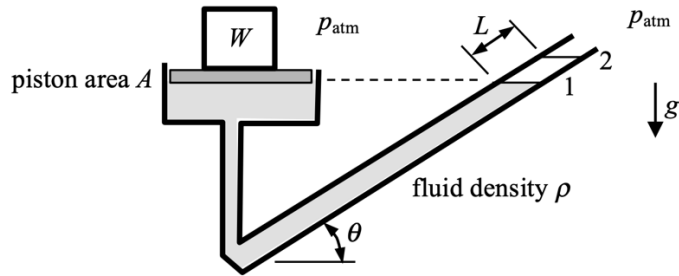


When a weight W is placed on a piston with an area A , fluid in an inclined manometer moves from point 1 to point 2. What is W in terms of the fluid density ρ , gravitational acceleration g , the displacement L , the piston area A , and the tube arm angle θ ?



SOLUTION:

Analyzing the manometer after the weight is applied,

$$p_{atm} = p_{piston} - \rho g L \sin \theta, \quad (1)$$

where the (absolute) pressure in the fluid just below the piston is,

$$p_{piston} = p_{atm} + \frac{W}{A}. \quad (2)$$

Combine both equations and solve for W ,

$$p_{atm} = p_{atm} + \frac{W}{A} - \rho g L \sin \theta, \quad (3)$$

$$\boxed{W = \rho g L A \sin \theta}. \quad (4)$$