SEVERE LOCAL STORMS.

[The table herewith contains such data as have been received concerning severe local storms that occured during the month. A more complete statement will appear in the Annual Report of the Chief of Bureau.]

Place.	Date.	Time.	Width of path (yards).	Loss of life.	Value of property destroyed.	Character of storms.	Remarks.	Authority.
Webb City, Mo.	1	A. m.		1	$75,000	Tornado	Houses demolished; 15 hurt	Evening Star (Washington, D. C.); Star (Oneonta, N. Y.).
Belleville, Ill.	1	10 a. m.			30,000	Wind	Smokestack, 60 feet high, blown down, wrecking factory building; 6 persons injured.	Official, U. S. Weather Bureau; Globe Democrat (St. Louis, Mo.).
Eastern Colorado	4	A. m.	100–1,760	5	130,000	Two tornadoes	Heavy damage to buildings, household goods, livestock; many injured.	Official, U. S. Weather Bureau; Star Journal (Peublo, Colo.).
Southern and north-central Kansas.	4	P. m.		1		Tornadoes and wind.	Buildings and wire lines blown down; tornadoes in Clark and Mitchell Counties; man killed in Butler County.	Official, U. S. Weather Bureau; Wichita Eagle (Kans.).
Creek County, Okla.	4	P. m.	100–880	6	500,000	Tornado	Houses and oil rigs wrecked	Tulsa Daily World (Okla.); Wichita Beacon (Kans.); Washington Herald, (D. C.).
Rapid City, S Dak., and vicinity.	4–5					Wind and snow	Railway and highway traffic impeded	Official, U. S. Weather Bureau.
New York State	23–24			2		Wind	Eight barges, carrying 130,000 bushels of wheat, wrecked on Lake Oneida.	Do.
Eastern and southern Minnesota.	30	P. m.		1		do	Buildings, trees, windows, etc., damaged	Official, U. S. Weather Bureau; Pioneer Press (St. Paul).

STORMS AND WEATHER WARNINGS.

EDWARD H. BOWIE, Supervising Forecaster.

The weather and storm conditions were not in anyway unusual during the month of November. It was noted, however, that there was a tendency for all areas of high barometer east of the Rocky Mountains to move well to the south of east before passing into the Atlantic after leaving the continent and that few of these were attended by temperatures much below the normal. For a considerable part of the month the pressure remained high over the northern Rocky Mountain and northern Plateau regions, a condition which is not infrequently observed in these regions after the first general fall of snow over the mountains of these regions. Moreover, the LOWS, or cyclones, of the month showed a marked inclination for those of the Alberta type to move eastward in high latitudes and for those which developed over the Plateau and southern Rocky Mountain regions to move northeastward toward the upper Lake region and thence along but north of the northern border to the Canadian Maritime Provinces and Newfoundland. As a matter of fact, it was not until near the end of the month that the tendency for cyclones to follow the northern border eastward from the Great Lakes to Newfoundland was departed from, or, to be specific, on the 26th a cyclone of the Alberta type moved rapidly southeastward to the South Atlantic coast and thence quite rapidly northeastward to the Grand Banks, where it became a disturbance of marked intensity with a central pressure below 29 inches.

It is also notable that during the last decade of the month the distribution of pressure underwent a marked change over the Alaskan area and the North Pacific Ocean, when there was a reversal of the pressure gradient that normally is found to be the order over these regions, i. e., high barometer off the California coast and low barometer to the northward. On and about the 21st and 22d a LOW of great magnitude covered the ocean south of Alaska and the Aleutian Islands, and at the same time the pressure rose to above normal over the continent and the Bering Sea. This change in pressure distribution was of such a nature that it was confidently expected that following shortly thereafter the tracks and types of cyclones of the United States could not but change to meet the newly developed pressure distribution. Hence on the 23d statement was issued for the press to the effect that relief from the drouth of several months duration in the middle Atlantic States might be expected in the near future. A cursory examination of the weather charts of the United States for the two weeks following the day on which this prediction was made will disclose a very marked shift southward of the storm tracks and, further, will disclose the the fact that all of the cyclones that followed were attended by rains in considerable quantities not only in the middle Atlantic States but generally east of the Rocky Mountains. Another notable phenomenon was the persistence of high barometer during the greater part of the month over the British Isles and southwestern Europe.

WASHINGTON FORECAST DISTRICT.

Few warnings, other than those for frosts in the southern and occasionally freezing temperatures in the middle and northern States of the Washington Forecast District, were required; but storm warnings were displayed on the 23d, 27th, 28th, and 30th for the Middle Atlantic or New England coasts, in connection with disturbances that crossed the continent. No storms of tropical origin occurred during the month in West Indian waters.

CHICAGO FORECAST DISTRICT.

The month was for the most part mild and uneventful throughout the Chicago Forecast District.

Strong winds prevailed on the Great Lakes on only two or three days, and, as a consequence, navigation continued under most favorable circumstances. Several disturbances in the West, as they approached the Great Lakes, seemed to justify storm warnings, but as they reached the Lake region their force was often very quickly dissipated.

The storm-warning service, for this reason, was not as effective as it should ordinarily be expected to be, as warnings were ordered for a few days for some portions of the Lakes when they were not justified.

