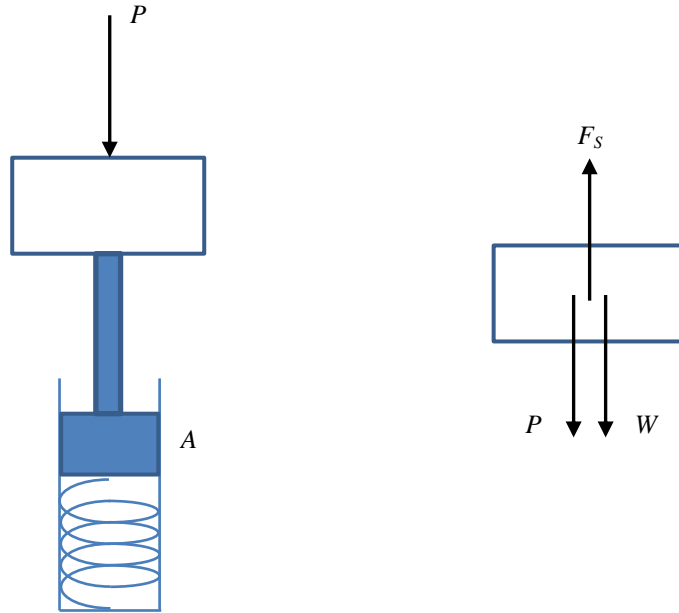


27. The piston  $A$  moves vertically between two smooth walls. If the spring has a stiffness of  $k = 15 \text{ lb/in}$ . Determine the distribution of the stretch of the spring if it is subjected to a normally distributed force  $P \sim N(10, 0.1^2) \text{ lb}$ . The weight of the block is  $W \sim N(5, 0.05^2) \text{ lb}$ , and  $P$  and  $W$  are independent. Assuming the weights of rod and piston are negligible.



**Solution**

$$\sum F_y = 0; \quad F_s = W + P$$

Also, we have

$$F_s = kx$$

Therefore, we can obtain,

$$x = (W + P) / k$$

$$\mu_x = (\mu_W + \mu_P) / k = 1 \text{ in}$$

$$\sigma_x = \sqrt{\sigma_W^2 + \sigma_P^2} / k = 0.00745 \text{ in}$$

**Ans.**