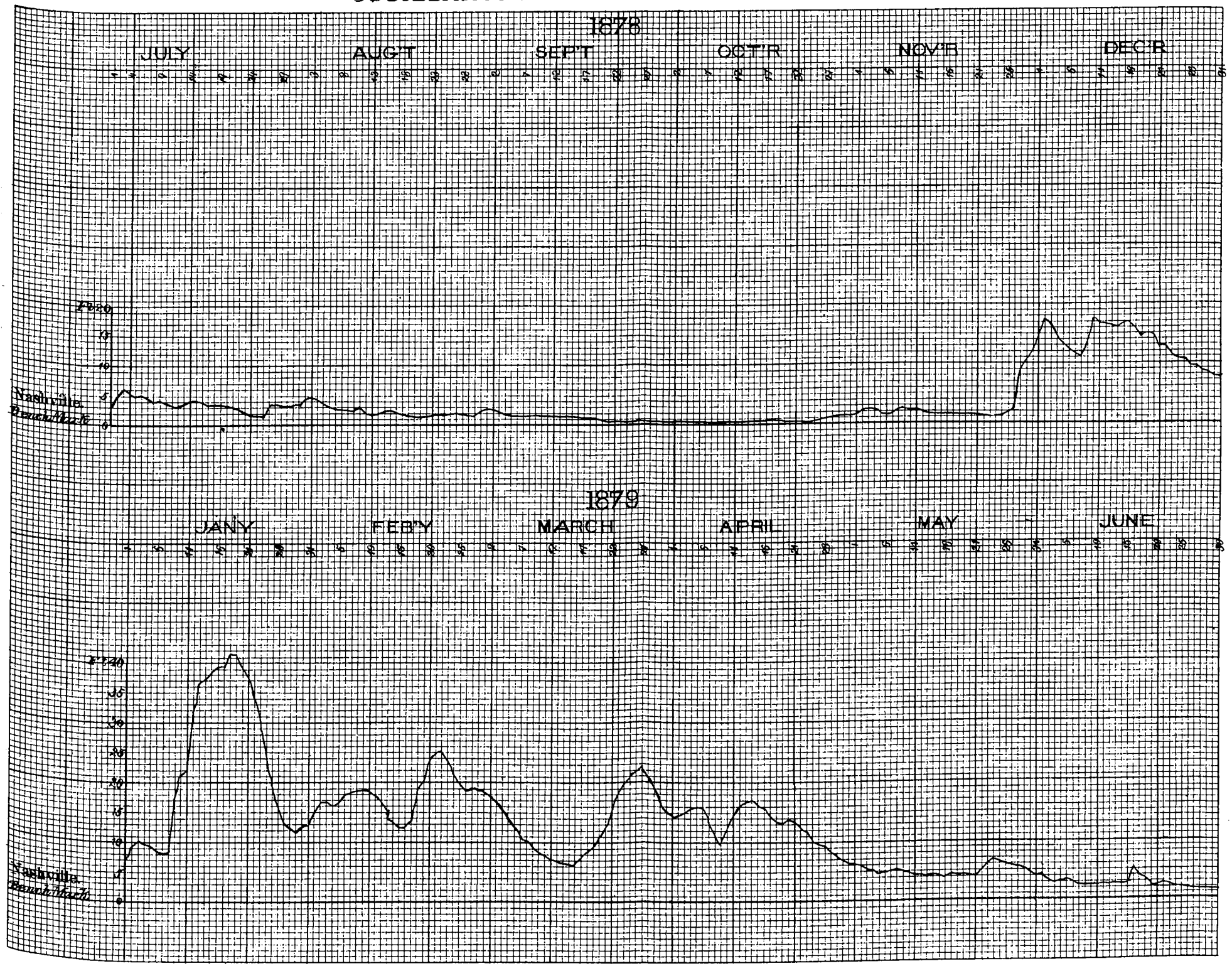
Oscillations of the Cumberland River.



