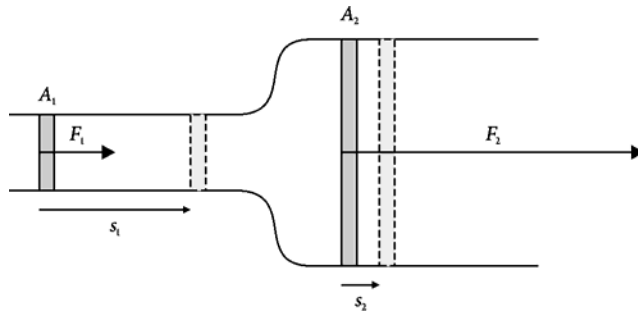


PASCAL'S PRINCIPLE

How does the pressure in different places of a liquid change when a force is applied at some place?



If the energy loss due to friction can be neglected, the work done by piston 1 equals the work done by piston 2:

$$W_1 = W_2$$

$$\Rightarrow F_1 \times s_1 = F_2 \times s_2 \quad (1)$$

Since liquids are (practically) incompressible, the liquid pushed away by piston 1 must equal the liquid pushed away by piston 2:

$$V_1 = V_2$$

$$\Rightarrow A_1 \times s_1 = A_2 \times s_2 \quad (2)$$

Dividing equation (1) by equation (2) yields

$$=$$

Using the definition of pressure, we finally get

$$=$$

PASCAL'S PRINCIPLE:

APPLICATION: HYDRAULIC SYSTEMS

A system of connected cylinders with different cross sectional areas filled with a liquid (usually oil) allows to transform forces.

$$p_1 = p_2 \Rightarrow \frac{F_1}{A_1} = \frac{F_2}{A_2} \Rightarrow \frac{F_1}{F_2} = \frac{A_1}{A_2}$$

The forces in a hydraulic system vary proportionally to the corresponding cross sectional areas.

EXAMPLES: