

## CRITICISM OF AN EXPERIMENT USED TO DETERMINE THE COMBINING RATIO OF MAGNESIUM AND OXYGEN.

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In some of the modern laboratory manuals for use in general chemistry work an experiment is described whereby a weighed amount of magnesium powder is oxidized in a covered crucible until a constant weight is obtained. The increase in weight has been assumed to be due to oxygen, and thus the ratio of the two elements in the oxide easily calculated.

My students have performed this experiment during the last two years but have not been able to secure sufficiently concordant results to make it appear to them as illustrating the law of constant composition.

Some observations are readily made in performing the experiment. The product, except perhaps at the surface, is not white, as is magnesium oxide, but of a gray color, due evidently to a mixture of substances of different colors. Also the crucibles at the end of the experiment are coated within with a black substance which can not be removed even on scouring with sand; and the crucibles lose in weight.

Examination of the product of burning shows that on treatment with small amounts of water ammonia is evolved, thus indicating that magnesium nitride is one of the substances present. As in this compound the ratio of the elements is 1:388 while in the oxide it is 1:667 it follows that from this standpoint the increase in weight must be less than the theory. Again, on treating the product with fairly concentrated hydrochloric acid a disagreeably odorous gas is evolved which at times is spontaneously combustible. It is, without doubt, hydrogen silicide from magnesium silicide formed by the action of magnesium on the crucible material. On treating with acid as above described there always remains a black insoluble amorphous residue mixed with white particles which under a hand-lens look like silica. The black mass when heated on platinum foil changes to a white powder which resembles silica. Apparently the black portion is silicon. It is conceivable that a part of the silicon after being formed, and during the heating, is oxidized by the air; and as it unites with nearly twice as much oxygen as does the same weight of magnesium, it might equalize the loss of the oxygen content due to the causes already indicated. Thus can be explained the nearly theoretical results so often obtained. But at best these results must re-

main a matter of chance and the experiment, seemingly so simple, but in reality so complicated, can not well be put into the hands of students doing their first work in chemistry.

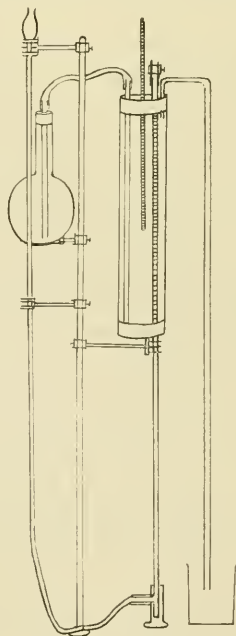
Modifications of the experiment which will avoid these sources of error are in the mind of the writer, but have not been subjected to test for lack of time. Should they prove successful I shall be pleased at some future time to communicate them to the Academy.

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## AN APPARATUS FOR ILLUSTRATING CHARLES'S AND BOYLE'S LAWS.

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Some difficulty having been experienced in making clear to students the changes in the volumes of gases due to the simultaneous changes in



temperature and pressure, it seemed that a clearer notion could be given by having a single piece of apparatus to illustrate their laws. Such an