

Auroras were most frequent in: North Dakota, on eight days; Washington, six days; Massachusetts, seven days.

CANADIAN DATA—THUNDERSTORMS AND AURORAS.

Auroras were reported as follows: 1st, Quebec. 3d, Port Arthur. 6th, Medicine Hat. 17th, Charlottetown. 19th, Port Arthur. 20th, Minnedosa. 21st, Quebec and Port Arthur. 28th, Toronto. 29th, Port Arthur. 30th, Charlottetown, Medicine Hat, and Prince Albert.

Thunderstorms were reported as follows: 1st, Prince Albert. 2d, Minnedosa and Medicine Hat. 3d, Charlottetown,

Port Stanley, Minnedosa, and Medicine Hat. 4th, Saugeen, Port Arthur, Winnipeg, and Qu'Appelle, 5th, Father Point. 6th, White River, Port Stanley, and Edmonton. 7th, Father Point, Montreal, Rockliffe, and Toronto. 8th, Quebec and Montreal. 9th, St. Andrews and Port Arthur. 10th, Swift Current. 11th, Father Point, Quebec, Montreal, Rockliffe, Toronto, Saugeen, and Parry Sound. 23d, Minnedosa. 26th, Rockliffe, Parry Sound, and Medicine Hat. 27th, Minnedosa. 29th, White River. 30th, Father Point and Edmonton. 31st, Yarmouth and St. Andrews.

SUNSHINE AND CLOUDINESS.

The quantity of sunshine, and therefore of heat, received by the atmosphere, as a whole, is very nearly constant from year to year, but the proportion received by the surface of the earth depends largely upon the absorption by the atmosphere, and varies with the distribution of cloudiness. The sunshine is now recorded automatically at 17 regular stations of the Weather Bureau by its photographic, and at 28 by its thermal effects. At three stations records are kept by both methods. The results are given in Table XI for each hour of local, not seventy-fifth meridian, time. The cloudiness is determined by numerous personal observations at all stations during the daytime, and is given in the column of "average cloudiness" in Table I; its complement or clear sky is given in the last column of Table XI.

COMPARISON OF SUNSHINE AND CLEAR SKY.

The sunshine registers give the *duration* of direct sunshine whence the percentage of possible sunshine is derived; the observer's personal estimates give the percentage of *area* of clear sky. It should not be assumed that these numbers should agree, and for comparative purposes they have been brought together, side by side, in the following table, from which it appears that, in general, the instrumental record of percentages of duration of sunshine is almost always larger than the observer's personal estimates of percentages of area of clear sky; the average excess for May, 1895, is 11 per

cent for photographic records, and 13 per cent for thermometric records. The details are shown in the following table:

*Difference between instrumental and personal observations of sunshine.*

Photographic stations.	Instrumental.			Thermometric stations.	Instrumental.		
	Instrumental.	Personal.	Difference.		Instrumental.	Personal.	Difference.
Tucson, Ariz. ....	87	65	22	Key West, Fla. ....	80	59	21
Cleveland, Ohio. ....	69	58	11	St. Louis, Mo. ....	80	59	21
Dodge City, Kans. ....	69	61	8	San Francisco, Cal. ....	74	65	9
Denver, Colo. ....	68	51	17	Buffalo, N. Y. ....	73	54	19
Kansas City, Mo. ....	68	52	16	Chicago, Ill. ....	73	62	11
Cincinnati, Ohio. ....	67	55	12	Cincinnati, Ohio. ....	72	55	17
Salt Lake City, Utah. ....	67	45	22	Rochester, N. Y. ....	72	58	14
Memphis, Tenn. ....	64	58	6	Columbus, Ohio. ....	69	49	20
Santa Fe, N. Mex. ....	63	54	9	Detroit, Mich. ....	68	60	8
Helena, Mont. ....	59	50	9	Portland, Me. ....	68	39	29
Savannah, Ga. ....	59	51	8	Salt Lake City, Utah. ....	67	45	22
Galveston, Tex. ....	59	58	1	Atlanta, Ga. ....	65	53	12
San Diego, Cal. ....	50	54	-4	Louisville, Ky. ....	64	50	14
Eastport, Me. ....	48	36	12	New Haven, Conn. ....	64	60	4
Bismarck, N. Dak. ....	46	45	1	Boston, Mass. ....	63	46	17
Spokane, Wash. ....	46	30	16	Marquette, Mich. ....	62	35	27
Portland, Oreg. ....	44	40	4	Vicksburg, Miss. ....	62	55	7
				Washington, D. C. ....	62	51	11
				Norfolk, Va. ....	61	62	-1
				Philadelphia, Pa. ....	61	44	17
				Little Rock, Ark. ....	60	41	19
				Des Moines, Iowa. ....	58	42	16
				New Orleans, La. ....	55	55	0
				New York, N. Y. ....	55	50	5
				Baltimore, Md. ....	54	48	6
				Seattle, Wash. ....	46	32	14
				Wilmington, N. C. ....	45	45	0
				Portland, Oreg. ....	44	40	4

