

gated, all assertions respecting the properties of the particles of bodies, their sizes, distances, attractions, and the like, are insecure and superfluous. Passing over, then, such hypotheses, the inductions which remain are these;—that two gases which are in communication will, by the elasticity of each, diffuse themselves in one another, quickly or slowly; and—that the quantity of steam contained in a certain space of air is the same, whatever be the air, whatever be its density, and even if there be a vacuum. These propositions may be included together by saying, that one gas is *mechanically mixed* with another; and we cannot but assent to what Mr. Dalton says of the latter fact,—“this is certainly the touchstone of the mechanical and chemical theories.” This *doctrine of the mechanical mixture of gases* appears to supply answers to all the difficulties opposed to it by Berthollet and others, as Mr. Dalton has shown;<sup>15</sup> and we may, therefore, accept it as well established.

This doctrine, along with the *principle of the constituent temperature of steam*, is applicable to a large series of meteorological and other consequences. But before considering the applications of theory to natural phenomena, which have been made, it will be proper to speak of researches which were carried on, in a great measure, in consequence of the use of steam in the arts: I mean the laws which connect its elastic force with its constituent temperature.

*Sect. 4.—Determination of the Laws of the Elastic Force of Steam.*

THE expansion of aqueous vapor at different temperatures is governed, like that of all other vapors, by the law of Dalton and Gay-Lussac, already mentioned; and from this, its elasticity, when its expansion is resisted, will be known by the law of Boyle and Mariotte; namely, by the rule that the pressure of airy fluids is as the condensation. But it is to be observed, that this process of calculation goes on the supposition that the steam is cut off from contact with water, so that no more steam can be generated; a case quite different from the common one, in which the steam is more abundant as the heat is greater. The examination of the force of vapor, when it is in contact with water, must be briefly noticed.

During the period of which we have been speaking, the progress of the investigation of the laws of aqueous vapor was much accelerated

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<sup>15</sup> *New System*, vol. i. p. 160, &c.