



Children's Activities

Combe Mill Learning



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Children's Activities

Changing states of water and the power of steam

Clocks and use of levers and gears

Carpentry/pattern workshop and use of pulleys,
levers and gears

Exploration area

Forge and temperature

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Combe Mill Learning



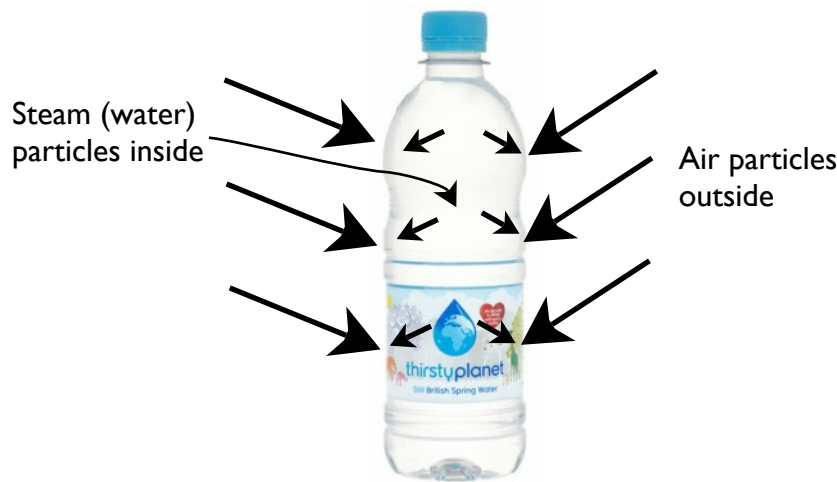
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CHANGING STATES OF WATER AND THE POWER OF STEAM

1. Use the steam pressure cleaner to replace the air with steam in a plastic bottle and seal.

This demonstrates that steam particles (gas particles) have lots of energy, move fast, fill all the internal space and collide with each other and the walls of the bottle.

These particles exert an internal pressure. The bottle does not explode because air (gas particles) outside the bottle collides with the wall and matches this pressure.



2. Spray the sealed bottle with cold water

Rapid cooling removes energy from the steam particles. They slow down and **CONDENSE** back into a small space as water (liquid). **THE REMAINING SPACE IS VACUUM**

The outside air (gas particles) still collide with the walls, but now this pressure is greater than the inside pressure.



RESULT: THE BOTTLE WALLS ARE PUSHED IN

Beam engine demonstration

THE BEAM ENGINE WORKS IN THE SAME WAY AS THE PLASTIC BOTTLE DEMONSTRATION

Steam is condensed on one side of a piston using a spray of cold water; this creates a vacuum. The piston is moved into this vacuum by the pressure of more steam on the other side.

CHILD ACTIVITY:

Each child to use a straw to move the piston. Who can blow and suck the fastest?

Blowing air particles mimics steam pushing a piston into a vacuum.

ENGINE MODELS:

Using the compressed air pump to demonstrate the engine models - (high energy gas particles to mimic steam but safer!)

CHILD ACTIVITY:

Ask the children to explain what is happening with each model.

Taking it further - why do steam particles exert pressure but water and ice do not?

Steam particles have no attraction to each other and move freely; water particles have more attraction but can still move around; ice particles have very strong attractions and are fixed.

CLOCKS: USES OF LEVERS AND GEARS

Child activity

1. Choose one child to wind the toy clock a quarter turn.

There is nothing to stop the energy being released all at once unlike the pendulum clock.

2. Choose one child to pull down on the winding lever on a clock.

A lever allows a force to be moved with less effort but over a larger distance.

3. Choose a child to gently start the pendulum swinging.

This allows the energy to be released one tooth at a time by the 'escapement' wheel.

4. All children to estimate the period of the pendulum - a period is one forward and one backward swing

: It is about 2 seconds; this keeps the clock hands moving accurately.

: The tick-tock sound is the escapement wheel releasing the tooth!

5. Ask the children where the energy comes from to turn the clock hands

: Food >> arm muscle >> lever >> stored potential energy in the raised stone weight >> controlled release by the 'escapement wheel' >> gears that drive the clock hands.

