THE INDUSTRIAL REVOLUTION

A resource pack that can be used to investigate the key inventions and innovations of the Industrial Revolution

Subject	History
Topics Covered	Major innovations and inventions of the Industrial Revolution
Inquiry Questions	What were the key inventions and innovations of the Industrial Revolution? Who were the key inventors of the Industrial Revolution?
Pages	16

Ned and Kelly

Hi my name's Ned and this is my mate Kelly. We live in Australia and together our names form the name of one of Australia's most famous bushrangers – Ned Kelly. Kelly's my best mate now but it wasn't always the case. We were both at the same school for four years before we spoke to each other for the first time; here is why we did.

One Friday, in grade four, we both got detention for not doing our homework and strangely enough we both had the same excuse. We didn't do it because we had a History project on explorers and we both preferred working on that instead. Our teacher made us write out *We love homework* 100 times. By the end of it my hand was sore and I still liked History better.

Anyway the point is, this shared experience got us talking and we quickly learnt that we both LOVE History and we thought that if he both liked it so much that there might be others out there who did also, so we decided to form a club. Because it was a History club and because it was a History project on explorers that brought us together, we decided to call it the History Explorers Club.

We meet the first Friday of the month in our classroom and we share different stories from History. We've also done some other things like hosting a History day at school. Everyone had to dress up as someone they admired from History. The principal (who is a man) dressed up as Queen Elizabeth I. He said he thought she was a great leader, just like him…. His wig kept falling off all day, it was hilarious.

We're always looking for club members so if you love History as much as we do, you might like to join our club. If you do you can download the club certificate to prove that you are a fair dinkum, true blue History explorer!

Time to stop talking now and get stuck in, in other words – let's explore!

Teaching Notes

Pack Contents

The resource pack contains the following:

Information Sheets

- The flying shuttle
- The spinning jenny
- The water frame
- The steam engine
- Crompton's mule
- The power loom
- The cotton gin

Activity Sheets

Use Your Noggin	Questions and activity suggestions designed to help your students 'use their noggins' and reflect on the information sheets. *Note– 'noggin' is Aussie slang for brain.*
KW Chart	Use this chart to record what the students **K**now about the inventions of the Industrial Revolution and **W**hat they would like to know. Have them develop questions to guide their investigations.
Matching Activity	Match the inventors, inventions and dates to each other.
Who? What? etc	Pick an inventor and write down the Who? What? Where? When? Why? of their inventions.
Crossword	Answer the questions to fill in the crossword.
P.M. Chart	Pick an invention and write down the benefits (plus) of the invention and the negatives (minus) of it. Consider different perspectives when filling out the chart. How would a factory owner feel about the invention as opposed to a farmer, a factory worker etc.

