

to standard gravity that depends on latitude is shown by the numbers printed on the right-hand border.

The mean pressures during the current month were equally high on the south Atlantic and California coasts. The highest were: Bermuda, 30.12; Charleston and Eureka, 30.11; Savannah, Jacksonville, and Jupiter, 30.09; Hatteras, Wilmington, Tampa, and Mobile, 30.08; Atlanta and Key West, 30.07.

The mean pressures were low in North and South Dakota, Manitoba, Athabasca, and the adjacent regions. The lowest were: Battleford and Prince Albert, 29.78; Qu'Appelle, Minnedosa, Winnipeg, Moorhead, Miles City, Rapid City, and El-paso, 29.80; Williston and Huron, 29.81.

As compared with the normal for May, the mean pressure was in excess in both the Atlantic and Pacific Coast regions and was deficient over the Lake Region, Mississippi Valley, and eastern Rocky Mountain Slope. The greatest excesses were: Eureka, 0.09; St. Johns, N. F., Halifax, Hatteras, and Charleston, 0.08; Jacksonville, Jupiter, Mobile, Knoxville, and Fresno, 0.07. The greatest deficits were: Winnipeg, Moorhead, and Rapid City, 0.13; Huron, 0.12; Pierre, Miles City, Concordia, and Marquette, 0.11; Duluth, 0.10.

As compared with the preceding month of April, the pressures, reduced to sea level, show a rise in Oregon, Washington, and Newfoundland, but a fall at all other stations. The greatest rises were: St. Johns, N. F., 0.13; Astoria, 0.12; Tatoosh Island and Port Angeles, 0.10. The greatest falls were: Prince Albert, Winnipeg, White River, 0.17; Ottawa, 0.16; Port Stanley and Moorhead, 0.15; Father Point, Rockliffe, Saugeen, Sault Ste. Marie, and Minnedosa, 0.14.

AREAS OF HIGH AND LOW PRESSURE.

By Prof. H. A. HAZEN.

During May ten low areas and seven high areas have been sufficiently well defined to be traced on Charts I and II, respectively. By comparing Charts I and II side by side, the very interesting contrast is brought out that, in general, the lows mass themselves or are more abundant between the Rocky Mountains and the Mississippi River, where there are almost no highs. On the other hand, the highs are most abundant off the Atlantic Coast, where there are almost no lows.

One of the more remarkable points brought out in Chart I is the disappearance of lows near the center of the country. This is due largely to the prevalence of high pressure off the Atlantic Coast, and also to the weakness of the conditions producing the lows which permitted their rapid filling up.

The accompanying table exhibits some of the more important data of the origin, motion, and velocity of these highs and lows. Very careful attention has been paid to the motion of cirrus clouds in connection with these highs and lows. The manuscript daily cloud maps of the Weather Bureau show every cloud direction that could be observed at telegraph stations, even though the cloud was so small as to be barely visible. This gives an additional advantage to any one studying the motions of clouds. The evidence from these cloud motions shows conclusively that the upper clouds within 500 miles of high and low centers move toward the east, or if they deviate from that direction they coincide very nearly with the surface wind. This is particularly the case in the interior, but on the coast there are several exceptions showing a changing influence from the proximity of the large body of water. The following is a brief summary of each high and low.

HIGH AREAS.

I.—First noted at the mouth of the St. Lawrence a. m. of 1st. Its motion was very slow, due south, and it was last seen a. m. of 5th off the south Atlantic Coast.

II.—The origin and track of high area No. II was precisely

similar to No. I. First noted a. m. of 5th and last seen off the southeast coast of Florida p. m. of 11th.

III.—First seen p. m. of 14th in southern Georgia. Its motion was quite circuitous, by Ohio and through eastern North Carolina, south to the east coast of Florida, where it was last noted p. m. of 18th.

IV.—First seen to the north of Montana a. m. of 17th. It moved east and was last seen over Newfoundland a. m. of 22d.

V.—First seen off the middle Pacific Coast a. m. of 19th. Its motion was eastward, reaching Newfoundland a. m. of 26th.

VI.—First noted off the north Pacific Coast a. m. of 26th. It moved east-southeast, and was last seen a. m. of 30th off the North Carolina coast.

