dioxane molecules exert a greater poisoning effect on the reaction velocity than water.

A fuller account of this work will be published elsewhere.

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Spread Around the Initiating Point of the Detonation Wave in High Explosives

There is an old belief that the detonation wave in an explosive must travel a certain distance from the initiating point before attaining its final speed. In order to elucidate this problem, cylindrical charges of pressed T.N.T. have been fired with the detonator in different orientations and at various distances from the end surface of the charge. During experiments the flame was photographed on a film running with a constant speed of about 100 m./sec. Between the charge and the camera a screen with a vertical slit, 5 mm. wide, was fitted 1 m. from the charge. In all cases the axis of the charge was horizontal and pointed at the camera.

The charges with the dimensions 99·8 mm. × 99·8 mm. were initiated by electric detonators No. 8 from Imperial Chemical Industries Ltd. The priming charge consisted of a lead azide–lead styphnate mixture (0·22 gm.), and the base charge, 18 mm. long, of tetryl (0·688 gm.). The diameter of the detonator was 6·8 mm. and of the hole in the charge 7·2 mm. The centre of the free end surface of the detonator was placed at various distances, denoted *d*, from the photographed end surface of the charge. The axis of the detonator coincided in

Case 1 with the axis ; depth of the hole for detonator : 99·8-*d* mm.

Case 2 with a horizontal radius } depth of hole : 62 mm.
Case 3 with a vertical radius }

A typical photographic record is reproduced in Fig. 1. The time axis is a horizontal line assumed to lie at equal distances from the points of the two protruding horns, which mark the arrival of the detonation wave at the upper and lower intersections between a vertical line through the initiating point and the cylindrical surface of the charge. A relative displacement in the time direction of the horns indicates a vertical excentricity of the initiating point. Zero time is the point where a line through the points of the two horns intersects the time axis.

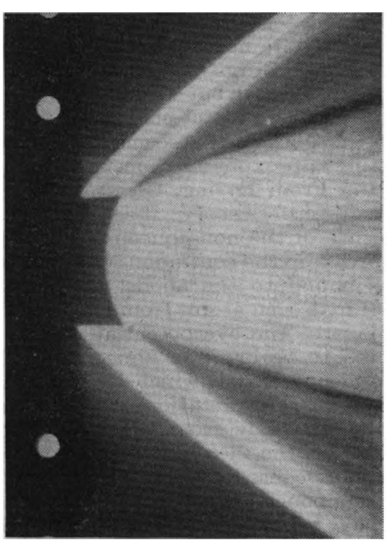

Fig. 1. Typical photographic record. Case 1, $d = 59·5$ mm.

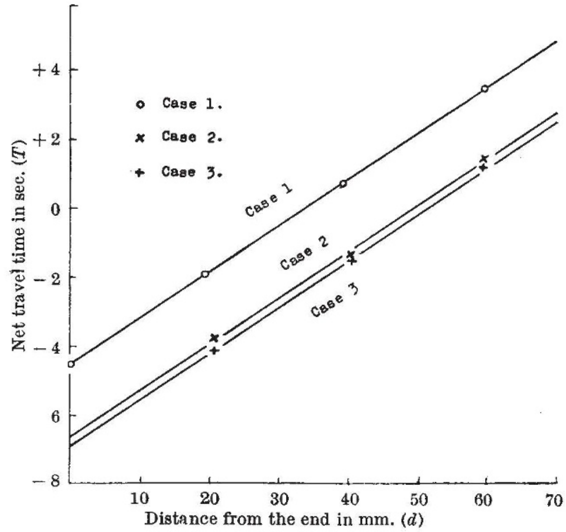

Fig. 2

The curved front between the horns shows how the detonation wave successively reaches the end of the charge. A vertical tangent to this front marks on the time axis the travel time to the end surface after deducting the travel time to the cylindrical surface.

The relation between this net travel time, *T*, and the distance, *d*, in the three cases is as shown in Fig. 2. In all cases the curves are straight lines with the same slope. Hence it may be concluded that the detonation is propagated with a uniform speed in all directions from the detonator.

For any distance *d* the difference between the travel times in Case 1 and Case 2 is about 2·1 μsec., which with due consideration of the detonation velocity of tetryl places the initiating point about 18 mm. from the free end of the detonator or almost exactly on the contact surface between the priming and the base charge. The small time difference (0·2 μsec.) between the lines of Case 2 and Case 3 may probably be explained by the fact that the depth of the hole for the detonator should have been 68 mm. instead of 62 mm. to get the initiating point exactly on the axis of the charge.

The slope of the lines corresponds to a wave-speed of 7,470 m./sec., which is 10 per cent higher than the generally accepted value 6,800 m./sec. for T.N.T. The discrepancy probably lies in the loss of speed when using built-up charges, as may be usual in routine tests. This question will be more thoroughly discussed elsewhere.

The camera was constructed and built by the Försvarets Forsknings Anstalt (FOA 2), who kindly placed the camera and some of their experts at our disposal.

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Jan. 27.