MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

VOL. XXXI. SEPTEMBER, 1903. No. 9

INTRODUCTION.

The MONTHLY WEATHER REVIEW for September, 1903, is based on data from about 3300 stations, classified as follows:

Weather Bureau stations, regular, telegraph and mail, 160; West Indian Service, cable and mail, 8; River and Flood Service, 52, river and rainfall, 177, rainfall only, 62; voluntary observers, domestic and foreign, 2565; total Weather Bureau Service, 2962; Canadian Meteorological Service, by telegraph and mail, 20, by mail only, 13; Meteorological Service of the Azores, by cable, 2; Meteorological Office, London, by cable, 8; Mexican Telegraph Company, by cable, 3; Army Post Hospital reports, 18; United States Life-Saving Service, 9; Southern Pacific Company, 96; Hawaiian Meteorological Service, 75; Jamaica Weather Service, 130; Costa Rican Meteorological Service, 25; The New Panama Canal Company, 5; Central Meteorological Observatory of Mexico, 20 station summaries, also printed daily bulletins and charts, based on simultaneous observations at about 40 stations; Mexican Federal Telegraph Service, printed daily charts, based on about 30 stations.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. Curtis J. Lyons, Territorial Meteorologist, Honolulu, H. I.; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; Lieut. Commander W. H. H. Southerland, Hydrographer, United States Navy; H. Pittier, Director of the Physico-Geographic Institute, San José, Costa Rica; Commandant Francisco S. Chaves, Director of the Meteorological Service of the Azores, Ponta Delgada, St. Michaels, Azores; W. N. Shaw, Esq., Secretary, Meteorological Office, London; Rev. Josef Algué, S. J., Director, Philippine Weather Service; and H. H. Cousins, Chemist, in charge of the Jamaica Weather Office.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. The Hawaiian standard meridian is 157° 30′, or $10^h\ 30^m$ west of Greenwich. The Costa Rican standard of time is that of San José, $0^h\ 36^m\ 13^s$ slower than seventy-fifth meridian time, corresponding to $5^h\ 36^m$ west of Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local standard is mentioned.

Barometric pressures, whether "station pressures" or "sea-level pressures," are now reduced to standard gravity, so that they express pressure in a standard system of absolute measures.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

Two storms of marked intensity advanced from the subtropical region north of the West Indies to the Atlantic coast of the United States during the second decade of the month.

The regular morning reports of the 10th indicated the presence of a disturbance over the eastern Bahamas. By the evening of the 10th the center of disturbance had advanced to the vicinity of Nassau, New Providence Island, Bahamas, where a minimum barometer reading of 29.20 inches was reported at 7 p. m. Between 6 and 7 p. m. the wind at Nassau increased from an easterly direction to 60 miles an hour, when the anemometer cups blew away. The wind then went to southerly and reached an estimated velocity of 90 miles an hour. On New Providence Island the fruit crop was destroyed and much damage was caused to small buildings. At Cat Cay, Bahamas, a minimum barometer reading of 28.82 inches was reported.

During the 11th the hurricane center approached the southern Florida coast. At Jupiter the barometer fell from 29.88, at 8 a. m., to 29.63, at 6 p. m., and the wind increased from the northeast to a velocity of 78 miles an hour at 6:45 p. m. For one minute the wind blew at a rate of 84 miles an hour. At 11 p. m. the direction of the wind changed to east and the velocity began to decrease. At 1 a. m. of the 12th the wind veered to southeast and increased to 60 miles an hour, and at 7 a. m. the gale ended. The center of the storm passed about 50 miles south of Jupiter, and the greatest amount of damage on the east Florida coast was caused in that region. The northern limit of destructive winds on the east coast was about 30 miles north of Jupiter. In the vicinity of Jupiter the losses were confined principally to pineapple sheds. From West Palm Beach to Miami the property loss amounted to about $100,000. Nine lives were lost in the stranding and breaking up of the British steamer *Inchulva* at Delray. The vessel and cargo are said to have been valued at $350,000. An oil barge was lost by a tug and blown on the beach at the lower end of Lake Worth; it was afterwards hauled off and the loss was estimated at $5000. The schooner *Martha T. Thomas*, loaded with lumber, was blown ashore near Jupiter, and if the efforts that were being made to save the cargo were successful the loss did not exceed $15,000.

During the 12th the storm center moved northeastward over the southern part of the Florida Peninsula and passed into the Gulf of Mexico. At Tampa the barometer fell from 29.68 at 8 a. m. to 29.42 at 1 p. m., and from 10:15 a. m. until after 2 p. m. the average wind velocity was about 40 miles an hour, with squalls at a rate of 50 to 60 miles an hour. In Tampa, buildings were destroyed or damaged to the extent of about $200,000, and in the surrounding country great havoc was caused to orange groves.

The center of disturbance crossed the extreme northeast part of the Gulf of Mexico during the 13th, and at 8 p. m. was located east of Pensacola. At St. Andrews the barometer

is reported as having fallen from 29.80 at 7 a. m. to 29.08 at 4:15 p. m., with northeast wind that increased in gusts to about 60 miles an hour. From 4:15 to 4:45 p. m. the barometer was stationary, and then rose slowly with wind going to southwest. The wind had been west from 3:30 to 4:45 p. m., and at 4 p. m. reached an estimated velocity of 75 to 80 miles an hour. The wind continued strong from the southwest until the morning of the 14th.

During the 15th and 16th this storm practically dissipated over the east Gulf and South Atlantic States.

The warnings and advices issued in connection with this storm permitted all possible precautions to save exposed property, and comparatively little damage was caused to vessels.

