analysis and from vapor-density, has been long maintained alike on dynamical and chemical grounds. It is discussed by the writer in 1853 in the essay already quoted, entitled "The Theory of Chemical Changes and Equivalent Volumes,"[1] and again in the late paper of Spencer Pickering in the *Chemical News* for November, 1885.

If, then, as maintained by the writer, the law of volumes is universal, and if the production of liquids and solids by the condensation of vapors is a process of chemical union, giving rise to polymerids, the equivalent weights of which are as much more elevated as their densities are greater than those of the vapors which combine to form them, the hypothesis of atoms and molecules, as applied to explain the law of definite proportions and the chemical process, is not only unnecessary, but misleading. According to this hypothesis, which supposes molecules to be built up of atoms, and masses of molecules, the different ratios in unlike species between the combining weight of the chemical unit or molecule (as deduced from analysis and from vapor-density; H = 1.0) and the specific gravity of the mass are supposed to represent the relative dimensions of the molecule. Hence, the values got by dividing these combined weights by the specific gravity have been called "molecular volumes." The number of such molecules required to build up a physical molecule of constant volume would, according to this hypothesis, be inversely as their size. If, however, as all the phenomena of chemistry show, the formation of higher and more complex species is by condensation, or, in other words, by identification of volume, and not by juxtaposition, it follows that the so-called molecular volumes are really the numbers representing the relative amount of contraction of the respective substances in passing from the gaseous to the liquid or solid state, and are the reciprocals of the coefficient of condensation of the assumed [illegible]mical units. If steam at 100° C. and 760 millimetres pressure, with a formula, as deduced from its density, of H_2O, and a combining weight of 18, is converted into

[1] See the author's "Chemical and Geological Essays," pp. 426-437, and, further, *ibid.*, pp. 453-458.