

WARWICK CASTLE



Key stage 3&4
Lighting the Castle



- 1421**
Earl of Warwick supervises trial of Joan of Arc
- 1445**
Henry de Beauchamp becomes Duke of Warwick
- 1449**
Richard Neville becomes Earl of Warwick
- 1471**
Richard Neville (Kingmaker), dies at the Battle of Barnet
- 1478**
George, Duke of Clarence imprisoned and killed
- 1540**
Further development at the Castle - including a new roof for kitchens and building of the spy tower.



The Earls of Warwick



De Newburgh



Duplessis



Maudult



De Beachamp



Neville



Plantagenet



Dudley



Rich



Greville



The development of the Mill

PRE VISIT ACTIVITIES:

Explore the sources of power that would have been used throughout the Castle's history. As a starting point get pupils to discuss how the Castle would have been lit.

DURING THE VISIT:

This section uses the Mill and Engine House attraction at Warwick Castle.

Since the 15th Century the mill used the power of the water running along the River Avon, dropping from the weir, to grind grain. In the late 19th Century that same hydro power was harnessed by the engine house to generate electricity for the Castle.

The development of electricity was exciting and life changing. The Earl and Countess were keen innovators of their time who wanted the prestige and luxury that its installation would bring. The 19th Century Mill and Engine House have been carefully restored so that it can be seen how electricity arrived at the Castle.

BRIEF HISTORY OF THE MILL

c. 1398 The Mill is built on this site as it was easily protected. The weir is constructed to control the flow of water to the wheel. The Mill's sole purpose was to grind grain for flour.

1642 During the Civil war the Mill is kept busy feeding the garrison. An engine house is built to pump well water to the courtyard.

1880 An overnight fire breaks out in the Mill and Engine House. By seven o'clock the next morning the Mill is gutted. The Castle windows above had cracked in the heat. Flour milling on the site comes to an end.

1894 Francis, the new Earl of Warwick installs electrical equipment, which is driven in part by the water wheel and river, helping supply the Castle with energy for the modern age.

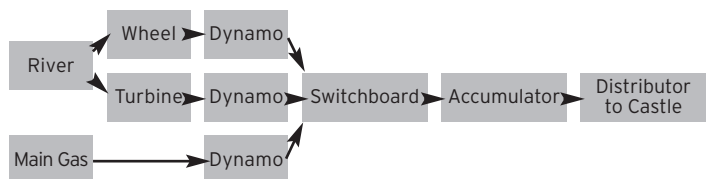
1940 Mains electricity reached Warwick. The generating plant can still be operated but is only used as a stand by facility. In 1954 the equipment is dismantled and the building stands empty.

2002 Warwick Castle restores the Mill and Engine House to its former glory to show visitors how it used to work.

HOW THE MILL GENERATED ELECTRICITY

Electricity was generated from two sources: water from the river and gas (in emergency or times of drought).

Originally a turbine was powered by water from the river. This in turn drove the dynamo to produce electricity. Energy from the river was also harnessed to turn the water wheel which turned a dynamo. In times of flood or drought a gas engine was used to drive a dynamo. The dynamos produced electricity which was then stored in a lead-acid accumulator (batteries).



TIPS FOR A SUCCESSFUL VISIT

The Mill and Engine House has wheelchair access. There are two access routes to this attraction, one of which, leading up from the river is suitable for wheelchair users. As with the rest of the Castle, pupils need to be accompanied at all times and teachers need to take extra care and attention beside the fast flowing river.

The best way to enjoy the Mill is to split your group into smaller groups of 10-15.

Worksheets 1, 2 and 3 are to be used on site at the Mill and Engine House.





The development of the Mill

THE WATER WHEEL

Standing on the wooden platform leading to the Mill answer the following questions:



1. What can you see from the platform?

2. Where is the river flowing fastest? Why?

3. What can you hear while stood outside?

4. Draw a diagram of the wheel. Label the flow of water and the direction in which the wheel rotates.

5. What is the Water wheel made from?

6. What did it used to be made from?

7. Why do you think the material was changed?

8. Look for the storm sluice gate. What is it for?

9. What is caught in the traps?



Teacher notes to Worksheet 1

Answers to Worksheet 1

This work sheet is to be completed outside the Engine House on the wooden platform looking at the Waterwheel. If you come down the steps this is the first area you come to.

1. What can you see from the platform?

The waterwheel, the eel traps, the weir, the bridge and the boathouse on the river bank.

2. Where is the river flowing fastest? Why?

The river flows fastest over the weir, as it is a drop (deliberately constructed to increase the flow of water)

3. What can you hear?

This should be significantly less than once inside the Engine House.

