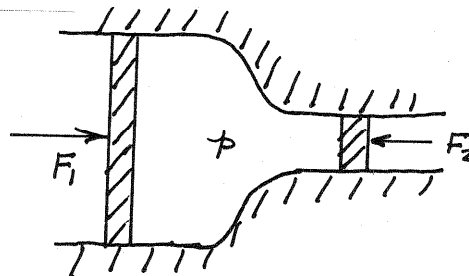2.13   A 0.3-m-diameter pipe is connected to a 0.02-m-diameter pipe and both are rigidly held in place. Both pipes are horizontal with pistons at each end. If the space between the pistons is filled with water, what force will have to be applied to the larger piston to balance a force of 80 N applied to the smaller piston? Neglect friction.

$$F_1 = p A_1$$

$$F_2 = p A_2$$

Thus,

$$\frac{F_1}{A_1} = \frac{F_2}{A_2}$$

or

$$F_1 = \frac{A_1}{A_2} F_2 = \frac{(0.3m)^2}{(0.02m)^2} (80\,N) = \underline{\underline{18,000\ N}}$$