The storm of November 1, which centered in eastern Kansas with lowest barometer of 29.50 inches at Iola, is a case in point. Warnings were ordered during the day

for Lakes Michigan and Superior, but while the center of the disturbance passed directly over the Great Lakes, its energy was rapidly lost and no strong winds followed. The severe disturbance which covered the Rocky Mountain Region and the Great Plains on the 3d, 4th, and 5th acted in much the same manner as it approached the Lake Region, except that it took a more northerly course, and the storm warnings that were ordered were not justified.

Another storm which had been causing severe conditions throughout the West on the 11th and 12th, including heavy snow, gradually lost its energy in approaching the Great Lakes Region. Northeast storm warnings, however, that were ordered on the morning of the 12th for the southern half of Lake Michigan were justified at Chicago with an onshore wind of 37 miles.

Small-craft warnings were ordered on the morning of the 17th for eastern Lake Michigan and Lakes Huron, Erie, and Ontario, as a disturbance crossed the Great Lakes with its center far to the north, and verifying velocities were registered at a few stations. The strong winds, however, were accompanied by fair weather so that conditions were not in the least critical.

A storm which appeared in the northern Rocky Mountain region on the night of the 17th lost some of its energy as it approached the western Lake Region, but, nevertheless, warnings ordered for Lakes Superior, Michigan, and Huron were verified at a few stations.

While, as I stated before, nearly all of the storms lost their intensity as they reached the Great Lakes, there were two exceptions in the last decade of the month, one on the 23d and one on the 30th. The first of these two storms had no indication of increasing severity. Small-craft warnings were ordered on the morning of the 23d for all lakes except extreme western Superior, and these were changed to storm warnings at 1 p. m., verifying velocities being registered at a large majority of stations.

On the morning of the 28th an extensive barometric depression covered the Canadian Northwest, and on the 29th the head of this storm had reached the Lake Superior region, but a secondary disturbance was then developing over the Great Basin. The latter rapidly became the main disturbance and moved in a northeasterly direction its center passing over Lake Superior on the night of the 30th. Warnings were ordered on the 30th for all lakes except eastern Lake Superior, and at night they were lowered on the western portion of that lake because of the omission of an important word from the Duluth signals which indicated that the storm was rapidly losing force. As an unavoidable consequence of this and the fact that night reports are not received at Chicago from either Houghton, Mich., or Wausau, Wis., the two stations nearest to Duluth and in close proximity to the storm center, the warnings on Superior were not handled in the manner the situation demanded. This is a marked example of the necessity of accurate reports for use in forecasting. Moreover, generally speaking, from the standpoint of the forecaster, the work of handling the storm warnings on the Great Lakes during the whole month was most difficult because of the erratic action and movement of the various disturbances.

No general cold-wave warnings were issued during the month, and frost warnings for only a limited area in the extreme southeastern portion of the region, the latter terminating about the 15th, as there were no crops there after that date susceptible to injury.

Stock warnings were issued for the Dakotas on the 18th and on the morning of the 30th because of the threatening and severe conditions anticipated in connection with the movement of the storms which passed northeastward toward Lake Superior.

Special advices for a week in advance have been sent from the beginning of the month to the Wenatchee Valley Traffic Association, Wenatchee, Wash., in connection with the shipment of fruit across the frontier States of the Northwest, and it has shown in various communications high appreciation of the service rendered.

The Chicago Weather Bureau office is making a special effort to get in even closer touch with the advertising interests in order to better guide these as to the time of publishing and the character of the ads. Many of the advertising managers of large establishments are in daily touch by telephone with the forecaster, and much appreciation has been shown of the service. The following letter received from the H. Paulman & Co. under date of November 23, which handles Pierce-Arrow motor cars and trucks, refers to an instance of such special service:

"We wish to thank you very much for the kind cooperation your department showed us last Saturday in advising us when you expected the first freeze.

"I do not know that we ever got so much consideration from a public department as we did from you, and, while I hope it will not be necessary to bother you again in the future, it would at least be a pleasure to do so."

—*H. J. Cox.*

NEW ORLEANS FORECAST DISTRICT.

The weather was exceptionally mild for the season, and frost warnings were continued longer than usual for the northern portion of the district. Colder weather during the last decade made frost warnings necessary in the interior of the southern portion, and warnings were issued accordingly. The frost warnings were verified except in a few instances characterized by persistent cloudiness.

On the 11th, with moderately low pressure over western Texas and high pressure over the northern and middle Rocky Mountain States, cold-wave warnings were issued at night for the Texas Panhandle and western Oklahoma. The warnings were extended the next morning over Oklahoma, northwestern Arkansas, and the northwestern and north-central portions of east Texas, a hard freeze being predicted for the northern portion of west Texas; and the warnings were given to stockmen. The cold wave occurred over part of the northwestern portion of the district, but was prevented from extending farther by the northward movement of the LOW, a trough of low pressure being maintained over the central portion of the country for two days, while the western HIGH became less intense and pressure increased over the Great Lakes. No other cold-wave warnings were issued or required.

Northwest storm warnings were displayed on the Texas coast because of conditions shown on the 8 p. m. map of the 12th, but were only partially verified, as the area of high pressure diminished greatly in intensity as it moved southward.

Small-craft warnings were displayed on the middle coast of Texas on the 22d and locally by the official in charge at Corpus Christi, Tex., on the 4th, 21st, and 30th. These warnings were justified.

Fire-weather warnings for forested areas in Arkansas and Oklahoma were issued on the 4th and 30th.—*R. A. Dyke.*

DENVER FORECAST DISTRICT.

A LOW which began to develop on the southern Rocky Mountain Plateau on the 1st had moved by the evening of the 3d to northern New Mexico, whence it advanced