$$d^2 \int_{T_0}^{T_1} \frac{\Lambda dT}{1 + \alpha d^2(\bar{\mathrm{q}} - \mathrm{q}_c)^2} = -\int_{T_0}^{T_1} \bar{\mathrm{q}} \frac{dz}{dT} dT = \bar{\mathrm{q}} L$$

which when rearranged gives

$$\bar{\mathrm{q}} = \frac{d^2}{L} \int_{T_0}^{T_1} \frac{\Lambda dT}{1 + \alpha d^2(\bar{\mathrm{q}} - \mathrm{q}_c)^2}. \tag{26}$$

Equation (25) provides the relationship for the variation of the temperature gradient along the slit length and may be substituted into (14) to yield

$$P_f = \int_{T_0}^{T_1} \frac{\rho s dT}{1 + \alpha d^2(\bar{\mathrm{q}} - \mathrm{q}_c)^2}. \tag{27}$$

Equations (26) and (27) will be used to obtain comparisons with the experimental results of I and II.

It is to be noted that (26) and (27) may be easily altered in order to arrive at solutions for heat flow and fountain pressure in circular capillaries. For a capillary of radius $r$ and length $L$, $d^2$ is merely replaced by $3r^2/2$.

### B. Neglected Terms

We show first that the approximation of (11) is a good one. We investigate

$$R_1 = \frac{\beta^{-1}(d^2\beta/dz^2)}{[\eta_n/(2\eta_n + \eta')]\bar{\mathrm{q}}^{-1}(d^2\mathrm{q}/dx^2)} \tag{28}$$

and show that $R_1 \ll 1$. In the temperature range of interest ($1.15° < T < 2.15°\mathrm{K}$), $s/s_\lambda \sim \rho_n/\rho \sim (T/T_\lambda)^n$ where $n \sim 5.6$. Let $T/T_\lambda = \zeta$ and $\beta_\lambda = (\rho s_\lambda T_\lambda)^{-1}$. Then

$$\frac{d\beta}{dz} = -(n+1)\beta_\lambda \zeta^{-(n+2)} \frac{d\zeta}{dz} \tag{29}$$

and

$$\frac{d^2\beta}{dz^2} = -(n+1)\beta_\lambda \left[ -(n+2)\zeta^{-(n+3)} \left(\frac{d\zeta}{dz}\right)^2 + \zeta^{-(n+2)} \frac{d^2\zeta}{dz^2} \right]$$
$$= \frac{(n+1)\beta_\lambda(\bar{\mathrm{q}} + \alpha d^2\bar{\mathrm{q}}^3)[(3n+3)\bar{\mathrm{q}} + \alpha d^2\bar{\mathrm{q}}^3(4n + 5 - 2\zeta^n - 4n\zeta^n)]}{\alpha^4\Lambda^2 T_\lambda^2 \zeta^{(n+3)}} \tag{30}$$

since from (25), neglecting $\mathrm{q}_c$ for simplicity

$$\frac{d\zeta}{dz} = -\frac{1}{d^2\Lambda T_\lambda}(\bar{\mathrm{q}} + \alpha d^2\bar{\mathrm{q}}^3) \tag{31}$$

and

$$\frac{d^2\zeta}{dz^2} = -\frac{(2n+1)}{\zeta}\left(\frac{d\zeta}{dz}\right)^2 + \frac{\alpha\bar{\mathrm{q}}^3}{\Lambda T_\lambda}\left(\frac{n + 2 - 2\zeta^2 - 4n\zeta^n}{\zeta(1-\zeta^n)}\right)\frac{d\zeta}{dz}. \tag{32}$$