(c) There is a radio-active emanation distributed throughout the lower atmosphere. It would seem that radio-active minerals give off a substance (gaseous or ultra gaseous) known as a "radio-active emanation," which has the power of ionizing gases, but which itself also undergoes a slow change, so that it finally disappears, or at least can not be recognized by any known method. This emanation is, therefore, one source of the ionization of our atmosphere.

Now a careful study of these last three sources of active ionizers, shows that they have not directly any large amount of influence on the dissipation of electricity from a charged body. On the other hand it may, however, be a plausible hypothesis that these electrified ions lose their properties as such by uniting into neutral molecules, or by attaching themselves to the walls, rocks, and trees of the open air, or to the particles of dust, fog, smoke, or vapor that float in the air. In fact the ions seem to form nuclei, on which water vapor accumulates when no other dust particles are present and especially when such dust-free air becomes super-saturated with moisture. An increase in the relative humidity of the air favors the recombination of the ions, or at least their neutralization, so also does an increase in the strength of the wind, and the presence of minute ice crystals at low temperatures. A dissipation of atmospheric electricity is continually going on, and this must have an effect on the negative charge of the earth's surface. There is a close connection between the rate of dissipation and the potential gradient near the earth's surface. The relation is as though the earth were continually receiving a definite quantity of negative electricity, thereby increasing the potential gradient, while the dissipation tends to diminish it. The fundamental problem is to ascertain whence the earth gets its negative charge. The hypotheses or theories attempting to explain this have been numerous, but the three best of them, namely Elster and Geitel, 1900, Ebert, 1904, and C. T. R. Wilson, 1900, have thus far failed to explain the phenomenon satisfactorily.

The preceding remarks refer to the normal conditions as to atmospheric electricity, but the abnormal conditions, which give rise to the aurora, lightning, and St. Elmo's fire, are matters concerning which we are still almost entirely in the dark. We have not yet been able to observe any connection between the aurora and the electricity of the lower atmosphere. There can be no doubt but that the electrical tension that gives rise to the lightning flash is not a simple abnormal increase in the earth's normal electrical field. The most popular theory is that of C. T. R. Wilson, namely that since aqueous vapor is deposited or condensed on negative ions with greater ease than on positive ions, therefore these fall quickly to the ground, thus giving the earth a negative charge. St. Elmo's fire is simply a brush discharge in consequence of a large potential gradient, which is, however, not large enough to cause a lightning flash. Ball lightning, and *ignis fatuus* are electrical phenomena concerning whose origin or cause we know nothing.—*C. A.*

SEVERE HAILSTORM AT PENSACOLA, FLA.[1]

By W. F. REED, jr., Observer. Dated Pensacola, Fla., March 28, 1906.

A third thunderstorm on March 2 began about 11:30 p. m., coming from the west; at 12:15 a. m. of the 3d there were incessant flashes of lightning and moderate thunder in the west; the thunder became louder and the lightning more blinding up to 1:45 a. m., when the thunder shook the houses; this storm was also attended by excessive rain, heavy hail, and high winds. Excessive rain from 12:40 a. m. to 1:30 a. m. amounted to 1.30 inches, of which 0.35 of an inch fell in the first five minutes. The wind reached 34 miles per hour for the five-minute period ending at 12:44 a. m., with an extreme velocity of 50 miles from the west for the minute ending at 12:43 a. m. A heavy hailstorm began at 12.42 a. m. and ended at 12:47 a. m.; the stones ranged from two-tenths to seven-tenths of an inch in diameter; most of them were the size of hazel nuts, and were somewhat flattened, with a center of hardened snow surrounded by transparent ice; the largest ones were of irregular shape, consisting of alternate layers of opaque snow and coatings of ice. About one-fourth of an inch of hail fell one mile northwest of the station; the fall was considerably heavier at the station, as evidenced by the markings of the hailstones on the western sides of the instrument shelter, rain gages, stone chimneys, ventilators, etc. This storm, coming as it did with high winds, which for the minute mentioned were in severe gusts, and with excessive rainfall, had the effect of cleansing thoroughly the spots where the hail struck, so that they could be counted on hard metal surfaces. It is reported that the hail drifted to a depth of two inches on the windward sides of three-story buildings near the Custom-House. This is probably true, as the count of the markings upon the instrument shelter, the tipping-bucket rain gage, and ventilators gave an average of 1000 marks to the square foot. At 2:25 a. m. there was vivid lightning and faint thunder from over the eastern horizon, the clouds overhead came from the west, and at that time a hissing, whistling sound could be heard which was strongest on the west side of buildings; this noise was also heard by other parties in different parts of the city. At 4:35 a. m. the sky had cleared. No very great damage resulted from this storm. The tin covering the west side of the shaft leading out on the roof of the Government building was dented over every inch of surface exposed. The anemometer cups were badly battered; 40 large dents were taken out of them. From all information that could be gathered, it is inferred that the track of this hailstorm was four miles in breadth, covering the entire city of Pensacola and its suburbs; it was traced to a point more than seven miles west of the station and beyond Bayou Texar, which is three miles to the east.

[1] This article is taken from the monthly meteorological report [Form 1014 A] of the Pensacola station for March, 1906, giving an account of a severe local thunderstorm which occurred on the night of the 2–3d.

A PECULIAR TEMPERATURE FLUCTUATION.

By Prof. WINSLOW UPTON, director of the Ladd Observatory. Dated Providence, R. I., April 2, 1906.

A peculiar thermometric change attended the passage of the barometric depression of March 3 over southern New England. The center of this depression, according to the observations of the Weather Bureau stations at 8 p. m. of the 3d and 8 a. m. of the 4th, went nearly over Providence, R. I., early on the 4th. The lowest barometric reading was recorded at 5 a. m. on the registering barometer (Richard Frères pattern) of the Ladd Observatory. The thermograph curve at this station shows that the temperature rose rapidly as the center approached, from 35° to 50° between 8 and 10:30 p. m., and to 52° by 3:20 a. m. Then it fell from 52° to 35° in an hour and a half, reaching its minimum just as the center of the depression passed. A rise to 48° by 11 a. m. followed, coincident with the slow rise of pressure. This was followed by the usual fall of temperature as the pressure rose and anticyclonic conditions came on.

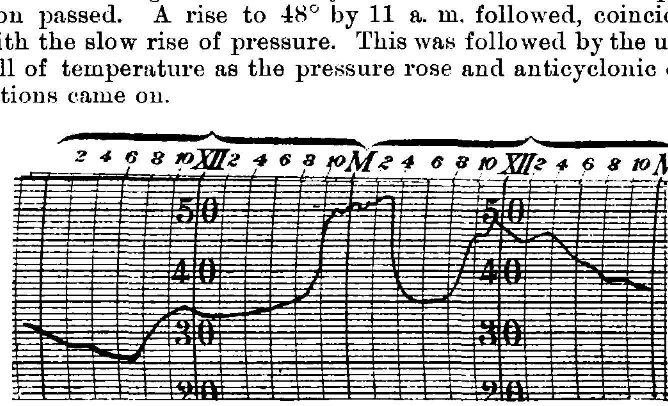

FIG. 1.—Thermogram at Providence, R. I., March 3-4, 1906.