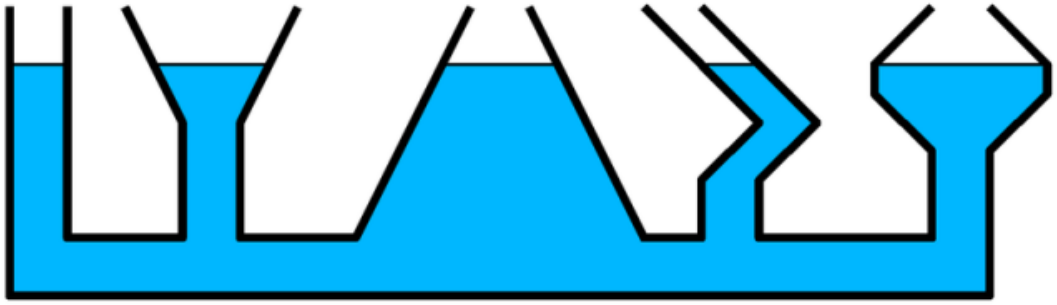
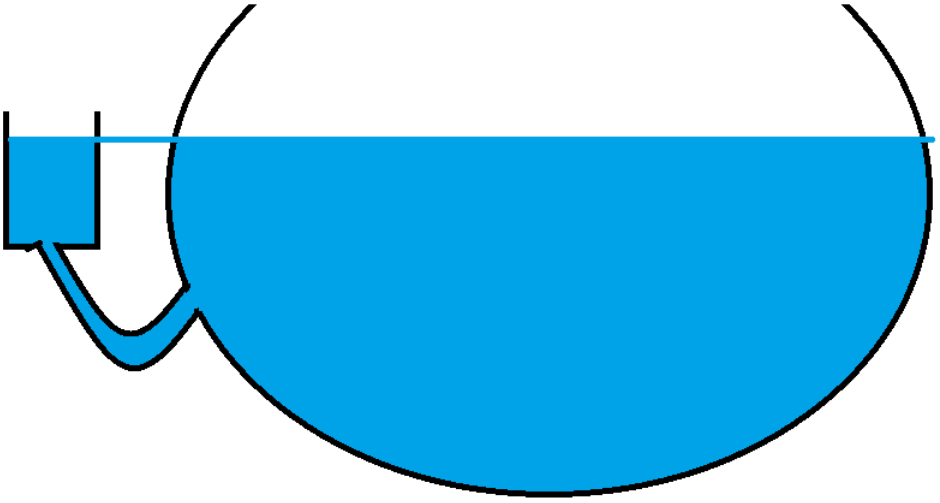
