1889, March 20, there was a succession of twelve flashes of zigzag lightning followed by as many loud peals of thunder; this was the longest display of lightning ever recorded here.

1889, April 2, a severe storm of forked lightning and thunder.

1891, September 5, a tree was struck by lightning.

1897, December 1, the second time that lightning occurred in December. The thunderstorm began at 4:05 a. m., seventy-fifth meridian time, and lasted about six minutes, during which time there were four flashes of lightning in the southwest, and the same number of loud peals of thunder. The lightning flash was of the zigzag or chain or forked variety, and was intensely white in color; the rainfall during the night (from 8 p. m. to 8 a. m.) was 0.10 inch; during these same twelve hours 5 inches of snow fell at Summit, 4 at Truckee, and 1 or 2 inches at other points on the mountains 50 or 100 miles west of Sacramento, and at points 3,000 feet or more above that station.

DISTANT CLOUD BANKS.

A letter from Mr. James Gun, of Durham, Grey County, Ontario, says:

I have often, when engaged in my practice in the country, observed these banks of clouds; especially when, having reached a height of land, I found myself placed in such a position that (by the refraction of the rays of light?) these clouds assumed the appearance of bodies of water, something after the appearance of a mirage. These cloud banks have been invariably, in my experience, followed by changes of weather and storms.

The Editor remembers to have seen in the distance about the time of sunset low clouds that closely resembled a distant lake or an ocean horizon. Of course the resemblance to such a solid mass of water was purely an optical delusion, and not due so much to the refraction that produces mirage, as to the peculiar tints of the blue sky, the clouds, and the ground at sunset. These were not the cloud banks that the Editor had especially in mind in his little note in the October REVIEW, but we are much obliged to Mr. Gun for calling our attention to them, and hope that other observers may put their observations on record.

CLOUDY CONDENSATION.

The researches of John Aitken, which have for the past twenty years been published from time to time in the "Transactions of the Royal Society of Edinburgh," have made the English-speaking world familiar with the fact that has been established by him and others, that whenever the aqueous vapor of the atmosphere condenses into the little globules that constitute fog or cloud it, by preference, condenses first upon the particles of so-called dust floating in the air which are, therefore, the nuclei of cloudy condensation. According to the last publication by Aitken (R. S. Edin., XXXIX, Part I, p. 15, 1897) he states that he has never said that dust particles are absolutely essential, but simply that as the air is full of dust and the condensation takes place on these by preference, therefore, practically all of our cloud particles have dust nuclei. The researches of Robert von Helmholtz and Professor Richarz and those of Prof. Carl Barus, as published by the Weather Bureau, agree with those of Aitken in showing that, in the absence of dust cloudy condensation also occurs, but the solid nuclei are replaced by molecules of some other foreign substances, such as the vapor of sulphuric acid, or the particles given off by anhydrous sulphuric acid, or even from metal surfaces when heated or electrified.

It has been suggested that, in the absence of dust nuclei, condensation may be produced by a molecular shock due to chemical processes, and more especially by the presence of the unsaturated molecular compounds known in chemistry as "ions." This last memoir by Aitken gives in detail an experimental method of determining the importance of these ions, especially those produced by the burning of pure hydrogen in pure air. Special pains were taken to obtain air and hydrogen perfectly free from dust, for when a single particle of dust is burned in the flame it gives rise to innumerable free atoms of carbon which becomes solid nuclei for condensation. Aitken's experiments show that in his apparatus the ions had no perceptible influence, whence he draws the safe conclusion that if they really had much influence in producing condensation they could have retained that power for only a very short time, viz, a fraction of a second, and it is not likely that they play any important part in the ordinary cloudy condensation of the atmosphere.

Mr. Aitken next turned his attention to the question of the direct influence of sunshine in producing condensation, a matter which was first brought to the attention of the world by the brilliant experiments of Tyndall, who describes the beautiful clouds produced by allowing a beam of light to pass through a long tube full of dustless, saturated vapor. Mr. Aitken finds that many of the vapors which we call impurities in our atmosphere, such as ammonia, nitric and nitrous acids, peroxide of hydrogen, sulphurous acid, sulphuretted hydrogen, hydrochloric acid, and chlorine give rise to nuclei of condensation when acted on by sunshine. Each of these, in a clean tube, was exposed to sunshine for about a minute. Ordinary pure air, after being filtered of dust and exposed to sunshine, does not show any cloudy condensation when expanded, but when any of the above-named gases are in the air a great deal of cloud is formed. Ammonia, after being sunned for a minute, has a very powerful effect; nitric acid not so much; nitrous acid probably as much as nitric acid. Hydrogen peroxide is a powerful generator of nuclei; sulphurous acid gives rise to condensation even in the dark and in a weak solution, but sunshine increases it; illuminating gas and the gases given off by the combustion of anthracite coal give a dense condensation after being exposed to sunshine, but these gases probably contain sulphur; pure sulphuretted hydrogen and hydrochloric acid give dense condensation after being exposed to the sunshine, but none when they are kept in the dark; chlorine causes condensation if kept in the dark and without being expanded and is still more fogged on exposure to sunlight. Some of these nuclei of condensation, due to the action of sunshine on the above-mentioned vapors, are very short lived, so that the air in the experimental flask loses the power of cloudy condensation in from fifteen to thirty minutes; but the nuclei from sulphurous acid do not lose their power for a long time; these nuclei are probably particles of fine sulphur dust and their action is as permanent as ordinary atmospheric dust. The light of burning magnesium acts on sulphurous acid easily, but scarcely at all on the other vapors. These experiments on the effects of sunshine on the gases ordinarily present in the atmosphere show that it is possible for cloudy condensation to take place in the absence of dust, since the sunshine may convert vapors into the nuclei of condensation. There is, indeed, always dust enough in the lower atmosphere, but we now see how it may become possible for clouds to form in the dustless higher strata.

ON THE TENSION OF AQUEOUS VAPOR.

Prof. Joseph Henry early called attention to the fact that the air is not necessarily saturated during rain, and he says (Smithsonian Annual Report, 1855, pp. 213–214, or Scientific Writings, Vol. II, p. 5):

That the air should ever be undersaturated during rain is at first thought a very surprising fact; it may, however, be accounted for on the principles of capillarity. The attraction of the surface of a spherical portion of water for itself is in proportion to the curvature or to the smallness of the quantity, and hence the tendency to evaporate from a raindrop ought to be much less than from an equal portion of a flat surface of water.