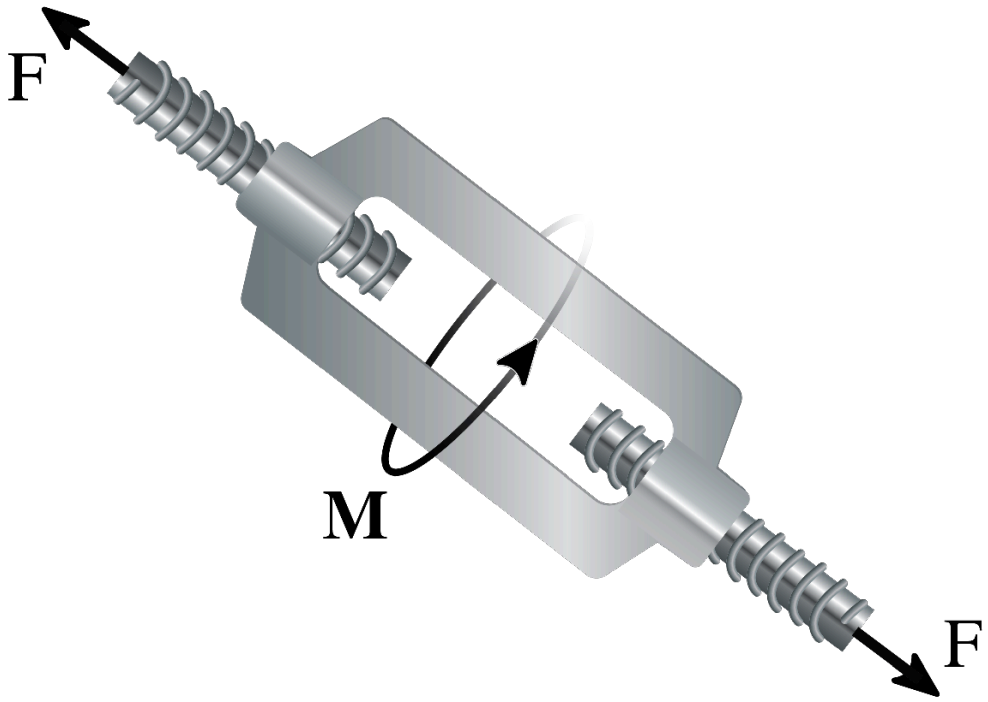

Two screws are connected by a turnbuckle as shown above. Despite being pulled with a force F, the screws do not move. If the screws have a mean radius of $r\ \mathrm{mm}$ and a static coefficient of friction of μ_s, and there is no moment being applied, determine the corresponding lead l.

For self-locking, the lead angle has to equal the angle of static friction:

$$\theta_L = \theta_S$$

$$\rightarrow \tan^{-1}\left(\frac{l}{2\pi r}\right) = \tan^{-1}(\mu_s)$$

$$\rightarrow \frac{l}{2\pi r} = \mu_s$$

$$\Rightarrow l = 2\pi r \cdot \mu_s$$

A different pair of screws are now used in the turnbuckle. If the new screws have the same lead and radius as the previous pair but have a greater static coefficient of friction of $\mu_{s\,new}$, determine the magnitude of the smallest moment that needs to be applied to cause the screws to move and the corresponding change in

distance between the screws. The screws are still being pulled with the same force. Assume that the screws have negligible weight.

$$\theta_L = \tan^{-1}\left(\frac{l}{2\pi r}\right)$$

$$\theta_S = \tan^{-1}(\mu_s)$$

$$\Rightarrow M = 2r \cdot F \tan(\theta_S - \theta_L)$$

The screws will move away from one another.