Demonstration

Gently lift the lever on the chime mechanism of the corner clock

See how the gears transfer the energy to the chime.

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CARPENTRY/PATTERN WORKSHOP

Children's activities

- 1. Children can become an apprentice and wear a carpenter's newspaper hat and dress in Victorian clothes**
- 2. Ask the children to go slowly through the Carpentry area and tell you what was made here**
: Wooden patterns for casting metal objects; farm gates; cartwheels; tool handles; furniture for the Palace.
Point out the large cartwheel and its felloes and spokes; hand out the decorated spokes.
- 3. Children to work out how all the carpentry tools are powered**
: A series of pulley wheels connected to the line shaft below and driven by leather belts
- 4. Demonstrate the band saw and show how it can make curved felloes**
- 5. Team game: who can remake the model gate and cartwheel fastest?**
- 6. Pairs to operate the Treadle Lathe with careful supervision**
Give out handfuls of sawdust: ask where it came from and what uses it has
: Sawdust is made when wood is turned or sawn; used for animal bedding
- 7. Children handle the wooden objects on display; point out where they are 'turned'**
- 8. Pairs use the wooden gear Pattern to make a mould in the sand. Ask who can work out why the pattern and actual gear are different sizes.:** Show the expansion rule and discuss the contraction of molten metal as it cools in the mould.

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EXPLORATION AREA

Children's activities

It is best to choose a few activities and work as a group. Please tidy up after your session.

1. Pulley Challenge

Use the pulley board and explain how a pulley can be made to turn twice as fast.

: The ratio of diameter of driving pulley to driven pulley is 2:1

Find pulleys used in the Carpentry area and explain why they are used.

: They transfer energy from the line shaft (a distance away) to the machines.

Display pulley - supervise each child lifting the weights by hand compared to using the pulley.

: Pulleys can be like levers to lift loads using less effort but for a longer distance.

2. Maths Challenge

Use the balance and three known weights to find the unknown weight of two bags - answer 40g and 80g.

Wooden puzzles - teams race to finish first!

3. Gear Challenge

Use the wheels in the big wooden box to make gears of different ratios.

Find gears used in the Carpentry area and work out their ratios.

4. K'Nex Challenge

Copy or design your own model.

Waterwheel challenge: judge the best outside with water from the bucket!

5. Artefacts Board Quiz

Can you match the objects to the names on the list?

Children's activities continued

6. Inventions Timeline

Let groups of children take turns to see if they can arrange the wooden blocks into the order in which the inventions depicted were made.

7. Typewriters

Supervise each child typing their name and a message to the Mill volunteers.

8. Dressing up

Encourage the children to dress up in the waistcoats and flat caps and become Victorian apprentices.

9. Bimetallic dial and oven thermometer using hair drier

Supervise children to use the warm air of the hair dryer to see a bi-metal strip uncurl as it gets warmer and how this effect has been used to make an oven thermometer.

10. Sound Sense Game

Engine drivers have to listen carefully when controlling the steam - can you?

Shake the sealed wooden boxes and guess each of the contents by their weight, sound and 'feel'.

BLACKSMITHS' FORGE

Child Activity

1. Test your knowledge of typical temperatures

: Arrange picture cards in ascending order of temperature

2. Find and count the number of gear wheels in this area (they have teeth and are touching)

3. Find and count the number of pulley wheels in this area (they have belts and do not touch)

4. Spot the bellows that bring air (oxygen) to the fire to make it hotter

5. Follow the line shaft from the water wheel

Follow it from the beam engine - is it the same line shaft?

: Yes, the same line shaft can be either driven by the waterwheel or the beam engine

6. Find the belt that passes up to the Carpentry Workshop - what makes it turn?

: The pulley on the line shaft beside the forge is connected by a belt that goes upstairs to the carpentry shop

7. Can you identify a stone for grinding grain and a stone for sharpening knives?

: You can see the whetstone used to sharpen edge tools and a corn mill stone for grinding animal feed

8. Match the names of blacksmiths' tools with their picture

: Use the picture cards as your prompt

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