were recorded at all the other five French observatories and in general they were larger than ever before recorded. In England, at Kew, the disturbance of the declination was about 2° 12′ and at Stonyhurst 2° 46′ as compared with 2° 4′ at Val-Joyeux in France.

Sun spots had been observed in October, but there did not appear to be any direct connection between them and the magnetic disturbances; thus, on the 5th of November a new group of spots crossed the central meridian of the sun without any disturbance of the very regular magnetic curves of that day.

It seems, as has been shown by Tacchini, that the magnetic pertubations are less dependent upon the heliocentric longitude of the spots than on the rapid variations in their forms, variations to which they are not all subjected, but of which we can take account, either by direct observation or by a series of photographs. It is necessary moreover to observe not only the spots, but all manifestations of solar activity, that is to say protuberances and faculæ. In the course of the disturbance, the earth currents as observed on telegraph wires and cables attained an intensity much greater than the battery currents ordinarily used in telegraphy: consequently there were serious troubles in the transmission of messages and total interruptions sometimes occurred in both America and Europe. In France communication became impossible about 9 a. m., October 31, and could only be resumed at 4:40 p. m.

The aurora borealis was observed in the United States on the morning of the 31st, and in Ireland and Scotland on the evening of that day. No trace of the aurora was observed in France. A beautiful aurora was observed at Sydney, N. S. W. during the night of October 31–November 1.

The reports from vessels at sea are given elsewhere in a letter from Mr. James Page, of the United States Hydrographic Office, as also a report from the magnetic observatory at Zi-Ka-Wei.

From Table IV, page 496, of the October REVIEW, and page 558 of the November REVIEW, we copy the total number of United States stations reporting thunderstorms and auroras, as follows:

| Date. | Thunderstorms. | Auroras. |
|---|---|---|
| October 27 | 5 | 1 |
| October 28 | 11 | 1 |
| October 29 | 13 | 2 |
| October 30 | 71 | 19 |
| October 31 | 89 | 139 |
| November 1 | 83 | 18 |
| November 2 | 38 | 6 |
| November 3 | 47 | 2 |

## STORMS ON THE SOUTHEAST COAST OF CAPE COLONY.

During the early morning of September 13, 1902, a violent storm suddenly struck the southeast coast of Cape Colony and caused great destruction of shipping and life along the shore of Algoa Bay, which is about 400 miles east of Cape Town. The beach facing Port Elizabeth was strewn with the wreckage of 29 sailing vessels and the bodies of over 100 sailors. The storm came absolutely without warning. There were 32 ships at anchor in the harbor under a leaden sky when the approach of a huge wave from the open sea gave the first warning of what was coming.

The study of the storms of south Africa by means of carefully compiled charts of the weather was, we believe, first prosecuted by Mr. Adolph G. Howard, of Cape Town, during 1885–1890. Others had compiled observations at individual localities, but to him is due the credit of preparing a systematic series of daily maps from January, 1885, to December, 1889, showing isobars and winds and the prevailing characteristics of the weather for the region between latitudes 25° and 33° south. These unpublished charts showed him the movements of storms, coming sometimes from the east and sometimes from the west, according to the season. The variations were very much the same as those experienced on our own coasts from South Carolina to Texas. The charts that are now being published daily for Argentina show similar variations in the paths of storms. Similar variations occur in the neighborhood of Australia, all of which merely goes to show that between latitude 20° and 40° in the Southern Hemisphere we have phenomena entirely analogous to those that occur between 20° and 50° in the Northern Hemisphere, so far as concerns the paths of revolving storm centers. On the other hand, we have in the Southern Hemisphere only the feeblest possible Antarctic cold waves, as compared with the very severe Arctic cold waves in the Northern Hemisphere. These latter flow from the Arctic Circle southward to latitude 25° in America, but scarcely as far as latitude 30° in Europe and Asia, while in the Southern Hemisphere they are only feebly represented by the southerly bursters of Australia and the southwest winds of Patagonia and Argentina. The southern point of Africa, Cape Agulhas, is too far from the Antarctic Continent and too well protected by ocean water to be ever reached by a wave colder than those that reach the equally well protected islands of the North Atlantic, such as the Bermudas and the Azores, which are in almost the same latitude north. Storm centers may approach the southern end of Africa from the southeast when the tropical area of high pressure to the eastward is unusually well developed or when the southeast monsoon is unusually strong. Storms may approach from the northwest when the tropical high pressure over the South Atlantic is unusually strong. Storms come down from the north when the interior of Africa is unusually dry and cool, so that it is brought under the influence of the South Atlantic area of high pressure.

## DENSITY OF THE ATMOSPHERE UNDER DIFFERENT CONDITIONS.

A correspondent asks the Weather Bureau to make some experimental determination of the density of the air within areas of low pressure, as compared with the density within areas of high pressure. He also asks whether moist air has not a greater specific gravity than dry air, and if moist air under low pressure is heavier than dry air under high pressure.

It is a common idiom to speak of "a heavy atmosphere" when smoke settles down to the ground, or when heavy clouds form low down and threaten to rain; so also we speak of "dull and heavy weather" when we are conscious of a feeling of oppression. This is a poetic usage of the word heavy, in which we attribute to the atmosphere something that really belongs to ourselves. When the smoke falls or the clouds drop rain, it is not the air that is heavy, but the thing that falls. If we experience an oppressive feeling, it is our nervous system that is slightly deranged; the oppression is not a matter of weight or of meteorology, but is a complex physiological phenomenon.

The density of the atmosphere, or its specific gravity, or the weight of a cubic foot of air, increases in proportion as the barometric pressure is greater, and in proportion as the air is drier or free from moisture, assuming that the air remains at the same temperature. Consequently there can be no doubt but that the atmosphere in a region of low pressure and damp air has a smaller specific gravity than in a region of high pressure and dry air. It is not necessary for the Weather Bureau to make any special test of this subject, as its truth is manifest from the experiments made frequently in physical laboratories, in order to determine the properties of gases.

## WEATHER NOTES AT WEST CUMMINGTON, MASS.

Mr. William G. Atkins, of West Cummington, Mass., writes, as follows:

Referring to my diary and weather records, which cover a period of forty-five years, I find that the snowfall which gave the most equivalent water occurred on April 20 and 21, 1857, when over 3 feet of heavy wet snow fell on the ground that was previously bare.

1861. February 7 was rainy and snowy; a violent snow squall came about 4 p. m. with a sudden fall in temperature. At 9 p. m. the mercury was at 0° F. and the next morning at 32° below, being a total fall of about 80°. It was 17° below at noon on the 8th of February. On one morning