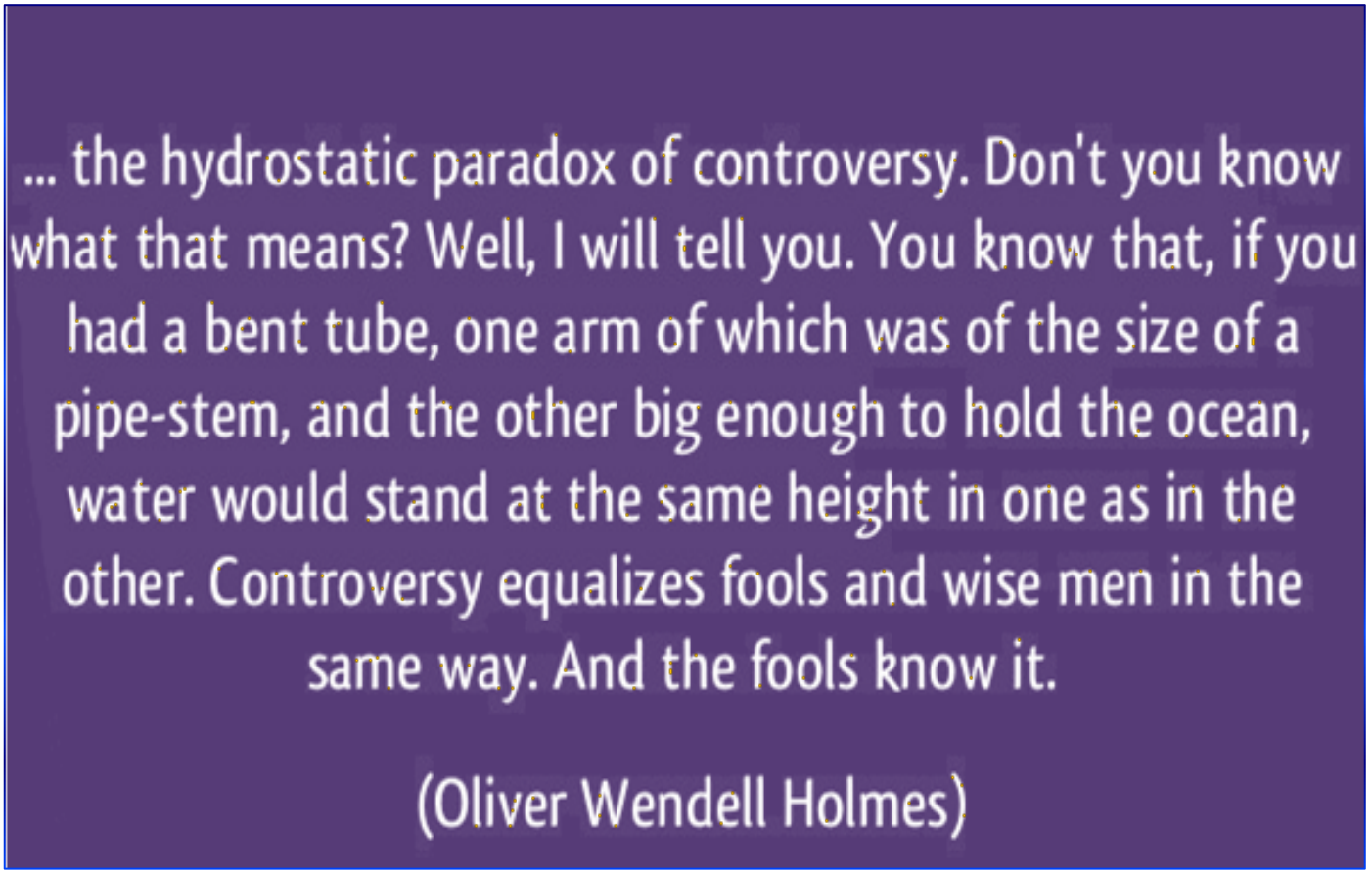
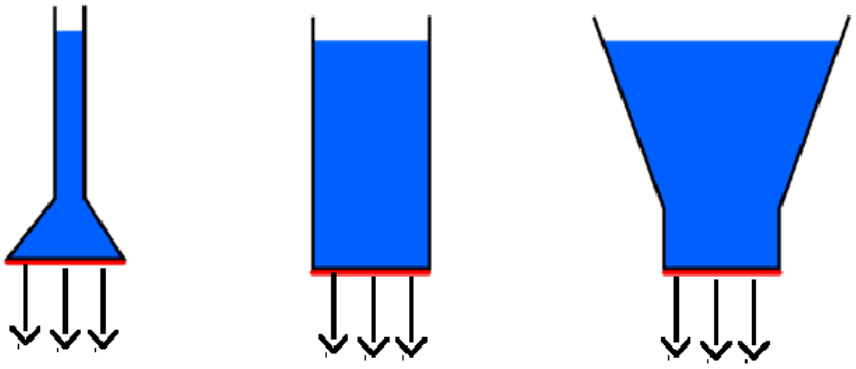


