exhaustive memoir* appeared,) the values of Dulong for c, and Johnson for l, have been adopted.

Value of theoretical results.

The results obtained by these different values do not differ as greatly from each other as they will be found to differ from actual results, and they are useful only in the absence of reliable practical trials. In coals of this class, *i.e.* bituminous coals with 25% to 35% of volatile matter, these theoretical indices are generally slightly higher than figures obtained from furnaces of low-pressure boilers where no special arrangements are made for "*smoke-consumption*"—as it is called, or more properly, smoke-prevention, for smoke once formed cannot be consumed.

Values from ultimate analyses.

In cases where ultimate analyses are to be obtained, the theoretical value of *all* the combustible matter in a coal may be obtained by the following formula:—

$$\left(\frac{C \times 13268}{965.7}\right) \quad \left(\frac{H - h \times 62470}{965.7}\right) = x$$

in which C represents the entire carbon content, both fixed and volatile, H the quantity of hydrogen in a unit of fuel, and h the quantity of hydrogen which will correspond to the oxygen in the coal; x expressing, as before, the number of pounds of water theoretically convertible into steam, from 212°, by one pound of coal, provided all the combustible constituents of the coal could be rendered available; or, in a word, the highest possible evaporative power of the fuel under any circumstances.

Expression of mechanical force.

The values of x, as used in the two preceding formulæ, or an evaporative value given by practical trial, may be converted into an expression of mechanical force by the formula:—

$$(Wn) \times 965.7 \times 782 = y,$$

in which W represents water, of which n pounds are evaporated by one pound of coal, (thus giving Wn the value of x in the preceding formulæ), and y representing the number of *foot-pounds* of work theoretically possible.†

*Regnault. *Relations des experiences entreprises * * * pour determiner les principales lois et les données numériques qui entrent dans le calcul des machines à vapeur. Paris*, 1847. See also a translation of the portion on the latent heat of steam at different pressures, in the Works of the Cavendish Society, vol. I.

† This formula is deduced from the fact that n pounds of water, multiplied by 965.7°, or the co-efficient of the latent heat of steam at 212° F., indicates the number of pounds of water which would be raised 1° Fahrenheit by the combustion of one pound of coal. The number 782 arises from experiments on the mechanical force denoted by the elevation of temperature of a pound of water 1° F., that force being equal to 782 lbs. raised one foot high, according to the careful experiments of Mr. Joule on the friction of oil, water and mercury.—(Extract from Report of British Commissioners, from which the formula is taken.)