

entered at the end of the respective month. It is their summation which establishes the points on the main or mass-curve of the diagram. The curve though prepared for a region, may nevertheless be accepted as correctly representing the normal precipitation at each one of the three stations on whose composite record it is based, because the values in percentage of normal, at the three several points were in fair correspondence. The composite, in fact, probably better represents normal conditions at each of the stations than do their own particular records because the influence of local sources of error is minimized in the composite.

Where the rainfall year runs with the calendar year the time record on a similar diagram would, of course, begin with January 1 instead of with July 1.

To illustrate the use of the curve the following example may suffice: It is desired to know on December 31 how the rainfall of 7 inches since July 31, 1926, at a point between Sacramento and San Francisco having a normal annual of 15 inches, compares with normal precipitation.

The curve shows that the normal seasonal to December 31 should be 38 per cent of the normal annual precipitation, that is, in this case 38 per cent of 15 inches or 5.7 inches. The rainfall at the point in question was therefore $(7 - 5.7 =)$ 1.3 inches in excess of normal on December 31.

TORNADOES IN ARKANSAS IN MARCH, 1927

By. W. C. HICKMON

[U. S. Weather Bureau, Little Rock, Ark.]

Two destructive tornadoes occurred in this State in March, 1927. The first started at 7:30 p. m. of the 17th at the village of Delight, in Pike County, and moved thence some 70 miles northeastward to the border between Saline and Pulaski Counties, covering the distance in about an hour. Eleven persons were killed and 25 injured in this storm.

The second storm originated in Carroll County, south of Eureka Springs, moving thence east to Green Forest and thence east by south to Coin, and thence northeast to Denver, where it disappeared. This storm practically demolished the town of Green Forest, where 22 persons were killed and about 100 injured. Forty-eight houses were destroyed and 132 badly damaged; property loss was large.

The distribution of pressure on the 17th was not such as usually attends a tornado, the V-shaped trough with a southward or southwestward protrusion which Humphreys terms a normal but not invariable condition,¹ was notably missing on the 8 a. m. map; however, the moderate anticyclone to the northwestward was present and the temperature gradient was steep, temperatures of 30° to 36° obtaining in western Oklahoma at 8 a. m., while at Little Rock the temperature was 62°. The 8 p. m. map showed a weak cyclonic condition over the

Rockies and the southwest which, on the morning of the 18th, had become a disturbance of wide extent. The temperature gradient was still fairly steep and by 8 p. m. of the 18th the map was much nearer the tornado type.

A THUNDERSTORM WITH RAIN, HAIL, SLEET, AND SNOW

A thunderstorm at St. Joseph, Mo., on the afternoon of March 19, 1927, was accompanied by rain, hail, sleet, and snow, a most unusual phenomenon. The storm came from the southwest in connection with an area of low barometric pressure central in southern Missouri at 7 p. m. of the 19th. The thunderstorm began at 1:42 p. m., and moderate thunder was heard at frequent intervals until 4:22 p. m. A rather heavy fall of hail began at 2:35 p. m., and continued for three minutes. The hail was preceded, accompanied, and followed by rain, and from 3:41 p. m. to 5:10 p. m., the rain was mixed with sleet, which in turn was followed by light mist. The hailstones were quite uniform in size, about one-fourth inch in diameter, and consisted of soft opaque centers surrounded by clear ice, while the sleet ranged from about the size of large shot to very small particles. The rain with temperature below freezing caused a light covering of glaze, and icicles 1 to 2 inches in length formed on wires and limbs of trees. The amounts of hail and sleet were about equal and when melted gave approximately 0.09 inch of water. During the progress of the thunderstorm snow flurries were noted in the northern portion of the city. The temperature at the time of the hail was 31° F., and while the sleet was falling it stood at 30°. During the storm the wind movement ranged from 7 to 11 miles per hour from the northeast, backing to north, and the barometer remained nearly stationary at slightly below normal. The total precipitation was 0.47 inch.—*W. S. Belden.*

METEOROLOGICAL SUMMARY FOR SOUTHERN SOUTH AMERICA, FEBRUARY, 1927

By J. B. NAVARRETE, Director

[Observatorio del Salto, Santiago, Chile]

February was characterized by increase in the activity of the atmospheric circulation over the far south. In the Central Zone the weather was settled and toward the end of the month the heat of summer began to decline.

The most important depressions were those of the 14th and 23d; the first of these affected the Central Zone to some extent, rain occurring as far north as Valdivia Province. The second depression was more intense; it affected the whole Southern Zone as far north as Concepcion, causing extremely heavy winds and rains. Maximum rainfalls varied between 26 and 46 mm.

The most important anticyclonic régimes developed between the 1st and the 5th, 15th and 22d, and 24th to 28th, and were characterized by general fine weather, and by strong southerly winds between the coasts of Chiloe and Arauco.—*Transl. B. M. V.*

¹ W. J. Humphreys, *The Tornado*. Mo. Wea. Rev., Dec., 1926.