Law (Principle) of Communicating Vessels




... the hydrostatic paradox of controversy. Don't you know what that means? Well, I will tell you. You know that, if you had a bent tube, one arm of which was of the size of a pipe-stem, and the other big enough to hold the ocean, water would stand at the same height in one as in the other. Controversy equalizes fools and wise men in the same way. And the fools know it.
(Oliver Wendell Holmes)

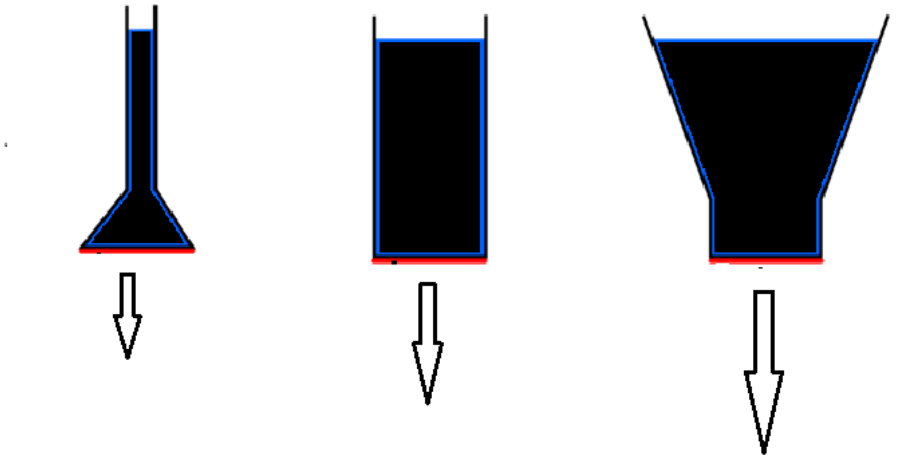


Total Force = Pressure × Area

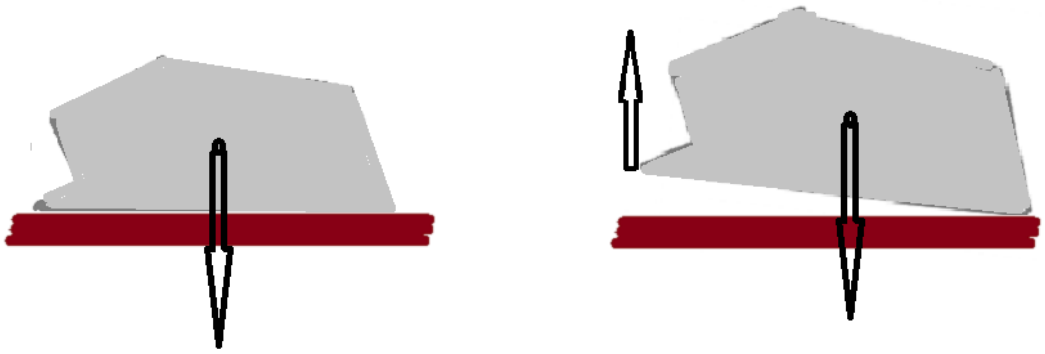
Liquid pressure depends only height of maximal column

If maximal heights are the same and areas are the same

Then the total forces are the same.

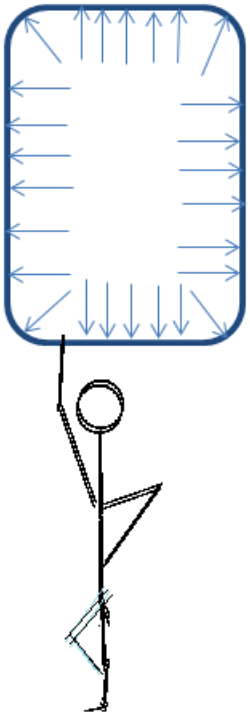


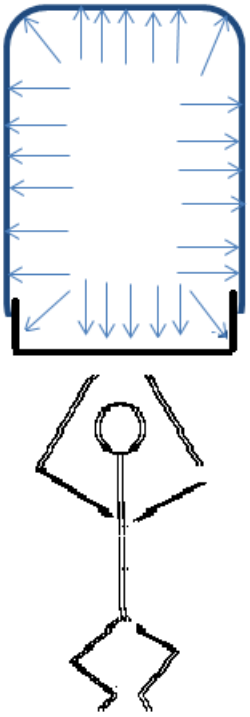
In solid state: Total Force = Total Weight



