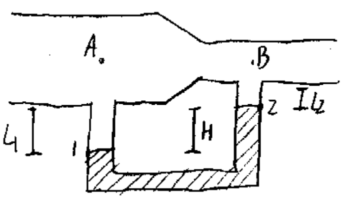
P2] Primero hay que calcular la velocidad de salida requerida, con ecuaciones de lanzamiento parabólico

$X: \; V\cdot\cos\alpha = \frac{L}{t} \Rightarrow t = \frac{L}{V\cos\alpha}$ ; $Y: \; Y(t) = V\cdot sen\alpha\, t - \frac{gt^2}{2}$ ; $Y = 0 = V sen\alpha \cancel{t} - \frac{g t^{\cancel{2}}}{2} \Leftrightarrow t = \frac{2V sen\alpha}{g}$

$$\Rightarrow \frac{L}{V\cos\alpha} = \frac{2V sen\alpha}{g} \Leftrightarrow V = \sqrt{\frac{gL}{2 sen\alpha \cos\alpha}} = \sqrt{\frac{gL}{sen(2\alpha)}} = \sqrt{\frac{9{,}8\cdot 50}{sen(2\cdot 30)}} = 23{,}8\,[m/s]$$

Venturímetro




$B = \text{Bernoulli} = \frac{V^2}{2g} + \frac{p}{\gamma} + z$

$$B_A = B_B \Leftrightarrow \frac{V_A^2}{2g} + \frac{P_A}{\gamma} + \cancel{z_A} = \frac{V_B^2}{2g} + \frac{P_B}{\gamma} + \cancel{z_B} \Leftrightarrow \frac{P_A - P_B}{\gamma} = \frac{V_B^2 - V_A^2}{2g} \quad (1)$$

Hidrostática
$$\begin{cases} P_1 = P_2 + \gamma_{Hg}\cdot H & (2) \\ P_1 = P_A + \gamma(D/2 + L_1) & (3) \\ P_2 = P_B + \gamma(d/2 + L_2) & (4) \end{cases}$$
(3) y (4) en (2): $P_A + \gamma(D/2 + L_1) = P_B + \gamma(d/2 + L_2) + \gamma_{Hg}\cdot H$

$$\Rightarrow P_A - P_B = \gamma\overbrace{\left(\frac{d}{2} + L_2 - \frac{D}{2} - L_1\right)}^{-H} + \gamma_{Hg}\cdot H \;/\; (\gamma) \Rightarrow \frac{P_A - P_B}{\gamma} = H\left(\frac{\gamma_{Hg} - \gamma}{\gamma}\right) \quad (5)$$

$(1) = (5) \Leftrightarrow \frac{V_B^2 - V_A^2}{2g} = H\left(\frac{\gamma_{Hg} - \gamma}{\gamma}\right)$ ; Continuidad: $Q = A_A V_A \Rightarrow V_A = \frac{Q}{A_A} = \frac{4Q}{\pi D^2}$ ; $V_B = \frac{4Q}{\pi d^2}$

$$\Rightarrow \frac{16Q^2}{2g\pi^2}\left(\frac{1}{d^4} - \frac{1}{D^4}\right) = H\left(\frac{\gamma_{Hg} - \gamma}{\gamma}\right) \Leftrightarrow Q = \sqrt{2gH\left(\frac{\gamma_{Hg} - \gamma}{\gamma}\right)}\cdot\frac{\pi}{4}\cdot\frac{d^2 D^2}{\sqrt{D^4 - d^4}}$$

Continuidad en boquilla: $Q = A_b \cdot \overset{V_{salida}}{V_b} \Leftrightarrow Q = \frac{\pi D_b^2}{4}\cdot V \Rightarrow D_b = \sqrt{\frac{4Q}{V\pi}}$

$$\Rightarrow D_b = \sqrt{\frac{\sqrt{2gH\left(\frac{\gamma_{Hg} - \gamma}{\gamma}\right)}\cdot\frac{d^2 D^2}{\sqrt{D^4 - d^4}}}{V}} = \sqrt{\frac{\sqrt{2\cdot 9{,}8\cdot H\cdot\left(\frac{135.240 - 9.800}{9.800}\right)}\cdot\frac{0{,}5^2\cdot 1^2}{\sqrt{1^4 - 0{,}5^4}}}{23{,}8}} = 0{,}415\sqrt[4]{H}$$