the sample. This situation is depicted in Fig. 2(b).

Referring again to Fig. 2, the first wave corresponding to the state $P_2$, $V_2$ travels at $U_{s1}$ with respect to the material ahead and $U_{s1} - U_{p1}$ with respect to the material behind it. The second wave travels at $U_{s2}$ with respect to the material ahead (state $P_1$, $V_1$). The shock wave is unstable when $U_{s2} < U_{s1} - U_{p1}$ and from Eqs. (7) and (8) can be rewritten as

$$U_{s1} - U_{p1} = V_1\sqrt{\frac{P_1 - P_0}{V_0 - V_1}} \tag{13}$$

and

$$U_{s2} = V_1\sqrt{\frac{P_2 - P_1}{V_1 - V_2}} \; . \tag{14}$$

Since

$$U_{s2} < U_{s1} - U_{p1} \tag{15}$$

then upon substitution of Eqs. (13) and (14) into (15)

$$\frac{P_2 - P_1}{V_1 - V_2} < \frac{P_1 - P_0}{V_0 - V_1} \; . \tag{16}$$

This then is the condition for a shock wave to separate into two stable shock waves at the state $P_1$, $V_1$. If $U_{s2} \geq U_{s1} - U_{p1}$ the shock wave cannot break up and is considered stable.

The stability question arises when the Hugoniot curve crosses a phase boundary. Consider the P-V diagram in Fig. 3 which represents one of many possible phase transition models. Here the two phase boundaries are represented by A and B and between them is a mixed-phase region. The coordinate $P_1$, $V_1$ represents the position at which the material begins to transform from phase A to B. For shock strengths less than $P_1$, the final