Solid Bodies

Local Pressure Depends on Relative Distance to Center of Gravity





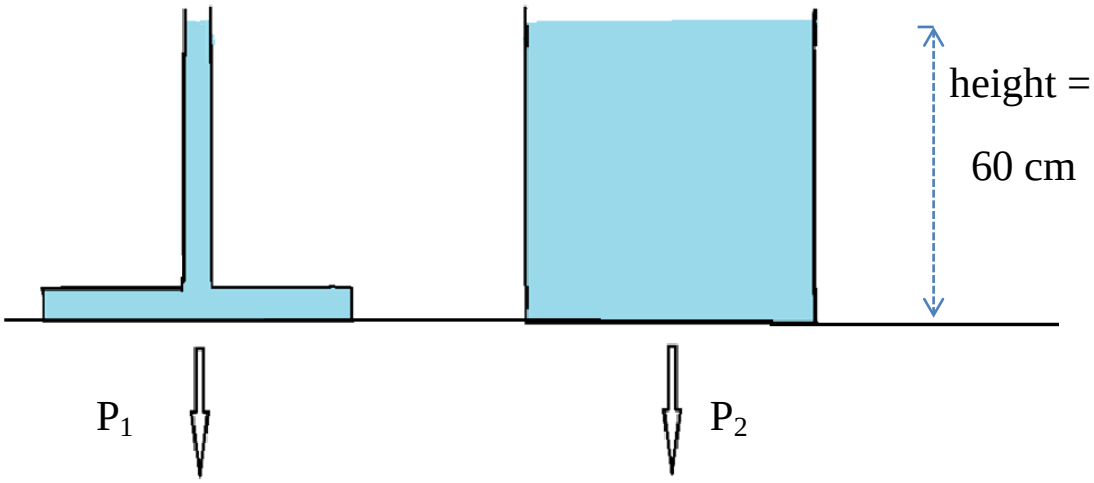
Container Containing Highly-Pressured Gas
Weight of Container + Gas Can be Very Small
Relative to the Pressure × Area.

W_1 = total weight of water in **left container**

W_2 = total weight of water in in **right container**

W_1 = 4 kg = 8.8 lb.

W_2 = 150 kg = 330 l



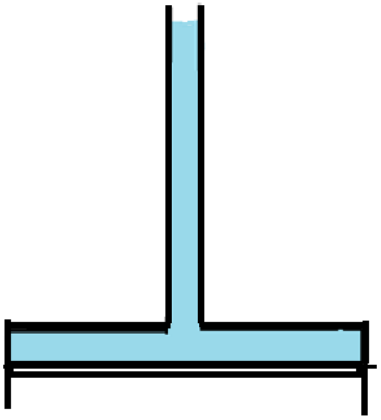
area = 50 × 50 = 2,500 cm^2

pressure = 60 gr/cm^2 = 0.06 kg/cm^2

P_1 = total pressure on left P_2 = total pressure on right

$P_1 = P_2 =$ 0.06 · 2,500 kg = 150 kg = 330 lb. !

