

Prony, in his *Architecture Hydraulique* (1796), established a mathematical formula,¹⁹ on the experiments of Betancourt, who began his researches in the belief that he was first in the field, although he afterwards found that he had been anticipated by Ziegler. Gren compared the experiments of Betancourt and De Luc with his own. He ascertained an important fact, that when water *boils*, the elasticity of the steam is equal to that of the atmosphere. Schmidt at Giessen endeavored to improve the apparatus used by Betancourt; and Biker, of Rotterdam, in 1800, made new trials for the same purpose.

In 1801, Mr. Dalton communicated to the Philosophical Society of Manchester his investigations on this subject; observing truly, that though the forces at high temperatures are most important when steam is considered as a mechanical agent, the progress of philosophy is more immediately interested in accurate observations on the force at low temperatures. He also found that his elasticities for equidistant temperatures resembled a *geometrical progression*, but with a ratio constantly diminishing. Dr. Ure, in 1818, published in the *Philosophical Transactions* of London, experiments of the same kind, valuable from the high temperatures at which they were made, and for the simplicity of his apparatus. The law which he thus obtained approached, like Dalton's, to a *geometrical progression*. Dr. Ure says, that a formula proposed by M. Biot gives an error of near nine inches out of seventy-five, at a temperature of 266 degrees. This is very conceivable, for if the formula be wrong at all, the geometrical progress rapidly inflames the error in the higher portions of the scale. The elasticity of steam, at high temperatures, has also been experimentally examined by Mr. Southern, of Soho, and Mr. Sharpe, of Manchester. Mr. Dalton has attempted to deduce certain general laws from Mr. Sharpe's experiments; and other persons have offered other rules, as those which govern the force of steam with reference to the temperature: but no rule appears yet to have assumed the character of an established scientific truth. Yet the law of the expansive force of steam is not only required in order that the steam-engine may be employed with safety and to the best advantage; but must also be an important point in every consistent thermotical theory.

[2nd Ed.] [To the experiments on steam made by private physicists, are to be added the experiments made on a grand scale by order of the governments of France and of America, with a view to

¹⁹ *Architecture Hydraulique*, Seconde Partie, p. 163.