

## PUMPS FROM THE DUMP

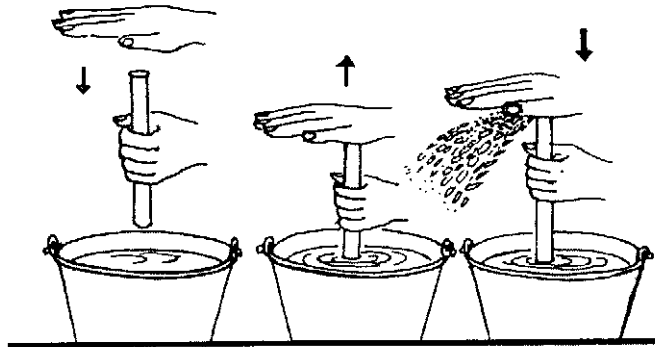
Arvind Gupta

Water pumps have been around for thousands of years. Early pumps were made with water wheels and chutes, and used to provide the energy to move the wheels. The Mesopotamians were responsible for the first pump around 3000 B.C. They used a wooden lever next to the water bank, with a counterweight on one end and a bucket on the other. When the pole was pushed down, the counterweight brought the bucket back up and it emptied into a trough.

Every multi-storey apartment has a pump on the ground floor which lifts water to the overhead tank. So what is a pump? A pump is a device to move fluids, such as liquid, gas or slurry.

One of the oldest pumps in the **Archimedes' screw** also called the screw pump. It has been used for transferring water from a low-lying body of water into ditches. The Archimedes' screw basically consists of a screw inside a hollow pipe. The screw is turned usually by a windmill or by manual labor. As the bottom end of the tube turns, it scoops up a volume of water. This amount of water slides up the spiral tube as the shaft is turned, until it finally pours out from the top of the tube and feeds the irrigation system. The screw pump was mostly used for draining water out of mines, boat bottoms and other low lying areas.

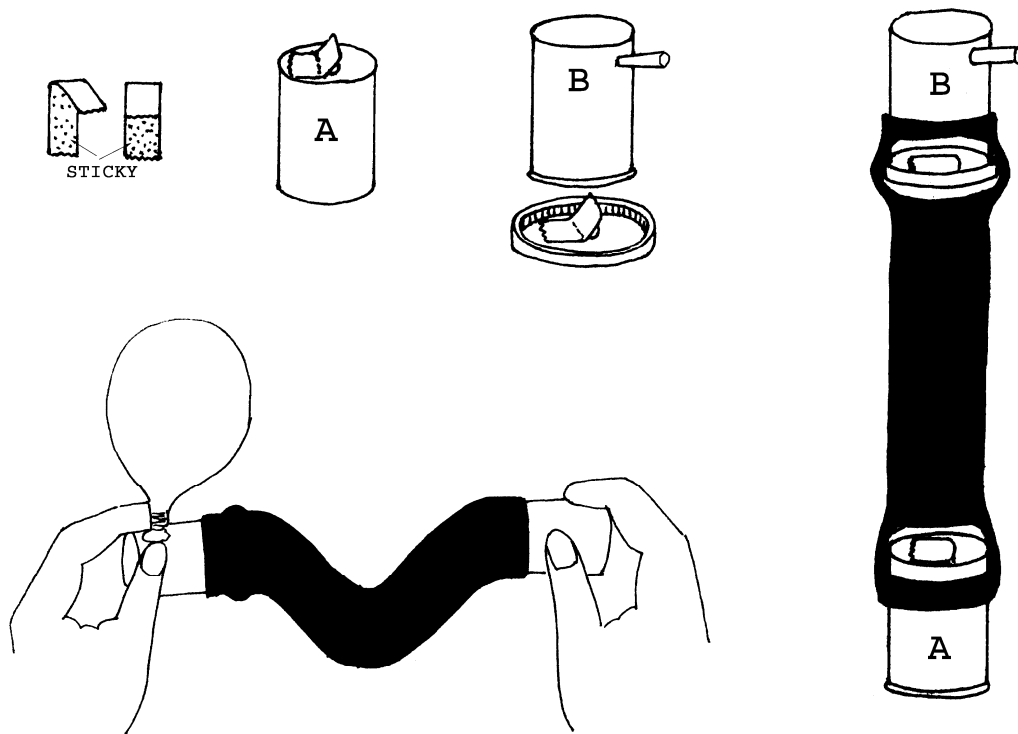
### Inertia Pump



One of the simplest pumps can be made from a 40-cm long PVC pipe used for piping in the home. Hold the pipe with your left hand and move it up and down in a bucket of water. Keep the palm of your right hand on the top of the tube and open and close it with each up and down reciprocation. Soon water will start squirting out. Here, the up-down motion of the pipe does the pumping while the right palm acts like a valve. Because you

use your hand as a valve it gives you a great feel of how a valve works. A valve is like a one way traffic light. It allows water to flow only in one direction.