1733 – THE FLYING SHUTTLE

Invention: The Flying Shuttle

Invented: 1733

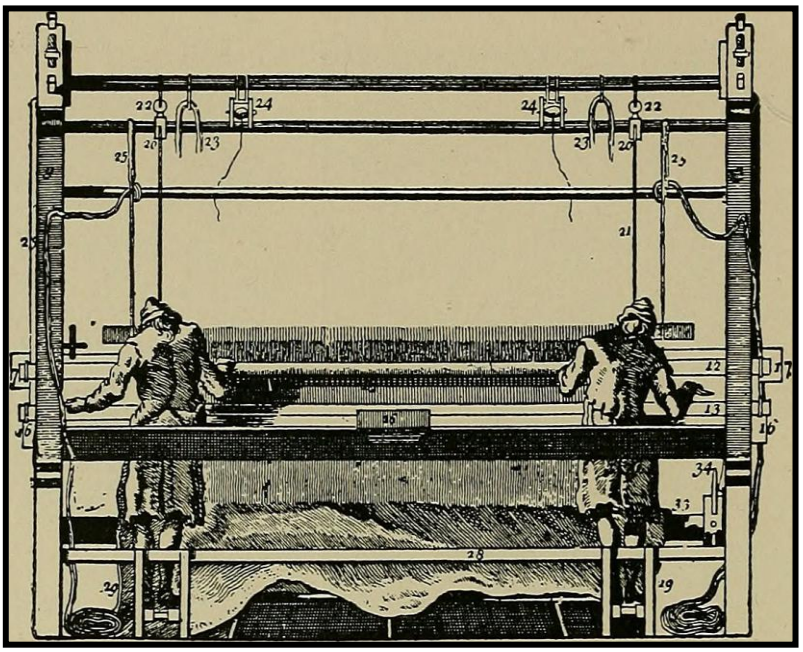
Inventor: John Kay

Purpose: To weave thread quickly

What did it replace: Hand weaving

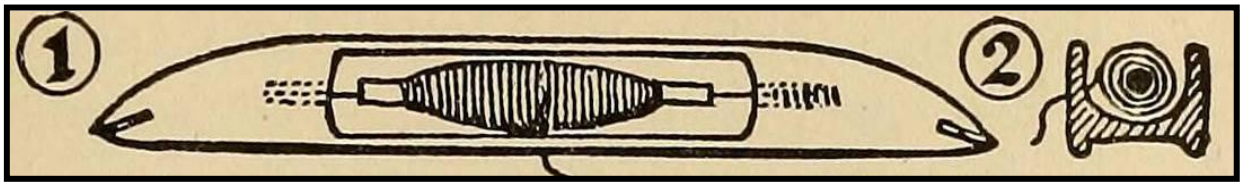
Note: No factories yet

For centuries, weaving thread into cloth had always been done on a loom. Cloth was woven by threading yarn horizontally through vertical strips of yarn. Before the flying shuttle was invented, the shuttle (which held the yarn) had to be hand thrown or passed through the vertical threads by hand. If the cloth was very wide, like the one in the image, two people were required to weave, one on each side of the cloth.



One day Kay had a bright idea – as all inventors do - and he placed the shuttle into a box on a horizontal track. With the pull of a cord the box containing the shuttle could be projected from one side to the other and 'wallah' the first mechanised loom had been invented.

It was an important invention because it allowed one person to weave fabric of any length and it made the process much, much quicker. People soon became redundant in the weaving process as they were replaced by machines which essentially pulled the cord and threw the shuttle from one side to the other at an even quicker pace.



