$w_1 + w_2 = 2160$ m/sec. In this example the final pressure is sufficiently high to prevent the argon from boiling at the interface. The final flow velocity (that is, the " free " surface velocity) is slightly more than twice w_1, in agreement with some experimental results for water (Rice and Walsh 1957). It would be exactly $2w_1$ in the limit of very weak shocks.

(*d*) *Conditions at the Head-on Collision of Two Plane Shock Waves*

The left-hand sections of the dotted curves in Figure 4 trace the changes in pressure and flow velocity which occur when secondary shock waves are driven back into the original shock. They were calculated by the method described in Section III (*e*). It is particularly interesting to consider the conditions which exist after the collision of two equal shocks (which is equivalent to the total reflection of a single shock). Such a collision reduces the absolute flow velocity $w_1^* + w_2^*$ to zero, and the final state is therefore given by the point of intersection of the secondary Hugoniot curve with the pressure axis in Figure 4. The conditions corresponding to three values of the primary shock pressure are given in Table 3.

TABLE 3

CONDITIONS BEFORE AND AFTER THE HEAD-ON COLLISION OF TWO PLANE SHOCK WAVES

Unshocked conditions : $P^* = 0$, $V^* = 1 \cdot 0503$, $T^* = 0 \cdot 75$

Before Collision			After Collision		
Pressure P_1^*	Temperature T_1^*	Compression V^*/V_1^*	Pressure P_2^*	Temperature T_2^*	Compression V^*/V_2^*
3·007	0·881	1·061	7·0	0·99	1·115
22·32	1·605	1·238	63·0	2·40	1·431
123·7	7·202	1·485	424	14·88	1·849

It is known that the total reflection of weak (sound) waves doubles the wave pressure at the boundary. But in shock waves the pressure ratio is always greater than this, and in an ideal monatomic gas it approaches the limiting value of 6 in very strong shocks. The LJD results in Table 3 show a similar increase from the low pressure ratio of 2 to a ratio of 3·4 in the strongest shock considered.

It should be noted that the temperature in the doubly-shocked material is considerably lower than it would have been had the liquid been compressed to the same total pressure by a *single* shock wave (cf. Table 1).† This effect could be exploited experimentally as a means of varying the temperature independently of the pressure, which it is impossible to do in a single shock compression from a given starting point.

† The reason for this is that step-wise compression is closer to being adiabatic than is single shock compression. In fact, true adiabatic compression could be imagined to occur by the superposition of an infinite number of infinitesimal shocks.

(*e*) *Shock Conditions for Liquid Argon in Contact with the Explosive 60/40 RDX/TNT*

By the method outlined in Section III (*f*) we have estimated that the explosion of a charge of 60/40 RDX/TNT (" Composition B ") in contact with argon at 90 °K ($T^*=0\cdot75$) and at atmospheric pressure ($P^*\approx0$) would launch a shock wave in which the pressure would be 236 000 atm and temperature 5240 °K. These are the conditions at the point of intersection of the Hugoniot curve (*a*) in Figure 5 with the shock and rarefaction loci for the products of explosion.

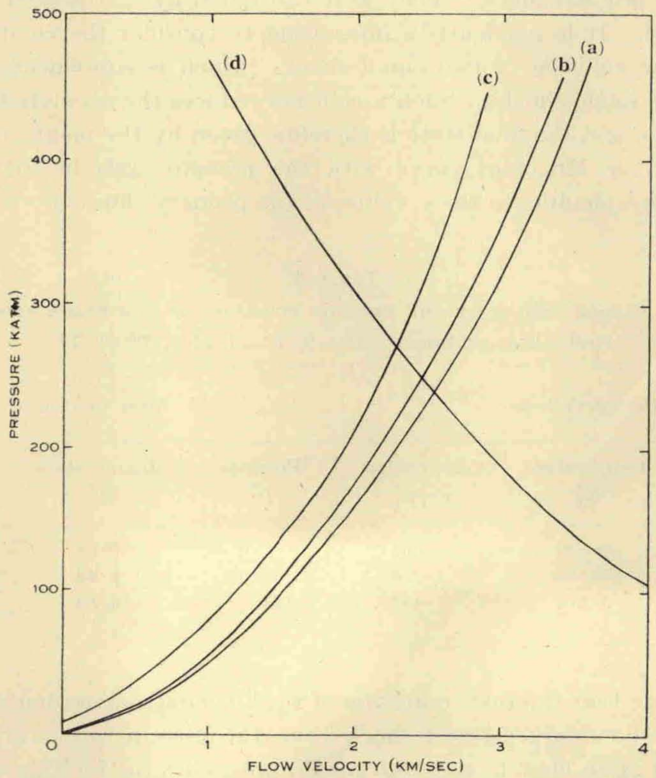

Fig. 5.—A pressure/flow-velocity diagram showing the effects of precompression on the initial shock pressure of liquid argon in contact with the explosive 60/40 RDX/TNT. The curves (*a*), (*b*), and (*c*) are Hugionot curves based on the starting pressures $P\approx1$ atm, $P=850$ atm, $P=6300$ atm, respectively, and the starting temperature 90 °K. The curve (*d*) is the locus of reflected shocks and rarefactions in the explosive products (Deal 1958).

(*f*) *Shock Conditions in Precompressed Liquids*

We have calculated Hugoniot curves from two finite starting pressures on the isotherm for $T^*=0\cdot75$. The results are listed in Table 4 and plotted in Figure 3. At a given volume the pressure and temperature are always less than for the uncompressed liquid, and at a given pressure the volume and temperature are also less. Precompression therefore provides an additional means of varying