METEOROLOGY AND MAGNETISM.

By Prof. FRANK H. BIGELOW.

For general remarks relative to this subject see page 7 of the REVIEW for January, 1895.

The comparison of the air temperature with magnetic horizontal force is shown in detail on Chart V, and the special features of the May curves are as follows:

SPECIAL FEATURES OF THE MAY CURVES.

There are no corrections for amplitude or slope. For the mean datum +2 is applied to temperature and +17 to magnetic force. The barometric pressures of May are plotted exactly as for April.

INLAND NAVIGATION.

The extreme and average stages of water in the rivers during the current month are given in Table VII, from which it appears that none of the rivers there recorded reached the dan-

ger line during the month; the nearest approach was that of the Sacramento, which was within 3 feet of the danger line on the 9th.

STATE WEATHER SERVICES.

By Mr. JAMES BERRY, Chief of State Weather Service Division.

The following extracts are taken from the reviews published by the services of the respective States:

Alabama.—The most notable feature of the weather for the month was the prolonged cool spell over the entire State from the 19th to the

28th, during which time the temperature ranged from 2° to 17° below the seasonal normals, and light frosts occurred in exposed places in the northern portions on the 13th, 14th, 18th, and 23d. The month closed with very warm weather during the last two days, when the temperature was as high as 98° in the northeast portion. The average

temperature for the State for the month was 69.3°, being 4° less than the normal. The average total precipitation for the month, 3.98 inches, was 0.03 of an inch in excess of the normal amount. Showers were light but frequent during the month, and on the 2d and 3d a very heavy rainfall occurred at Oxanna, amounting to 3.65 inches in twenty-four hours.

**Arkansas.**—The monthly mean temperature was 69°, which is 0.1° below the normal. The temperature was above the normal during the first decade of the month, the excess ranging from 3° to 8°. From the 11th to 27th, inclusive, the departure ranged from 1° to 13° below the normal, averaging 7° per day; from the 28th to the close of the month it averaged 4° per day above. The weather during the month was generally favorable for the cultivation of crops, but too cool for rapid growth, and in some sections the scarcity of moisture was detrimental to crops in general, but especially so to wheat and oats. At the end of the month, however, a marked improvement in the condition of all crops was reported. The monthly rainfall was heaviest over the western portion of the State, and lightest over the eastern portion, the greatest amount, 7.23 inches, occurring at Dallas, and the least, 1.16 inch, at Gaines Landing. The average amount for the State, 3.91 inches, shows a departure of -0.94 inch. Heavy frosts were reported from Fayetteville and Keesees Ferry on the 12th, doing no material damage, and occurring chiefly in the valleys and lowlands.

**California.**—The average temperature was 63.9°, or 0.2° less than the normal. The highest temperature for the month, 116°, was reported from Salton and Volcano Springs, on the 8th, and the lowest, 15°, at Bodie, on the 29th. The average total precipitation for the State, 1.02 inch, was 0.13 of an inch above the normal. Thunderstorms occurred on the 15th, 16th, 18th, and 19th.

**Colorado.**—The month was slightly warmer than the average, the mean temperature for the State, 53°, being about half a degree above the normal. The highest temperature occurred generally on the 8th and 27th; the maximum, 106°, occurring at Crook, Logan Co., on the 27th, and the lowest, 6°, at Breckenridge, Summit Co., on the 17th. Early garden stuff, strawberries, and other small fruits sustained some damage by the frosts which occurred generally throughout the farming sections of the State from the 10th to 18th. The average precipitation for the State was 2.60 inches, which is half an inch greater than the normal. Showers were frequent, the wettest periods being the 16th, 19th to 24th, 29th and 30th. Precipitation on the latter date was general over the State, and in many instances the measurements were more than half of the total amount for the month.