1764 – THE SPINNING JENNY

Invention: The Spinning Jenny

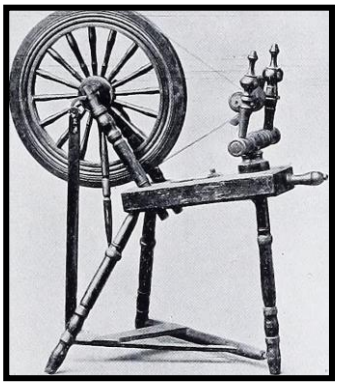
Invented: 1764

Inventor: James Hargreaves

Purpose: To spin more yarn more quickly

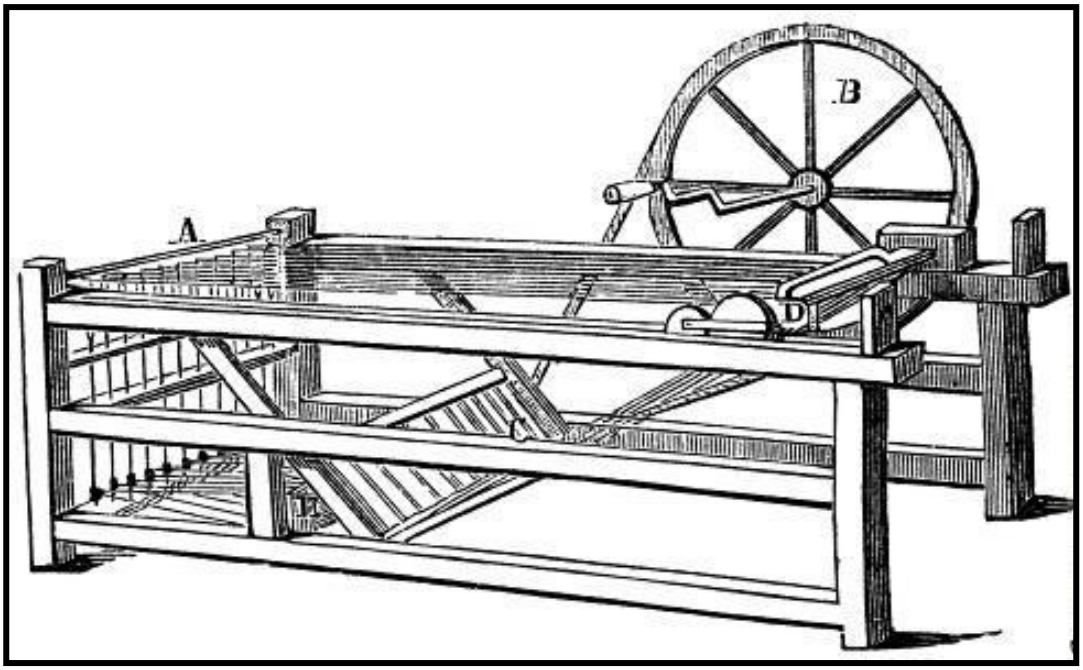
What did it replace: The spinning wheel

Note: No factories yet



The flying shuttle was great but it caused a problem; a shortage of yarn. Before the spinning jenny, yarn was produced on a spinning wheel, just like the one in this photo. People would take raw material, generally wool, and spin it into threads or yarn which was then woven into cloth on a mechanised loom using the flying shuttle. The problem was a spinning wheel took a long time to produce one spool of yarn and the flying shuttle used a lot of yarn.

In 1764, a man named James Hargreaves overcame this problem when he invented the spinning jenny. The spinning jenny enabled people to spin more yarn more quickly. In fact a spinning jenny could spin up to 120 threads at once. While this may have been the answer to the manufacturers' dreams, the weavers were not happy. In 1768 a mob of domestic spinners, fearing the jenny would put them out of work and unhappy with Hargreaves for inventing this evil monster of a machine, stormed Hargreaves home. He fled and they wrecked the place.



1769 – THE WATER FRAME

Invention: The Water Frame

Invented: 1769

Inventor: Richard Arkwright

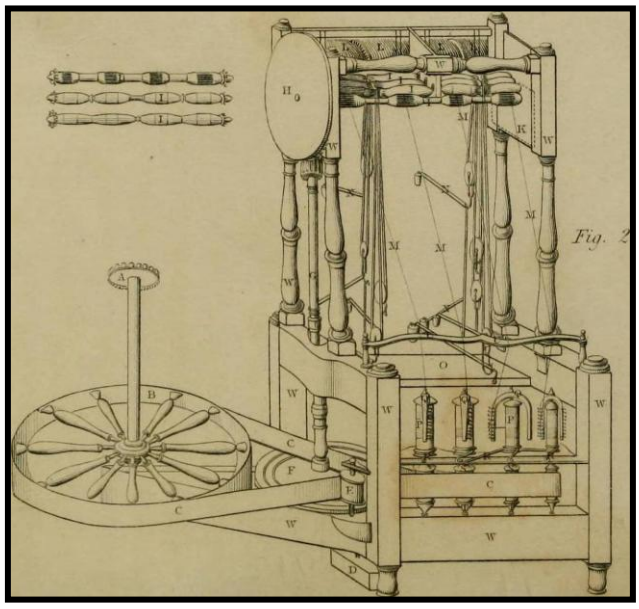
Purpose: To spin more yarn more quickly than the Jenny

What did it replace: The Spinning Jenny

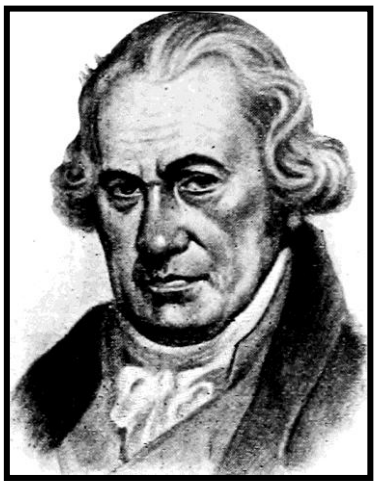
Note: First factories built near streams and rivers to house water frames. Factories are another Industrial Revolution innovation.

The spinning jenny was good but it wasn't good enough. Its main problem was that the thread it produced wasn't very strong. Richard Arkwright thought he could do better and in 1769 he patented an invention called the water frame. Arkwright must have had his boring hat on the day he named it because the name is, quite frankly, boring. His neighbours had a much better name for it. They called it the 'Devil's Bagpipes' because it was EXTREMELY noisy. So why did Arkwright give it such a boring name? Simple really, it was powered by water.

