

MERCURIAL VAPORS.

OBSERVATIONS ON CERTAIN MOLECULAR ACTIONS OF CRYSTALLINE PARTICLES, ETC.; AND ON THE CAUSE OF THE FIXATION OF MERCURIAL VAPOR IN THE DAGUERREO-TYPE PROCESS.

BY AUGUSTUS WELLER, M. D.

When a piece of glass is covered with a solution containing the double phosphate of ammonia and magnesia, and traces are made upon it by any hard body, it is known that they become visible shortly afterwards by the salt being precipitated upon them. Berzelius, who mentions this test in his Elements of Chemistry, states that Wollaston proposed to make use of this fact as a test of the presence of magnesia in solution, which has since been frequently adopted. According to Berzelius, "the cause of this property is of a mechanical nature, probably from the glass being covered with microscopic crystals, the facets of which take a different position on the traces, for some reason which is not easily explained." More recently, Prof. Liebig has alluded to this subject in his Vegetable Physiology, § 157. These effects are referred by him to a state of unstable equilibrium of the various particles which compose the liquid, which is destroyed whenever a dynamical action is created sufficiently powerful to overcome the feeble attractions, or the inertia of the molecules in solution. He ascribes to the same cause the sudden solidification of water, which had remained liquid when below the freezing-point, upon being agitated; the precipitation of a mixture of potash and tartaric acid; also the detonation of fulminating powder from the contact of any solid body. Neither of these eminent observers mentions having submitted these traces to microscopic observation, although that is the only manner to test the hypothesis advanced by Berzelius.

On the present occasion it is my intention to describe some observations I have made,

in order to elucidate the influence of molecular action on the precipitation of saline bodies, similar to that observed in the double phosphate, and to show that a similar influence is exerted over bodies in a gaseous state and in a state of vapor, and afterwards to point out some phenomena hitherto unexplained, such as the fixation of the mercurial vapors in the Daguerreotype for instance, which evidently depends upon a like cause.

In order to obtain the double phosphate, I have generally used a solution containing about ten grains of phosphate of soda with about three of carbonate of ammonia in an ounce and a half of water. I have preferred this mixture, because the ingredients are more easily procured, and are less acted upon by the atmosphere than the phosphate of ammonia. The magnesian solution was generally a few grains of sulphate of magnesia to the same quantity of water as above.

A small quantity of the first mixture is poured on a piece of glass, and to this are added a few drops of the magnesia in solution; if it be allowed to remain undisturbed, in a few minutes the surface of the liquid becomes covered with a thin film, and on the glass appear minute shining crystals; but if before these crystals have time to form, any solid substance, as a glass rod or an empty pen, for instance, is passed over the glass through the liquid, the course it follows becomes visible shortly after. The images which are thus formed are double, and may be termed the upper and lower images.

I will first describe the upper images;—They appear on the surface of the liquid itself, when the film would otherwise have been formed. They are seen immediately after the passage of the pen through the liquid, whereas the lower ones only become apparent a few moments after. Being formed on a moveable surface, they are not perfect representations of the traces that