**Connecticut.**—(See *New England*.)

**Delaware.**—(See *Maryland*.)

**Florida.**—No abnormal features obtained during the month. On the contrary, the conditions were about the average. The mean temperature for the State, 79.5°, was but 0.1° below the normal, and the average total precipitation, 4.46 inches, but 0.14 of an inch less than the normal. The greatest monthly rainfall occurred at Merritts Island, and amounted to 9.31 inches; the least at Mullet Key, where 1.15 inch was reported.

**Georgia.**—The month of May was noticeable for its frequent rains and abnormally cool weather. Although the weather during the first decade of the month was slightly warmer than was seasonable, a cool wave spread over the State on the morning of the 12th, and on that morning and several thereafter light frosts were noted in the northern and in exposed places in the central counties. From the 10th to the expiration of the month there were few days on which the temperature reached the seasonal normal. The average temperature of the month for the State, as a whole, was 69.8°, being nearly 2° below the normal. Showers and thunderstorms were frequent in all parts of the State, but the greatest amount of rainfall was in the northeastern counties and the least in the western section.

**Idaho.**—The month opened with cool weather and showery conditions prevailing generally over the State, remaining so until the 7th; a period of cool weather began on the 8th and continued until the 20th, when another rainy period set in, lasting two days; rain was general from the 25th to 28th. The coldest days were the 9th and 10th, when killing frosts and freezing temperatures occurred over nearly the entire State. The mean temperature of the State for the month of May, 1895, 52.0°, was higher by 3° than for May, 1894, and the average total precipitation, 2.19 inches, was greater by 0.85 of an inch.

**Illinois.**—The month was an exceptionally erratic one, filled with extremes both of heat and cold and largely given to drought. The first ten days of the month were abnormally hot with average rainfall, the next fifteen abnormally cold with decreasing rainfall, and the last six again abnormally hot with drought. In almost the entire State the lowest temperature of the second decade, in some instances the lowest ever recorded for the month, was recorded on the 14th. The average temperature for the State was 63.8°, which is 2° above the normal. The highest temperature recorded was 102°, at Olney, on the 31st, and the lowest was 24°, at Clear Creek and Philo, on the morning of the 14th, on which date a temperature of 32° or below, with slight exceptions, covered the entire State. The rainfall came in generous and quite general showers during the first fifteen days, with scattered showers on the 17-18th, and again in northern counties on the 25th and 30th. The rainfall for the State, as a whole, shows a deficiency

of about 2.00 inches. Light frosts were general over the State on the 12th, 19th, 20th, and 27th; and killing frosts on the 14th, 16th, and 21st, with touches of frost in some parts of the State on the 11th, 13th, 15th, 17th, 18th, and 23d. The frost on the morning of the 14th was more severe and wrought more general havoc than any at so late a period for many years.

**Indiana.**—Great changes in temperature occurred during the month; the first decade was decidedly warm, followed from the 11th to 27th by low temperatures, and the last days were again exceedingly hot. The cold period which occurs invariably in every month of May came later this year and was more continuous and severe; frost and ice formed on several days. The average temperature for the State for May was 1.8° above the normal, and an excess was noted in all sections. The drought continued, as rain fell only on a few days in small quantities. The average amount for the State, 1.63 inch, is 2.58 inches below the normal; the rains in the southern portion were slightly heavier than in other sections. Frosts formed on many days, those of the 14th and 21st were very injurious, and ice formed in localities on several days during the cold spell. Snow fell at a few stations in the northern portion in small quantities on one day.

**Indian Territory.**—(See *Oklahoma*.)

**Iowa.**—The monthly mean temperature of the whole State was 61.7°, which is 2.0° above the normal. It was a month of extremes and sharp fluctuations in temperature, the range being from 94° to 32° or below. The average for the first decade was about 12° above the normal. From the 10th to the 22d the average was about 10° below the normal, and the closing week brought the temperature up again somewhat above the normal, so that the mean for the whole month was higher than the average. There were two periods of general frost throughout the State, 11th to 14th and 19th to 22d. All sections were visited by killing frost on one or more days, causing much damage in the aggregate. By the close of the month, however, the field crops had mostly recovered their lost ground, and the conditions were then very favorable. The average rainfall for the State was 3.19 inches, which is about 1 inch below the seasonal normal. During the afternoon and evening of the 3d, severe local storms developed in the northern half of the State, causing loss of life and destruction of property, doing the greatest damage in Sioux County.