Because they were so big, so noisy and because they required water to run, the water frame was obviously not suitable for domestic use so in 1771 Arkwright built the first cotton mill in the world to store them in. This mill was built in Cromford, England and was the world's first factory. Arkwright employed over 300 people to work in his dreary mill, many of whom were children. Work in the mills was a whole family affair and in Arkwright's mills children often spun the thread on the water frame while their parents weaved the thread into cloth using looms with a flying shuttle. This was revolutionary – pardon the pun. Dicky was a genius. No-one had done this before. As a result he is remembered as the 'Father of the Factory System'. However, not only was he the first man to build a factory he was also one of the first people to spin a relatively new raw material – cotton – into yarn. Before cotton, wool was the dominant fibre. Before long he was mass producing cotton yarn, something which had never been done before.



1775 – WATT'S FIRST EFFICIENT STEAM ENGINE



Invention: The Steam Engine

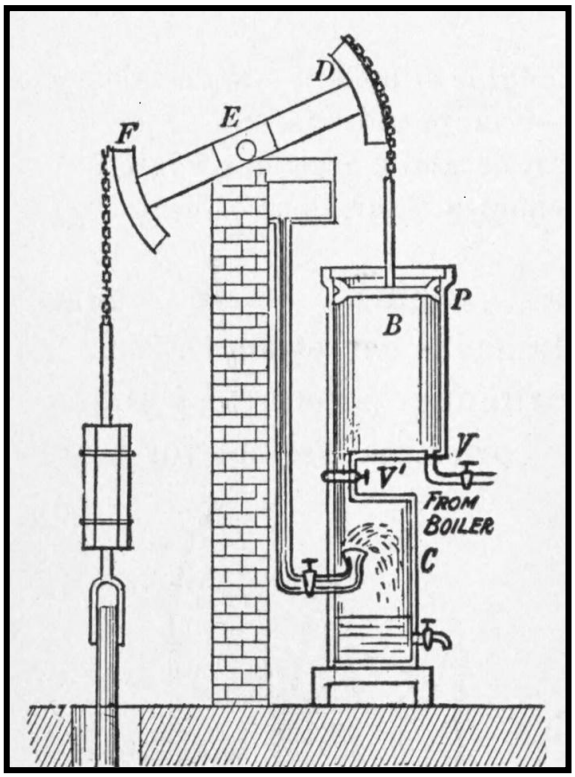
Perfected (not invented): 1778

Inventor: James Watt – what!

Purpose: To produce more power than the water wheel

What did it replace: The water wheel

Note: If a textile manufacturing machine could be invented that harnessed the power of steam rather than water then factories could be located away from water sources.

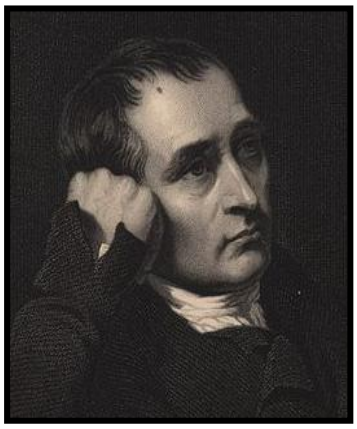


Before the steam engine, power came from three main sources: humans, horses and water. Wind energy was also sometimes used but not often. Watt's steam engine was first released in 1781 by the firm Boulton and Watt. Watt designed the machine; Boulton provided the money for the venture. Watt didn't actually invent the steam engine. The benefits of steam as a source of power had been known for hundreds of years. What Watt did was perfect the many attempts at harnessing its power. In other words he looked at what other people had invented and improved upon it.

Before the steam engine, factories relied upon water power and so were built near streams. Water power was not always dependable and so factory owners were on the lookout for an alternative. Steam engines powered by coal were more reliable and once a machine that harnessed steam was invented, factory owners across England quickly replaced water power with steam power. For Watt and Boulton factory machines were only the start of it. Soon their invention was powering railway locomotives and steamships which carried goods, raw materials and people around the world.

