MONTHLY WEATHER REVIEW.

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INTRODUCTION.

The MONTHLY WEATHER REVIEW for February, 1901, is based on reports from about 3,100 stations furnished by employees and voluntary observers, classified as follows: regular stations of the Weather Bureau, 159; West Indian service stations, 13; special river stations, 132; special rainfall stations, 48; voluntary observers of the Weather Bureau, 2,562; Army post hospital reports, 18; United States Life-Saving Service, 9; Southern Pacific Railway Company, 96; Canadian Meteorological Service, 32; Mexican Telegraph Service, 20; Mexican voluntary stations, 7; Mexican Telegraph Company, 3; Costa Rica Service, 7. International simultaneous observations are received from a few stations and used, together with trustworthy newspaper extracts and special reports.

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, Meteorologist to the Hawaiian Government Survey, Honolulu; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Mr. Maxwell Hall, Government Meteorologist, Kingston, Jamaica; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; Commander Chapman C. Todd, Hydrographer, United States Navy; H. Pittier, Director of the Physico-Geographic Institute, San Jose, Costa Rica; Captain François S. Chaves, Director of the Meteorological Observatory, Ponta Delgada, St. Michaels, Azores, and W. M. Shaw, Esq., Secretary, Meteorological Office, London.

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. 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 always 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.

Forecasts of the force and direction of the wind and the state of the weather covering the first three days of the route of steamers from New York and Boston bound for European ports were made daily during the month and printed on the weather maps issued at Boston, New York, Philadelphia, Baltimore, and Washington. On the 5th and 7th special forecasts were issued to the effect that steamers bound west from European ports would encounter severe gales during the second and third days out. During the periods referred to gales of exceptional severity prevailed from mid ocean to the American coast.

The first important storm of the month appeared on the south Pacific coast on the morning of the 1st, whence it passed east-northeast and disappeared off the New England coast during the 4th. Following the passage of this storm freezing temperature occurred in the central valleys of California, and frost was reported as far south as San Diego. In advance of the storm center snow fell generally in the middle-western States and in the middle and eastern districts north of the Ohio River and Maryland. On the Atlantic coast north of Hatteras high winds attended the passage of the storm, with maximum velocities ranging from 50 to 60 miles an hour on the New Jersey and south New England coasts. Attending the area of high barometer which swept southward over the Missouri, Mississippi, and Ohio valleys in the rear of the storm the temperature fell to zero to the southern line of Nebraska on the morning of the 4th, light frost occurred on the middle coast of the Gulf of Mexico on the morning of the 5th, and heavy frost was reported at Jacksonville, Fla., on the morning of the 6th. The frosts of the 2d in California were accurately forecast. Warnings of heavy snow were telegraphed on the 2d to railroad and transportation companies in the region threatened with heavy snow, and additional advices were sent on the 2d and 3d stating that cold weather would follow the passage of the storm. Ample warning was given of the Atlantic coast gales, and of the frosts in the Gulf and South Atlantic States.

The second noteworthy storm of the month crossed the Continent from the 5th to the 9th. This storm appeared over the north California coast on the morning of the 5th, moved thence south of east to the southern Rocky Mountain slope and Texas by the night of the 7th, and from that region drifted eastward and northeastward to the Atlantic coast by the 9th. Heavy rains ended in California during the day and night of the 5th, and heavy snow had fallen in the mountains of central and southern California. With the eastward

advance of the storm center heavy snow fell in the middle-western States and from the upper Mississippi Valley over the Lake region and the interior of the North Atlantic States. Special warnings of heavy snow were telegraphed throughout the districts named on the 7th and 8th, and advices were also given in connection with the marked fall in temperature which followed the passage of the storm, and of the high winds which it caused along the Atlantic coast.

A third well-marked storm appeared over California on the 8th; rain, however, set in along the coast on the 7th, and during the night of the 7th the rain became general and heavy over the State, with snow in the mountain districts. By the morning of the 9th the center of this disturbance had shifted to a position off the southern California coast, whence it apparently passed eastward over northern Mexico during the 10th. On the morning of the 9th killing frost occurred in central and northern California, and on the 10th special frost warnings were issued for southern California and Arizona. Heavy to killing frosts occurred generally in southern California on the morning of the 11th.

On the morning of the 23d the following special warning was telegraphed to Jacksonville, Fla., with instructions to give it the widest possible distribution throughout the State:

Temperature will fall to-night to a minimum of between 20° and 25° at Jacksonville, and to freezing as far south as Tampa, with frost extending somewhat south of the latitude of Jupiter.

Frost occurred as predicted, and the minimum at Tampa, Fla., the night of the 23d was 32°.

The following report on the cold wave warning has been made by Mr. A. J. Mitchell, official in charge United States Weather Bureau office, Jacksonville, Fla.