Mr. C. E. Garner, President of the Jacksonville Board of Trade, has written as follows regarding the warnings:

> I wish to express my appreciation of the timely warnings given by the Weather Bureau both at this point and at Tampa during the recent West Indian hurricane. They were especially valuable at Tampa, as I have steamers operating from that point to Manatee River and Terre Cela Bay points, and the notice we had from the Weather Bureau prevented our leaving port on Saturday the 12th. The observer at Tampa kept us fully advised as to the situation there, and his warnings to vessels not to leave port, in my judgment, prevented serious disasters. I think it is very fortunate for the agricultural and shipping interests of this State that we have such an efficient service of the Weather Bureau, and that the service is in the hands of such capable and accommodating officials.

The Tampa Evening Herald of September 15 comments editorially regarding the storm, and says, in part:

> Too much credit for the saving effected can not be given to the Weather Bureau, and it is the intention of this article to direct public attention seriously toward one of the most valuable of the Government branches in this city.

The Weather Bureau observer at Jacksonville, Fla., reports that there is no doubt but that a large amount of property and a number of lives were saved by the timely display of the storm warnings. Ten vessels, the approximate value of which was one-quarter of a million dollars, remained in port at Jacksonville during the displays, and three vessels, valued at $135,000, at Fernandina. Sponge and fishing vessels, valued at nearly $200,000 and employing hundreds of men, remained in ports along the Florida coast, and the display of warnings undoubtedly saved many of these vessels and their crews. The observers at Tampa and Pensacola gave the widest possible distribution to the warnings and state that they were, as usual, well heeded.

The origin of the severe storm that visited the middle Atlantic coast on the 16th is obscure; it is probable, however, that it advanced northwestward from the subtropical region south of Bermuda. Evening reports of the 15th showed the presence of a disturbance off the North Carolina coast, but did not clearly indicate its intensity and subsequent course. Advancing northward during the night of the 15th, the disturbance was central near the southern New Jersey coast on the morning of the 16th. During the 16th the center of disturbance moved northward along the New Jersey coast and divided, one part apparently passing up the Connecticut Valley and the other northwestward over New York. During this day recorded wind velocities of more than 60 miles an hour occurred along the New Jersey, New York, and southern New England coasts. Although the area of this storm was small, it caused the loss of a number of lives and considerable destruction of property and crops. On account of high winds along the middle and north Atlantic coasts, storm warnings that were ordered on the morning of the 16th were continued during the 17th.

During the 28th a severe storm recurved northeastward over Bermuda. At 8 a. m. the barometer at Hamilton was 29.82 inches with a moderate east wind and rain. At 10:40 a. m. 29.60 inches, and at 12:20 p. m. 29.20 inches. At 2:20 p. m. a reading of 29.18 inches was reported, with barometer rising rapidly. The wind, that had been increasing from northeast shifting to east, backed about 2 p. m. to northwest. The wind is reported to have attained hurricane force, uprooting trees, damaging houses, and destroying crops. The storm probably approached Bermuda from the east or southeast, or possibly it developed in the southern end of a trough of low barometric pressure that passed eastward from the middle and north Atlantic coasts of the United States during the night of the 27th. Its recurve northward near Bermuda was made on the eastern edge of an area of high barometric pressure that extended eastward from the Atlantic coast during the 28th. Moving northeastward from Bermuda this disturbance apparently united with an extensive area of low barometer that covered the British Isles during the closing days of September and the first week of October.

During the 10th and 11th a severe storm prevailed over the British Isles, the North Sea, and adjoining continental coasts, wrecking many vessels. During the 12th and 13th this storm passed eastward over continental Europe. From the 19th to the 21st a storm advanced from the ocean between the Azores and the coast of Portugal to the west coasts of the British Isles, where high but diminishing winds prevailed during the next two days.

The first storm of the month on the Great Lakes advanced from Kansas to the St. Lawrence Valley during the 9th and 10th. A storm that caused high winds over the western Lake region moved from Colorado to Manitoba during the 11th and 12th. A disturbance of moderate strength occupied the eastern Lake region during the 16th and 17th, and a storm of marked intensity moved eastward over the Great Lakes during the 25th, 26th, and 27th.

No severe general storms crossed the Pacific coast. On the 12th, 13th, and 23d high northwest winds occurred at coast points near San Francisco, Cal.

The month opened with prevailing dry weather in the interior of the Gulf and South Atlantic States, Tennessee, and Kentucky. On the 9th rain relieved to some extent the drought conditions in central Texas, and rains from the 13th to 15th broke the dry period in the eastern part of the cotton belt.

Frost occurred in the Northwestern States on the 4th and 5th, and in northwestern Ohio on the 6th. From the 14th to the 16th frost was reported in the corn belt as far south as northern Kansas, extreme northwestern Missouri, southern Iowa, and northern Illinois, and injury to corn, mostly in the lowlands, was reported in the Dakotas, Nebraska, and Minnesota. The occurrence of frost was, in each instance, announced in the forecasts.

Snow fell on the Continental Divide, Colorado, on the 7th, and at Butte, Mont., on the 8th. On the 15th heavy snow was reported in Wyoming.

During the second decade of the month flood stages were reached in the upper Mississippi River and tributaries.

BOSTON FORECAST DISTRICT.

Frosts during the second week of the month caused considerable damage, especially on lowlands. Storm warnings were displayed on the 15th, 16th, 18th, and 24th, and no storms occurred without warnings.—*J. W. Smith, District Forecaster.*

NEW ORLEANS FORECAST DISTRICT.

Warnings were issued on the 10th for a storm that occurred on the 11th. The information received regarding the hurricane that crossed the eastern Gulf from the 12th to the 14th was greatly appreciated by shipping interests.

Warnings were issued for the first frost of the season that occurred in exposed localities over the northern portion of the district on the 17th.