James Watt coined the term horsepower to compare the power of his newly invented steam engine with the power of draft horses. Watt worked out how much power a horse could produce and then used this as his standard for 1horse power (Hp).

1779 – CROMPTON'S MULE



Invention: Crompton's Mule

Invented: 1779

Inventor: Samuel Crompton

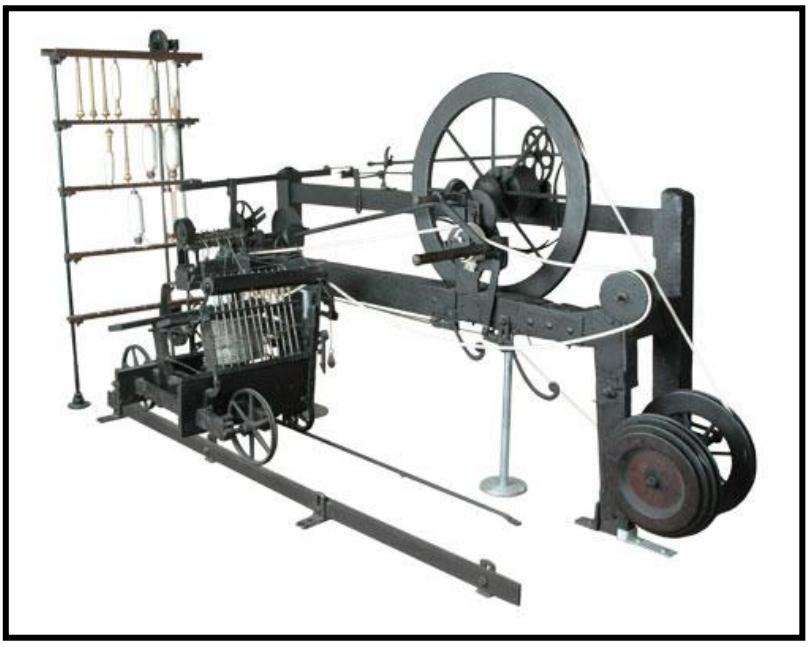
Purpose: To spin yarn quicker and stronger than the jenny or the water frame

What did it replace: The spinning jenny and Arkwright's water frame

Note: Crompton's mule used steam power rather than water power. This was the first time steam powered machines were used in factories.

Samuel Crompton lost his father when he was a young boy and therefore had to help support his family financially which he did by spinning yarn on Hargreaves spinning jenny. As a result he became familiar with the deficiencies of the jenny and for several years he secretly worked at devising another more efficient spinning machine which included the best of both the jenny and Arkwright's water frame. In 1779 he believed he had achieved this with the mule. Crompton called his new machine a mule because a mule is the offspring or combination of two different animals: a male donkey and a female horse. Crompton's invention in turn was the combination of two inventions: the spinning jenny and the water frame.

Crompton's mule was a great success. It was an important invention because yarn spun on it was stronger than that spun on a jenny or a water frame. It also harnessed the power of steam which enabled the first steam powered mills to be built. Despite his success, Crompton did not die a rich man. He had difficulties patenting his invention and therefore anybody who had the means could copy it without having to pay Crompton royalties. Many people did and Crompton could only watch on as other people grew rich from his hard work.