Referring to the cold wave warnings on the 23d and 24th ultimo, and the disposition made of the same by this office, I have the honor to report that action was taken immediately on the receipt of your telegram, with the view of widely disseminating the information. Nearly three hundred telegrams were sent from this office, which, in conjunction with the energetic measures taken by the various railways in the State, resulted in a gratifying distribution of the warnings throughout the State. Although the warnings were fully verified, it is, nevertheless, a cause for congratulation that minimum temperatures were not such as to prove disastrous to the very large fruit and vegetable interests in this State. As indicated by the phraseology of the message, freezing weather prevailed as far south as Tampa, Fla., with a sharp frost southward to Dade County. Past experience has taught fruit and vegetable growers that the month of February is a hapless one for their interests, and the far reaching measures put in force with the view of protecting crops, amply testify to the necessity for the same, as well as their abiding faith in the forecasts and warnings of the Weather Bureau. Protective measures, now employed in this State, are such that had extremely cold weather prevailed, the amount saved would have been enormous. Thousands of tents and sheds are available in north and north-central portions of the State, while quantities of fuel were conveniently placed in the southern section, where the degree of cold is decidedly less, and where open fires have proven sufficiently efficacious. The reports from orange and vegetable growers show that they were prepared to protect, by the methods mentioned above, fruits and vegetables valued at $750,000. The value of orange bloom, vegetables, and strawberries actually saved by the warning is placed by them at $105,550. This is a small sum compared with the amount which would have been saved, had the cold wave been one of great and prolonged intensity. A few excerpts from the many reports received may show how firmly the weather service is established in this State. The official in charge feels secure in asserting that the relation of the Weather Bureau to the various interests of Florida is that of a vital organ to the human system.

"All bloom and new growth were saved under tents and sheds."

"A few degrees colder or a longer duration of cold would have killed trees without protection. The warning saved them."

"Warnings were effectual in saving thousands of dollars. Thanks."

"The service is greatly appreciated."

"Many beans would have remained unprotected but for the warning. Do not fail to continue the service."

"Everything was saved. The weather service is of great benefit."

"Warning saved a large quantity of berries.

"Vegetable growers appreciate and are governed very much by the service."

"Everyone was prepared to protect, and the warning concentrated the forces."

"I consider the warnings of the greatest importance."

"Weather reports are of incalculable benefit to our people."

"The warning was of very great value. Weather reports are very much appreciated here."

"Please continue sending special reports."

"It is worth a great deal to this vicinity to get these reports. I hope they will be continued."

"Warnings are valuable as they have saved much to growers."

"Our people watch this office every day for reports, and would be greatly disappointed to have them discontinued. They are a great help to us."

"The warning enabled us to 'fire' and otherwise protect two hundred acres of young grove, saving even the tenderest growth."

"People here appreciate weather reports and wait for them daily."

"The value of the service is amply demonstrated."

"Reports are looked for very anxiously daily."

"People appreciate these reports and wait for them."

"Weather forecasts are of inestimable value to orange growers. Without them we might as well give up business."

"Warnings are very profitable to orange growers and 'truckers.'"

"I want to express our estimate of the value and also our high appreciation of the excellent service of the Weather Bureau. The success of the orange industry in this vicinity depends largely upon you. I want to thank you, also, for the daily charts. I find them valuable, and feel that they are indispensable to the success of my operations here."

The manner of disseminating frost warnings and the methods employed in protecting fruit from frost in Florida is described as follows in the Chicago Record of February 28, 1901:

Bellair, Fla., February 25.—The United States Weather Bureau people sent a bulletin into Florida on Saturday last which created the greatest activity among the army of orange and pineapple growers from the Georgia line to Key West. The Weather Bureau predicted that there would be a freeze as far south as Tampa, and frost farther south. Twenty minutes after the warning came thousands of teams were galloping along the roadways leading to pine forests. There was such a bustle as one sees after a fire alarm has been struck. The wagons were loaded with pine knots, logs, and wood of all kinds and hauled at a run to the orange orchards. The stuff is arranged in piles north of the orchard and set on fire. Thousands of acres of fruit trees were saved by this kind of night work, which was general all over the orange-growing sections.

Still another army of workers were made busy by the weather bulletin. They were the men, women, and children who attend to the orange tree tents, for thousands of orange trees are now protected by canvass which covers the whole tree. In fine weather the canvass is rolled back so that the tree is exposed to the sunshine, but when Professor Moore sends his note of warning a whole household will sally forth to close up the tents. Inside the tent one or two kerosene lamps are lighted, which sufficiently heat the air to prevent a freeze. The same warning serves to interest the pineapple people. Their patches of plants are mainly inclosed and covered with slats nailed on stringers 6 feet overhead. The space between the slats lets in the sunshine during fine weather. When a cold wave is signaled the "hands" run out a canvass screen which slides on wires just under the slats, working on the principle of a shade in a photograph gallery. By means of these screens an acre—indeed sometimes five or six—are closed up and the plants kept snug and warm by means of fires lighted in different places within the inclosure.

A period of heavy rains began in the North Pacific coast States on the 12th and continued through the 15th, causing slight freshets in the Willamette River and tributaries. These rains attended the passage of areas of low barometer eastward over British Columbia on the 13th and 15th. Heavy rains and warm weather about the middle of the month also caused a marked rise in the rivers of California. The rises in the rivers of the Pacific slope were anticipated by special warnings.

CHICAGO FORECAST DISTRICT.

The first storm of the month crossed the southern Rocky Mountain region on the 2d, and its center moved forward along the middle Mississippi and Missouri valleys during the 3d. It was accompanied by unusually heavy snow and high winds in portions of the Missouri and middle Mississippi valleys and the upper Lake region. Warnings of heavy snow were issued on the evening of the 2d, and on the morning of the 3d supplementary messages were sent out containing ad-