

According to the dates furnished, the *Charleston* was apparently some distance south of the center, during the period from 8 p. m. on the 10th to 2 a. m. on the 11th, when westerly winds of over 70 miles an hour prevailed and waves of from 50 to 60 feet in height did considerable damage to the ship. The lowest barometer 29.19 inches occurred from 8 to 9 p. m. on the 10th, the pressure then rising slowly, and the wind gradually diminishing in force, although moderate northwesterly gales prevailing until noon of February 11.

A letter was also received from the commanding officer of the U. S. S. *Antigone* that referred to the same storm. The *Antigone* was some distance north of the position of the *Charleston*, when the gale was at its height, and therefore nearer the center. Extracts from the letter are as follows:

On February 6, about noon, we passed close to the Azores and shortly after leaving the islands the barometer started to fall and the wind to increase in force from the southwest quadrant. The barometer fell until it reached 29.14 inches at 3 a. m. February 7, the wind blowing with a force of from 8 to 9, with moderate sea. At 4 a. m. the wind suddenly shifted to the northwest, the weather cleared, and the wind moderated to force 4 or 5, gradually backing around to the southwest. Barometer rose only slightly on the 7th.

On February 8 the barometer continued very low, with strong northwesterly winds, and moderated on the 9th, the barometer rising as high as 29.97 on the afternoon of the 9th. After midnight on that date it started to fall rapidly and gave signs of an approaching gale, although the barometer had been steadily low, as shown. There was no accompanying swell, nor was there much wind, which was in the southwest quadrant.

February 10, near midnight, the wind began to increase rapidly, the sea picked up materially, and the barometer fell at the rate of about one-tenth of an inch per hour, the wind coming from the west and

southwest quadrants. Between 2 and 3 a. m. on the 11th the blow seemed to be at its height. The sea was very rough, the waves being from 30 to 50 feet in height, and it became necessary to heave to with the wind on the bow, as several lifeboats had been stove in, and it was not advisable to risk shipping a sea, loaded as we were with troops. At 5 a. m. the barometer reached its lowest point, 28.53 inches, then rose slightly and remained practically stationary for two hours, the wind and sea being exceptionally heavy. At 6 p. m. the wind began to haul gradually to the westward, and later the barometer started up slowly, then moved rapidly, rising on the average at a rate of about 0.12 inch per hour up to noon, the wind and sea moderating slightly.

When the effect of the wind from the northwest began to be felt a very disagreeable, choppy cross sea was the result. This condition lasted through February 12, the wind continuing strong from the northwest quarter.

On February 11 intercepted messages were received from the steamships *Mumwood* and *Cape Henry*, which gave the height of the barometer at this position. These positions and barometer readings, together with that of the *Antigone* at the same time, follow:

February 11, 3 hours, 42 minutes G. M. T., S. S. *Mumwood* in latitude 34-14 N., longitude 52-09 W., barometer, 29.47 inches.

February 11, 3 hours, 34 minutes G. M. T., S. S. *Cape Henry* in latitude 36-30 N., longitude 50-00 N., barometer 29.26 inches.

February 11, 3 hours, 49 minutes G. M. T., U. S. S. *Antigone* in latitude 37-21, longitude 53-45, barometer 29.18 inches.

The lowest barometer was experienced by the *Antigone* in latitude 27-15 N., longitude 55 W., 20 hours, 46 minutes G. M. T., barometer 28.53 inches.

It is thought that the center of this storm passed very close to the *Antigone*, and to the northward of us, between 2 and 5 a. m., February 11. During that time the barometer reached the lowest point and the wind blew with hurricane force, seas very high though regular, and all around the ship there was a heavy bank of clouds with continuous lightning. Directly overhead the sky was clear nearly all the time, the stars being clearly seen. In other words, the ship seemed to be in a pocket surrounded by heavy clouds, the limits of the horizon being only a mile or two from the ship, as could be seen during the flashes of lightning.

NOTES ON WEATHER IN OTHER PARTS OF THE WORLD.

BRITISH ISLES.