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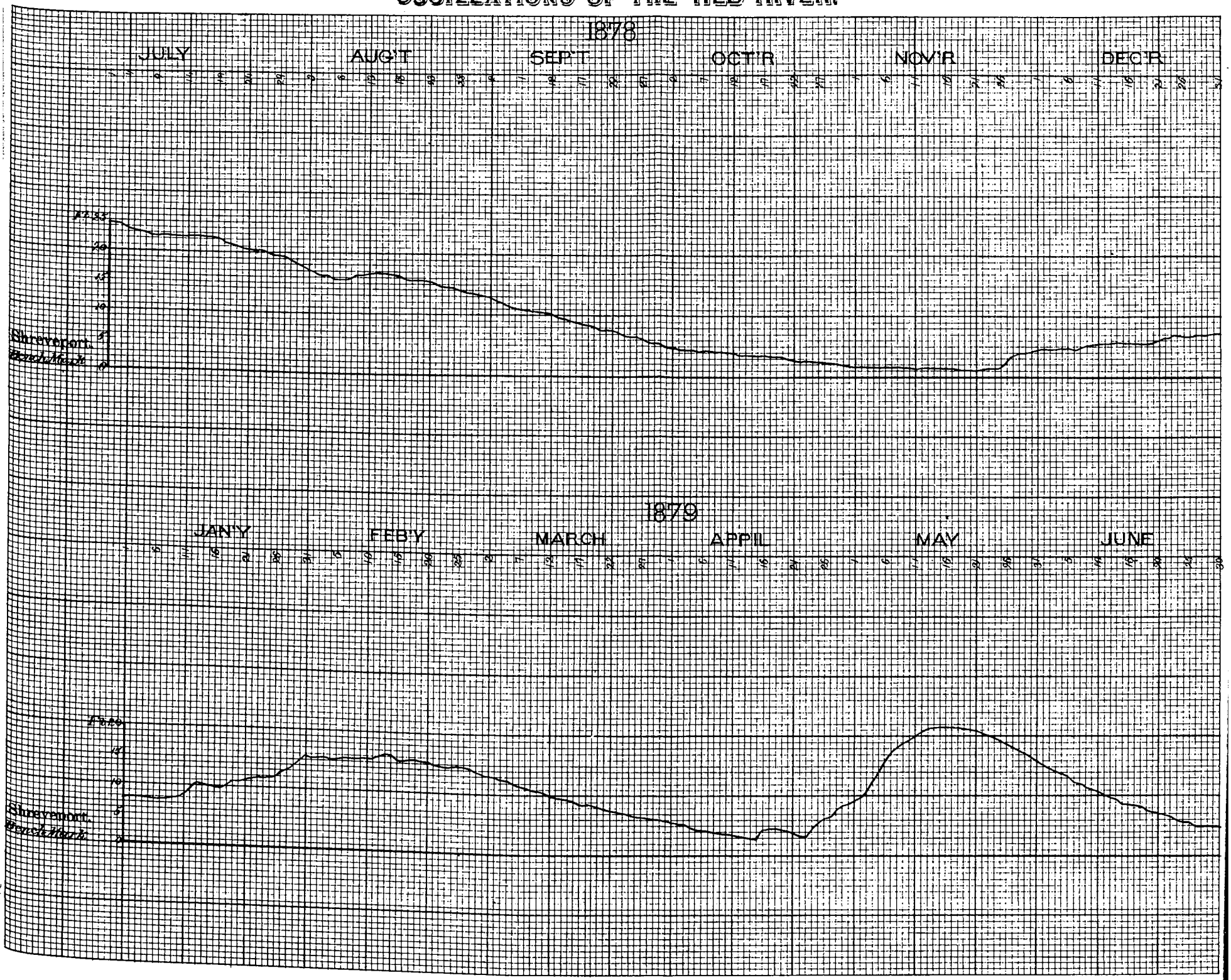
OSCILLATIONS OF THE RED RIVER.



