

MONTHLY WEATHER REVIEW,

JUNE, 1881.

(General Weather Service of the United States.)

WAR DEPARTMENT,

Office of the Chief Signal Officer,

DIVISION OF

TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

INTRODUCTION.

In preparing this REVIEW the following data, received up to July 20th, have been used, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at 133 Signal Service stations and 15 Canadian stations, as telegraphed to this office; 195 monthly journals and 167 monthly means from the former, and 15 monthly means from the latter; 199 monthly registers from Voluntary Observers; 56 monthly registers from United States Army Post Surgeons; Marine Records; International Simultaneous Observations; monthly reports from the local Weather Services of Iowa, Nebraska and Missouri, and of the Central Pacific Railway Co.; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

The distribution of mean atmospheric pressure over the United States and Canada for the month of June, 1881, is shown by isobaric lines (in black) upon chart No. II. The region of the area of low, which was changed during the month of May from the Canadian Maritime Provinces to the Missouri valley, still remains over the latter district, but with a more decided and extensive depression. The pressure over the former district has fallen very decidedly, forming an area of 29.85, which with that over the Missouri valley makes two areas of low for the present month. For the same latitudes the pressure is very evenly distributed over the country east of the 100th meridian, but it is generally low, the highest, 30.00, being reported from only two stations—Cedar Keys and Port Eads—and the lowest, 29.83, at Chatham and 29.84 at Moorhead. There are two areas of comparatively high pressure, one covering the Gulf coast and the other the North Pacific coast. Compared with the preceding month, the pressure is everywhere lower except over the Florida Peninsula, where there is a slight rise. The greatest change is shown over the Canadian Maritime Provinces, where a fall of 0.16 to 0.25 inch is reported.

Departures from the Normal Values for the Month.—The pressure is below the mean at all stations, except in the northern portion of the Upper Lakes. Along the Atlantic coast the departures increase from -0.03 inch at Key West to -0.42 inch on the summit of Mt. Washington, which latter is the largest for the month. Wilmington, N. C., reports the next highest on this coast, -0.10 inch, and from this station northeastward the departures along the immediate coast diminish to -0.06 at Eastport. Over the interior the departures diminish from -0.10 inch at New Orleans to -0.01 inch at Cairo, and thence increase from $+0.01$ inch at St. Louis to $+0.06$ inch at St. Vincent and $+0.07$ inch at Marquette. At western stations the following departures are given: Dodge City, $+0.05$ inch; Bismarck, -0.02 ; Pike's Peak, $+0.05$; Denver, -0.04 ; Cheyenne, -0.03 ; Salt Lake City, -0.06 . On the Pacific coast: San Diego, -0.05 ; San Francisco, $+0.02$; Portland, Or., -0.09 .

Barometric Ranges.—The range of pressure for the month has varied in the extremes from 0.18 inch at Campo, Cal., to 1.01 inch at Eastport. In general the range varied from 0.4 to 0.6 inch. Ranges of 0.7 and above were reported from the following stations: Olympia and New Shoreham, 0.7; Marquette, 0.72; Boston, Duluth and Portland, Or., 0.73; Mt. Washington, 0.74; Portland, Me., 0.76. Ranges of 0.3 inch and below were reported as follows: El Paso, 0.19; Silver City and Tucson, 0.2; Los Angeles, 0.21; San Diego, Prescott, Ariz., and Ft. Davis, Tex., 0.22; Camp Thomas, 0.24; Key West, 0.26; Stockton, 0.27; Florence, Ariz., La Mesilla, N. M., and Indianola, 0.28; Eagle Pass, 0.29; Sante Fé, 0.3. On the Atlantic and Pacific coasts the range increases with the latitude, but with a more decided contrast along the former, where the extreme difference between the highest and lowest ranges is 0.75, while along the latter it is 0.55 inch. Along the southern boundary of the country the range increases from California and Florida inward to the maximum at Brownsville, Tex., while over the northern boundary it diminishes from Washington Territory and Maine inward to the minimum in Montana.

Areas of High Barometer.—Six such areas have been sufficiently important during the month of June, 1881, to merit description.

No. I.—This area appeared on the morning of the 1st over the Northern Slope and the eastern portion of the Middle Plateau region, where the pressure was from 0.06 to 0.1 inch above the normal. 2nd, moved slowly eastward, covering the region from western Texas northward to British America; barometer, 0.09 to 0.2 inch above the normal. 3rd, covered nearly the whole of Texas, and spread eastward over the Upper Mississippi valley and western portion of the Upper Lakes; Leavenworth, +0.19, St. Paul, +0.16, and Duluth, +0.13 inch above the normal. On this and the preceding day the lowest temperatures of the month in Texas were recorded at most stations. During the 4th and 5th, passed southeastward over the Tennessee and Ohio valley to the South Atlantic coast. On these dates the lowest temperatures of the month in the Upper Mississippi and Ohio valleys, Tennessee, the Eastern Gulf and South Atlantic states were reported from most stations.