The predominant character of the weather over the British Isles since the commencement of the year has been rainy and dull * * *. February rainfall was in excess of the average in the south and east of England and deficient elsewhere. The general rainfall expressed as a percentage of the average was: England and Wales, 103; Scotland, 38; Ireland, 69; British Isles, 71. The aggregate duration of bright sunshine * * * has been deficient in all districts of the British Isles except in Ireland and in Scotland north; in the southeast district of England the deficiency amounts to 0.6 hour

daily for the first nine weeks [of the year], or, in all, 38 hours. At Kew Observatory the sunshine in February was little more than one-half of the average, and at Cambridge it was less than one-half of the normal. In mid February the weather was cold enough for skating in nearly all districts. The month as a whole was cold, the mean temperature was 35° 6 being 4° 1 below the average, and 2° 2 lower than in January.—From *Nature*, London, Mar. 13, 1919, pp. 30-31; and *Symons's Met'l. Mag.*, Mar., 1919, p. 21.

DETAILS OF THE WEATHER IN THE UNITED STATES, FEBRUARY, 1919.

CYCLONES AND ANTICYCLONES.

By ALFRED J. HENRY, Meteorologist.

Cyclones.—Eleven cyclones have been plotted on Chart III, distributed according to place of origin or first appearance on the daily weather maps as follows: North Pacific 6, South Pacific 2, and Alberta 3. The North Pacific cyclone which appeared off the Washington coast on the morning of the 10th moved thence south-eastward across the Plateau and Rocky Mountain regions, pressure at the center, diminishing until on the morning of the 13th when it reached the low value of 28.90 inches at Kansas City, Mo. At this time the surface air over practically the entire area of the United States east of the Rocky Mountains was in cyclonic circulation about the center of the whirl. As the cyclone moved eastward several minor cyclonic systems developed within the greater primary cyclone.

The latter passed off to sea over Newfoundland on the 17th.

Anticyclones.—Although pressure was below normal over Alaska and the Canadian Northwest, 6 HIGHS have been plotted as originating in Alberta, 1 in the Hudson Bay region, and 3 apparently moved into the continent from the Pacific. The HIGHS presented no unusual features.

THE WEATHER ELEMENTS.

By P. C. DAY, Climatologist and Chief of Division.

[Dated Weather Bureau, Washington, Apr. 1, 1919.]

PRESSURE AND WINDS.

The distribution of the mean atmospheric pressure over the United States and Canada and the prevailing direction of the winds for February, 1919, are graphi-

cally shown on Chart VII, while the means at the several stations, with the departures from the normal, are shown in Tables I and III.

February was a month of generally low pressure, but without unusual storm activity, particularly the first half of the month, during which time much clear and pleasant winter weather prevailed. The latter half of the month was more turbulent and several storms of wide extent developed, mostly in the southwest, and moved eastward into the central valleys and southern districts. High pressures moving into the country maintained their eastward courses well to the north, and were frequently accompanied by much milder weather than is usual during a winter month.

The average pressure for the month was below normal in practically all portions of the United States and over the eastern half of Canada as well. In the western Canadian Provinces there was a slight excess in pressure, extending southward into the valley of the Red River of the North. The average pressure was distinctly low over the Rocky Mountain districts and the far northwest, and from the lower Missouri Valley eastward and northeastward to the Atlantic coast, the negative departures becoming unusually large over the Canadian Maritime Provinces.

While the general pressure distribution favored winds with strong northerly components over much of the country from the Missouri and Mississippi Valleys eastward, they were, nevertheless, far warmer than are usually experienced from that direction during a winter month, due in the main to moderate temperatures prevailing over northern districts. The absence of any material snow cover and the generally unfrozen condition of the soil materially assisted in increasing the temperature of these air currents as they moved southward. Over the southern plains the winds were mostly from southerly points, while west of the Rocky Mountains they were mainly from southerly or westerly points.

TEMPERATURE.

