correspond to a so-called 'extrapolation-type' chamber, in which the earthed guard-surface surrounding the collecting electrode, and the upper (plane) surface of the chamber cavity (to which the polarizing voltage is applied), are each carried over by means of a conductive coating on to the cylindrical wall, being separated midway by a narrow gap. The data given in Fig. 2 will obviously enable such a chamber to be constructed with the maximum possible diameter of collecting electrode for given chamber dimensions.

A full account of this work and its application to radiation dosimetry will be published elsewhere.

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Effect of Tube Diameter on the Pressures in Gaseous Detonation Waves

It has been shown by Kistiakowsky *et al.*[1,2] that the velocities of plane detonation waves in the steady state in gaseous mixtures contained in straight tubes are influenced by the energy losses to the walls of the tube. For tubes the diameters of which are less than 10 cm., the velocities are found to decrease with decreasing diameter; this effect is attributed to the formation at the wall of the tube of the rarefaction wave, which travels inwards with acoustic velocity, thereby causing a lowering of temperature and the rate of chemical reaction. Such a rarefaction can be produced by two mechanisms, namely, cooling of the gas in contact with the wall and frictional drag at the wall. The individual effects are indistinguishable experimentally.

It is of some interest to investigate the influence of tube diameter on the (pressure, time) relationships of the waves, since the effect in this case is likely to be more pronounced than in the case of velocity. A series of measurements, of both static and reflexion pressures, were carried out in three detonation tubes of diameters 10, 3·8 and 1·6 cm. Each tube was 10 ft. in length and detonation was initiated at one end by means of a copper acetylide matchhead. Specially designed pressure bar-gauges were employed to record the pressures. Only the results obtained for the mixture $2H_2 + O_2$ will be described here. Typical (pressure, time) curves for the static condition are shown in Fig. 1.

In the static pressure records obtained in the 10 and 3·8 cm. tubes the initial peak lying in the region 0–20 μsec. can be attributed to a combination of dispersion effects in the bar of the gauge[3] and to excitation by the von Neumann pressure 'spike'[4] even though the gauge is incapable of resolving the extremely short-duration reaction zone. The Chapman–Jouguet pressures have therefore been taken to be the average values between approximately 20 and 80 μsec. In both these tubes, for this particular mixture, the measured Chapman–Jouguet pressures agree well with the theoretical value of 18·05 atmospheres. A completely different (pressure, time) relationship, however, is observed in the 1·6-cm. tube. Here the pressure, which has a peak value of 24·6 atm., drops rapidly after about 8 μsec. and thereafter oscillates about a low value. As would be expected, the reflexion pressure records do not exhibit such marked differences.

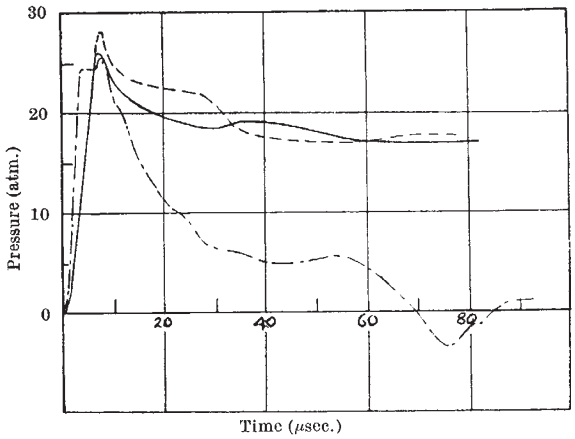

Fig. 1. Static (pressure, time) curves for plane detonation waves in a stoichiometric $2H_2 + O_2$ mixture in tubes of various diameters; 10 cm. diam., ——, 3·8 cm. diam. – – – –, 1·6 cm. diam. — · — ·

The original records show oscillations which have been smoothed out in Fig. 1 in order to show the general trend more clearly; the periods of these oscillations agree closely with the times of traverse of a sound wave in the hot gases behind the detonation front, across the respective tube diameter. These times in the case of $2H_2 + O_2$ for the 10, 3·8 and 1·6 cm. tubes are 63, 24 and 10 μsec. respectively. Confirmation of this fact was obtained in mixtures with different acoustic velocities, and it lends support to the hypothesis that energy is abstracted from the detonation wave through the formation of rarefaction waves at the wall of the tube.

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Adsorption of Water on Tungsten

The adsorption of water on tungsten and its subsequent desorption have been studied using the technique of field emission microscopy[1]. The field emission patterns obtained from a tungsten cathode at a pressure of water equal to 4×10^{-9} mm. are shown in Figs. 1 and 2. The times given are those for which the tip was exposed to water vapour after a 2-min. flash at 2,500° K. These patterns are quite different from those obtained during the adsorption of