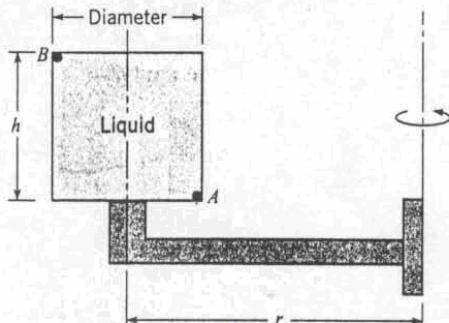5.26 A tank of liquid (S = 0.80) that is 1 ft in diameter and 1.0 ft high (h = 1.0 ft) is rigidly fixed (as shown) to a rotating arm having a 2-ft radius. The arm rotates such that the speed at point *A* is 20 ft/s. If the pressure at *A* is 30 psf, what is the pressure at *B*?

PROBLEM 5.26

$$p/\gamma + z - \frac{V^2}{2g} = \text{constant} \qquad \text{where } V = r\omega$$

$$p_A + \gamma z_A - \rho r_A^2 \omega^2 / 2 = p_B + \gamma z_B - \rho r_B^2 \omega^2 / 2$$

$$p_B = p_A + \frac{\rho \omega^2}{2}(r_B^2 - r_A^2) + \gamma (z_A - z_B)$$

$$\omega = V_A / r_A = 20/1.5 = 13.33 \text{ rad/s} \qquad r_B = 2.5 \text{ ft}$$

$$\rho = S \cdot 1.94 \text{ slug/ft}^3 = 1.552 \text{ slug/ft}^3 \qquad r_A = 1.5 \text{ ft}$$

$$z_A - z_B = -1$$

$$p_B = 30 + \frac{(1.552)(13.33)^2}{2}(2.5^2 - 1.5^2) + 62.4 \cdot (.8) \cdot (-1)$$

$$p_B = 30 + 551.5 - 49.9 = 531.6 \text{ psf}$$