Tennessee.—The mean temperature was 49.1°, or about 2° above the normal. The highest temperature was 86° at Elizabethton on the 7th, and the lowest, 17°, at Franklin and Hohenwald on the 27th. The average precipitation was 2.97, or 0.75 below the normal. The greatest rainfall was 7.68 at Osceola, and the least, 0.78, at Harriman. Killing frosts were reported at various times during the month.

Texas.—The temperature on an average for the State was 2.1° below the normal. The highest temperature was 87° at Alice on the 8th, and the lowest, 10°, at Dean on the 25th and at Graham on the 26th. The precipitation averaged 0.79 above the normal. The rainfall was not well distributed; there was a deficiency over the northern and eastern portions of the State, and an excess over the central and southern portions. The greatest monthly rainfall was 9.35 at Angleton, and the least, 0.65 at Dean. There was a general snowstorm over the northern portion of the State on the 25th.

Utah.—The mean temperature was 32.7°. The highest recorded was 75° at Fillmore on the 2d, and the lowest, 24° below zero, at Koosharem on the 3d. The average precipitation was 1.47, or about normal. The greatest monthly amount was 2.44, at Salt Lake City, and the least, 0.40, at Loa. The average snowfall for the month was 11.0.

Virginia.—The mean temperature for the State was 48.0°. The highest temperature recorded was 82°, at Bon Air on the 9th, and the lowest, 12°, at Buckingham on the 28th. The average precipitation was 2.38. The greatest monthly total was 6.45, at Rocky Mount, and the least, 0.69, at Alexandria.

Wisconsin.—The mean temperature was 3.13°, or 1.10° above the normal. The highest temperature reported was 74°, at Pine River on the 4th, and the lowest, 8° below zero, at Osceola Mills on the 26th. The average precipitation was 1.66, or 0.80 below the normal. The greatest amount was 3.68 at Sharon, and the least, 0.28, at Butternut. The ground was covered with snow from the 19th to the end of the month.

Wyoming.—The mean temperature was 30.0°, or several degrees below the normal. The highest temperature was 70° at Fort Washakie on the 17th, and the lowest, 18° below zero, at Sheridan on the 23d. The average precipitation was 1.30, or about twice the normal value. The greatest amount was 2.72, at Sundance, and the least, 0.32, at Laramie. All the precipitation during the month was snow.

Washington.—The mean temperature was 41.1°, or 2° below the normal. The highest temperature, 70°, was recorded at Connell on the 10th, and the lowest, 8°, at Ellensburg on the 5th, Hunters and Moxee on the 23d. The average precipitation was 3.76, or 1.49 below the normal. The greatest amount during the month was 11.55, at Neah Bay, and the least, 0.00, at Connell.

West Virginia.—The mean temperature was 44.6°, or about 2° above the normal. The highest temperature was 87°, at Nuttallburg on the 7th, and the lowest, 12°, at Beverly on the 13th. The average precipitation was 2.17, or below the average, but, on the whole, was well distributed. The greatest monthly total was 4.00, at Spencer, and the least, 1.34, at Bloomery.

STUDIES BY FORECAST OFFICIALS.

WEATHER TYPES OF THE NORTH PACIFIC SLOPE.

By B. S. PAGUE, Local Forecast Official (dated Portland, Oreg., Dec. 20, 1895).

There are two distinct, well-defined types of weather on the North Pacific Slope, viz, the summer type and the winter type. These are illustrated by the following sketch of the meteorology of 1895:

On April 20 the first type of summer weather conditions appeared over the North Pacific Slope, viz, an area of high barometric pressure moving northward along the coast to northwestern Washington, and thence eastward over the State of Washington. In the synopsis of April 20 it was officially announced at Portland that the conditions which would prevail until the first appearance of a winter type of weather would be more in favor of fair weather than of rain, for it had been observed that after the first appearance of a pure type of summer conditions there is seldom a recurrence of the winter type until the autumn.

The spring, summer, and autumn were unusually dry. This was especially true of the period from September 15 to November 1, which was the driest recorded in the history of this portion of the country during the past fifty years. Experience had shown that no general or continued rain would occur until the first appearance of the winter type of storms, and this knowledge was used in the daily forecasts issuing regularly from the Weather Bureau office at Portland, Oreg. This winter type finally appeared on the morning of Tuesday, November 12.

On Monday morning, November 11, 1895, there was no appearance of any storm disturbance, but by noon of that day the rapid fall in the barometer indicated the approach of a well-defined disturbance, and from the evening reports of this date the approaching storm was forecast. The morning reports of November 12 showed that the storm area was central over northwestern Washington and that the trough of the depression extended northeastward over British Columbia, thereby indicating the probable path of the storm. Warnings of approaching rains and high winds had been issued on the evening of November 11, or from twelve to twenty hours before the storm arrived. The morning reports of November 12 showed that an area of high barometer was approaching from the southwest toward California. General precipitation occurred over Washington, Oregon, and Idaho on the 12th and 13th, and heavy gales from the south and east prevailed along the coast of northern Oregon and Washington.