1785 – THE POWER LOOM

Invention: The Power Loom

Invented: 1785

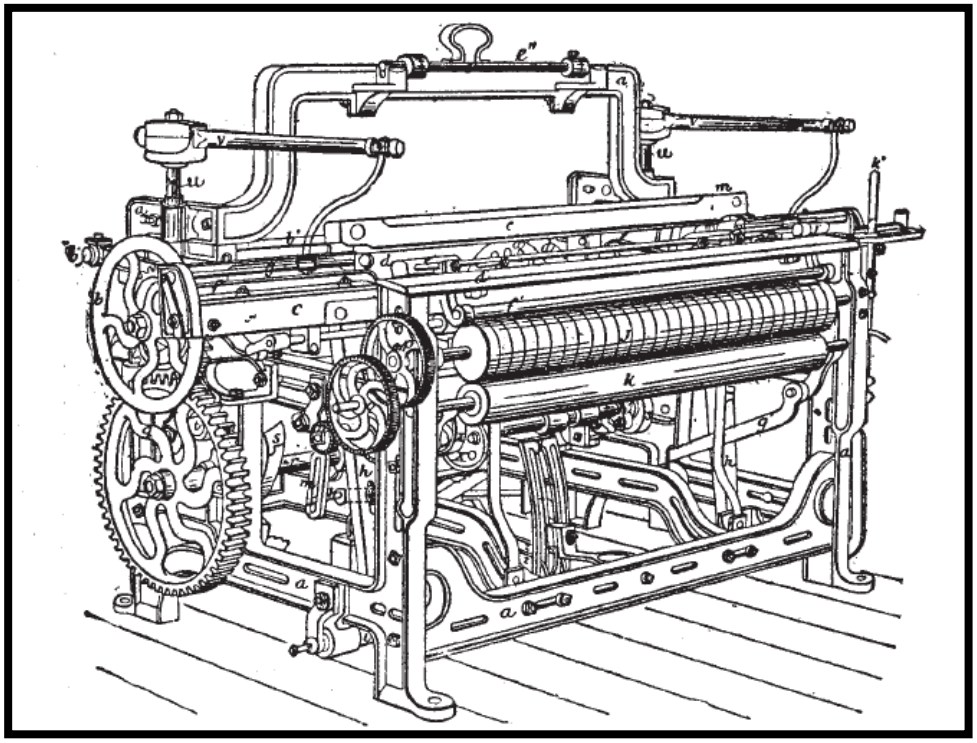
Inventor: Edmund Cartwright

Purpose: To invent a loom that wove cloth quickly

What did it replace: People powered looms

Note: With this invention steam was now being used in machines that spun yarn and in machines that wove cloth.

Edmund Cartwright patented the power loom in 1785. Cartwright had previously visited Arkwright's mill in Cromford and had noticed that the weavers could not keep up with the increased production of yarn that was being produced on Crompton's mule. He saw the need to produce a loom that was driven by something more powerful than the hand of the weaver. His first looms were driven by the weaver's feet. These were quickly superseded by steam engines which drove the looms. Factories started popping up all over Britain full of steam driven looms. By 1838 there were more than 100,000 power looms in operation across England. Cartwright's invention made a lot of people very rich – but not him. He should have paid as much attention to his finances as he did to his inventing because despite all his success and thanks largely to his lack of ability in all things business he was declared bankrupt in 1793.



1794 – THE COTTON GIN

Invention: The Cotton Gin

Invented: 1793

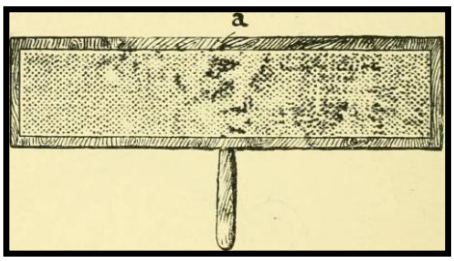
Inventor: Eli Witney

Purpose: To clean the cotton quickly so that it could be spun into yarn

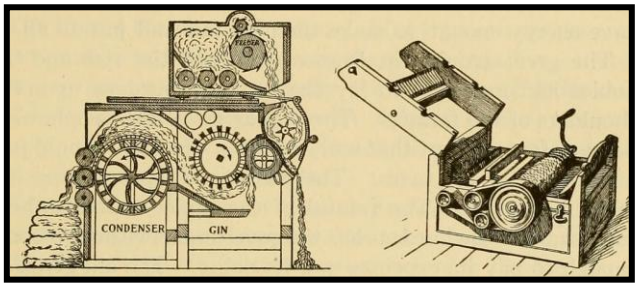
What did it replace: Hand carding

Note: Hand carding was a job performed by people, often children. The aim of carding was to separate cotton seeds from the cotton fibre. This was done using two hand-held wire brushes to comb the fibres in one direction until all the seeds and any tangles were removed. The fibre was then shaped into small fleecy rolls ready to be spun into yarn.