At the beginning of the month moderate winter temperatures prevailed in most sections of the country, continuing till about the middle of the first decade, when a sharp fall occurred over eastern districts, the line of freezing extending to the central portion of the East Gulf States. Rather cool weather prevailed in most portions of the country during the latter half of the decade, but early in the second decade warm weather for the season again set in over most sections, continuing till shortly after the middle of the month, when lower temperatures were experienced in the Southeast, with freezing weather extending well into the Florida Peninsula and light frost occurring in the southern portion. Moderate temperature followed, continuing in most sections until near the middle of the third decade, when a cold wave of considerable severity overspread most central and eastern districts. The month closed with rather mild weather in most eastern sections, but with temperatures generally below the seasonal average in the West, and with a moderate cold wave moving into the central valleys.

For the month as a whole the temperature was above normal over much of the country, as has been the case during the preceding winter and late fall months, particularly in the northern districts. In some sections of the more northern States the temperatures have been almost constantly above the normal during the five months October to February, inclusive, the average excess during that period amounting to 5° or more per day.

In contrast with the high temperatures that have prevailed so continuously in the districts above mentioned, small areas west of the Rocky Mountains, particularly in the southern plateau and southern Rocky Mountain regions, have had almost continuous cold since early in November. This condition doubtless has been due largely to an unusually heavy fall of snow over these regions early in November, which in certain districts, particularly the elevated portions of northern Arizona and New Mexico and southern Utah and Colorado, remained unmelted throughout the following months, thereby tending to maintain a constant cold surface, which intensified cooling by radiation at night and hindered any material warming up during the day. As a result, temperatures remained unusually low over small local areas and new records of low monthly mean temperatures were established at a few points. (See article in March, 1919, REVIEW.)

PRECIPITATION.

The month opened with precipitation in the far Southwest, the first of importance in that region for about two months, and during the next several days it extended over practically all districts, except the Northwest. There was heavy snowfall in the southern Rocky Mountain region, and the rainfall was rather heavy in portions of the Gulf States, but elsewhere precipitation was mostly light. Near the latter part of the first decade light rains fell locally in the South, and rather heavy precipitation occurred along the North Pacific coast.

Early in the second decade there was heavy rainfall in central and northern California, and lighter falls were general throughout the Pacific Coast States. The precipitation area gradually extended eastward, and near the middle of the month had developed into a storm of considerable severity and wide extent over the central valleys, the falls becoming heavy in portions of the Gulf States and Ohio Valley. Except for light precipitation from the Rocky Mountains westward, fair weather prevailed during the latter half of the second decade.

The remainder of the month was mostly cloudy and wet, and about the middle of the third decade the rainfall was quite heavy in the South, particularly in Alabama, Georgia, and northern Florida. The month closed with a storm of considerable intensity over the middle Mississippi Valley, and rain or snow was falling over large areas between the Mississippi River and Rocky Mountains and in the far Northwest. In the East, South, and far Southwest the weather was generally fair.

For the month as a whole precipitation was heavy and considerably above the normal in the Gulf States; but elsewhere east of the Mississippi River the amounts were generally moderate to light, and mainly below the normal. From the middle and upper Mississippi Valley westward to the Pacific, precipitation was mainly above the normal, the excess being quite pronounced in portions of California and Arizona, but elsewhere rather small. As usual the precipitation was unevenly distributed in the mountain regions of the West, the monthly amounts ranging from only a trace in the lower Colorado River Valley to more than 20 inches in some elevated districts of the Sierra Nevada. The monthly amounts were mostly small and below normal from Texas westward to southern California.

SNOWFALL.