4. Diagram of wheel. Label flow of water and direction of wheel rotation.

Pupils' own drawing

5. What is the waterwheel made from?

Iron

6. What did it used to be made from?

It was originally an iron frame with wooden panels

7. Why do you think the material has changed?

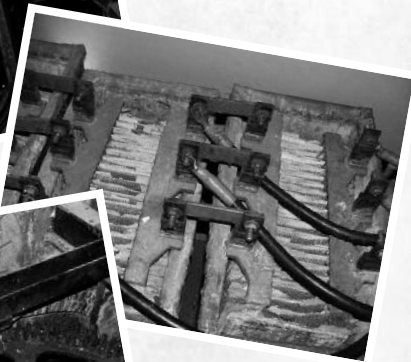
It did not need to be replaced as often - wood rots.

8. What is the storm sluice gate for?

It helps control the river levels in times of flood. It is also used to catch eels with the eels trap.

9. What is caught in the traps?

Eels





The development of the Mill

The Battery Room

THE WATERWHEEL AND CHEVRON GEAR WHEEL.

Using the white markers to help you, count the number of turns the small wheel makes to one of the larger wheel's turns. (Ask the guide where to stand if you cannot see the markers)

THE USE OF ELECTRICITY IN THE CASTLE.

1. When did they first use electric light in Warwick Castle?

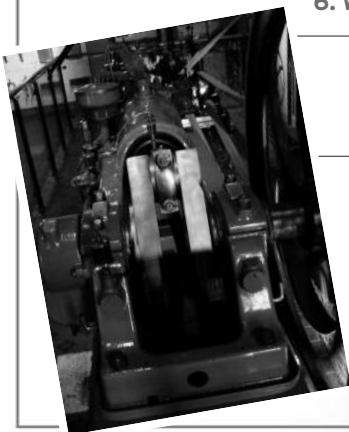
2. The child's electric car was powered by a battery.
What other vehicle was also powered by a battery?

3. Draw a picture of a battery.

4. How is it different to the batteries we use today?

5. Why is there a gap under the door?

6. What was the water pump used for?



Teacher notes to Worksheet 2

Answers to Worksheet 2

This worksheet is to be completed in
the Battery Room.

THE WATERWHEEL AND CHEVRON GEAR WHEEL

The smaller pinion gear turns approximately seven times to the one turn of the larger Chevron Gear Wheel.

THE USE OF ELECTRICITY IN THE CASTLE

1. When did they first use electric light in Warwick Castle?

1894 the electricity generating plant was installed. In December the work was completed and 475 bulbs on strings were lit to the delight and surprise of Daisy on her birthday celebrations.

2. What other vehicle was also powered by battery other than the child's electric car?

An electric launch. This luxurious launch was powered by a number of batteries which were recharged in the Mill.

3. Draw a picture of a battery.

Pupils' own drawings

4. How is it different to the batteries we use today?

Pupils' own thoughts.

5. Why is there a gap under the door?

The lead plates in each of the batteries were immersed in diluted sulphuric acid. The gap under the door allowed the fumes to escape.

6. What was the water pump used for?

The pump took water from the River Avon to a cistern in the courtyard and provided water for the Castle's fire hydrants as well as the town's fire engines. The pump was powered by electricity.





The development of the Mill

THE ENGINE ROOM



1. Which rooms in the Castle were lit with electric lights?

2. Why would you want to change the setting from WATER to GAS?

3. What material is the drive belt made out of and what material was originally used?



Teacher notes to Worksheet 3

Answers to Worksheet 3

1. Which rooms in the Castle were lit with electric lights?

The Engine House, Servants' Hall, Library and Cedar Drawing Room.

2. Why would you want to change the setting from WATER to GAS?

There were times during droughts and floods when there was either insufficient water or difference in the levels above and below the weir to turn the waterwheel or turbine to the speed required. In such circumstances power was generated from the gas engines.

3. What material is the drive belt made out of and what material was originally used?

Originally the long continuous piece of leather for the drive belts came from giraffe neck. It was gradually replaced by cotton or linen webbing treated with rubber solution, which was cheaper, more resistant to the damp and not so hard to find!

POST VISIT ACTIVITIES:

• **Discussion:**

Discuss how the coming of electricity to the Castle would have impacted on the lives of those living in the Castle (both the family and the staff).

• **Technology/Investigation:**

Build you own Waterwheel. In pairs or groups ask pupils to build their own waterwheel. They can investigate which is the best material to use and the optimum amount of paddles. Warwick Castle would welcome any pictures!

• **Science:**

Ask pupils as individuals or pairs to construct an electric circuit to light a bulb. Extension work could include additional bulbs, switches, conductors and insulators.