VII.—First noted to the north of Montana a. m. of 29th. It moved south-southeast and was still in existence on the last day of the month in Nebraska.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
High areas.							Miles.	Days.	Miles.	Miles.
I.....	1, a. m.	50	67	5, a. m.	32	78	1,650	4.0	412	17.2
II.....	5, a. m.	49	60	11, p. m.	24	79	2,990	6.5	460	19.2
III.....	14, p. m.	31	84	18, p. m.	26	90	1,960	4.0	490	20.4
IV.....	17, a. m.	53	116	22, a. m.	48	53	3,520	5.0	704	29.3
V.....	19, a. m.	41	124	26, a. m.	47	54	4,060	7.0	579	24.1
VI.....	26, a. m.	46	126	30, a. m.	34	76	2,940	4.0	735	30.6
VII.....	29, a. m.	51	116	31, p. m.	42	104	1,400	2.5	561	23.4
Sums.....							18,520	38.0	3,941
Mean of 7 paths.....							2,646	4.71	563	23.5
Mean of 33.0 days.....									561	23.4
Low areas.										
I.....	1, a. m.	41	93	2, p. m.	50	86	700	1.5	468	19.5
II.....	3, a. m.	49	122	13, p. m.	53	102	3,430	10.5	326	13.6
III.....	12, a. m.	37	99	15, a. m.	49	92	1,220	3.0	406	16.9
IV.....	14, p. m.	33	114	19, a. m.	47	59	3,240	4.5	720	30.0
V.....	17, a. m.	40	104	19, a. m.	41	88	1,210	2.0	606	25.2
VI.....	17, p. m.	32	113	20, p. m.	36	97	1,840	3.0	448	18.6
VII.....	19, a. m.	51	122	23, a. m.	48	53	3,230	4.0	808	33.7
VIII.....	21, p. m.	52	119	27, a. m.	49	67	2,440	5.5	443	18.5
IX.....	26, p. m.	41	104	30, a. m.	46	76	1,780	3.5	509	21.2
X.....	27, p. m.	32	113	31, p. m.	36	93	1,370	4.0	343	14.3
Sums.....							19,960	41.5	5,075
Mean of 10 paths.....									507	21.1
Mean of 41.5 days.....									481	20.0

LOW AREAS.

I.—This was noted on a. m. of 1st, in Iowa. Its track could be followed only 1.5 day, and it disappeared to the north of Lake Superior p. m. of 2d.

II.—Was first noted on the north Pacific Coast a. m. of 3d; its motion was first southeast to Nebraska and Kansas. It had a remarkable persistence in the region just east of the Rocky Mountains; it finally disappeared to the north of Montana p. m. of 13th. It was traced for 10.5 days, which gives a very long life to this low.

III.—This was first seen in south Kansas a. m. of 12th; its motion was nearly due north and it was last noted a. m. of 15th to the northwest of Lake Superior.

IV.—During the month of May there were three remarkable cases of low areas taking their origin in Arizona, viz, the present one, and Nos. VI and X. In their place of origin these lows did not display much activity, though it can not be doubted that the disturbance came from Arizona. This storm, IV, moved in a northeast direction, and disappeared over Newfoundland a. m. of 19th.

V.—Was first seen in Colorado a. m. of 17th. Its track was eastward, and it filled up in Ohio a. m. of 19th.

VI.—First noted in Arizona p. m. of 17th. Its track was due east, and very short, disappearing in Oklahoma p. m. of 20th.

VII.—First noted a. m. of 18th to the north of Washington State. Its motion was eastward, and it was last seen over Newfoundland a. m. of 23d.

VIII.—First noted at the same point as VII, p. m. of 21st. Its motion was in the same line as VII, and it was last noted at the mouth of the St. Lawrence a. m. of 27th.

IX.—First seen p. m. of 26th in extreme southwestern Nebraska. Its track was short, in an east-northeast direction, being last seen in the St. Lawrence Valley a. m. of 30th.

In connection with this storm occurred the severest tornado ever noted in this country, that at St. Louis, Mo., afternoon of 27th. A full description of this tornado, by Mr. Frank- enfield, will be found in the March WEATHER REVIEW, pp. 77-81.

X.—First noted p. m. of 27th in Arizona. Its motion was eastward, being last seen in Arkansas p. m. of 31st.

LOCAL STORMS.

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

The severe local storms of the month, including under that term tornadoes, thunderstorms, high winds, with or without electrical manifestations, occurred on 22 dates, as follows: 2d, 3d, 5th, 9th, 10th, 11th, 12th, 13th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 24th, 25th, 26th, 27th, 28th, 30th, and 31st. The severity of the individual storms varied from that of an ordinary thunderstorm to that of a violent tornado. Tornadoes occurred on 10 dates, viz: 11th, 15th, 17th, 19th, 20th, 24th, 25th, 27th, and 28th (see REVIEW, March, 1896, page 82). The disturbances on the remaining dates were mainly thunderstorms and hailstorms. In some cases the wind attained a high velocity, and much damage was done to barns and outbuildings, and especially to crops.

The following is a brief statement of the general characteristics of the storm dates:

2d.—Thunderstorms occurred in the lower Lake Region and the Ohio Valley; not especially destructive.

3d.—A damaging hailstorm, having a path 2 miles in width, passed through the southern part of Vernon County, Mo.