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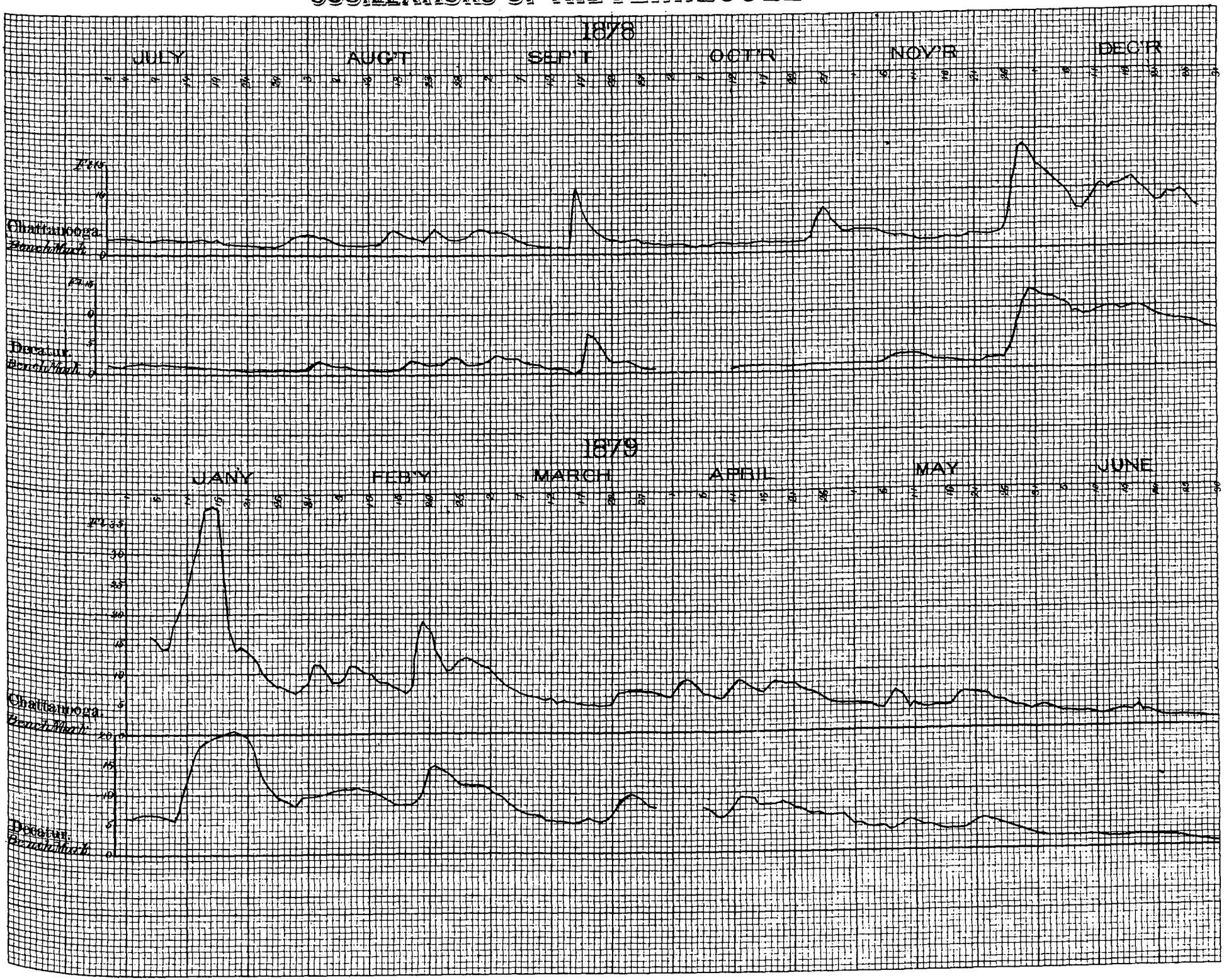
OSCILLATIONS OF THE TENNESSEE RIVER.



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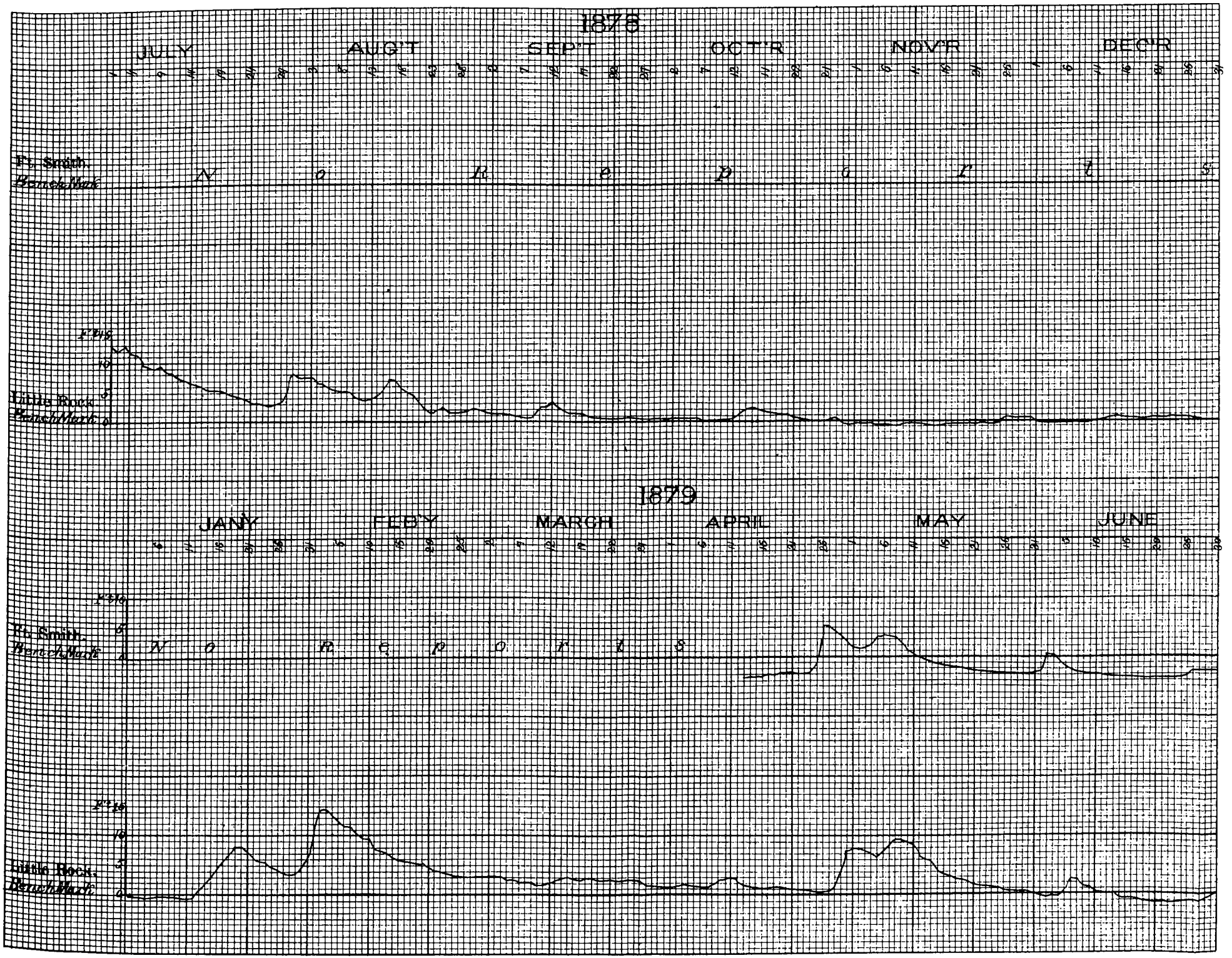
OSCILLATIONS OF THE ARKANSAS RIVER.



