TORNADO OF APRIL 14 NEAR PENSACOLA, FLA.

By WM. F. REED, jr., Observer, Weather Bureau.

A tornado was reported near Beulah Settlement, twelve miles northwest of Pensacola, Fla., at 10 p. m., April 14, 1905, eastern time.

The barometer readings over the eastern and southern portions of the country on the morning of the 14th were unusually low. Three areas of low pressure were charted, which were encircled by isobars of 29.7 inches, one around Denver, Colo.; one around Palestine, Tex., and the other inclosing Wytheville, Va., and Charlotte, N. C., with indications of southeasterly movement of high pressure from the northwest. The morning barometer at Pensacola was 29.81 inches, with the relative humidity 93 per cent. A local thunderstorm occurred from 6:05 to 7:10 p. m., and came from the southwest. The highest velocity for the day was twenty miles, from the southwest, at 11:48 p. m. The sky remained cloudy during the night, with strato-cumulus clouds prevailing.

The following account of the tornado was obtained from Mr. Arthur Spare, Cantonement, Fla.:

The storm of the 14th of April was undoubtedly a small tornado, or, as we called it, a "twister." It seemed to be the culmination of two storms, starting close together. It rained very hard for a few minutes, when it began to hail from the northwest. The hail came twice from that direction in intervals of about five minutes, the hailstones both times being round or slightly oblong, smooth, hard, and as large as hazel nuts. A second hailstorm came from the southeast, with heavy rain and wind. The hailstones in this instance were flat, about three-fourths of an inch in diameter and three-eighths of an inch thick, with rough, ragged edges. It was one continuous storm of wind, rain, and hail for the time it lasted, and did not slack up raining when the wind changed. The hardest part of the storm lasted for 30 minutes, the rain continuing an hour longer. There was plenty of lightning, but not much thunder. The amount of rainfall can not be determined. A funnel-shaped cloud was described to me by two neighbors who saw it. There was a roaring sound accompanying the storm, which came from the southwest and moved generally toward the northeast, showing zig zag path in some places. The presence of a whirl is plainly shown by the distribution of débris. At one place the path is 50 yards wide, the trees on one side lying with their tops toward the southwest, and fifteen steps from there is a tree twisted off with its top the other way. I traced the path for about one-half of a mile. It mixed up things badly at my old house, where the path is fifteen yards wide, and will take much of my time to straighten up matters again.

NOTES AND EXTRACTS.

UNUSUAL WEATHER AT DODGE, KANS.

The following is a letter from Mr. E. D. Emigh, assistant observer, temporarily in charge of the Weather Bureau station at Baltimore, Md.:

TO THE EDITOR:

Permit me to add the following note to your interesting comment on my article concerning the unusual weather conditions at Dodge, Kans., during the last week in February and the first week in March, published in the MONTHLY WEATHER REVIEW, p. 51, for February, 1905.

A short explanation of certain features of the phenomenon may not be amiss. Upon striking the ground or cold objects against which it was driven by wind, the mist formed into a solid sheet of ice, as assumed in your remarks; but when it came into contact with woolen clothing the liquid form was retained, however long the clothing had been exposed to the cold air. I presume, therefore, that it is correct to assume that the temperature of the wool must have been sufficiently high to overcome the subcooled condition of the mist.

With reference to the last paragraph of your comment, it was, of course, necessary to melt the ice collected in the receiver of the rain gage before the amount of precipitation could be measured.

SNOW AND FROST CRYSTALS.

Referring to the preceding letter from Mr. E. D. Emigh, we reprint the following extract from the annual report of the Chief Signal Officer for 1891—being a part of the report of Prof. C. F. Marvin, on "Maximum pressure of aqueous vapor at low pressure," pp. 351–386:

NOTE UPON THE ABNORMAL FREEZING OF WATER AND CORRESPONDING VAPOR PRESSURE.

During the progress of the vapor-pressure work considerable difficulty was experienced in freezing the water capsules used in the experiments, and the particular results obtained indicate the possibility of water retaining its liquid condition under very unusual circumstances.