**Kansas.**—May opened very warm, with a storm central between Pueblo, Colo., and Dodge City, causing southeast and east winds, with fair rains; a tornado occurred in Harvey County, injuring 7 or 8 people, killing about 60 head of horses, cattle, and hogs, and destroying several houses, barns, and other buildings. Light rains occurred over the State on the 3d, with the temperature ranging from 10° to 17° above the normal. Unusually warm weather prevailed during the next seven days, with light scattered showers in the western and middle divisions and good rains in the eastern; the maximum temperature for the month was recorded in a large part of the State on the 8th and 9th. A cold wave occurred on the night of the 10-11th, producing severe frosts in the western division and western half of the middle division, light frosts in the eastern north half, and none in the south half. The mean temperature was 65.8°, which is 2.7° above the normal, and the average amount of precipitation was 2.57 inches, a deficiency of 1.11 inch below the usual amount for May. Duststorms occurred on the 27th and 28th.

**Kentucky.**—The month of May was remarkable for the abnormally great fluctuations in temperature. From the 13th to 15th, inclusive, severe frosts occurred throughout the State, many stations reporting temperatures below the freezing point on the 13th. These temperatures are the lowest on record for the second decade of May, and likewise the excessively high temperatures of the last three days of the month surpassed any others of which there is a record for the third decade. The precipitation amounted to 3.16 inches, which is less than half an inch below the normal. The distribution of rainfall was not uniform, and hence in some localities was insufficient for the needs of vegetation. The southern and eastern counties were more favored than some of the western counties, where at the close of the month a condition of partial drought existed.

**Louisiana.**—The temperature during May averaged 72.6°, just about the normal; the rainfall, 5.59 inches, being an excess of 1.78 inch. Notwithstanding that the temperature averaged about the normal, the rather cloudy and wet weather that prevailed during the greater portion of the month served to retard the growth of vegetation materially, and as a result at the close of the month we find vegetation late. The damage from the cool weather was solely in a retardation of growth, though affecting cotton by making it lousy and delaying the germination of seed.

**Maine.**—(See *New England*.)

**Maryland.**—The monthly mean temperature was 61.5°, being 1.1° below normal, and the amount of precipitation, 3.33 inches, was 0.47 of an inch below. The highest temperature recorded during the month was 101° at Hancock, Md., on the 30th; and the lowest, 20°, at Deer Park, Md., on the 18th and 22d. Killing frosts were reported on the 13th, 14th, 15th, 17th, 22d, and 23d. The greatest amount of snow reported, 7 inches, occurred at Oakland.

**Massachusetts.**—(See *New England*.)

**Michigan.**—The mean temperature for the month was 57.5°, which

is 1.8° above the normal; the temperature was above the normal in each section of the State as follows: Upper Peninsula, 6.5°; northern counties, 4.0°; central counties, 1.8°, and southern counties, 1.9°. Altogether the temperature was above the normal on sixteen days, normal on one day, and below on fourteen days. The highest temperature recorded at any station in the State during the month was 100° at Berrien Springs, on the 31st, and the lowest was 20° at Grayling and Boon on the 15th. This latter temperature was caused by the severe cold wave which swept across the State during the 14th, 15th, and 16th, and which caused general and destructive frosts in all sections. The average precipitation for the State for the month, 2.99 inches, was 0.63 of an inch below the normal. The departures from the normal in each section were as follows: Upper Peninsula, 2.61 inches above the normal; northern counties, 0.36 of an inch below the normal; central counties, 0.70 of an inch below the normal, and southern counties, 1.71 inch below the normal. It will be seen that the excessive rainfall over the Upper Peninsula brings up the general average for the State, and that a deficiency prevailed in all sections of the Lower Peninsula. Frosts occurred as late as the 26th.