### Balloon Pump



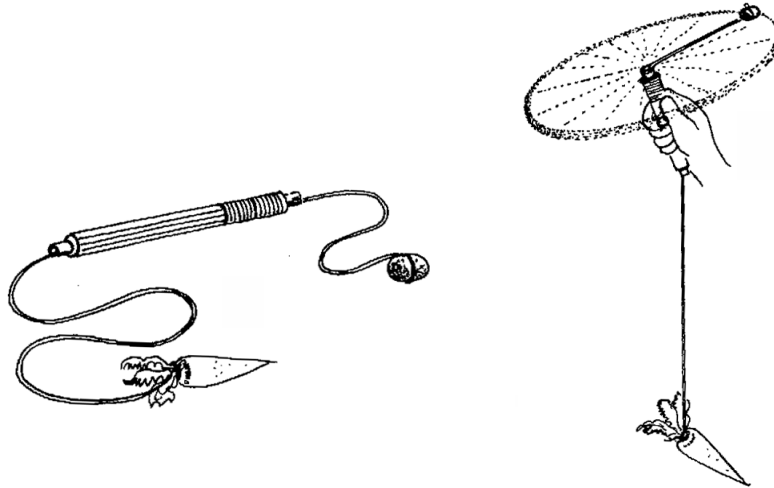
One pump which all children are familiar with is the Bicycle Pump used to inflate the cycle tires or the football. Children can make a similar pump at home to inflate a balloon. You will need two old film cans, 20-cm long old cycle tube, sticky tape and a 4-cm long piece of stiff straw.

Make a 1-cm diameter hole in the base of a film can (A). Take a 3-cm long sticky tape and fold 1-cm of the sticky part on to itself. Paste the sticky part to the bottle base such the non-sticky part covers the hole. The flap will open-close and become the **Suction Valve**.

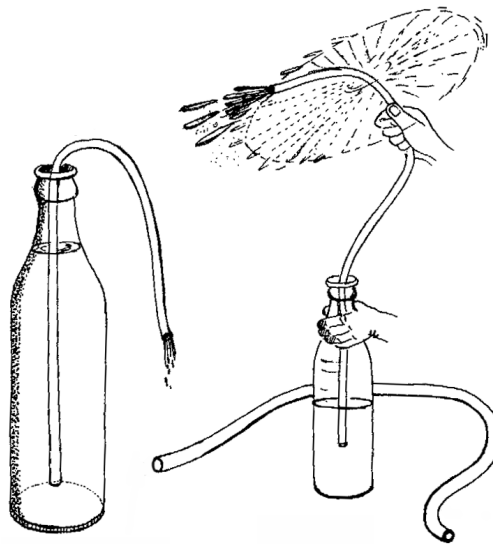
Similarly stick another tape on the hole of lid of film can (B) to make the **Delivery Valve**. Make a hole in (B) and press fit a 4-cm stiff straw to make the Delivery pipe.

Insert film can (A) from below and film can (B) from top tightly on a 20-cm long cycle tube. Fix a balloon on the Delivery pipe with a rubber band. On stretching and pressing the cycle tube like a bellows the balloon will get inflated. This positive displacement pump can easily POP a balloon!

## Centrifugal Pump



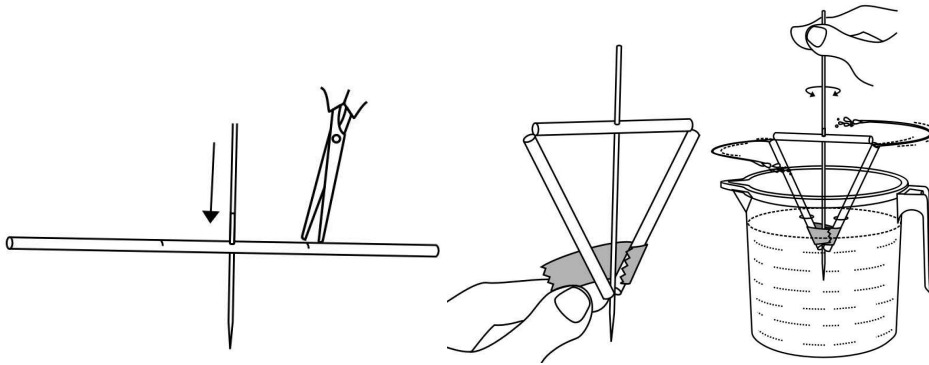
This is really a simple pump. To understand its working tie a carrot heavy weight (carrot) to one end of a meter long string. Weave the string through a ball pen body and tie a light weight (small potato) to the other end. Hold the pen and begin making circular motions such that the potato swings in a circle. As you increase the speed the carrot will rise. There is a force associated with the rotation of the potato. This force pulls the object away from the center and is called Centrifugal force.



You can make a centrifugal pump based on the same principle. Take a meter long flexible plastic tube and dip it in a bottle of water. Suck from the other end. When water starts flowing from the other end you start rotating the tube and slowly raise it. Water will keep

sprinkling out as long as you continue spinning the tube. This way you can drain out the whole bottle. The Centrifugal force of rotation is enough to suck and lift water from a height of almost half a meter.

### Straw Sprinkler



You can make an amazing sprinkler in less than 2-minutes using a straw, a broomstick and a little tape. Poke the straw in the centre of a plastic straw and make two half cuts 3-cm from the centre. Bend the arms into a triangle and tape it. Place the triangle in water and spin it to see water sprinkle all over. It is the most wonderful toy to play with on a hot summer day.

Talking about pumps we must not forget that the best and the most amazing pump is the human heart. The heart pumps 15,000 liters of blood through 90,000-km of blood vessels every single day. In a person's lifetime the heart would have pumped 300,000 tons of blood! Isn't that amazing!