From 10 to 14 inches of snow fell during the month north of a line from southern Kansas northeastward to lower Michigan, and in the northern New England States; elsewhere east of the Rockies the snowfall was unusually

light for February. Scarcely more than 1 inch fell in the Ohio Valley during the entire month, and from Tennessee and Arkansas southward little or none was recorded. In the mountain districts of the West, however, the month brought heavy snows over extensive areas where the amounts during the preceding months had been exceedingly scant. This was particularly true in the Sierra of California and the adjacent mountains of Nevada and Oregon, where the stored amounts up to the end of January had been in some instances the least of record. The heavy falls during February brought the average depths to normal or above; but while good depths prevailed, the snow lacked the dense condition it attains when the falls occur earlier in the season, and it will naturally melt more rapidly with the approach of warm weather. However, the amounts were generally sufficient to alleviate danger of any material shortage in water for irrigation or other purposes during the coming summer. In other portions of the western mountains the snowfall was mainly close to or above the normal; and while the amounts now stored are not usually in excess of the normal, the snow has accumulated slowly, and is reported as well packed and containing a good percentage of water.

RELATIVE HUMIDITY.

There was much local variation in the relative humidity but it was above normal in the main from the Mississippi River westward and below the normal to the eastward. Excesses were most pronounced at points in the middle Plains region and locally in central California, where they ranged from 8 to 15 per cent. The deficiencies were not so pronounced.

STORMS AND HIGH WINDS.

The month was mostly free from severe storms or notably high winds, although in portions of the country, particularly in some of the mountain States of the West, the month was classed as unusually windy.

Average accumulated departures for February, 1919.

Districts.	Temperature.			Precipitation.			Cloudiness.		Relative humidity.	
	General mean for the current month.	Departure for the current month.	Accumulated departure since Jan. 1.	General mean for the current month.	Departure for the current month.	Accumulated departure since Jan. 1.	General mean for the current month.	Departure from the normal.	General mean for the current month.	Departure from the normal.
New England.....	28.6	+3.1	+8.2	2.51	-0.80	+1.70	5.9	+4.9	71	-3
Middle Atlantic.....	35.8	+3.0	+7.8	2.46	-0.80	-0.98	5.5	+1.1	70	-3
South Atlantic.....	47.3	-0.5	+2.1	3.85	-0.20	-0.50	5.3	+0.1	74	-1
Florida Peninsula.....	66.3	-1.0	-2.1	3.54	+1.00	0.00	5.9	+1.7	77	-3
East Gulf.....	50.1	-0.7	-1.1	7.00	+2.20	+2.90	6.1	+0.6	75	0
West Gulf.....	49.3	-0.3	0.0	2.49	-0.20	-0.10	5.2	+0.3	74	0
Ohio Valley and Tennessee.....	39.8	+1.2	+5.0	1.91	-1.70	-2.90	6.6	+0.4	74	-1
Lower Lakes.....	29.1	+4.4	+10.5	1.31	-1.10	-2.60	7.1	+0.3	76	-4
Upper Lakes.....	24.3	+5.1	+12.6	1.94	0.00	-1.30	7.1	+0.8	81	0
North Dakota.....	7.6	+0.7	+16.4	0.73	+0.20	-0.20	6.3	+1.3	86	+5
Upper Mississippi Valley.....	28.4	+3.8	+11.5	2.17	+0.50	-1.00	5.8	+0.5	79	0
Missouri Valley.....	26.9	+2.5	+13.2	1.88	+0.80	-0.10	6.0	+0.8	80	+4
Northern slope.....	21.1	-0.4	+10.1	1.02	+0.30	-0.30	6.0	+0.8	75	+2
Middle slope.....	33.2	+0.8	+5.2	1.54	+0.80	+0.20	5.4	+0.9	76	+9
Southern slope.....	45.4	+0.8	2.5	0.44	-0.40	0.00	3.9	-0.6	55	-7
Southern Plateau.....	40.3	-4.6	-6.2	0.45	-0.10	-0.70	3.4	-0.2	53	+5
Middle Plateau.....	32.9	-0.1	0.5	1.44	+0.30	-0.60	6.7	+1.5	70	+3
Northern Plateau.....	34.1	+2.0	+5.6	1.96	+0.00	+0.20	8.1	+1.7	76	+1
North Pacific.....	42.0	+0.7	+3.1	6.02	+0.70	+2.70	7.8	+0.5	84	+2
Middle Pacific.....	47.6	-1.4	-0.8	5.82	+3.00	+1.50	5.4	+1.2	82	+5
South Pacific.....	51.7	-1.1	+2.7	2.33	-0.10	-2.00	5.0	+0.6	74	+3

Winds of 50 mis./hr. (22.4 m./sec.) or over, during February, 1919.