**Minnesota.**—The average temperature for the State for the month of May, 1895, was 56.9°, and the average amount of precipitation, 3.30 inches. The greatest amount of rainfall for the month, 6.67 inches, was reported from Winona, and the least, 1.34 inch, from Moorhead. The maximum temperature for the month was 96°, and was reported from Bingham Lake on the 27th and Wabasha on the 29th, and the minimum temperature, 13°, was reported from Sandy Lake Dam on the 27th.

**Mississippi.**—The mean temperature for May, 1895, was 70.8°, or 1.5° below the normal. The highest during the month was 98° at Aberdeen, Macon, and Yazoo City, on the 31st. The record of 101° at Rosedale on the 30th is subject to correction, owing to the fact that the thermometer was exposed to the rays of the sun. The lowest temperature was 30°, and occurred at Corinth on the 14th. Heavy rains fell in the coast counties, and about normal amounts generally over the remaining southern and southeastern districts during the month, but elsewhere there was a deficiency. The driest sections were Clay, Lowndes, and Noxubee counties, and the entire delta country. The mean monthly precipitation was 3.34 inches, which is less than the normal rainfall for May by 0.81 of an inch. Hail fell on the 1st, 2d, 5th, and 6th, hailstones being reported, from Aberdeen, on the 2d, as large as hen's eggs. Crop prospects, highly favorable until the middle of the month, were impaired by the cold weather at that time, and cotton has not since entirely recovered. The close of the month saw all other products in good condition except oats, which has given poor to fair yields.

**Missouri.**—The mean temperature of the month was about normal in the southeast section, about 1° below in the southwest section, and from 1° to 2° above in the central and northern sections. The mean temperature for the State was 64.5°, or 0.8° above the normal. The highest temperature during the month, 103°, occurred at Darksville, Randolph County, on the 9th; the lowest, 28°, at Pickering, Nodaway County, on the 12th. At St. Louis the maximum temperature of the 31st, 94°, is the highest recorded at that station during any May since the establishment of the Weather Bureau. The precipitation was about normal in the southwest section, slightly in excess in the northeast section, and deficient in the remaining sections, the greatest departure from normal being in the southeast section, where the average deficiency amounted to 1.78 inch. The average precipitation for the State for the month, 4.10 inches, is 0.71 of an inch below the normal. Killing frosts occurred in portions of the State on the 11th, 12th, 13th, 14th, 15th, 16th, 17th, 22d, and 23d; those of the 12th and 14th being the most destructive; corn, beans, potatoes, melons, and tender vegetation on low ground were killed or greatly damaged in many of the northern and eastern counties, and in some localities fruit and wheat were also seriously injured.

**Montana.**—The temperature for May, 1895, was about 1° above the normal, the average for the State was 52°, and the average amount of precipitation for the month, 1 inch, or 0.69 of an inch below normal. The highest daily temperature was 94° at Musselshell on the 13th, and the lowest, 17°, at Fort Logan, on the 11th.

**Nebraska.**—The mean temperature for the State was 59.1°, which is 1.8° below normal. The highest temperature reported from the State was 110°, at Broken Bow, on the 8th, and the lowest, 23°, at Lexington, on the 10th. The average amount of precipitation for the State was 2.40 inches, which is about two-thirds of the normal amount. The driest section was the northwestern, with an average rainfall of 1.71 inch; the heaviest rainfall was in the central section, where the average was 3.16 inches. The largest rainfall reported at any one station was 7.16 inches at Grand Island and the least was 0.82 of an inch at Springfield. Heavy frosts were general in the northern portion of the State on the 11th and 12th, and light frosts on the same dates in the southern portion. Light frosts were general in the northern portion on the 19th and 20th.

**Nevada.**—The temperature during the month was nearly normal, the average being 56.1°, a deficiency of 0.3°. Generally, the western and west-central portions of the State received less sunshine than usual, and the northern and southern a greater amount. The highest tem-

perature, 105°, was reported from St. Thomas, on the 8th, and the lowest, 18°, at Elko, on the 1st. The rain and snow was less than that usually experienced in May, the deficiency being 0.42 of an inch. The greatest monthly amount was 2.66 inches, at Austin, and the least, 0.00, at Palisade. Fully one-third of the stations reported snow, the average depth being 2.5 inches. Thunderstorms occurred on the 1st, 14th to 19th, inclusive, 23d, and 28th. The first part of May was very favorable for all crops grown in this State. The weather, while not very warm, was far above the freezing limit. On the 29th (in some parts of the State on the 28th, 30th, and 31st), however, a severe frost occurred, killing on an average two-thirds of the first blossoms and blackening all vegetation above ground. The heavy wind of the 28th was very destructive to vegetation, whipping off the green fruit, and in many instances breaking down the trees. Some crop correspondents give this wind credit for more destructive effects than the frosts. The gale was general throughout the State. Reports from the northern and southern extremes show the same results.

