

STEM ACTIVITY: POWERING STEAM ENGINES

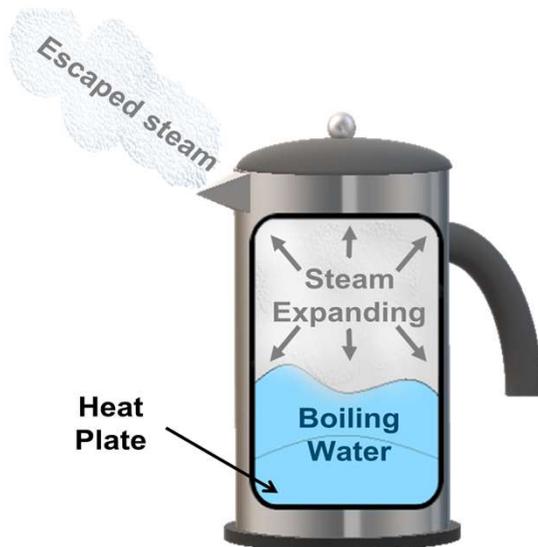
Powering Steam Engines

Purpose of Activity:

To discover how gases behave when heated then cooled back down.

Introduction:

Have you noticed the speed of steam that rises when you boil a kettle? Why does that happen and can engineers harness (use) this energy?



When water is heated to 100°C , like in a kettle, it turns into a gas: steam. That steam is forced out of a small gap, the pour hole, because the volume of the gas will increase as the temperature increases, aka gas expands when it is heated!

Engineers use the steam to power pistons, moving pumps up and down or rotate a shaft allowing wheels or propellers on a boat to turn.

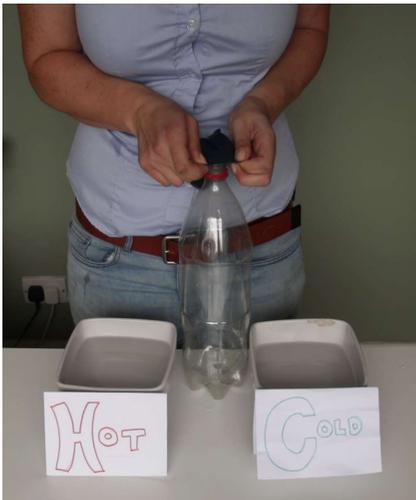
Equipment

- Bowl of cold water
- Bowl of very hot water (with adult supervision)
- A sturdy plastic bottle 1.5-2 liters
- A balloon



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Instructions:



1. Have a bowl of cold water and a bowl of very hot water (with supervision) and fit a balloon to the neck of the bottle.



2. Place the bottle into the hot water and watch the balloon expand

Why has the balloon expanded?



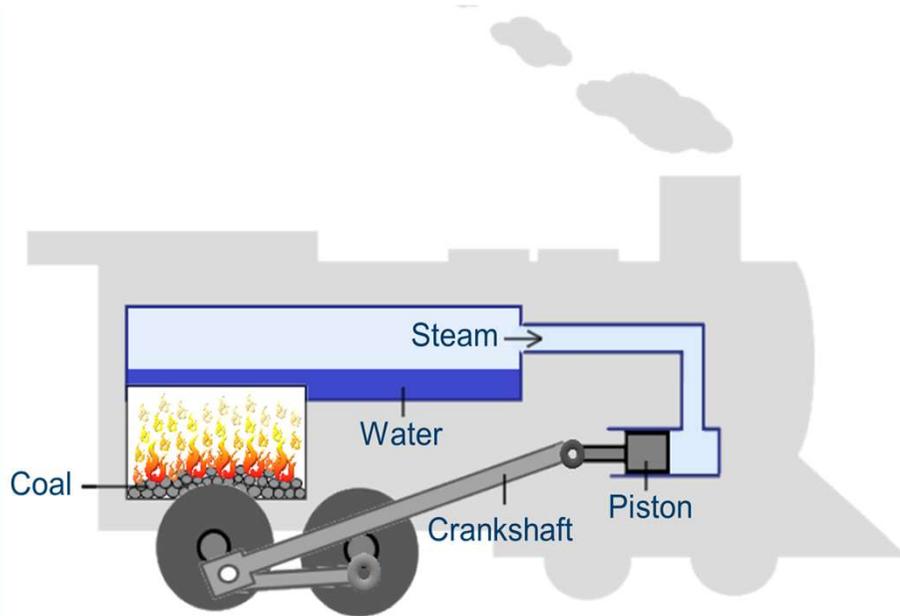
3. Move the bottle over to the cold water.



4. Put the bottle into the cold water and watch it deflate.

Why has the balloon deflated?

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Find out more at

<https://www.britannica.com/technology/steam-engine>

<https://wonderopolis.org/wonder/what-is-a-steamboat>

This is how steam engines operate, whether to power locomotive or boats:

- A coal furnace heats up the water in the boiler creating steam, like a giant kettle.
- There are tubes running from the furnace to the chimney, carrying the heat and the smoke of the fire with them - *these tubes go through the water tank helping to create steam more efficiently.*
- As the steam expands the pressure increases to very high levels causing it to travel through cylinders pushing the piston. An inlet valve, controlled by the piston position, lets in the steam.
- When the piston has reached the end of the cylinder, the crankshaft continues with the wheel motion causing the piston to be pushed back into the cylinder the way it came, causing the inlet valve to close.
- At the same time, an outlet valve opens and the piston pushes the steam back through the cylinder and out up the chimney.
- The chuff-chuff-chuff noise and the puff-puff-puff of smoke happen when the piston moves back and forth in the cylinder.