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

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

and

$$U_{s2} = V_1 \sqrt{\frac{P_2 - P_1}{V_1 - V_2}}$$
 (14)

Since

$$U_{s2} < U_{s1} - U_{p1}$$
 (15)

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

$$\frac{P_2 - P_1}{V_1 - V_2} < \frac{P_1 - P_0}{V_0 - V_1} .$$
 (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  $U_{s2} \ge U_{s1} - U_{p1}$  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