**New England.**—The mean temperature for May over this district was 57.2°, an excess of 2.5° above the average. The departure was least along the southern coast, and greatest in the north-central districts. The middle of the month was unusually cold with killing frosts in all low places on the 14th, 17th, 19th, and 22d. Very low temperatures were experienced in the extreme north on the 1st, and near the southeast coast on the 2d. The frosts did considerable damage in the south to garden truck where it was above ground, and injured grapes and strawberries. Large fruits were not badly injured, except in some low valleys in the central counties. The average precipitation for May was 2.49 inches, a deficit of 1.14 inch. A slight excess of precipitation was recorded at the southeastern stations, but generally there was a deficiency of from 1 to 2 inches. A trace of snow fell in the highlands in the north on the 14th and 16th, and at places in the south on the 16th.

**New Hampshire.**—(See *New England*.)

**New Jersey.**—The mean temperature for the State for May was 60.9°, or 0.7° above the normal for the month. The means for the various districts were as follows: The Highlands and Kittatinny Valley, 60.7°; the red stone plain, 60.9°; the southern interior, 62.5°; and the sea coast, 60.9°. The warmest days were the 9th, 10th, 11th, 29th, 30th, and 31st, when the maximum temperatures ranged from 92° to 102°. The minimum temperatures ranged from 28° to 42° on the 12th, 13th, 16th, 17th, 20th, 21st, and 23d. Precipitation was quite general throughout the State on the 12th, 14th, 18th, 21st, 26th, 27th, and in the central and southern sections on the 1st. The average total amount for the month, 2.85 inches, was 0.99 of an inch below the normal. Killing frosts were reported as late as the 23d.

**New Mexico.**—The temperature during the month of May averaged a little below the normal. The warmest period was from the 8th to the 10th, and the coldest from the 1st to the 3d, and 30th and 31st. The precipitation was quite heavy, averaging much above the normal, but was unevenly distributed. The north-central and northeastern sections and the Pecos Valley were favored with heavy rains, while the lower Rio Grande Valley and the southwestern parts of the Territory received only light rains. There was quite a fall of moist snow on the 30th in the northern part, and at a few stations in that section light frosts were also reported, but they were not severe enough to cause any serious damage.

**New York.**—During May the weather was influenced by five areas of high and five areas of low pressure, which is rather less than the usual number of disturbances for the month in this vicinity. The areas were generally large, sluggish in movement, and of moderate intensity. The weather was remarkable for great ranges and variability of temperature, a very deficient rainfall, and more than the usual amount of sunshine, especially during the first and last decades. There was a corresponding fluctuation in the condition of crops, which were in a very advanced stage early in the month, but apparently suffered very seriously from the cold of the middle of the month, and finally were restored to nearly their usual vigor by the warmth and showers of the last week. There were no severe general rains or windstorms, but thunderstorms, in some cases accompanied by hail, caused some damage in scattered localities, especially near Rochester and Elmira on the 11th, where much damage to vegetation was reported. The average of the mean temperatures shows an excess of 2.3° above the normal, and the average amount of precipitation, 0.99 inch below. The temperature departures were greatest in the vicinity of Lake Ontario and the St. Lawrence Valley, and the least near the Atlantic coast. The rainfall was most deficient in the vicinity of the central lakes and western highlands, and more nearly normal in the Great Lake region and on the northern plateau.

**North Carolina.**—The month of May was characterized by unusually low minimum temperatures during the second and third decades, by the extreme heat of the last days, when the maximum temperature exceeded, with one exception, the highest previously recorded in May, and by the large number of rainy days, though the average precipitation was only about half an inch above the normal. The mean temperature for the month, 64.1°, is 2.8° below the normal, and the average amount of precipitation, 4.83 inches, is 0.63 inch above. The coldest periods were the 12th to 15th, and about the 23d, on all of which

dates frost occurred, especially on the 15th, extending as far south as Wilmington and Southport. The rise in temperature during the last few days was very rapid, the highest, 99°, was recorded at several places in the central portion of the State on the 31st. The effect of these conditions on crops was bad. Plowing and planting was much hindered, and growth of all staple crops retarded, until at the end of May, the season was from two to four weeks late everywhere.

