to the snow cover at the head of the Northern and Southern Feeders.

5. The summer precipitation during the melting of the snow cover, as from April through June.

Owing to the great length of the Humboldt Basin, the relative lowness of much of its watershed, the shallowness of its snow cover, and the tendency of the latter to melt out at the lower elevations during the winter, the forecasting of the run-off there is far more complex than in the Sierra Nevada, where the snow is deep and the streams relatively short. The problem is further complicated by the lack of adequate snow survey courses and stream gaging stations.

Consequently, detailed study must be made of the relative area at various elevations, with the usual snow cover at each, and more exact measurements must be kept of diversions along the stream before any reliable basis can be established for forecasting the run-off with even approximate precision, while the close accuracy now possible in the Sierra Nevada may never be attained owing to the more patent effects of the relatively heavier summer rains in the Humboldt Basin.

The present season, the snow cover, winter precipitation and amount of snow on the ground at the lower levels in March indicate an approximately normal run-off for April-July, especially along the upper stream near the source of supply and above diversions. In case of heavy summer rain the run-off may reach as high as 125 per cent, but lack of rain and the heavy draft on the Humboldt may cause a minimum run-off of approximately 75 per cent, at Palisade, as was experienced with nearly normal winter snow cover and summer precipitation in 1919-1920. Furthermore the dry stream bed resulting from the low water of last season must be re-primed, especially down stream below the effect of the winter snow and rain.

The run-off on the Lower Humboldt can be forecasted with far less accuracy than can the Upper Humboldt because of the increasing effect of diversions. Few data on run-off and storage are available. However, normal run-off of 233,278 A. F. at Palisade should furnish a correspondingly normal run-off of 121,197 A. F. at Oreana uncorrected for storage. The snow cover this season is 122.5 per cent and the winter run-off at Palisade 78.0 per cent or 61,520 A. F.

The Little Humboldt should flow 150 per cent the present season because of the deep snow cover and presence of snow at lower elevations. The normal run-off at the head of Paradise Valley has not yet been ascertained because of the shortness of the record and the apparent inaccuracy of the present normal for snow cover.

RAIN MAKES FREIGHT TONNAGE

When asked in the middle of January of this year for an appraisal of the 1927 business outlook, Vice-President Frank W. Robinson of the Union Pacific Railroad System said to a reporter for the Salt Lake *Tribune*:

"We measure future business and prosperity by the amount of moisture in the form of rain and snow that has been received over the territory served by our lines. We derive a large percentage of our freight from agricultural sources, and plenty of moisture in this western country assures good crops. Thus at the present time the business outlook is considered good."

Each week throughout the year the Omaha officials of the Union Pacific System collect precipitation data from representative Weather Bureau offices on their lines upon which to base these periodical business predictions or estimates. The data compiled include total precipitation for the current week ending Saturday morning; normal precipitation for the week; seasonal precipitation to date from October 1st (the beginning of the irrigation water storage season); and the normal precipitation for the same period. A similar set of figures for the previous year is compiled at the same time for direct comparison.—*J. Cecil Alter.*

WEATHER BUREAU AIDS BRIDGE CONSTRUCTION

During the recent construction of the Carquinez Straits bridge at Crockett, Calif., said to be the largest cantilever bridge in the world, two steel spans weighing 750 tons each were built on shore, towed on pontoons out into the straits, and hoisted by means of counter-weights to the level of the bridge, 135 feet above the water. The towing and lifting of these spans, which required several hours, could not be safely undertaken except under favorable weather conditions. High winds or rough waters would probably have resulted in the loss of the spans by collapse or sinking, entailing an expense of hundreds of thousands of dollars, and possibly some fatalities to the workmen.

In view of these facts, the construction company asked the Weather Bureau of the United States Department of Agriculture to detail a meteorologist to make special observations at the straits and advise the engineers as to the best time to proceed with the work. A man was accordingly detailed from the Weather Bureau office in San Francisco, an anemometer was installed on the completed portion of the bridge, and current weather indications were supplied by long-distance telephone from San Francisco. Both spans were successfully raised, one on March 3 and the other on March 19, 1927, in accordance with advice furnished by the meteorological expert. The construction company has expressed its high appreciation of the services rendered by the Weather Bureau on this occasion.—U. S. Dept. of Agriculture *Clip Sheet.*

PROFESSOR EDOUARD BRUECKNER

Professor Brueckner, noted for his scientific demonstration of the Brueckner cycle of approximately 35 years, died May 21, 1927, at the age of 64 years. He was Professor of Geography at Vienna, and his research was mostly in the field of paleoclimatology. With Dr. A. Penck he made a notable contribution on "Die Alpen im Eiszeitalter"