temperature interval from 350° to 500° C., the velocity increases very slowly and then, above 500° C., rapidly again, so that for example at $P = 20$ cm. and $T = 562^\circ$ C., explosion takes place after a period of induction of 7 seconds. The shape of the curves is similar at quite different pressures, and it is natural to draw the conclusion that with increase

the numerical values of the quantities, are both completely arbitrary, depending upon the units of measurement which may be selected".

The Stroud system is fully described in a paper which I read to the Educational Section of the British Association at the Liverpool meeting in 1923, published in *Engineering* of September 28 of that

year. An example will illustrate its main features. The dynamical equation $f = ma$ is a definitional equation defining force, and according to Stroud each symbol contains its own units and dimensions; the equation is true in all units if only the units are written down with the numerical values when these are known. For example, a train of mass 100 tons acquires a speed of 60 miles per hour in 5 minutes, what is the average force? $f = 100 \text{ tons} \times 60 \text{ miles/hour} / 5 \text{ min.}$ If the force is wanted in tons weight, one ton wt. = 1 ton $\times 32 \text{ ft./sec.}^2$. Whence, dividing one by the other and cancelling dimensions, we get $f = 11/12 \text{ ton wt.}$

The Stroud system has been applied by him and others to all branches of physics and enables one to treat the science in symbols without reference to units, as I have done in my letter. In electrical science, for example, $f = ce'/K_0 r^2$ is a definitional equation defining electric charge e , and K_0 is a dimensional constant, which is assumed to de-

pend solely upon the medium; it covers therefore our ignorance of the mechanism by which the force is transmitted. The charges e and e' can be in ampere-hours, coulombs, c.g.s.e.s. or e.m. units, electronic charges or any other units, provided these are written down with their numerical values. The same applies to all other equations, hence it provides a means of discussing problems in the science such as, "the fundamental dimensions of μ_0 and K_0 ", irrespective of systems of units. It is as easy to work in electrons and 'magnetons' as in c.g.s. or any other units. Hence the natural system of units which Prof. Wilberforce presents does not influence any of my conclusions.

I notice that Prof. Wilberforce heads his letter "Dimensions of Electric and Magnetic Units", whereas mine was headed "Fundamental Dimensions of μ_0 and K_0 in Electrical Science". I hope that this is the cause of the difference of opinion between us and that now it is clearly stated, he will agree with my deductions.

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Do Whales Descend to Great Depths?

DR. F. D. OMMANNEY, in his letter in *NATURE* of March 16 (p. 429), is of opinion that whales cannot descend with impunity below very moderate depths. In his "Discovery" Report on "The Vascular Networks of the Fin-Whale" he limits their normal dives to about 130 ft. and now, in his letter, to 35 fathoms or 210 ft.

FIG. 1.

of pressure we should observe two regions of thermal ignition—at low (c. 300° C.) and at high (above 500° C.) temperatures. These have in fact been observed for a series of hydrocarbons by Prettre, Dumanois and Laffitte³ and by Townend and Mandelkar and others.

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Jan. 7.

¹ D. T. A. Townend and M. R. Mandelkar, *Proc. Roy. Soc., A*, **141**, 484; 1933.

² D. T. A. Townend and M. R. Mandelkar, *Proc. Roy. Soc., A*, **143**, 168; 1933.

³ D. T. A. Townend, L. L. Cohen and M. R. Mandelkar, *Proc. Roy. Soc., A*, **146**, 113; 1934.

⁴ M. Neumann and V. Estrovitch, *NATURE*, **133**, 105; 1934.

⁵ H. F. Coward, *J. Chem. Soc.*, 1382; 1934.

⁶ Prettre, Dumanois and Laffitte, *C.R.*, **191**, 329; 1930.

Fundamental Dimensions of Electric and Magnetic Constants μ_0 and K_0

THE letter from Prof. Wilberforce in *NATURE* of February 16, criticising my letter in the issue of January 19 on the above subject, shows me clearly that the system introduced into the teaching of dynamics and physics by Prof. Wm. Stroud more than fifty years ago, of allowing all the symbols in equations to contain their own units, is not so well known as I assumed or as it ought to be. This is clearly proved in the introductory paragraph; referring to the dimensions of μ_0 and K_0 Prof. Wilberforce writes: "... these dimensions, and not merely