$$A_{i+1} = -\frac{(2M-kV_0^{-iM})A_i^{+kMA_{i-1}}}{(i+1)V_0} \quad \text{for } i \ge 2 . \tag{41}$$

Integration by parts suggests that

$$A_0 = 0$$
,  $A_1 = 1$ ,  $A_2 = 0$ , and  $A_3 = -kM/3V_0$ . (42)

Expanding Eq. (40) to obtain the first three terms and using the results from Eqs. (32) and (42), the solution becomes

$$P_S = P_H + Ae^{k\alpha} + \frac{C^2}{(V_0 - M\alpha)^2} \sum_{i=3}^{\infty} A_i \alpha^i$$
 (43)

The constant of integration A is determined from the point at which the Hugoniot and the isentrope curves cross. Here  $P_S = P_H$  and  $\alpha = \alpha_H$  so that

$$P_{H} = P_{H} + Ae^{ka_{H}} + \frac{C^{2}}{(V_{0} - Ma_{H})^{2}} \sum_{i=3}^{\infty} A_{i} a_{H}^{i}$$

and

$$A = -\frac{C^{2} e^{-k\alpha} H}{(V_{0} - M\alpha_{H})^{2}} \sum_{i=3}^{\infty} A_{i} \alpha_{H}^{i}.$$
 (44)

From Eq. (43), the pressure in terms of a anywhere along an isentrope can be calculated since the  $A_i$ 's are determined from Eq. (41), A is found from Eq. (44), and  $P_H$  and  $a_H$  are experimentally determined values.

The calculation of an isotherm is very similar. Starting again with Eq. (24)

$$P_{T}-P_{H} = \Gamma/V(E_{T}-E_{H})$$
 (45)

where  $P_T$  and  $E_T$  are the pressure and energy along an isotherm. Differentiating Eq. (45) with respect to volume yields

$$\left(\frac{\partial P}{\partial V}\right)_{T} - k \left(\frac{\partial E}{\partial V}\right)_{T} = \left(\frac{\partial P}{\partial V}\right)_{H} - k \left(\frac{\partial E}{\partial V}\right)_{H}$$
(46)

which represents the differential equation for pressure along an isotherm. At this point, it becomes advantageous to express ( $\partial E/\partial V$ )<sub>T</sub>