The morning reports of November 13 showed that the low was now central north of eastern Montana and that the high pressure was moving inland over southern Oregon and northern California. The morning reports of November 14 showed the low area in about the same position, but more distinctly defined, and the high area central near the region where Oregon, Idaho, Nevada, and Utah come nearest together. The morning reports of the 15th showed the high over Oregon and northern Nevada and the low slightly east of its position of the previous day.

The feature to which attention is especially called is the passage of the low eastward over Washington and the formation of the area of high pressure. This movement of the low and formation of the high were the first of the kind to occur in the autumn of 1895, and indicated that the wet or winter season had set in over the north Pacific Slope.

The conditions under which areas of high pressure form and move are those under which chinook winds are formed over the northwestern portion of the United States. As the low pressure passes to the north and the movement of the wind is from the high on the south or southwest to the low on the northeast side of the mountains, therefore the air flowing down the mountain sides is dynamically heated.

That the high pressure produced the rise in the temperature and the winds called chinook winds in the present case is shown by the following:

On the morning of November 12 the barometer at Portland was 29.86, the temperature 36°; on the morning of the 15th the barometer was 30.62 and the temperature 56°, a rise in the pressure of 0.76 of an inch and a rise of 20° in the temperature. At Roseburg the rise in the barometer was 0.72 of an inch and the temperature rose 16°; at Seattle the barometer rose 0.72 of an inch and the temperature 16°; at Baker City the barometer rose 0.66 of an inch and the temperature 12°; at Spokane the barometer rose 0.42 of an inch and the temperature rose 26°: at Helena the barometer rose 0.20 of an inch and the temperature 30°. Chinook winds occurred in Montana on November 16 and 17.

The following, from the November report of the Montana State Weather Service, may, in this connection, be of interest:

> A cold-wave signal having been ordered for that date (November 17), and the weather at the time of receipt of order being very warm and pleasant, the observer [Mr. R. M. Crawford, at Helena] decided to pay more than ordinary attention to the expected change. About 3.30 p. m. the wind, which had been blowing gently from the north, veering at

times to the northeast, with a velocity of about 9 miles an hour, stiffened quickly and came directly from the north, lowering the temperature 6° in less than five minutes.

The indications were that the temperature would fall much lower, but suddenly dark, vaporous-looking clouds appeared in the extreme southwest; with them simultaneously a strong gale from the same quarter, blowing at the rate of at least 40 miles an hour. The gale seemed to meet the wind coming in from the north, and drove it in a whirl directly toward the northeast, across the prairie, in a funnel-shaped cone, plainly perceptible for a long distance by the dust gathered. The temperature quickly rose to 58°, the maximum recorded for this date, and the chinook had mastered the cold wave.

Under some circumstances a rise of from 0.25 to 0.75 inch in pressure will produce colder weather, but under other conditions, such as those that prevailed on this occasion, a rise in pressure will produce a rise in temperature, or chinook winds, over the northwest portions of the United States. The rise in temperature in the latter case, accompanying a rise in pressure, can only be ascribed to dynamic heating.

The following table, showing pressure and temperature at 8 a. m., seventy-fifth meridian time, from November 8 to 18, inclusive, at the regular Weather Bureau stations, in the region now under consideration, illustrates the conditions prevailing during this first chinook in the autumn of 1895:

Nov. 1895.	Portland.		Roseburg.		Seattle.		Baker City.		Spokane.		Helena.	
	Bar.	Temp.	Bar.	Temp.	Bar.	Temp.	Bar.	Temp.	Bar.	Temp.	Bar.	Temp.
8	30.36	34	30.34	26	30.36	46	30.32	30	30.42	32	30.30	34
9	30.16	34	30.18	32	30.10	42	30.26	26	30.26	32	30.30	28
10	30.12	48	31.14	46	30.02	48	30.04	34	30.04	36	30.22	26
11	30.36	36	30.30	36	30.32	40	30.22	32	30.32	30	30.28	28
12	29.86	36	29.90	38	29.98	40	29.96	20	30.02	24	30.10	24
13	30.34	44	30.40	36	30.26	40	30.34	20	30.30	32	30.12	34
14	30.40	50	30.48	46	30.28	54	30.38	32	30.32	42	30.32	42
15	30.62	56	30.62	52	30.50	56	30.62	32	30.44	50	30.30	54
16	30.58	46	30.52	48	30.56	48	30.60	28	30.50	42	30.32	50
17	30.32	44	30.30	42	30.26	48	30.38	32	30.18	40	30.08	44
18	30.36	44	30.30	42	30.36	50	30.32	30	30.26	38	30.00	50

