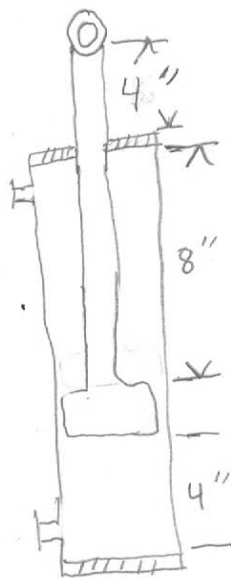


Figure 2



cylinder with the ports blocked and the piston seals completely removed, cylinder is full of oil, so...

There is $(3.14 \text{ in}^2) \times (12") = 37.68 \text{ in}^3$ total oil in the cylinder.

also...

There is $(1.23 \text{ in}^2) \times (12") = 14.7 \text{ in}^3$ of Rod Volume.

If the cylinder is full of oil, how can the rod retract if the oil that would be displaced by the rod itself has nowhere to go?

Figure 2 is the same cylinder retracted 8"

cap end;

$$(3.14 \text{ in}^2) \times (4") = 12.56 \text{ in}^3 \text{ of oil in Cap end}$$

Rod end;

$$[(3.14 \text{ in}^2) \times (8")] - [(1.23 \text{ in}^2) \times (8")] =$$

Volume of Bore minus Rod Volume

$$(25.12 \text{ in}^3) - (9.84 \text{ in}^3) = 15.28 \text{ in}^3 \text{ in Rod end}$$

so $12.56 \text{ in}^3 + 15.28 \text{ in}^3 = 27.84 \text{ in}^3$ total oil

original oil volume = 37.68 in^3

so $37.68 \text{ in}^3 - 27.84 \text{ in}^3 = 9.84 \text{ in}^3$ difference

so 9.84 in^3 of oil would have to go "somewhere" for the cylinder to retract to this state