RESULTS

SHOCK VELOCITIES AND PRESSURES

Of the eight liquids studied, five gave well-defined current pulses when the shock waves reached the electrodes. In each experiment the position of the current pulse on the oscillograph trace provided a measure of the time t which the shock had taken to travel the distance d between the explosive and the electrodes. By varying this distance in different experiments we obtained a family of d, t points which we fitted to the empirical relation: [1]

$$d = U_s t + A[1 - \exp(-\alpha t)], \tag{1}$$

where U_s is the velocity of sound in the unperturbed liquid. The shock velocity at any time t is then given by

$$U = U_s + A\alpha \exp(-\alpha t). \tag{2}$$

This formula satisfies the condition that the shock velocity must ultimately decay to the velocity of sound as the wave travels away from the explosive.

Our results are given in table 2, where $U_{t=0}$ $(= U_s + \alpha A)$ is the calculated velocity at the explosive/liquid interface. The pressure $P_{t=0}$ at that point can be worked out from the shock impedance of the liquid, defined as the product of its normal density and the initial shock velocity $U_{t=0}$, together with the corresponding detonation impedance of the explosive.[8] The calculated values of $P_{t=0}$ are listed in the last column of table 2 and are probably correct to within 5,000 atm. The pressures at later times can be found for water and methyl alcohol from the U, P data of Walsh and Rice,[4] but they are not known for the other liquids.

TABLE 2.—CONDITIONS * IN SHOCK WAVES LAUNCHED BY 65/35 RDX/TNT

liquid	number of t, d points	U_s (mm/μsec)	A (mm)	α (μsec^{-1})	initial conditions	
					$U_{t=0}$ (mm/μsec)	$P_{t=0}$ (atm)
water	22	1·51	19	0·241	6·1 ± 0·07†	161,000
methyl alcohol	8	1·09	19	0·319	7·1 ± 0·15	152,000
acetic acid	6	1·10	19	0·296	6·7 ± 0·15	175,000
propionic acid	4	1·16	30	0·168	6·2 ± 0·06	162,000
1 : 1 (vol.) water/ethyl alcohol	6	1·42	20	0·285	7·1 ± 0·20	168,000

* These conditions apply only to the particular geometry of our experiments.

† The figures after the ± signs are the statistical " mean square errors ".[7] The actual errors may be greater.

CONDUCTIVITIES

The methods (*a*) and (*b*) gave single current pulses similar to those described in part 5 of this series.[1] The shock conductivities were derived from the pulse amplitudes in the same way as before.

However, the colliding shock waves in method (*c*) usually produced two fairly distinct pulses. Fig. 3 reproduces an oscillograph trace given by the interaction of two shocks in water. It was obtained with the electrode arrangement shown in fig. 1*c*, the mid-point of the electrodes being 7·8 mm from the two explosive charges. The interval between the launching of the shocks at t_0 and the beginning of the first pulse at t_1 was about 0·8 μsec, which is roughly the time required for the shock waves to travel the distance of 5·3 mm between the explosives and the leading edges of the electrodes (eqn. (1) gives 0·95 μsec). Moreover, the interval between t_1 and the appearance of the second pulse at t_3 was 0·5 μsec, and this is close to the time needed for the waves to move from the edges to the centre of the