LETTERS TO THE EDITOR

A Note on the Kinetic Theory Expression for the Viscosity of a Gas

BY an elementary application of the kinetic theory, the expression for the viscosity of a gas works out to be 1/3 $nm\bar{c}\Lambda$ where n is the number of molecules per c.c., m is the mass of a molecule, $\bar{c}$ the mean velocity and Λ the mean free path. This expression is approximate and differs from the accurate expression proposed by Chapman[1] by a numerical factor. A modified elementary procedure is suggested herein, which leads to an expression practically identical with that of Chapman. In the elementary derivation of the formula for viscosity, it is assumed that the number of molecules crossing a unit area from a lower layer to an upper layer (and *vice versa*) in one second is equal to 1/6 $n\bar{c}$. If one replaces this approximate expression by the correct one, *viz.*, $n\sqrt{\frac{RT}{2\pi M}}$ (where R is the gas constant, T is the absolute temperature and M the molecular weight), the final expression for viscosity is found to become,

$$\frac{1}{\pi}\sqrt{\frac{MRT}{\pi}}\cdot\frac{1}{Nd^2} \text{ or } 0\cdot3185\sqrt{\frac{MRT}{\pi}}\cdot\frac{1}{Nd^2}$$

where N is the Avogadro number and d is the diameter of the molecule. The accurate expression for viscosity derived by Chapman is

$$\frac{5 \times 1\cdot018}{16}\sqrt{\frac{MRT}{\pi}}\cdot\frac{1}{Nd^2} \text{ or } 0\cdot3175\sqrt{\frac{MRT}{\pi}}\cdot\frac{1}{Nd^2}.$$

A comparison of the two formulæ shows that by the modified procedure suggested herein, the expression obtained is practically identical with that got by Chapman, the difference between the two being barely 0·3%.

K. S. GURURAJA DOSS.

Department of Chemistry,
Central College, Bangalore,
University of Mysore,
March 1, 1939.

[1] *Phil. Trans.* (A), 1916, **216**, 337.

A Note on the Effect of Finite Breadth of the Hammer Striking a Pianoforte String

IN a theoretical paper (*Bull. Cal. Math. Soc.*, 1937, **28**, 187) it has been shown by me that the finite breadth of the hammer has an effect on the duration of contact. In the said paper duration of contact ϕ is given by

$$\phi \quad \pi\sqrt{\frac{M(a \quad b)}{T_1}},$$

where M stands for the mass of the hammer, a for the length of the shorter segment of the