

Chemical Science, though for merely external reasons this was summarily handled. It is equally significant that the first valuable suggestions as to the connection of the various sciences, and the practical or common measure of the various agencies, came from practical or professional persons who took an outside and general view of physical and chemical processes and their application in arts and medicine. Young himself was a medical man, as were Robert Mayer and Helmholtz after him. Practical men such as Watt felt the necessity of measuring not so much forces (in the Newtonian sense) as the action of forces, and introduced the term power, and the quantity called horse-power¹ to measure the capacity of an engine for doing work. Newton had already measured this action²

5.
Watt introduces the term "power."

of the quantity of motion; but although this opinion has been very universally rejected, yet the force thus estimated well deserves a distinct denomination." See also p. 172.

¹ The quantity called horse-power was introduced by Boulton and Watt to measure the power of the engines they built and sold at Soho towards the end of the eighteenth century. They caused experiments to be made with the strong horses used in the breweries in London, and from the result of these trials they assigned 33,000 lb., raised one foot per minute, as the value of one horse-power. Dr Young in his 'Lectures' has the following statement: "A steam-engine of the best construction, with a 30-inch cylinder, has the force of forty horses; and since it acts without intermission, will perform the work of 120 horses or of 600 men, each square inch of the piston being nearly equivalent to a labourer" (vol. i. p. 103).

² See the Scholium to the "Axio-

mata sive Leges Motus," p. 25 of the first edition of the 'Principia,' in which the "Agentis Actio" is measured "ex ejus vi et velocitate conjunctim." Thomson and Tait ('Natural Philosophy,' 1886, part i. p. 250 *sqq.*, and Tait, 'Dynamics,' 1895, p. 181) have drawn attention to the fact that this passage of the 'Principia' contains implicitly the modern notion of energy, and the principle of the conservation of energy. The continental historians named above are inclined to give Huygens credit for having first made explicit use of the idea of the conservation of the quantity now termed energy, and they trace the further elucidation of it to the Bernoullis, especially John Bernoulli, who repeatedly speaks of the "conservatio virium vivarum," and "urges that where *vis viva* disappears, the power to do work (*facultas agendi*) is not lost, but is only changed into some other form" ('Opera,' 1742, vol. iii. pp. 239 and 243, quoted by Planck, *loc. cit.*, p. 10).