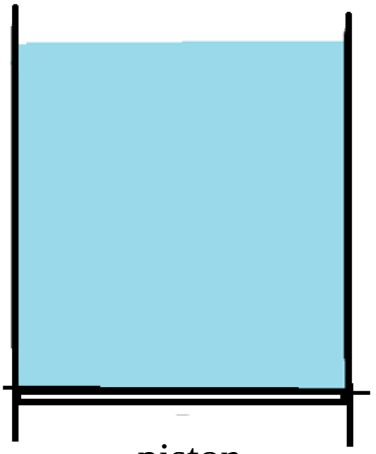
total water weight 4 kg



piston

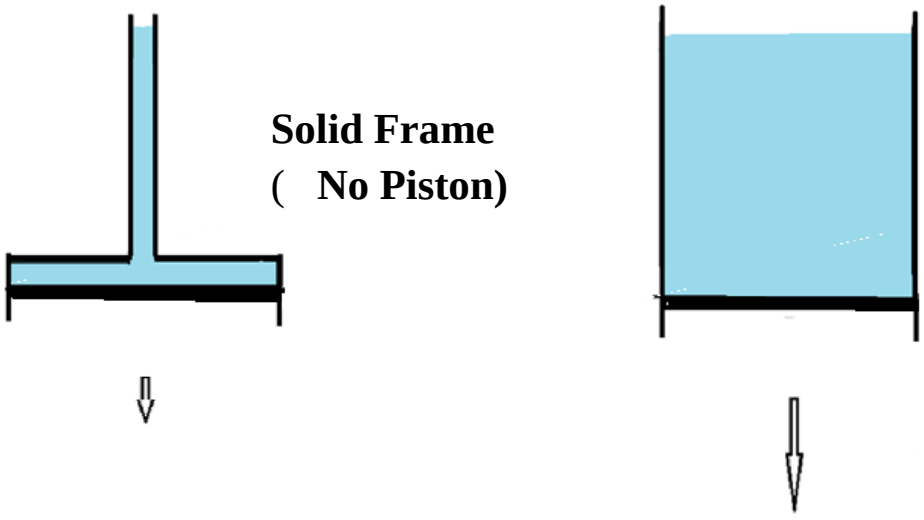
150 kg

total water weight 150 kg



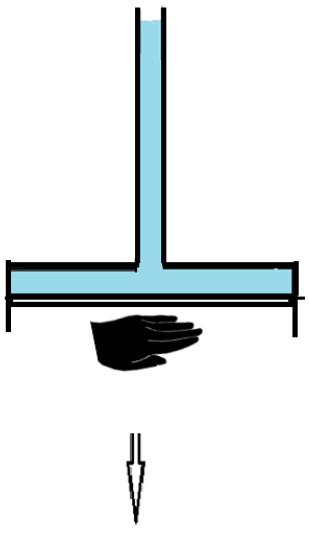
piston

150 kg



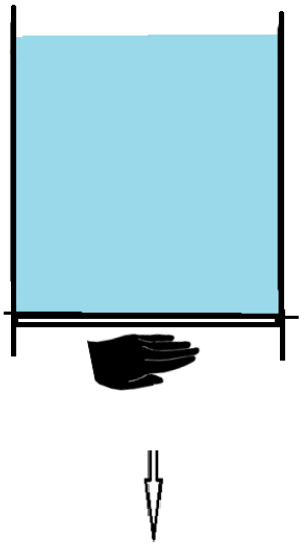
The rigid frame takes all the water pressure