Station.	Date.	Velocity.	Direction.	Station.	Date.	Velocity.	Direction.
Alpena, Mich.....	28	52	s.	New York, N. Y.....	16	62	nw.
Block Island, R. I.....	1	55	nw.	Do.....	18	60	nw.
Do.....	16	60	nw.	Do.....	19	52	nw.
Do.....	17	50	nw.	Do.....	23	62	nw.
Do.....	29	60	nw.	Do.....	24	56	nw.
Buffalo, N. Y.....	23	60	sw.	Do.....	29	66	nw.
Do.....	28	62	sw.	Do.....	28	53	s.
Cheyenne, Wyo.....	11	52	sw.	North Head, Wash.....	8	66	se.
Do.....	22	52	w.	Do.....	9	56	se.
Do.....	25	50	sw.	Do.....	12	60	se.
Chicago, Ill.....	28	50	sw.	Do.....	10	50	s.
Dallas, Tex.....	12	55	sw.	Do.....	24	60	s.
Dayton, Ohio.....	28	62	sw.	Do.....	25	76	se.
Del Rio, Tex.....	12	56	nw.	Do.....	27	73	se.
Detroit, Mich.....	28	62	w.	Do.....	13	52	nw.
Duluth, Minn.....	3	57	nw.	North Platte, Nebr.....	13	58	nw.
Do.....	24	54	w.	Oklahoma, Okla.....	13	58	nw.
Eastport, Me.....	23	59	ne.	Pensacola, Fla.....	13	50	s.
Ellendale, N. Dak.....	14	50	nw.	Point Reyes Light, Calif.....	8	60	se.
El Paso, Tex.....	12	62	w.	Do.....	9	72	se.
Do.....	27	56	w.	Do.....	10	71	s.
Do.....	27	56	w.	Do.....	11	72	nw.
Erie, Pa.....	23	60	se.	Do.....	12	54	nw.
Do.....	23	52	sw.	Do.....	15	50	nw.
Do.....	23	53	w.	Do.....	17	73	nw.
Evansville, Ind.....	28	53	sw.	Do.....	18	50	nw.
Fort Smith, Ark.....	13	52	sw.	Do.....	19	58	nw.
Do.....	28	52	w.	Do.....	20	57	nw.
Hatteras, N. C.....	10	54	n.	Do.....	20	56	nw.
Jacksonville, Fla.....	14	50	sw.	Do.....	21	56	nw.
Lexington, Ky.....	28	56	sw.	Do.....	22	72	nw.
Louisville, Ky.....	13	50	s.	Do.....	24	51	nw.
Do.....	26	60	sw.	Do.....	26	60	sw.
Memphis, Tenn.....	13	58	sw.	Port Huron, Mich.....	28	54	sw.
Modena, Utah.....	26	68	s.	Providence, R. I.....	16	54	nw.
Mount Tamalpais, Cal.....	8	58	s.	Do.....	24	55	nw.
Do.....	8	54	s.	Do.....	26	50	nw.
Do.....	9	62	s.	Saint Louis, Mo.....	28	52	w.
Do.....	10	68	s.	Salt Lake City, Utah.....	28	52	nw.
Do.....	11	56	nw.	Sandusky, Ohio.....	28	56	sw.
Do.....	12	62	nw.	Sandy Hook, N. J.....	26	60	sw.
Do.....	21	60	s.	Tatoosh Island, Wash.....	4	80	sw.
Do.....	25	50	s.	Do.....	7	54	e.
Do.....	26	58	s.	Do.....	6	62	se.
Do.....	28	50	se.	Do.....	9	54	sw.
New York, N. Y.....	1	50	nw.	Toledo, Ohio.....	28	72	sw.
Do.....	2	50	nw.	Wichita, Kans.....	13	53	w.