ATMOSPHERIC OZONE FOR JANUARY, 1881.

By L. P. Gratacap.

The memorable discovery of Ozone by Schönbein, in 1840, bequeathed to the scientific world one of its questiones vexatæ, about which opinions and experiments seem to have been equally at variance. As regards its constitution and essential nature there seems little reason to doubt it is a condensed form of oxygen, according to the views of Andrews and Tait, and that it displays the characteristic properties of that gas in an intensified degree. Its existence in the air can be hardly less questioned, but the extent and origin of its presence are involved in obscurity, and partly from the modifying influence of local circumstances and the identity of its reactions with other atmospheric bodies the conclusions of various experimenters are either equivocal or contradictory. The fact that chlorine, sulphurous fumes, the nitrogen oxides, affect the test papers in the same manner as ozone, and that humidity of the atmosphere, strong winds, bright sunshine, or local nuisances exaggerate or diminish the normal reaction, renders it difficult to eliminate the error introduced by their adventitious influence. The results here given were obtained with test papers of starch and iodide of calcium, prepared, presumably, like those of Dr. Moffat, from starch and iodide of potassium, and compared, after the test, with a scale of colors similar to Negretti and Zambra's.

After E. Schöne's recent condemnation of ozone tests made in this way, they may appear valueless, but it would hardly seem, admitting the justice of Schöne's strictures, that their comparative showing would be seriously impaired. The coloration obtained was in a great measure due to ozone, and its increase or decrease was due in the same proportion to an increase or decrease of this re-agent; the contemporaneous influence of nitrogen oxides may have deepened the tints, it certainly could not have neutralized them, and inasmuch as the papers were kept moist the effects of the varying humidity of the air were, in a measure, cancelled. Precautions against the disturbing influence of winds and that of strong sunshine were also taken. Duplicate observations were taken at 10 feet and at 40 feet from the ground, and their average (though in nearly all cases they proved identical one with the others) recorded, as the color-mark of the hours they were exposed.

Observations were taken every 12 hours, dividing the 24 between day and night, and notes kept of the weather. As a rule, the papers exposed at an elevation were more deeply colored than those near the ground, though this was probably due to a freer circulation of air. The papers at the periods of strongest ozonization were changed throughout; at other times they were marked in spots and near the edges, showing an unequal sensitiveness to the re-agents. In supplementary trials on the effect of the wind, it was found that those papers exposed to the wind were sometimes one-third deeper in tint than the protected ones, and reached their maximum much quicker. These contrasts were, of course, lessened with a diminished velocity of wind.

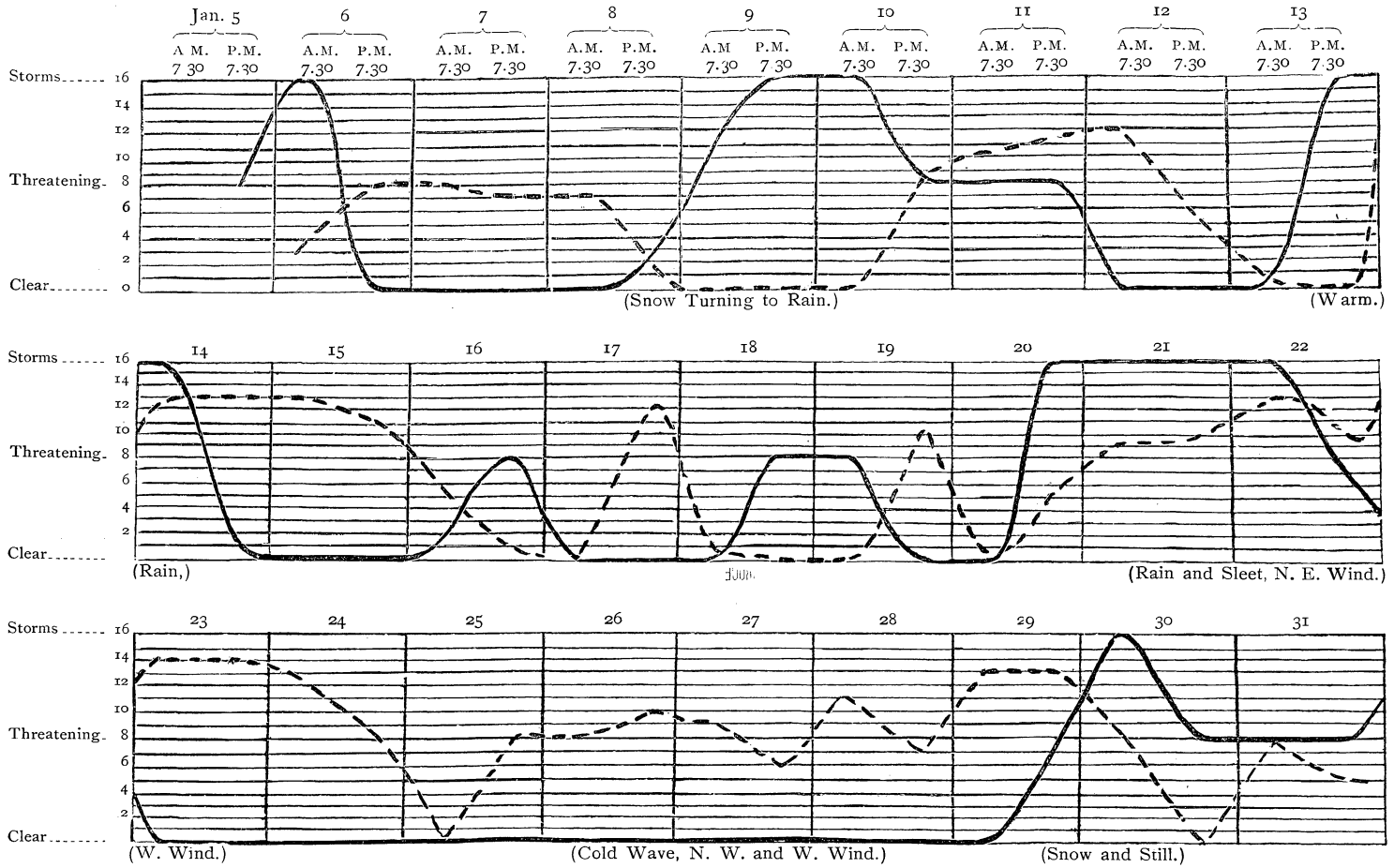
The manifestations of ozone followed, as a rule, lowered barometric pressure and rising temperature, in other words, they were coincident with change of weather. This is an interesting confirmation of Houzeau's experiments, and in the attempt I make below to give this a graphic demonstration this generalization appears, *i. e.*, that a wave of ozonization follows the storm wave, lagging somewhat behind it, and appreciably corresponding in duration and intensity to the force and continuance of the air wave which preceded it.* In this connection it will be noticed that threatening weather on the 16th and 18th was followed by a sudden projection of the ozone curve which as rapidly subsides, indicating either atmospheric disturbances responsive to an incipient but unfinished change of weather, or else undulations of ozonization coming from some neighboring storm centre or both. Further on the curve of ozonization rises somewhat before that of the weather, and I apprehend this may often or always happen when storms of unusual severity and violence are about to traverse a district. The thrill of ozonization recorded on the papers taken in on the morning of the 20th were prophetic of the fierce and extraordinary tempest which devastated New York and its vicinity upon the 21st.

