to me that altimeters on free balloons will not be subject to this effect to such a marked degree. A free balloon is completely subject to the wind in which it is moving; it cannot be propelled nor can it be steered. The wind, at altitudes sufficiently great as not to be affected by surface friction, is subject to the distribution of pressure with respect to speed and direction. It is known as the gradient wind. The direction of the gradient wind is parallel to the isobars at a given level. If, then, a free balloon rises into such a wind, the barometric pressure which is affecting its altimeter will not change, except as the balloon changes its altitude. At a given level the altimeter would be constant in its reading, which would not be the case with an altimeter which was being moved *across* the isobars. It is true, that close to the surface, perhaps below 500 meters, a balloon would not strictly follow the isobars, owing to surface friction, and perhaps above 1000 meters the direction of the isobars would be such that it would be carried across the sea-level isobars; but this affords a range of about 500 meters at a convenient flying level where the balloonist may fly without danger of erroneous altimeter indications.—*C. LeRoy Meisinger.*

DIAGNOSING A HURRICANE.

The hurricane that hit the coast of Louisiana in the early morning of September 21 was the first that has occurred this year and makes the work of the Weather Bureau in connection with these disastrous storms of timely interest. Fortunately this one was of comparatively moderate intensity and struck at a point where no large city is located and not largely populated. However, the violence of even a moderate hurricane is terrorizing and can be fully appreciated only by those who have experienced their destructive power. They are always of tropical origin and rarely occur except in the summer and autumn months. Those that originate in the Caribbean Sea and Gulf of Mexico are called hurricanes, and have the same characteristics as the dreaded typhoons of the Philippines. They are by far the most violent of all general storms and are attended by clouds of inky blackness, downpours of rain, and wind of tremendous velocity, sometimes more than 135 miles an hour. In low-lying sections the high winds pile up the tides many feet and inundate the country for miles inshore. The hurricane of 1915 that passed near Galveston left a large ocean-going vessel high and dry several miles from the coast line. If a hurricane should strike on the south Atlantic or Gulf coasts unheralded the loss of life and destruction of property would be appalling. And this is what did happen before the Weather Bureau began its hurricane warning service and had learned the nature and characteristics of these awful maelstroms. For many years no tropical storm has occurred unannounced, and the savings in vessels and property undoubtedly amounts to millions of dollars, and the saving of lives can be reckoned in hundreds of thousands.

The means of detecting the beginning of hurricanes, their intensity, speed and direction of movement requires marvelous skill on the part of the forecaster. It can be compared to a physician who diagnoses a case in which there is menace and death to his patient by symptoms that he recognizes because of his technical skill and experience. If he makes a mistake, one person is apt to die; if the forecaster errs, thousands of lives may be the penalty. The forecaster has less than the physician on which to base his diagnosis, oftentimes a single wireless report of weather conditions from a vessel at sea or a land station a hundred miles or more from the storm center. His task is made more difficult because hurricanes may, and most frequently do, originate over the tropical waters of the Caribbean Sea and move for days without coming near land. A vessel caught unawares is in for a terrible buffeting and is lucky to escape.

The recent hurricane was typical of the forecaster's problem. As early as September 18 he announced that conditions were becoming threatening over the Caribbean Sea and the west portion of the Gulf of Mexico, and advised caution on the part of all vessels in those waters. It was a case of diagnosis. The caution was broadcast by wireless and placed vessel masters on the alert. The next morning the symptoms had developed and it was evident that there was a disturbance moving toward the Yucatan channel. It might keep a straight course, move to the right or the left, or describe a parabolic curve and strike anywhere on a fifteen hundred mile coast line from western Florida to southern Texas. For sixty hours, with only a few reports, none closer than 100 miles from the center of the disturbance, as a guide, the forecaster kept the people of the entire Gulf coast, who were in a fever of anxiety, in touch with the situation. When it finally struck, those in the danger zone were prepared, while hours before those in the other threatened districts had been relieved of their anxiety. The forecaster had diagnosed the case accurately. Like the physician, he spent many sleepless hours beside his charts and took only short periods of rest until the danger had passed.—*E. B. Calvert.*

LOCALIZED HURRICANE DAMAGE INLAND.

Although a West Indian hurricane is a good-sized storm, it is surprising at times to learn of cases of very localized damage such as is described by Mr. T. W. Forman in the following passage from a letter:

"When I went to Brownsville (Tex.) the last time, two days after the storm (of Sept. 1919), I noticed that the path of most destruction along the St. Louis, Brownsville and Mexico R. R., crossed the railroad north of Kingsville, in the vicinity of Bishop, Texas. In this section many buildings were unroofed and small ones completely demolished, while 15 or 20 miles either side of this strip you could not tell that anything had happened.

"The railroad officials of this same railroad reported that at a little station south of Kingsville, Armstong, Texas, that the rainfall for the month of Sept., 1919, alone, was 53 inches. The make-up of the country in this vicinity is unlike any adjacent to it. The surface of the ground is several feet of hard-pan, covered with shifting sand that has formed into small dunes. It seems that the area covered by this hard-pan forms a basin, as it has no drainage, except evaporation. When we went down on the train, through that section the water was up to the steps on the cars, and remained that way for several months."—*T. W. Forman* (U. S. Engineer Office, Galveston, Tex.).

METEOROLOGICAL RESOLUTIONS ADOPTED AT THE FIRST SCIENTIFIC CONFERENCE OF THE PAN-PACIFIC UNION.

A general account of the Conference is published in the *Monthly Weather Review*, August, 1920, vol. 48, pp. 466, 467; the text of the general resolutions is to be found in *Science*, Sept. 24, 1920, pp. 286–287, and that of the special resolutions in subsequent issues of *Science*. An account of the origin of the Pan-Pacific Union and its relation to the Bishop Museum appeared in *Science*, July 23, 1920, pp. 74–76. The papers presented at the Conference will be published in the Proceedings of the Conference; and those of meteorological interest will probably appear in some form in the *Monthly Weather Review*.

METEOROLOGY.

Investigations in meteorology, or the physics of the atmosphere, designed to lead to an accurate, scientific knowledge of atmospheric phenomena are of recognized importance. Very little is known of the behavior of the upper air over the land, and still less over the ocean. The fundamental aspects of these phenomena are exhibited in their simplest manner over the greatest of oceans, the Pacific. Hence it is necessary to make meteorological observations over the Pacific for use in studying the more complex problems over the land.

Moreover, the collection, and prompt dissemination of marine meteorological