No. II.—Appeared on the afternoon of the 5th over the Lake Superior region; Marquette barometer, 0.12 inch above the normal. By the afternoon of the 6th this area had spread southeastward to the Middle Atlantic coast and eastward to Maine; barometer, 0.03 to 0.2 inch above the normal. 7th, pressure above the normal along the entire Atlantic coast from Key West to Sydney, Cape Breton Island. On this date occurred in New England the lowest temperatures of the month. 8th, disappeared over the ocean.

No. III.—As area No. II, left the Atlantic coast the pressure again rose decidedly over the Lake Superior region, and by the morning of the 9th the area of high covered the Missouri valley, and extended thence northeastward over the Upper Lakes and Canada to the Gulf of St. Lawrence; barometer from 0.03 to 0.18 inch above the normal. During the 9th the area spread southward to Tennessee and covered the whole of New England and the Canadian Maritime Provinces, where, in the latter district, the barometer was from 0.15 to 0.34 inch above the normal. 10th, pressure rose rapidly over New England and the Maritime Provinces, where the barometer was from 0.25 to 0.45 inch above the normal. 11th, pressure rapidly diminishing; area covered the country from the Ohio valley and Tennessee eastward to the Atlantic. 12th, remained about stationary, pressure slowly rising along the immediate coast and in the Maritime Provinces. 13th, disappeared entirely during the night, except at Sydney, Cape Breton Island, which remained above the normal until the afternoon of the 14th.

No. IV.—On the morning of the 13th the pressure was slightly above the normal from Arizona and New Mexico northward to British America, and by midnight this area had extended eastward to the Mississippi, and covered every western district except the Middle Plateau and California, being from 0.01 to 0.11 inch above the normal. 14th, spread eastward to about the 80th meridian, highest pressure in the Missouri valley; barometer, slowly falling over the Rocky Mountain and Plateau regions. 15th, covered the entire country (except Florida) from Texas north-eastward to Maine; barometer, from 0.02 to 0.3 inch above the normal; highest over the Lake region. 16th, barometer above the normal over the entire country except Florida, the Maritime Provinces and the Upper Mississippi and Lower Missouri valleys; highest pressure over the Lower Lakes. 17th, one portion of area disappeared off the South Atlantic coast and the remainder over the Mississippi valley.

No. V.—Passed southeastward from the Saskatchewan valley on the 19th; Ft. Buford barometer at midnight, 0.27 inch above the normal. 20th, covered the region north of Iowa and Illinois and every district westward to the Pacific except the Middle Plateau; highest pressure in Dakota and Minnesota, where the barometer was from 0.13 to 0.3 inch above the normal. 21st, moved southeastward the line of no change, passing northeastward from Indian Territory to the eastern end of Lake Ontario; highest pressure still in the Northwest. 22nd, pressure above the normal over the entire northern half of the country, except New England; highest pressure over the Upper Lakes. 23rd, pressure above the normal over the entire country north of the 35th parallel, except the Pacific coast; highest pressure over the Lake region. 24th, pressure everywhere above the normal east of the 107th meridian, except along the Gulf coast; highest over the Lower Lakes.

25th, centre of highest pressure about stationary; area closing up from the south, the line of no change running eastward through Tennessee. 26th, pressure above the normal from the Gulf northeastward to the St. Lawrence valley; highest barometer over New England and eastward. 27th, by midnight, area confined to the Canadian Maritime Provinces; barometer, 0.1 to 0.19 inch above the normal. 28th, disappeared off the Nova Scotia coast during the afternoon.

No. VI.—On the morning of the 28th the influence of a high pressure area was observed descending over Montana and Dakota from the Saskatchewan valley and moving southeastward; by afternoon Ft. Buford barometer 0.09 inch above the normal. 29th, a. m., barometer at Bismarck 0.2 inch above the normal, the high area during the day extending southeastward into Iowa and Kansas. 30th, a. m., barometer at Duluth 0.18 inch above the normal; area extended southwestward into Colorado and northeastward over the Upper Lakes. By midnight the pressure was from 0.02 to 0.29 inch above the normal from Texas northeastward to the province of Ontario and northward to the Lake Superior region. Further description of this area will be found in the July, 1881, REVIEW.

Areas of Low Barometer.—Six such areas have been charted for the month of June, 1881. No unusual display of energy was noted in the progress of any of them.