5th.—Fruit trees and vegetables were reported as being damaged by a severe hailstorm that occurred on the line of the P. W. & B. R. R. between Port Deposit and Bush River, Md.

9th.—From the 5th to the 9th there were no severe storms. From the 9th to the end of the month storms of greater or less severity visited the greater part of the territory east of the Rocky Mountains. There were no violent storms in the Gulf States, with the exception of Texas, nor in the south Atlantic States and New England. This unusual storm period began with thunderstorms in North Dakota and Minnesota, destructive hailstorms in the northeastern portion of South Dakota, and a miniature tornado was reported near Fergus Falls, Minn.

10th.—Thunderstorm conditions prevailed over northern Texas and the Dakotas, but no severe storms occurred. A very severe windstorm was experienced in southern Maine on the night of the 10th; more than 50 barns were wrecked or injured in and about the vicinity of Belgrade, Vienna, and Mt. Vernon, all about 20 miles northwest of Augusta, and at South Jefferson, about the same distance southeast of that city; the loss was probably somewhere near \$30,000.

11th.—Tornadoes were reported from Rice County, Kans., and Worthington, Minn; loss about \$2,000.

12th.—In the West severe windstorms visited portions of Nebraska, Iowa, Kansas, Oklahoma, Texas, Illinois, and Minnesota. Tornadoes also occurred in Nebraska, Kansas, and Texas. In the East severe wind and hail storms prevailed

in Maryland and Virginia. It is not possible to estimate the damage done in the rural districts by wind and hail. Estimates of the damages to buildings, streets, sewers, electric light plants, etc., place the total for the day at \$24,000.

13th.—Heavy wind and rain storms prevailed in Maryland, Virginia, Wisconsin, Iowa, Illinois, Nebraska, Kansas, Missouri, Oklahoma, and Texas. Snow fell on the mountains of western Montana on the same date.

15th.—A series of very destructive tornadoes passed over portions of Denton and Grayson counties, Texas, on the afternoon of this date. Loss of property, \$150,000 to \$200,000. Damages to fences and outbuildings were also reported from portions of Arkansas. A tornado occurred near Moundridge, Kans. (See Special Bulletin, No. 8, of the Texas Service.)

16th.—High winds and heavy rains prevailed throughout portions of Illinois and Iowa. Damage by wind about \$15,000.

17th.—A very destructive tornado visited the counties of Clay, Riley, Marshall, Nemaha, and Brown, Kans., and Richardson, Nebr., on the afternoon of this date. Graves and Marshall counties, Ky., were also the scene of tornadic violence on the same date. The winds throughout Wisconsin and Lower Michigan reached the proportions of a gale. Strong winds were also reported from Buffalo and Niagara, N. Y.

18th.—Severe wind and hail storms prevailed in Maryland and Virginia; houses were unroofed in Baltimore and other points, and many trees were prostrated.

19th.—Severe thunderstorms occurred at a number of points in Missouri. The damage by wind and water in that State, and also in Minnesota and Illinois, was very great. At Eldon and Sedalia, Mo., the losses are reported to have been at least \$50,000.

20th.—Tornadoes occurred in Lyon and Cowley counties, Kans., also near Topeka in the same State, and in Kay Co., Cherokee Strip, Okla. Damages light.

21st.—A heavy thunderstorm damaged buildings, fences, and standing timber in the southern part of Adair County, Ky. Heavy rains in Missouri and southern Kansas caused a general flooding of all the streams and much damage to bottom lands, fences, and bridges.

24th.—Hailstorms occurred in portions of the Dakotas and Minnesota, and destructive tornadoes and floods in Iowa.

25th.—The Iowa storm of the 24th continued throughout northern Illinois, being most severe in Ogle and Winnebago counties, and near Chicago. An independent series of very destructive tornadoes occurred in southeastern Michigan on the evening of the same date.

26th.—Severe wind and rain storms visited portions of Tennessee, Kentucky, Ohio, West Virginia, and Virginia.

27th.—The most destructive tornado in the history of the country passed over St. Louis, Mo., at 6.10 p. m. of this date (see p. 77 March REVIEW). Portions of Indiana and Ohio were also visited by severe and destructive windstorms on the night of the 27th.

28th.—A series of violent thunderstorms passed over Virginia, Maryland, Delaware, Pennsylvania, and New Jersey on the afternoon of this date. In southeastern Pennsylvania tornadoes occurred in two separate localities. The property losses were very great.

30th.—A severe windstorm visited the southern and western sections of Chicago; trees were blown down and a number of outbuildings were damaged.

31st.—High winds accompanied by a heavy downpour of rain were experienced in eastern Kansas and western Missouri on the morning of the 31st.

TEMPERATURE OF THE AIR.

[In degrees Fahrenheit.]

The mean temperature is given for each station in Table