total water weight 4 kg



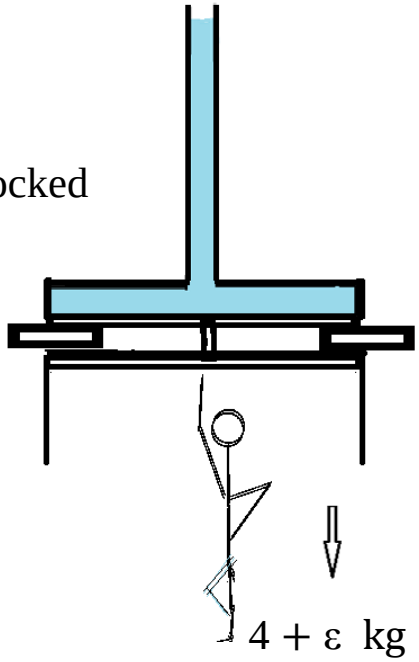
150 kg

total water weight 150 kg



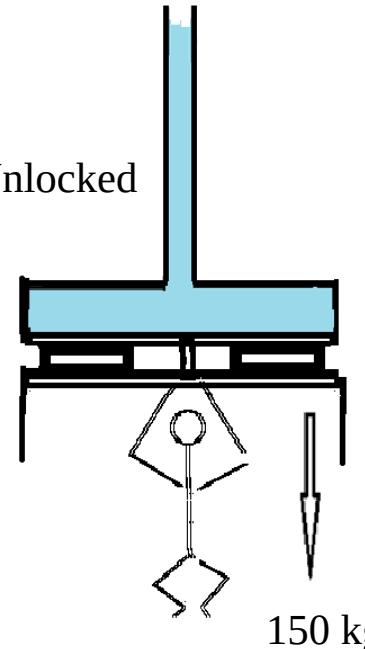
150 kg

Locked



$4 + \varepsilon$ kg

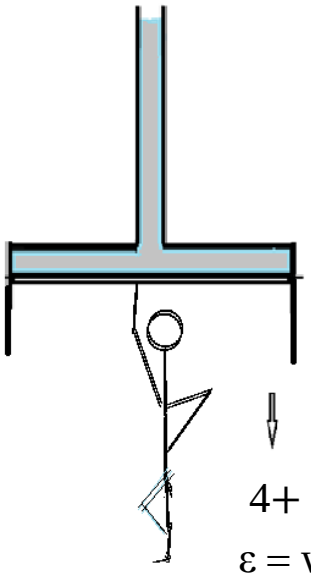
Unlocked



150 kg

ε = weight of frame

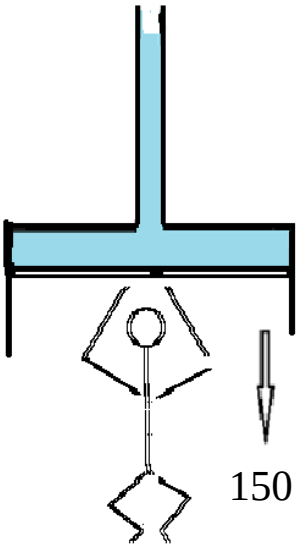
Ice



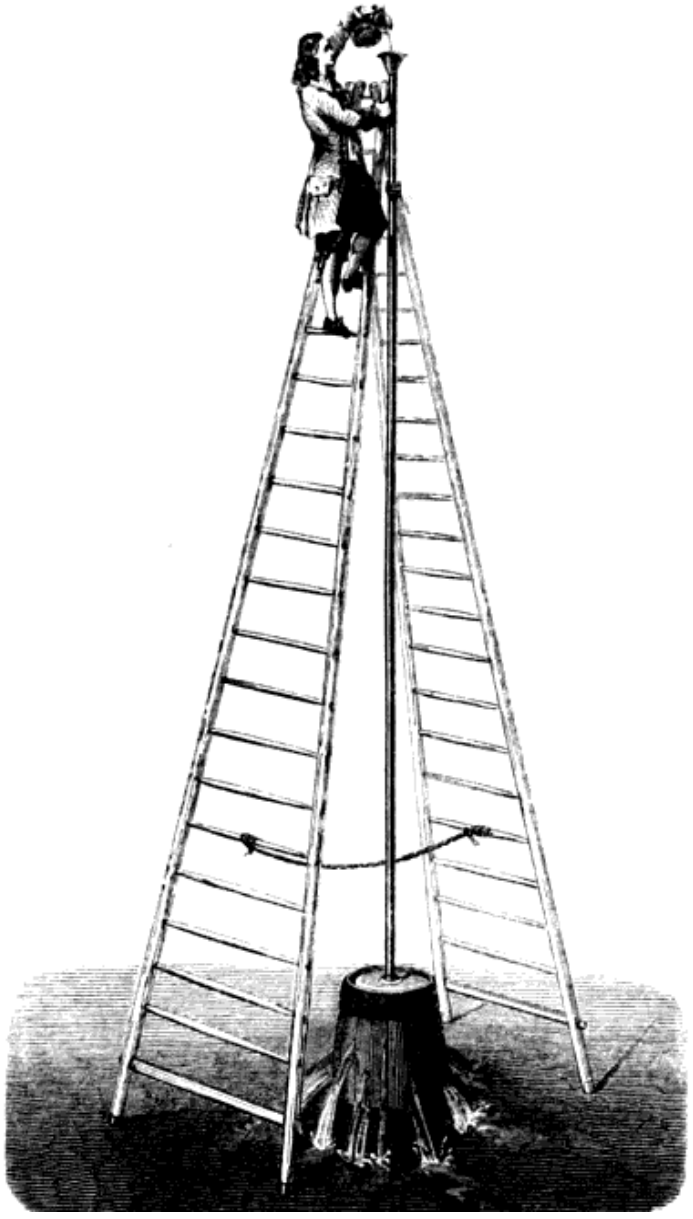
4+ ε kg

ε = weight of frame

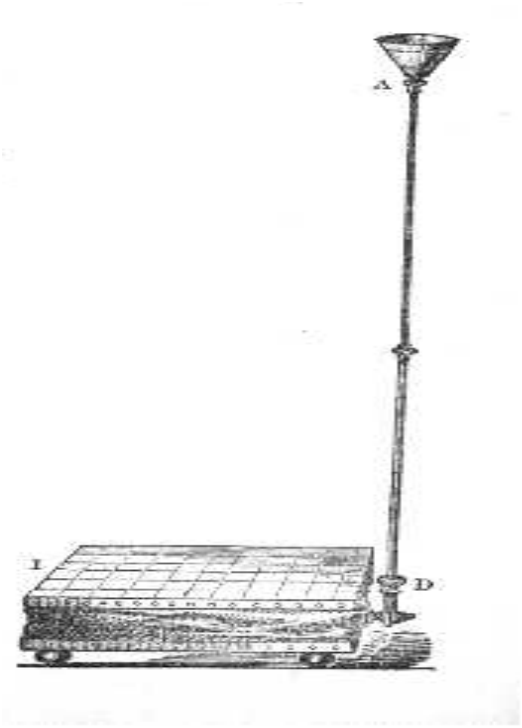
Water



150 kg



Pascal’s Barrel



From a 1871 book on Natural Philosophy

1860 Ritchie catalog: " improved form and construction; mahogany, twelve inches square, with patent leather sides lined