

exactly twice as much hydrogen as olefiant gas does. This determined him to state the ratios of these constituents in numbers, and to consider the olefiant gas as a compound of one atom of carbon and one atom of hydrogen; and carburetted hydrogen of one atom of carbon and two atoms of hydrogen, &c. This is Dalton's own account of his discovery, and of the theory founded on it, as reported by Professor Thomas Thompson, who writes* :— "In the year 1804, on the 26th of August, I spent a day or two at Manchester, and was much with Mr. Dalton. At that time he explained to me his notions respecting the composition of bodies. I wrote down at the time the opinions which he offered, and the following account is taken literally from my journal of that date." This is the account quoted from. If the historical order is taken in teaching this part of chemistry, it requires that before the theory is mentioned some calculation or calculations analogous to that mentioned by Dalton should be made to place the law clearly before the student. The atomic theory was deduced by Dalton not merely from the law of multiple proportions, but, as is seen from a careful examination of his own statement to Thompson, from the wider law of Reciprocal Proportions, the statement of which can at once be recognized as the generalization which the atomic theory attempts to explain. The usual statement of this law is somewhat as follows: If two elements combine in the proportions A to B, and if the first

combines with a third in the proportion of A to C, then the compounds of the second and third will be found to be in the proportions mB to nC, where m and n are small rational numbers. But a statement like this makes very little impression on a beginner unless it is followed up somewhat in this way :—

The composition of litharge is:— lead, 100 parts by weight; oxygen, 7.8 parts by weight, and of lead chloride:—lead, 100 parts by weight; chlorine, 34.3 parts by weight.

When the compounds of chlorine and oxygen are analysed it is found that the elements are in the following proportions by weight :

Chlorine monoxide:— Chlorine, 34.3; oxygen, 7.8.

Chlorine tetroxide :— Chlorine, 34.3; 4x7.8.

In fact there is no known compound of lead and oxygen, of lead and chlorine, of chlorine and oxygen, or of lead, oxygen, and chlorine, the composition of which cannot be expressed by these three numbers or by small multiples of them. A fourth element may be taken in, and the same law is found to hold; and so on until all the elements are included. It thus appears that, taking a certain weight of one of the elements as a starting point, a certain fixed weight can be found for each of the others, and that all compounds are in the proportions of these fixed weights or of small whole multiples of them. It is quite evident that these fixed weights or as they were formerly and perhaps more logically called, proportionate numbers, are properties of the elements, and independent of

*History of Chemistry, Vol II, p. 259.