

2.12

2.12 The basic elements of a hydraulic press are shown in Fig. P2.12. The plunger has an area of  $1 \text{ in.}^2$ , 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  $150 \text{ in.}^2$ , what load,  $F_2$ , can be raised by a force of 30 lb applied to the lever? Neglect the hydrostatic pressure variation.

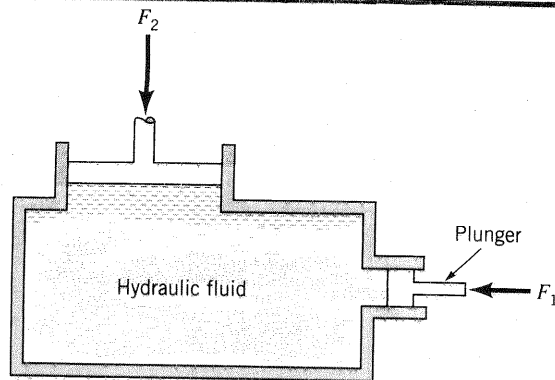


FIGURE P2.12

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

Since  $F_1 = p A_1$  and  $F_2 = p A_2$  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

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