2.68 The basic elements of a hydraulic press are shown in Fig. P2.68. The plunger has an area of 1 in.^{2}, and a force, F_1, can be applied to the plunger through a lever mechanism having a mechanical advantage of 8 to 1. If the large piston has an area of 150 in.^{2}, what load, F_2, can be raised by a force of 30 lb applied to the lever? Neglect the hydrostatic pressure variation.
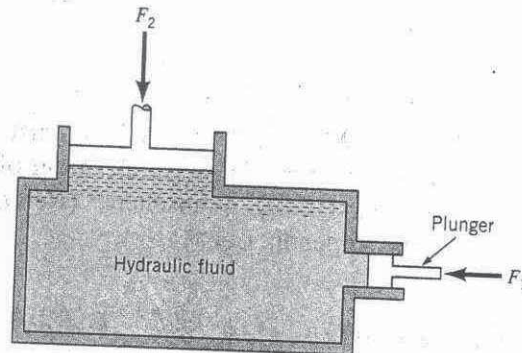

■ FIGURE P2.68

A force of 3.0 lb applied to the lever results in a plunger force, F_1, of $F_1 = (8)(30) = 240\ lb$.

Since $F_1 = pA_1$ and $F_2 = pA_2$ where p is the pressure and A_1 and A_2 are the areas of the plunger and piston, respectively. Since p is constant throughout the chamber,

$$\frac{F_1}{A_1} = \frac{F_2}{A_2}$$

so that

$$F_2 = \frac{A_2}{A_1} F_1 = \left(\frac{150\ in.^2}{1\ in.^2}\right)(240\ lb) = \underline{\underline{36,000\ lb}}$$