**North Dakota.**—The month of May has been characterized by a deficiency in temperature and sunshine and an excess of precipitation. While frosts have been more frequent than usual, they have not, on the whole, been destructive to vegetation. The mean temperature for the month, 54.4°, is 1.3° below the normal; and the precipitation, 2.48 inches, 0.23 of an inch above. The highest temperature during the month was 101°, at Larimore, on the 8th, and the lowest, 15°, at White Earth, on the 20th.

**Ohio.**—The mean temperature for the State for May, 61.1°, is 1.3° above the average, and the precipitation, 1.80 inch, is 4.43 inches below. The rainfall is the smallest on record for May since the opening of the service. The maximum temperature for the month was 102° on the 30th, at Milligan, and on the 31st, at Warsaw, and is the highest maximum on record; the minimum temperature was 19°, at Norwalk, on the 21st, which is the lowest minimum on record. Killing frosts, with ice and light snow during the cold period, caused great damage to the corn crop, wheat, oats, barley, rye, young clover on lowlands, cherries, grapes, and garden vegetables. The corn and grapes were nearly all destroyed, and replanting of corn was in general progress at the close of the month. The hot dry periods at the opening and close of the month caused too rapid maturing of the cereals and grass, causing them to head out unusually short and close to the ground. The droughty conditions were general over the State, and all crops suffered. The grass fields looked brown and bare as if in August.

**Oklahoma.**—The mean temperature for the month was 69.9°, which is 1.3° above the normal, and the precipitation, 2.91 inches, is 2.39 inches below. Light frosts occurred on the lowlands on the 11th and 12th, and over the Territories as far south as Healdton, Chickasaw Nation, doing no damage. The month closed with the long drought unbroken over the greater part of old Oklahoma, and the prospects for corn lessening daily.

**Oregon.**—This month's weather conditions were very favorable to all crops grown in this State. The mean temperature, 54.0°, is 1.8° below the average, and the precipitation, 4.80 inches, 2.62 inches above. In the coast and Willamette Valley districts the excess of precipitation was very great, being over 7 inches in the former and over 3 inches in the latter. At the close of the month the outlook for cereal crops was much better everywhere, but more particularly in eastern Oregon. While frosts, both light and killing, were frequent during the month, yet in the western half of the State there was no damage to vegetation worth mentioning, and in the eastern half the crops were not sufficiently advanced, except in a few isolated places, to be damaged by the frosts. The weather has been all that could be desired by the farmers and agriculturists generally.

**Pennsylvania.**—High temperatures prevailed until the 11th, causing rapid growth to vegetation. On the night of the 12-13th a severe frost occurred, which killed the greater portion of the grape crop and badly injured other fruits. This was followed on the 17th by another damaging frost and freeze, which added additional injury to fruit, corn, and early vegetables. The average temperature for the month, 60.6°, is 1.4° above the normal. The highest temperature recorded during the month was 110°, reported at Hollidaysburg, on the 30th, and the lowest, 22°, at Smethport, on the 17th. The average amount of precipitation for the State for the month was 2.68 inches, being 2.90 inches less than the average.

**Rhode Island.**—(See *New England*.)

**South Carolina.**—The mean temperature was 69°, which is 1.6° below the normal, and the precipitation, 4.36 inches, is 0.84 of an inch above. The month exhibited almost the extreme variations in temperature ever recorded during May. The period from the 13th to 28th was cool and continuously below the normal, with light frosts over the greater portion of the State on the mornings of the 13th and 15th and at a few places on the morning of the 23d. These frosts did no material injury, except to check crop growth and development. The

month was not generally favorable for agricultural interests, chiefly on account of the cool weather.

**South Dakota.**—The monthly mean temperature, 57.2°, was about 1.8° above the normal, and the precipitation, 2.36 inches, was 1.12 inch less than the usual amount. A remarkable feature of the month was the late and severe frost. Frosts were frequent, and killing frosts occurred over the eastern portion of the State as far south as Huron as late as the 26th. Corn, potatoes, flax, and garden vegetables were cut to the ground in many localities and over much of the State; fruit was almost entirely destroyed where unprotected; small grain crops did not suffer permanent injury, and most of the corn and potatoes recovered.