The high readings from the 25th to 29th accompanied the advent of a cold wave in the Hudson River Valley on the night of the 24th, which sent the mercury down to 15° below 0° at Poughkeepsie and brought colder weather to New York and its vicinity, lasting four days, with strong N.-W. and W. winds. This appears analogous to the strong ozonization concurrent with storms, etc.; the atmospheric disturbance originating the cold wave propagated an ozone wave which appears simultaneously with the former. It is not probably due simply to an apparent increase of normal ozone from the rapid passage of air currents past the tester. This latter effect is doubtless efficient in heightening the entire result, but the wind appears to act as an ozone carrier, bringing into one area supplies of this gas formed in a different and removed one. Indeed it does not appear unwise to speculate upon the possibility of the wind acting as an ozone generator since the irruption of a volume of air at a high velocity of different temperature and density from that of the points over which its path sweeps, must comprise electrical changes, discharges and perturbations. Such effects would correspond in their intensity with the violence and character of the air blast, and we might find the neighboring areas to the track of a cyclone strongly ozonized. As a matter of observation the strong ozonization on the 29th succeeded the strong winds which ushered in the cold of the 27th and 28th. And in any case the deeper tints during wind indicate justly enough the increased prevalence of ozone in the areas swept over by the gale. That wind is not always efficient in changing the ozone papers was shown in Daremberg's experience at Mentone, where, although variations were caused by the wind, in some instances along the sea board the coloration did not at all respond to the strength of the former, and Houzeau is of the opinion that dry winds have slight influence upon the papers.

The cold wave was followed on the 30th by a still snow storm, the shower of pellets falling through an atmosphere unmoved by even a current of air. Threatening weather succeeded the cessation of the snowfall only to usher in the fierce storm of February 1st, when snow, wind, and a low temperature united to arrest life and motion upon the thoroughfares of land and water. The ozone curve responds but feebly to these meterological perturbations until February 1st, when it slowly rises, recalling Houzeau's conjectures as to storms which generated ozone and storms which did not.

It may seem superfluous, if not trivial, to record any observations upon atmospheric ozone when the whole subject is involved in a fog of scientific confusion, contempt and obloquy. It may be said that these observations presented no inconsistent, aberrant or contradictory results, and that to the general student of our local metereology they may in this graphic form exhibit some features of interest. The chart is simply suggestive and absolutely artificial; the numbers on the left of the lines indicate degrees of coloration and the weather line is determined by three points: clear, threatening and stormy. The readings were made at West Brighton, Staten Island, in New York Harbor, the maxima of colorations, and hence ozone, considered as coincident with the time at which the reading was taken, 7.30, night and morning, which must be at times barely approximative.

* As regards the sensible effects of the ozone following by many hours the opening of the storm on the 9th and 13th, the reactions appeared concurrently with a change in the weather from snow to rain. On the other hand, the storm of the 21st opened with rain.



OZONE AND WEATHER CURVE, JANUARY, 1881, STATEN ISLAND, N. Y.

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