ature and pressure; for instance, at room temperature and atmospheric pressure one vol. oxygen unites with 2.0003 vols. carbon monoxide to form 1.9879 vols. carbon dioxide; while at 10 atmospheres pressure, one vol. oxygen gives 1.8289 vols. carbon dioxide. This change is observed not because the proportions by weight in which the gases react are affected by the pressure, but because on increasing the pressure the volume of the dioxide is decreased more than is that of the oxygen. Guy-Lussac's law unlike the "law" of combination in definite proportions, is thus not *exact*, but only approximately true; the lower the pressure the better it holds.

THEORIES AND EXPLANATIONS

When striking and unfamiliar facts force themselves on the attention, there is a natural desire to "explain" them in some way or other; an explanation of the laws of combination in reciprocal and multiple proportions is offered by the Atomic and Molecular theories. These theories assume that all substances are composed of small indivisible particles, the atoms, which unite by twos or threes or larger groups—molecules, *i.e.*, "little heaps"—to constitute the "ultimate particles" of various chemical compounds. As no microscope has shewn any trace of these atoms or molecules, it is necessary to assume that they are very small indeed.

The molecules thus take the place of the groups of tickets of pages 21 and 22, while the atoms correspond to the individual cards. It is further assumed that each atom has a definite weight, just as each ticket represents a definite number of grammes, so that the analogy between the atoms and the tickets is complete.

The view of the Atomic Theory which is now gaining ground is, that the world of atoms stands in the same relation to the facts of chemistry that Lilliput and Brobdingnag did to the England of Swift's time, or that the diagram of page 11 does to the solubility experiments;—in fact, that the atoms are exactly on a par with the tickets. But for nearly a century atoms and molecules have been taken very seriously indeed; so difficult is it to follow the

Golden Rule for discovering scientific truth

> Give unqualified assent to no propositions but those the truth of which is so clear and distinct that they cannot be doubted . . . . . Réné Descartes, 1637.

In this connection it is proper to ask why an explanation of the laws of chemical combination seems necessary, and why this particular hypothesis has proved so satisfactory.