Mention was made on page 360 of the method of breaking the water capsule by freezing. For this purpose the tube *a*, fig. 9,[1] was wholly surrounded by a freezing mixture of salt and ice. In many instances, even after one or two hours' exposure in this manner to a temperature continuously from 3° to 5° below zero, F., the water in the capsule remaining unfrozen. It is true the transfer of heat from the water through the vacuum must undoubtedly have been very slow, taking place quite wholly by radiation, yet the temperature was certainly very low, and the phenomenon of not freezing a real one, as the same result was obtained with a precisely similar capsule directly immersed and moved freely about within the liquid freezing mixture. In this case there could be no doubt as to the temperature. In both of these cases, although it was possible to considerably agitate and jar the capsule, yet the water so very nearly filled it as to be but very little disturbed; nevertheless in the case of the free capsule the small bubble of space within could be made to move about from end to end, etc., yet without the slightest effect to induce solidification. It was therefore found necessary to lower the temperature still further to effect freezing, which was generally successfully accomplished at temperatures from —10° to —15° F. I am disposed to believe, however, that the real temperature of the water in such cases may doubtless have been little lower than —5°, but that it could be appreciably higher than 0° seems scarcely credible under the circumstances.

In more than one instance solidification took place within the capsule, but peculiarly enough it was not broken thereby, and, in consequence, I have even been to the annoyance of entirely refilling the apparatus in order to introduce a new capsule of thinner glass and presumably less strong. Subsequent experience, however, led me to believe that in all these cases the failure to break the capsule was really due to the fact that a part only of the water was frozen, and had sufficient time been given, the capsule must surely have burst. It was at first imagined, since the solidification was practically instantaneous, that the whole mass froze at once. This, however, does not appear to be the case, as is indicated by the following considerations: Water in freezing must give off about 140 units of heat. If now, without freezing, the temperature be lowered to, say, —5° F., that is, 37° below the normal freezing point, about 37 units of heat have been withdrawn in lowering the temperature more than is really necessary. When, therefore, solidification once starts the dissipation of 37 units of the latent heat of freezing can take place with great suddenness and operates to warm up the whole mass of water to its normal freezing point, and further solidification can take place only on the slow dissipation of the latent heat.

Phenomena of this character were repeatedly observed with different capsules, and subsequently a few other experiments in the same direction were made. Thus, a capsule of somewhat larger dimensions was attached to a piece of spirit-thermometer tubing having a comparatively fine bore. This was filled with well-boiled, distilled water and sealed up after the manner of a thermometer.

The elimination of air from the water or the space above was by no means so perfect in this thermometer as in the capsules used in the vapor-pressure tubes. Marks were made on the tubes at the points opposite the top of the water column when the bulb was in ice, and also at the temperature of maximum density. Thus, the water was made to roughly indicate its own temperature, but more particularly showed the changes in volume with temperature. When the bulb was immersed and moved about within the freezing mixture, the column would soon fall to the point of maximum density, and would gradually ascend again and pass considerably beyond the line marking the volume at the freezing point, showing thereby that the *expansion observed to take place in water, from the point of maximum density to the normal freezing point, is continuous when under any circumstances the water may be cooled below this normal freezing point without solidification.* As soon, however, as the water reaches the point at which it will start to freeze, there is a very sudden solidification of a part of the water, and the increase in volume is very great, forcing the unfrozen water far up into the chamber at the top of the stem.

The structure of the ice in these cases, as, in fact, in all others of sudden freezing, is coarsely crystalline, presenting many arrangements of long, interlacing needles, and giving a somewhat milky color to the whole. An instant's exposure of the frozen bulb to the air quickly loosens the ice from the walls of the bulb, and as it melts slowly can be seen to rise to the top side of the bulb as the latter is revolved or turned about into different positions. The ice seems to be a comparatively compact mass throughout, not shell-like, as might be imagined.

When the small quantities of water used in the vapor-pressure bulbs were subjected to low temperatures, here also freezing never took place at the normal temperature. As the temperature of the bath in which

[1] Not reproduced.