

How to make a stirling piston engine

Learn about the principles of converting changes in pressure into movement using tin cans

Before you start

To carry out this activity safely, visit scouts.org.uk/safety

Suitable for Scouts

Preparation: can 1 (bottom can)

You will need: materials

- 1.5mm diameter steel wire
- 22mm PVC pipe elbow
- 4mm bolt, nut and 2 washers (about 10mm long)
- balloon
- CD
- double sided tape
- fizzy drinks can x 2
- lolly stick
- rigid wire
- plastic milk bottle top
- tealight candle
- wire wool

You will need: tools

- craft knife
- drawing pin
- drill
- lighter/matches
- sand paper
- scissors
- tin opener



1 Start with an empty drink can and, holding it securely, cut the top off at the largest width using the craft knife. Trim any rough edges away with scissors.



2 Using the other drink can, wrap sandpaper around it and press the 22mm PVC pipe elbow against it. Sand away the pipe until the shape of the can is formed into the end of the elbow.



3 Using double-sided tape, cover the formed end of the PVC pipe, leaving sufficient overlap to seal to the can. Using the craft knife, cut the inside of the double-sided tape to clear the pipe, leaving a seal on the edge. Adhere the elbow facing upwards onto the can. Its position should be about 10mm below the top.



4 Using a craft knife, cut through the wall of the can into the pipe. Taking extra care of any sharp edges, push the cut metal edges into the pipe using your fingers.

Preparation: can 2 (top can)



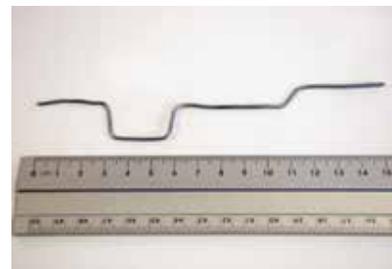
5 Using the tin opener, remove the top section of the can. The tin opener should cut inside the top edge, so no sharp edges stick out.



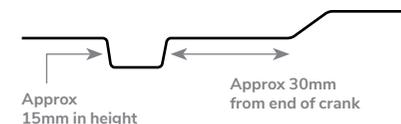
6 Holding the can securely, cut a large hole in the front of the can using the craft knife, to allow for access. Trim any sharp edges with scissors.



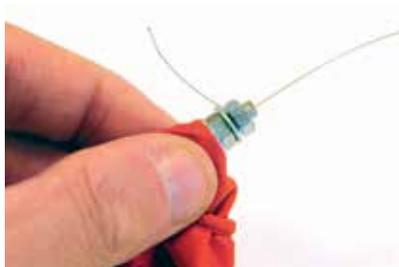
7 Using the drawing pin, pierce two holes directly opposite each other at the top of the can. Make another small hole in the base of the can, as central as possible.



8 Make your crankshaft: cut off a length of straight steel wire (Approximately 20cm). Using a pair of pliers, create a U-shaped 'crank' about a third of the way up the steel wire. A second crank needs to be added onto the crankshaft further along the steel wire at an offset of 45 degrees.



The first end of the crankshaft can then be trimmed shorter so it fits between the two holes in the top of can 2.



9 Cut the bottom off the balloon. Push the bolt and washer through from the inside at the centre. Add the second washer and tighten the nut. Connect the rigid wire to the end of the bolt using a double knot.



10 Make the connecting rod: cut the lolly stick down to approximately 25mm in length. Drill two holes at either end.



11 Make your flywheel: using the drawing pin, pierce a hole in the centre of the milk bottle cap and stick it onto the centre of the CD using double sided tape.



12 Make a displacer: Cut a piece of steel wire to approximately 25mm in length and tie a length of the rigid wire onto the centre of the steel wire. Wrap wire wool around the ends of the steel wire to create a small cylinder, keep adding wire wool until the outer shape is slightly smaller than the inside of Can 1. When complete the displacer should be able to move up and down inside the cut can using the rigid wire.



Assembly



13 Fit the balloon over the PVC pipe elbow and secure it in place using the end of the balloon like an elastic band.



14 Being careful of any remaining sharp edges, insert the fishing line connected to the displacer through the pierced hole in can 2.



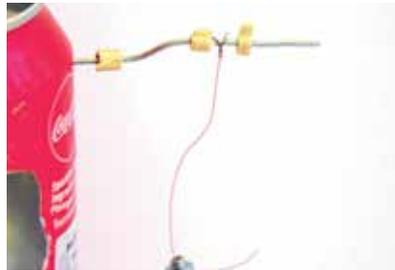
15 Loop the lolly stick onto the crankshaft and position the crankshaft through the two holes in can 2.



16 Tie the fishing line from the displacer onto the bottom hole of the crankshaft. This must be tied ensuring that the wire wool does not clash with the bottom of can 1 or can 2 when in motion.



17 Push the base of can 2 into the top of can 1. Take care not to depress the can too hard as this may cause the can to tear.



18 Tie the fishing line from the balloon onto the second crank of the crankshaft.



19 Push the flywheel onto the crankshaft, positioning the CD first.



20 Place a small section of double-sided tape inside the milk bottle cap and then bend the end of the crankshaft inside the cap and press it against the tape to secure it. Trim the crankshaft if it is too long.

Operation