No. I.—On the morning of the 1st the barometer was above the normal at all stations along the Eastern Rocky Mountain slope and in the Missouri valley, accompanied by light rains in the latter district. By midnight the pressure had fallen decidedly over Minnesota, Iowa and Wisconsin, and the area appeared central in the southern portion of the former State. Everywhere over the country, to the south and east, the pressure was below the normal from 0.09 to 0.32 inch, and light to heavy rains, with occasional thunderstorms, prevailed from Texas, northeastward, to New England. 2d, storm passed southeastward into northern Indiana and Illinois, where it was central at the midnight report; Chicago 0.34 inch below the normal; Springfield, Illinois, and Indianapolis 0.35 inch below. The area of rain covered the country from the Mississippi, eastward to the Maritime Provinces, and the pressure over such territory was decidedly below the normal. 3d, passed southeastward to northern Virginia, where it was central at midnight, accompanied by rains, occasionally heavy, and thunderstorms throughout the Middle Atlantic states, Tennessee and the Ohio valley; pressure from 0.03 to 0.39 inch below the normal from the Gulf northeastward to the Canadian Maritime Provinces. Central morning of the 4th in western Virginia it passed off the North Carolina coast during the afternoon. Rain continued along the Atlantic coast from North Carolina northeastward to Nova Scotia, followed at the a. m. report of the 5th by northwest winds and clearing weather. Cautionary signals were ordered up along the Atlantic coast, in advance of this area, from Cape Hatteras to Sandy Hook at midnight of the 2d; from New York to Boston morning of the 3d, and at Portland and Eastport at midnight of the 3rd. All signals were justified by the following maximum velocities: Cape Hatteras, S. 42 miles; Kittyhawk, NE. 34; Delaware Breakwater, NE. 40; Cape May, NE. 30; Atlantic City, NE. 34; Barnegat, E. 36; Sandy Hook, E. 40; New York, NE. 31; New Shoreham, NE. 47; Wood's Holl, NE. 25; Boston, NE. 29; Portland, NE. 30; Eastport, N. 29. A signal hoisted at Macon morning of the 4th, and lowered morning of the 5th, was justified by W. 28 miles.

No. II.—Pressure remained from 0.06 to 0.4 inch below the normal over the Middle Slope, with occasional heavy rains and thunderstorms from morning of the 5th to the morning of the 8th, when the depression took decided form, and was central in western Illinois, with the area of rain extending eastward to the Middle Atlantic coast. By midnight was central in Ohio; Columbus barometer 0.26 inch below the normal. Very heavy rains and floods accompanied the progress of this area through the Ohio valley, causing great destruction of property. Central morning of the 9th in western Virginia, and during the afternoon passed off the coast near Norfolk. During the 8th and 9th, as the storm passed over the southwestern portion of Pennsylvania, very heavy rains and destructive floods occurred, causing a loss of property valued at over one million of dollars. Storm centre remained over the ocean, near the coast, until the afternoon of the 10th, when it disappeared to the eastward, followed along the coast by northeast to northwest winds, rising pressure, and cloudy, or partly cloudy weather, with occasional light rains. Cautionary signals were ordered up morning of the 9th from Chincoteague to Sandy Hook; afternoon, from Cape Hatteras to Delaware Breakwater; at midnight, from New York to Portland, and on the afternoon of the 10th at Eastport. All signals were justified except at Cape Hatteras, Kittyhawk, Cape Henry, New London, Newport and Eastport by the following maximum velocities: Delaware Breakwater, NE. 40 miles; Cape May, NE. 30; Atlantic City, NE. 37; Barnegat, NE. 44; Sandy Hook, SE. 44; New York, N. 33; New Haven, NE. 31; New Shoreham, NE. 48; Wood's Holl, E. 32; Boston, NE. 37, and Portland, NE. 26.

No. III.—From Texas northward to Nebraska the pressure had remained below the normal from the incipient stages of area No. II to the morning of the 10th, when the depression extended northward to Manitoba, with the barometer from 0.06 to 0.16 inch below the normal. The pressure continued to fall steadily, and on the afternoon of the 11th the area was central in western Nebraska; Omaha barometer 0.37 inch below the normal. By midnight central in southern Minnesota; St. Paul barometer 0.43 inch below the normal. Very heavy rains, and severe wind and

hail storms accompanied the progress of the area thus far, but on the 12th, as the centre passed slowly northward, and a trough of low pressure extended southwestward to Texas, the most violent wind and hail storms of the month occurred. Very destructive tornadoes formed in eastern Kansas, western Missouri and southern Iowa. On the afternoon of the 12th this depression combined with area No. IV, then in Manitoba. On the afternoon of the 11th, cautionary signals were ordered for Milwaukee, Escanaba, Marquette and Duluth, and were justified, except at the latter station by winds of from 26 to 33 miles per hour.