Eli Whitney patented the cotton gin in 1794. The cotton gin is a machine that is used to separate tiny cotton seeds from the cotton fibres. When cotton is harvested, not only does the boll of fibre – not ball of fibre – come away from the plant but so do lots of tiny seeds which are mixed in with it. Before the invention of the cotton gin, these tiny cotton seeds had to be removed from the cotton bolls using wire combs which when rubbed together, essentially combed the seeds out of the cotton. Using this process it commonly took one day for one person to 'clean' half a kilogram of cotton, but cotton cannot be spun into threads if it still has seeds in it, so separating the seeds from the fibre is a vital step. The cotton gin automated this process and made it much, much quicker. This meant more cotton could be harvested and processed ready for spinning at a much faster rate than before.



Eli Whitney was an American. Cotton grew really well in America and before long Britain was importing a lot of it from there and mass producing cotton cloth in their factories. Like other Industrial Revolution inventors, Whitney made very little money from his gin. The reason being that his design was so simple people could make simple modifications to it and apply for their own patent for their new design. As a result slightly modified copies of his gin started appearing all over the place. Today large cotton gins process cotton on an industrial scale.



Use Your 'Noggin'

Define the Following Terms

Industrialisation	Indentured Labour	Slave
Mass production	Revolution	Patent

Questions

Use your 'noggin' and research the following questions:

Why was Manchester the heart of the Industrial Revolution?

What was Eli Witney's connection with slavery in America?

Who were the Luddites?

Who were the winners and who were the losers of these inventions?

For each invention think about the following:

What did this invention replace?

Did the invention build on what had come before?

Did the invention bring about social change?

Is the invention still in use today? Why/why not?

Other Activity Suggestions

Design an advertising campaign for different inventions.

Design a game of memory. On half the cards write the name of Industrial Revolution inventions, on the other half write the name of the inventors then match them. Mix it up and include a third set of cards with the years each invention was patented or invented.

Organise a 'launch' for one of the inventions.

Produce episodes of 'This is Your Life' for different inventors.

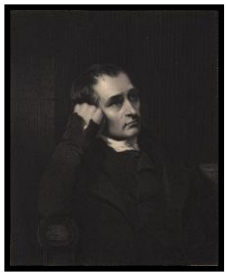
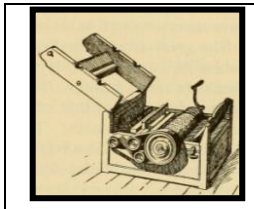
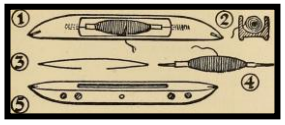
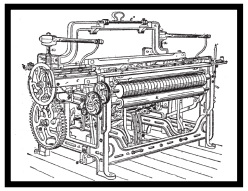
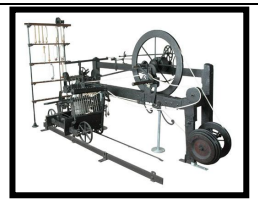
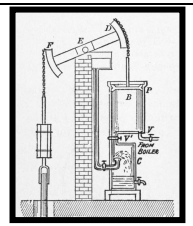
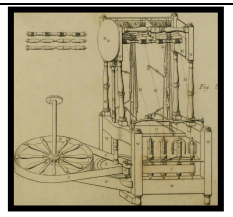
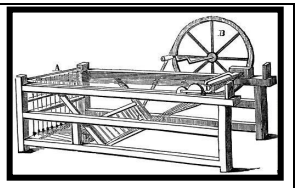
Create a 'Face book' page for individual inventors.

Vote..which was the most important machine invented during the Industrial Revolution? Why?

KW CHART

What I **k**now about…..	What I **w**ould like to know about….

MATCH THE INVENTOR TO THE INVENTION AND DATE

 Samuel Crompton	 Edmund Cartwright	 Eli Whitney	 James Hargreaves	 James Watt	 John Kay	 Richard Arkwright
1733	**1764**	**1769**	**1775**	**1779**	**1785**	**1794**
 The Cotton Gin	 The Flying Shuttle	 The Power Loom	 The Mule	 The Steam Engine	 The Water Frame	 The Spinning Jenny

What?

Where?

When?

