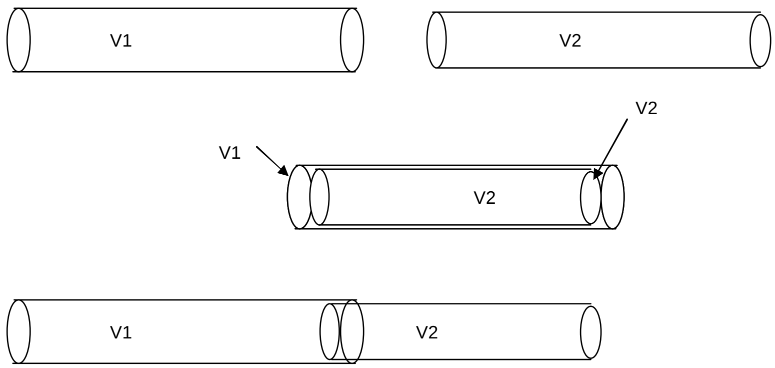
PUMPING WATER WITH ATMOSPHERIC PRESSURE



Consider two solid tubes of different volumes V1 and V2. The size of V2 is such that it is just enough to fit inside V1. When V2 is pushed inside V1, the net volume inside will be V2 and when V2 is pulled out of V1 upto the end, the net volume inside will be V1 + V2.

This principle can be used in a closed system to lift water as detailed in the following experiment :

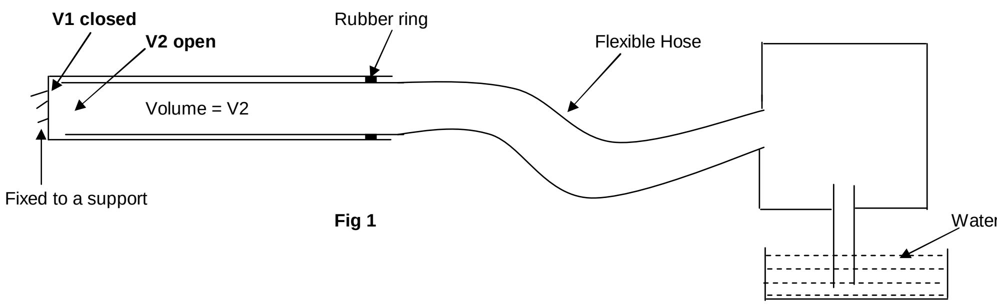


Fig 1

Close one end of tube V1 and fix a rubber ring on the other end. Insert tube V2 into V1 upto the end. Connect the outer end of tube V2 to a container using a flixible rubber tube. A small tube is provided at the bottom of container which is inserted into a jar containing water. (Fig1). The rubber tube should be strong enough to withstand drop of pressure and also flexible.

Now if the tube V2 is pulled out upto the rubber ring, the volume of the entire closed system goes up by V1 causing a drop of pressure inside the system. This makes external atmospheric pressure to push the water from jar to the container through the tube provided at the bottom. (Fig 2)

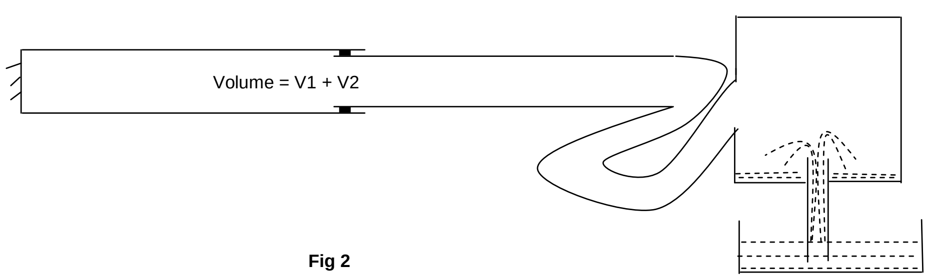


Fig 2

A very interesting point here to note is that work input to the system is only energy supplied to overcome friction between tube V2 and rubber ring which can be minimised using proper lubrication whereas the work out put will be done by enormous atmospheric pressure acting on water. Which means that work output is independent of work input unlike conventional reciprocating and centrifugal pumps which do work against enormous atmospheric pressure and thereby consume huge power. In the above experiment if one end of V2 is also closed (end inside V1) then you have to apply enormous force to pull it out of V1 since it will be doing work against external atmospheric pressure.