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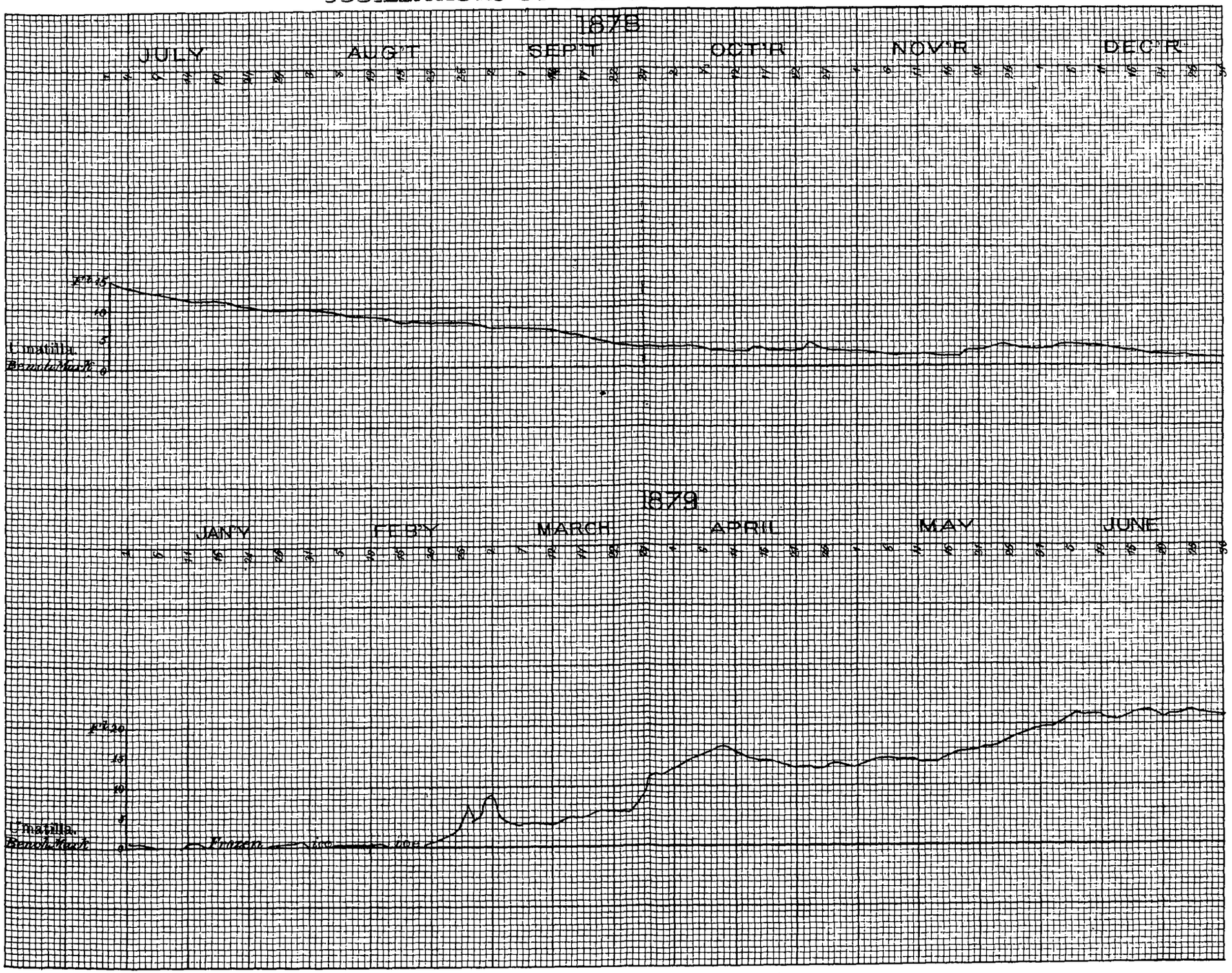
OSCILLATIONS OF THE COLUMBIA RIVER.