with vulcanized rubber; brass socket and three-way water cock; brass and glass tubes with brass screw connections; funnel, ...$10.00"

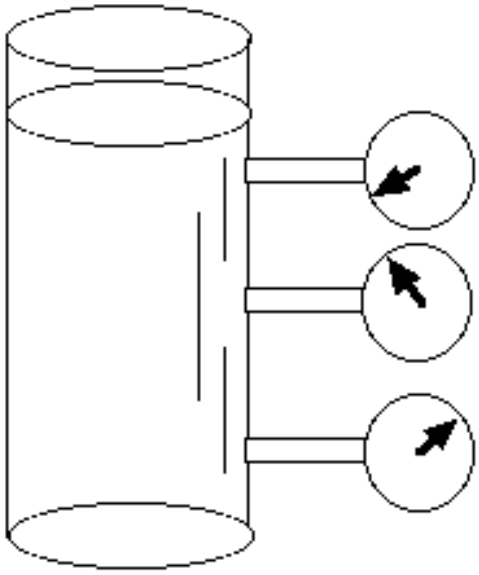
Pascal: "Traité de l'équilibre de liqueurs et de la pesanteur de la masse de l'air"

A treatise on the equilibrium of fluids and on the weight of the air

Published in 1653 (after his death in 1652)

Pascal's Law States (in modern formulation):

when there is an increase in pressure at any point in a confined non-compressible fluid, there is an equal increase at every other point in the container, so that the pressure variations remain the same



