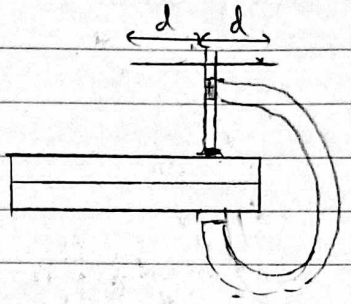
Solutions: 21-S-E.4-MK-02



$F = 19\,lb$

$r = 0.5\ in$

$\mu_s = 0.38$

$\ell = 0.25$

$d = 3in$

$$\theta = \tan^{-1}\left(\frac{\ell}{2\pi r}\right) = \tan^{-1}\left(\frac{0.25}{2\pi(0.5)}\right) = 4.55^\circ$$

$$\phi_s = \tan^{-1}(\mu_s) = \tan^{-1}(0.38) = 20.8^\circ$$

$$M = Wr\tan(\phi_s + \theta)$$

$$W = \frac{M}{r\tan(\phi_s + \theta)} = \frac{(19.16)(2)(3)}{(0.5)(\tan(4.55 + 20.8))} \Rightarrow W = 4E1.25\ lb$$

Self locking as $\phi_s > \theta$