From the definition of α^{eq} we have

$$\begin{aligned} \alpha^{eq} &= 0, \quad p \le p_o \\ &= (v-v_o)/(v_a-v_o), \quad p_o \le p \le p_a \qquad (5.23) \\ &= 1, \quad p_a \le p \end{aligned}$$

where p_o, p_a, v_a, v_o are defined in Fig. 5.18. Combining Eq. (5.23) with (5.18), (5.21), and (5.22) yields the following expressions for dp/dx:

$$dp/dx = m^3(v_o-v_1)/\tau(1+m^2 dv_1/dp)(m^2 v_o-p+p_o)\ , \qquad p_o \le p \le p_a \qquad (5.24)$$

$$dp/dx = m(m^2(2v_o-v_1-v_a) + p_o-p)/\tau(1+m^2 dv_1/dp) \cdot (m^2 v_o-p+p_o)\ , \quad p_a \le p \le p_f \qquad (5.25)$$

Here v_1 is a known function of p, Eq. (5.20). Examination of Eqs. (5.24) and (5.25) shows that $dp/dx = 0$ at $p = p_o$ and $p = p_f$. In Eq. (5.22), $m < 0$ for a forward-facing shock, $\alpha^{eq} - \alpha > 0$, $v_1-v_2 > 0$, and $1 + m^2 dv_1/dp > 0$, from Fig. 5.18. Therefore $dp/dx < 0$ throughout the transition. The qualitative features of dp/dx are shown in Fig. 5.18.

Eqs. (5.24) and (5.25) have been integrated for the iron transition, assuming that no temperature changes occur in the shock. The results are compared with the temperature-independent transient case in Fig. 5.19 for a driving pressure of .200 Mbar. The shock width, defined as $\Delta x = \Delta p/|dp/dx|_{max}$, is for this case about .3 cm. The steady velocity of the second shock with respect to the material ahead of it is U_{II} = 0.37 cm/μsec. The relaxation time assumed for the calculation

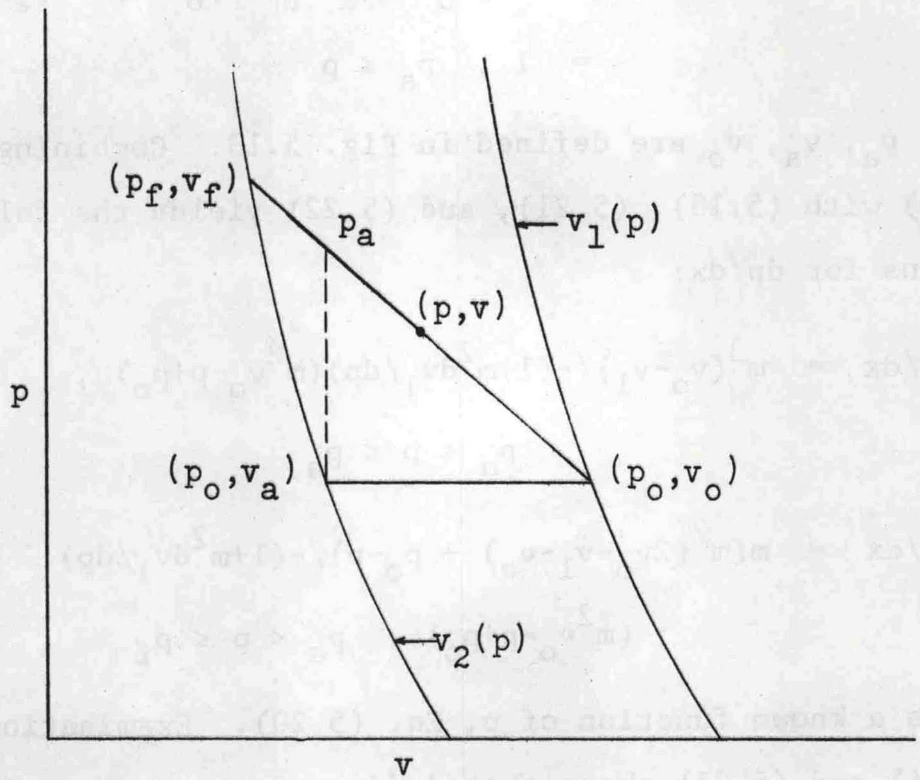

Fig. 5.17.--Path of the Permanent Regime Solution

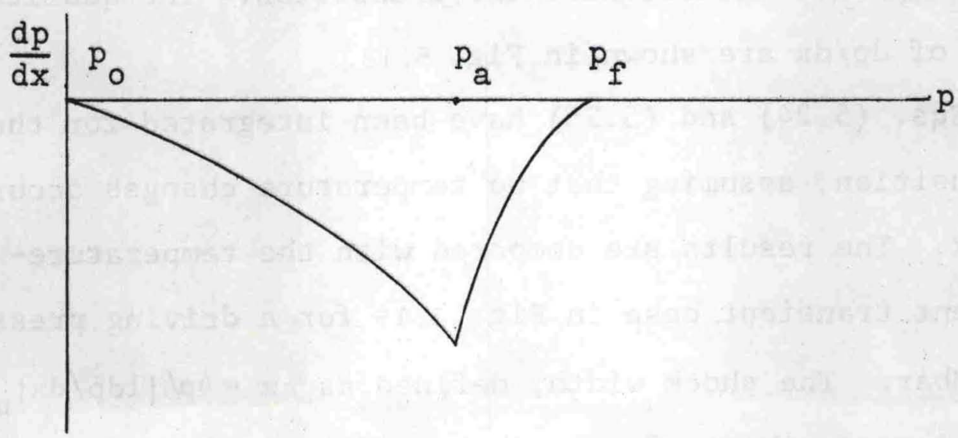

Fig. 5.18.--dp/dx for Permanent Regime Solution