$P_1=1$

$P_2=3$

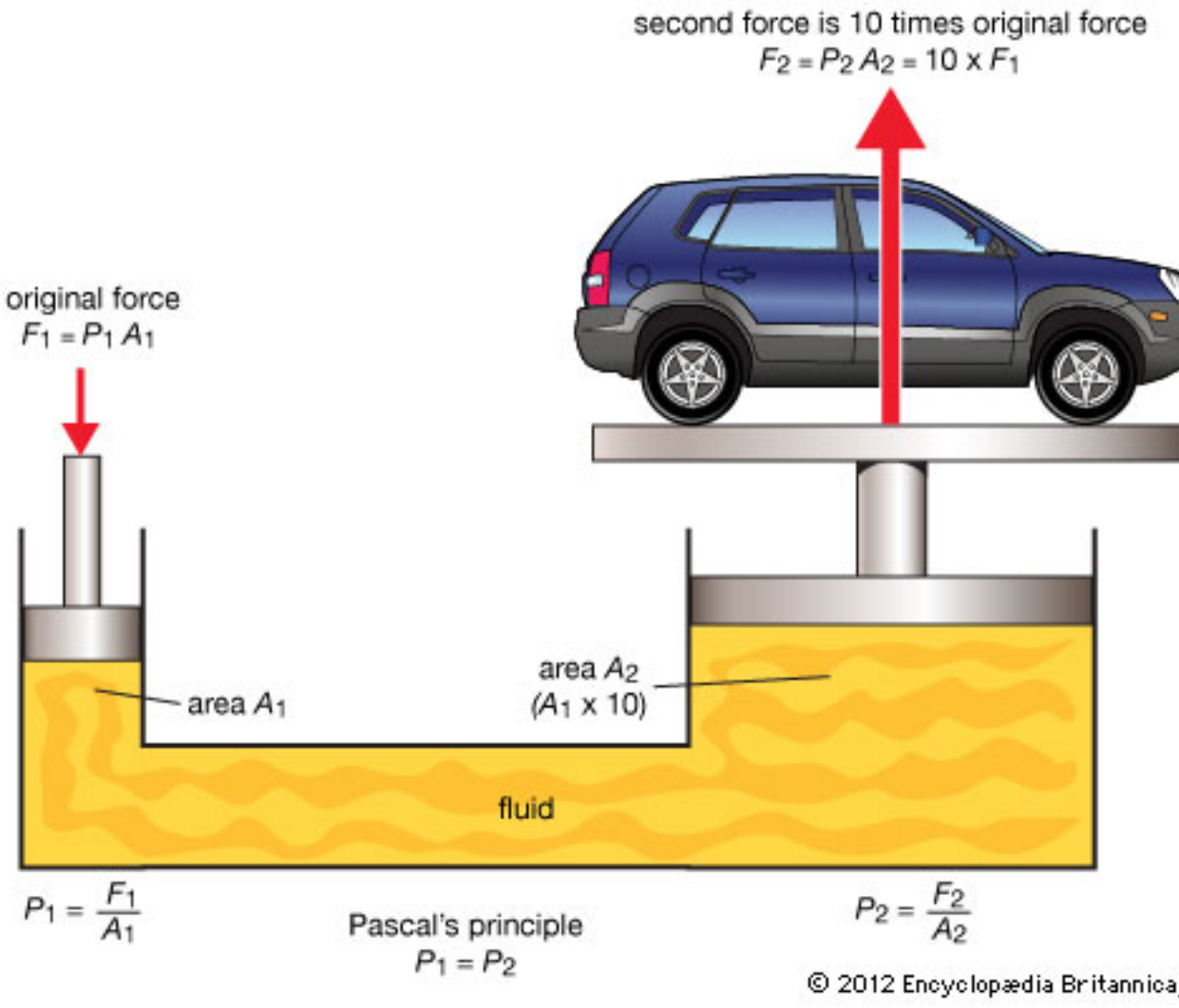
$P_3=5$

added pressure of **5** units

P1 = 1+**5**=6

P2 = 3+**5**=8

P3 = 5+**5**=10



Hydraulic Lift/Press invented by:

Joseph Bramah (1748 – 1814), at the time, an internationally famous English locksmith and inventor.