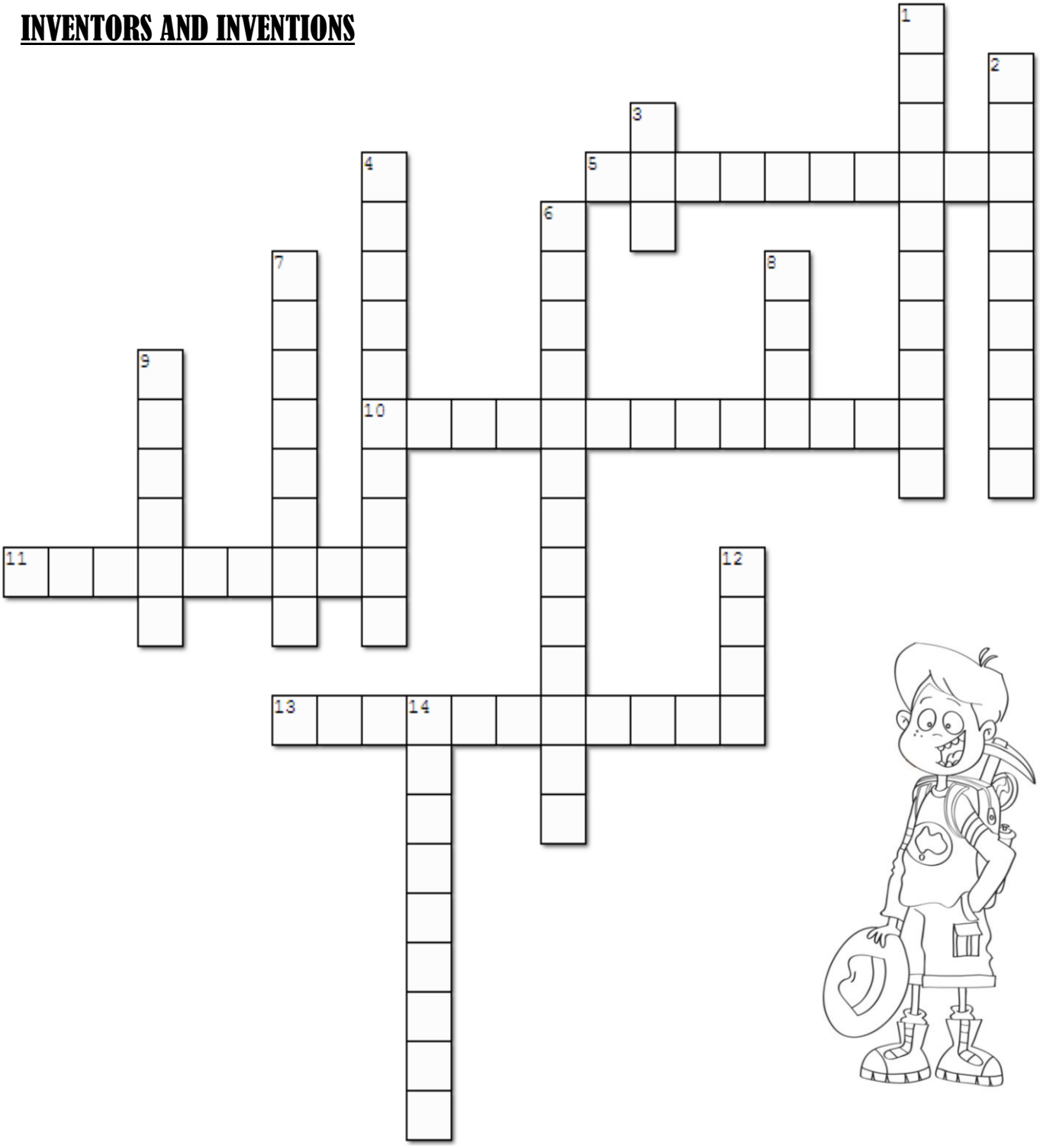
Why?

What did it replace?

Who?

INTERESTING FACT(S)

INVENTORS AND INVENTIONS



Across

5. Invented the power loom
10. One of the first inventions
11. Invented to make the weaving process automated and therefore quicker
13. This invention really powered the Industrial Revolution full 'steam' ahead

Down

1. Invented the spinning jenny
2. This invention made processing cotton much, much quicker
3. Invented the flying shuttle
4. The first mills in England were built to house this invention
6. Invented after the flying shuttle
7. Invented the mule
8. Perfected the steam engine
9. Invented the cotton gin
12. This invention is the combination of the Spinning Jenny and the Water Frame
14. Invented the water frame

P.M. CHART

PLUS	MINUS