No. IV.—Appeared to form over the Saskatchewan valley during the 11th and 12th, and by morning of the 13th, passing in a southeasterly course, was central over Lake Superior; Duluth and Marquette barometers 0.27 inch below the normal. The area of rain extended southward to the Ohio valley, and heavy rains, with southerly winds, were reported from the northern portion of Ohio. The rains were comparatively light, with westerly winds over the Upper Lakes. During the day centre passed eastward over Ontario, and on the morning of the 14th was central near Rockliffe; barometer 0.46 inch below the normal. Clear or fair weather, with westerly winds, prevailed at all Lake stations, except Kingston, where light rain was falling, wind south. During the day centre passed northeastward down the St. Lawrence, and by midnight was central near Father Point; barometer 0.44 inch below the normal. Morning of the 15th central over the Gulf of St. Lawrence; Chatham barometer 0.35 inch below the normal. During the afternoon the area passed beyond the limits of our charts.

No. V.—Appeared during the afternoon of the 15th over the Northern Rocky Mountain slope, and by midnight was central near Bismarck; barometer 0.26 inch below the normal. Occasionally heavy rains and numerous thunderstorms, with westerly winds, prevailed over the entire Northwest. Morning of the 16th central in Minnesota; St. Paul barometer 0.22 inch below the normal. During this day passed southeastward to southern Michigan, where by midnight it was central near Grand Haven; barometer 0.18 inch below the normal. The area of rain covered the entire Lake region and Canada; occasionally heavy rains fell over lower Michigan, and the severest thunderstorms for years prevailed throughout Ohio. Morning of the 17th central near Erie; through the night very heavy rains fell in western Pennsylvania and in Ohio. During the day centre passed northeastward over southern New York, and by midnight passed off the coast between Boston and Portland. During the passage of this storm over the Upper Lakes cautionary signals were ordered on the morning of the 16th at Milwaukee and Grand Haven, justified by W. 28 and S. 30 miles; at midnight, at Alpena and Port Huron, not justified; at Escanaba, Marquette and Duluth, at midnight of the 15th, all justified except at Duluth; along the Lower Lakes, at midnight of the 16th, from Detroit to Buffalo, and justified, except at Buffalo and Erie by NW. 30 miles at Sandusky. Along the Atlantic coast signals were ordered up at midnight of the 16th from Chincoteague to Sandy Hook, and at Kittyhawk and Cape Henry morning of the 17th; justified except at Kittyhawk and Sandy Hook by the following maximum velocities: Chincoteague, SW. 28; Delaware Breakwater, SW. 35.

No. VI.—Appeared to form during the 27th over the region south of Hudson's Bay; pressure below the normal over the entire Lake region and Ontario. Morning of the 28th central over Lake Superior; Marquette barometer 0.36 inch below the normal. During the day passed southeastward over the Province of Quebec, and by midnight was central in southwestern Maine; Portland barometer 0.51 inch below the normal. Light rains and thunderstorms prevailed over the Lake region and New England. Central morning of the 29th off the southwestern coast of Nova Scotia; Eastport barometer 0.65 inch below the normal, and Yarmouth 0.6 inch below. During the day skirted the eastern coast of Nova Scotia, and by midnight was central over Cape Breton Island; barometer at Sydney 0.8 inch below the normal. Light rains prevailed over the Maritime Provinces, with occasional thunderstorms and northeast to northwest winds. Cautionary signals were ordered along the Atlantic coast at noon of the 27th from Chincoteague to Sandy Hook, and in the afternoon from Cape Hatteras to Cape Henry. Justified at all stations, except Sandy Hook, by the following maximum velocities: Cape Hatteras, SW. 32; Kittyhawk, SE. 29; Chincoteague, SE. 26; Delaware Breakwater, SE. 32.

INTERNATIONAL METEOROLOGY.

International charts, Nos. V and VI, accompany the present REVIEW. Of the former, two are published, one for the month of July and the other for the month of August, 1877. This completes the series of chart No. V for the year 1877, which were first commenced in October of that year, and finally, as indicated in an explanation given in the leading paragraph under *International Meteorology* in the January, 1881, REVIEW, it was determined to commence with January and complete the entire year. Chart No VI is for July, 1879, and continues the series of this chart begun in October, 1877.

Chart No. V, for the month of July, 1877, shows the mean pressure, temperature, wind force and the prevailing direction of the wind at 7.35 a. m. Washington, or 0.43 p. m. Greenwich, mean time, over the Northern and at certain isolated stations in the Southern Hemisphere. The area of lowest