Each square contains (from top to bottom) the symbol of the element, the possible number of hydrogen and helium atoms composing it, the theoretical atomic weight, and the experimental value of the atomic weight. It can be seen that a surprising number of the atomic weights can be closely expressed by adding together small multiples of the atomic weights of helium and hydrogen. Hydrogen is here assumed to be "packed" and to have an atomic weight of 1.000. The exceptions (magnesium, chlorine, and silicon) may be mixtures of isotopes, though this is but a hypothesis and a basis for further research.

It is interesting to note that with the single exception of beryllium, the weights of the atoms in the even-numbered and zero groups in this table may be expressed as whole numbers times the atomic weight of helium. This may be the reason why hydrogen is never given off in radio-active transformations, as the more stable radioactive substances all belong to the even-numbered and zero groups.

The author's purpose in this brief sketch will be more than fulfilled if it induces any readers to go further into the subject by consulting some of the references below, where the subjects are dealt with in more detail.

- ¹ *Proceedings of the Royal Society*. 72A, 204 (1903).
- ² Soddy, *Radiochemistry*. (Longmans, Green & Company.)
- ³ *Journal of the American Chemical Society*, 36, 1329 (1914).
- ⁴ *Transactions of the Chemical Society*, 105, 1402.
- ⁵ *X-Rays and Crystal Structure*. (A. Bell and Sons.)
- ⁶ *Philosophical Magazine*, 26, 1024, and 27, 703.
- ⁷ *Philosophical Magazine*, 27, 854.
- ⁸ *Philosophical Magazine*, 21, 669 (1911).
- ⁹ *Journal of the American Chemical Society*, 37, 1367 (1915).

A SIMPLE DEMONSTRATION TUBE FOR EXHIBITING THE MERCURY HAMMER, GLOW BY MERCURY FRICTION, AND THE VAPORIZATION OF MERCURY AT REDUCED PRESSURE.¹

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When the pressure over mercury is reduced to that of mercury vapor only, vaporization with heat takes place at surprisingly low temperatures, and the resulting mechanical pressure

¹Apparatus exhibited and demonstrated before the Galesburg meeting of the Illinois Academy of Science, February 24, 1917.

exerted by the issuing vapor from the mercury surface is even more surprising. The magnitude of this pressure over a surface confined in a large bulb, so that the vapor stream is not concentrated, is sufficient even at temperatures as low as 130°C . to freely support bits of cork. To make this easy of demonstration the writer has designed a tube to show the above, together with the familiar mercury hammer, and glow by mercury friction phenomena—all in one.

The tube should be about 35 cm. long by $1\frac{1}{2}$ cm. in diameter, and have the usual bulb at each end that obtains for the mercury hammer. A stricture reducing the diameter to $\frac{1}{2}$ cm. is placed near one end. A small quantity of mercury (about 10 grams) is put in the tube, and also a spherical pith ball about $\frac{3}{4}$ cm. in diameter is placed in the bulb farthest removed from the stricture. The tube is pumped out carefully and sealed off (the sealing-off nipple should be attached to the stem and not to one of the bulbs). It is now ready for the exhibition of the three phenomena referred to above. To show the pressure of the mercury vapor it is only necessary to hold the tube by the upper bulb (the one farthest from the stricture) over a Bunsen burner and allow it to heat gently. Soon condensed mercury vapor appears on the walls of the lower bulb and its progress up the tube is readily followed. The *bombardment of the mercury vapor lifts the pith ball* which, oscillating up and down, is forced into the upper bulb where it is violently agitated by the expanding mercury vapor stream. Removing the apparatus from the heat allows the oscillating pith ball to descend the tube until it again rests upon the stricture. At this moment if the bulb is returned to the flame the ball is again almost instantly shot upward—showing in a striking manner how sensitive the apparatus is. There is little danger of cracking the tube if care is taken not to plunge the lower bulb suddenly into the flame, and if it is allowed to cool before laying down.

The other two phenomena, i. e., the mercury hammer, and glow by mercury friction, are so familiar that they do not call for special mention here.