

The object in collecting these data is to institute a comparison between the crude magnetic readings, particularly of the bifilar, and the temperature changes at meteorological stations in the northwest. Ultimately such comparisons will show how far unreduced magnetic observations may be available for determining the direction and the intensity of the temperature variations and other weather conditions before these become fully developed, as given by the isotherms and isobars of the daily weather maps. It has already been shown that weather and magnetism conform on the average to a normal type, but the problem of the synchronous changes from day to day is still under advisement as a practical feature in forecasting. The original data are presented on Chart VI in a slightly reduced form, without further comment, thus offering the reader an opportunity for individual study.

The columns headed Calgary, Williston, and Sioux City, give for each day, respectively, the mean of the 8 a. m. and 8 p. m. observations of temperature at the following groups of stations:

Calgary for Minnedosa, Qu'Appelle, Prince Albert, Swift Current, Medicine Hat, Battleford, Edmonton, Calgary.

Williston for Valentine, Yankton, Huron, Pierre, Moorhead, Bismarck, Williston.

Sioux City for Springfield, Mo., Kansas City, Wichita, Concordia, Omaha, Sioux City.

The average temperature for each group is reduced back to the origin, W. 115°, N. 55°, by a correction for eastward drift (see Amer. Jour. Sci., Dec., 1894). The first differences of these numbers are taken; then the monthly mean of the first

differences for slope; then the variations on the slope; then these latter are added successively throughout the month and the accumulated sums give the ordinates of the curve for each group; the mean of these three groups is taken and gives the curve in the upper part of Chart VI; the monthly mean of the ordinates being -5, this is added with reverse sign to reduce to a true datum line. Thus, the eastward drift and the slope have been eliminated, and the variations reduced to a zero base line. The final temperature variations are multiplied by -2, the minus sign being required for an inversion which seems to have prevailed during October.

The magnetic data are treated in the same way as the temperatures, excepting that in order to reduce to a similar amplitude the readings of horizontal magnetic force at San Antonio are divided by 3. The curve as plotted is the mean of the ordinates of the three stations.

It has been found that at least five magnetic observations are required to eliminate local conditions and to give a true value of the external impressed field, though seven are better. By inspecting the columns it will be seen that local variations disturb the curves in certain cases. Hence, as the data now exists, the comparison can give only partially accurate curves as to detail, though the main features may be expected to appear. No important magnetic disturbances were reported for October. The dates of beginning of the 26.68 day period are October 1.22 and October 27.90. These curves should be compared with the inverse type, and this has been effected by applying the factor -2 to the temperature data as above stated.

INLAND NAVIGATION.

STAGE OF WATER IN RIVERS.

The following table shows the danger point and the highest and lowest stages for the month of October, 1894:

Heights of rivers above low-water mark, October, 1894.

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Height.	Date.	Height.	Date.	
<i>Red River.</i>	<i>Feet.</i>	<i>Feet.</i>		<i>Feet.</i>		<i>Feet.</i>
Shreveport, La.	29.2	2.3	14	4.9	31	2.6
<i>Arkansas River.</i>						
Fort Smith, Ark.	22.0	3.4	2.3	1.0	31	2.4
Little Rock, Ark.	23.0	5.0	1	2.9	31	2.1
<i>Missouri River.</i>						
Bismarck, N. Dak.	75.0	3.2	11, 12	2.8	8, 30, 31	0.4
Pierre, S. Dak.	13.0	2.3	22, 24, 25	1.8	6-13	0.5
Sioux City, Iowa	18.7	6.7	2	5.7	18, 19	1.0
Omaha, Nebr.	18.0					
Kansas City, Mo.	21.0	7.9	19	6.3	25, 26	1.6
<i>Mississippi River.</i>						
St. Paul, Minn.	14.0	2.2	12	1.6	18, 19, 27, 28	0.6
La Crosse, Wis.	10.0	1.9	31	1.2	1	0.7
Dubuque, Iowa	16.0	1.7	31	0.9	1-4	0.8
Davenport, Iowa	15.0	1.0	29-31	0.6	2-21	0.4
Keokuk, Iowa	14.0	0.7	30, 31	0.2	8, 10, 13	0.9
Hannibal, Mo.	17.0	1.2	31	0.5	8, 9, 11, 20	0.7
St. Louis, Mo.	30.0	4.0	1	2.4	23, 24, 29, 30	1.6
Cairo, Ill.	40.0	6.4	5, 6	2.9	31	3.5
Memphis, Tenn.	33.0	1.4	8, 9	1.1	30, 31	2.5
Vicksburg, Miss.	41.0	1.2	1	4.2	30, 31	5.4
New Orleans, La.	13.0	6.6	8	2.8	14, 28, 30, 31	3.8
<i>Ohio River.</i>						
Parkersburg, W. Va.	38.0	3.5	1	0.7	29, 30	2.8
Cincinnati, Ohio	45.0	9.0	1	3.5	24	5.5
Louisville, Ky.	24.0	6.3	1	2.4	25-27	3.9
<i>Cumberland River.</i>						
Nashville, Tenn.	40.0	0.5	1, 2	0.3	24-31	0.8
<i>Tennessee River.</i>						
Chattanooga, Tenn.	33.0	2.4	15	0.7	27-29	1.7
Knoxville, Tenn.	29.0					
<i>Monongahela River.</i>						
Pittsburg, Pa.	22.0	6.4	18	5.0	4, 10, 26	1.4

Heights of rivers—Continued.

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Height.	Date.	Height.	Date.	
<i>Savannah River.</i>	<i>Feet.</i>	<i>Feet.</i>		<i>Feet.</i>		<i>Feet.</i>
Augusta, Ga.	32.6	27.6	10	5.4	31	22.2
<i>Willamette River.</i>						
Portland, Oregon	15.0	5.4	28	1.7	9	3.7
<i>Susquehanna River.</i>						
Harrisburg, Pa.	17.0					
<i>Alabama River.</i>						
Montgomery, Ala.	48.0	1.8	11	0.5	27-31	2.3
<i>James River.</i>						
Lynchburg, Va.	18.0	2.2	1	0.0	26-30	2.2
<i>Sacramento River.</i>						
Red Bluff, Cal.	22.0	8.5	24	0.7	3-17	7.8
Sacramento, Cal.	25.0	11.7	25, 26	7.5	10, 11	4.2
<i>Des Moines River.</i>						
Des Moines, Iowa*	19.0	3.3	7-10, 28	3.0	1-4	0.3

* Record for 20 days.

The above table shows that no floods occurred during the month in the rivers therein tabulated. In most cases the rivers were unusually low.

FLOODS AND NAVIGATION.

The reports of floods were confined to a few rivers in the south Atlantic coast region. On the 9th the Congaree River at Columbia, S. C., rose 4.7 feet above the danger line, flooding the lowlands. As a rule, the rivers in the interior of the country reached extreme low water during this month and, in some cases, were lower than at any time during the past fifty years.