**Tennessee.**—The month of May showed but few abnormal features, the low temperature during the second decade being the most pronounced. This period culminated in frosts and in some localities freezing temperature, which seriously injured and retarded the growth of vegetation. The closing days showed quite a high temperature in many parts of the State. The average temperature for the month was 64.9°, being less than 1° below the normal; the precipitation for the month, 3.10 inches, was less than the usual amount for May by nearly an inch.

**Texas.**—The average temperature for May, for the State, was 2.0° below the normal and the rainfall 2.78 inches in excess of the normal. A severe norther for this season of the year prevailed from the 11th to the 13th, and the temperature fell 10° to 16° and ranged from 5° to 10° below the normal. The minimum temperature for the month at nearly all stations was recorded on these dates. On the night of the 21st and on the 22d high winds, with rain and hail, did much damage to crops in some localities. The wind at Salado, Bell Co., was very severe, and large corn was badly blown down and much of it broken off. Oats were also blown down. At Rockport, on the 22d, over 25 residences were reported blown from their foundations.

**Utah.**—The temperature for May, 1895, averaged about 1° below the normal, and the precipitation, 1.16 inch, about 0.76 of an inch below. The highest temperature recorded during the month was 99°, at St. George, on the 7th, 8th, and 25th, and the lowest, 19°, at Filmore on the 10th. The principal portion of the precipitation fell during the first and last weeks of the month. Killing frost was reported as late as the 31st.

**Vermont.**—(See *New England*.)

**Virginia.**—The mean temperature for the State averaged a little below the normal for May and the precipitation above. The highest temperature, 102°, was reported from Bon Air and occurred on the 31st, and the lowest, 26°, at Big Stone Gap on the 14th and 15th. Killing frosts were reported on the 13th, 14th, 15th, 16th, 22d, and 23d, doing considerable damage in the western sections.

**Washington.**—The mean temperature for May, 1895, was 53.4°, which is 1.6° below the normal, while the precipitation, 3.94 inches, is 1.46 inch above. The month averaged eleven clear, ten partly cloudy, and ten cloudy days. Thunderstorms were recorded on the 4th, 26th, 27th, and 30th.

**Wisconsin.**—The weather during May was unusual in many respects, but the most notable feature was the extremes in temperature, which were the greatest on record, the mean temperature, 57.6°, being 4.0° above, and the average amount of precipitation, 3.83 inches, or 0.15 of an inch below the normal. The highest temperature recorded during the month was 100°, at Crandon, on the 31st, and the lowest, 17°, at Florence on the 14th. During the first week the temperature was considerably above the normal, and vegetation was advancing rapidly when, about the 10th, a sudden change occurred. The temperature fell rapidly, and frosts occurred in some portions of the State every night from the 10th to the 22d, killing all vegetation in some sections, and in all sections tender plants were cut down. Added to this a heavy snowstorm occurred, amounting in the northern part of the State to from 4 to 6 inches. Thunderstorms were frequent from the 1st to the 19th and were reported on five subsequent dates.

**Wyoming.**—The mean temperature for the month was 51°, which is very near the May normal, while the precipitation, 2.55 inches, is almost an inch in excess of the average amount for that month. The highest temperature for the month was 90°, at Wheatland, on the 8th, and the lowest, 6°, at Wise, on the 10th. Frosts, more or less severe, were reported as late as the 31st.

## STUDIES BY FORECAST OFFICIALS.

### TROPICAL STORMS OF THE GULF OF MEXICO AND THE ATLANTIC OCEAN IN SEPTEMBER.

By E. B. GARRIOTT: dated August 18, 1893.

The first indications of the approach of a cyclone in the West Indies are abnormally high barometric pressure and unusually cool, clear weather. These conditions may con-

tinue several days. The nearer approach of a cyclone is indicated by slowly falling barometer and the appearance in the upper atmosphere of thin, hazy, cirrus clouds. The cirrus clouds thicken, change to cirro-stratus, and, at sunrise and sunset, present dark red and violet tints. The air becomes moist and heavy and the heat oppressive. Following these conditions the cloud bank of the cyclone appears, the barom-