[NOTE.—A general explanation of the relation of chinooks to areas of high pressure was given in the MONTHLY WEATHER REVIEW for 1894, on page 77, and a further illustration on page 444. In a recent letter (February 3, 1896) Mr. Pague says:]

It is not, as I understand, admitted by all that chinook winds occur west of the Cascades. From my knowledge of conditions over the Pacific northwest I maintain that perfect forms of chinooks occur west of the Cascades and Rocky Mountains as well as to the east of the Rocky Mountains. The degree of moisture in the chinook winds varies with the conditions and the country over which they blow (at Walla Walla, Wash., for example, sometimes the very dry chinook occurs, which causes the snow to disappear without leaving any water behind); again, under another chinook the snow is melted and little evaporation takes place. The explanation of this is as follows: In the first case, there is little or no movement of the upper currents from off the ocean, hence the expansion and heating of the air will allow dry air to be brought into contact with the snow which evaporates as it melts. In the second case, there is a decided movement of air from the ocean inland and the dryness of the chinook is overcome by the vastness of the supply of moist air. The Rocky Mountains bar the moist air and, therefore, to the east of the Rockies the dry chinook usually prevails.

From November to March the mean temperature over Washington and Oregon is materially higher than it is to the east of the Rocky Mountains over the country having the same latitude. This mild winter temperature is generally ascribed to the proximity of the ocean and to the Japan current (Kuro-Sivo). While the ocean does modify the otherwise low temperature, yet the mean temperature is as much or more influenced by the dynamic heating of the air or chinook winds. If, during the winter season, the low is off the California coast the cold air on the northeast flows southeastward and gives the low temperatures over Washington and Oregon; if the low is passing eastward over British Columbia and a high is central about Salt Lake City, then the dynamic heating, or chinook winds, prevail and high temperature occurs.

In these two instances the oceanic influence is only indirect. Comparatively high temperatures also occur in connection with lows moving from off the California coast northward along the Oregon and Washington coasts, gradually extending inland; in this latter case the oceanic influence on the mean temperature is of direct effect.

Low mean temperatures occur from November to March when the lows are frequent and move southward along the coast to the Columbia River or farther south (they seldom move much to the south of the Columbia). Mean temperatures above the normal occur when the lows pass eastward at a high latitude, about British Columbia. In the latter case the chinook, or dynamic heating, prevails.

SPECIAL CONTRIBUTIONS.

A WEATHER BUREAU KITE.

By Prof. C. F. MARVIN, U. S. Weather Bureau (dated March, 1896).

In this age of progress even the boy's kite is made to serve a useful purpose, and investigations are now being made under the special direction of Prof. Willis L. Moore, Chief of the Weather Bureau, with a view to employing kites for the purpose of sending meteorological instruments to high elevations, so as to gain better information respecting the nature and causes of atmospheric phenomena than can be done from observations at the surface of the earth.

We are sometimes told by naturalists and others that man is a descendant of the monkey, and that by processes of evolution the tail, among other characteristics, has been entirely dispensed with. Exactly this same sort of evolution is going on before our eyes to-day. Kites are rapidly losing their tails, and those of the future are sure to be made altogether without tails. Among the great variety of sizes and forms tried by the Weather Bureau, none have tails.

The one of which a detailed description is given in this article is selected for the reason that it is among the best, and at the same time is not very difficult to make.

A word here respecting the origin of kites of this character will be interesting to many readers, who will be surprised to find that as early as 1866 Wenham perceived the advantages of superposing two or more planes one above the other for the purpose of securing a large extent of sustaining surface for artificial flying machines. After many years, Hargrave, an indefatigable and very able inventor of flying machines in Australia, embodied Wenham's idea of superposed planes in his odd-looking box-shaped kites. The resemblance of these kites with their thin walls to a honeycomb with the ends of the cells open seems to have suggested to Hargrave that the kites be called cellular kites. Some made by him were employed for the purpose of sustaining himself at considerable heights in the air in order that he might the better conduct certain investigations.

Finally, in order to determine whether kites of the Hargrave type were suited to the needs of the Weather Bureau work, Mr. S. A. Potter, in October, 1895, made several cellular kites of different sizes. The trials were so successful from the first that kites of this type have been employed exclusively in subsequent investigations. Mr. Potter, it seems, was the first in the United States to successfully construct and fly kites of this kind. After a few trials he hit upon an important modification whereby the construction was greatly simplified, and the strength and lightness increased. This kite is described below and shown in the illustrations on Chart VIII.

The following description of a kite of convenient size is given with great minuteness, for the reason that there will probably be many observers who will be delighted and instructed to possess and fly one of these seemingly odd-shaped cellular kites.