

# 7.7A An age of invention

In the eighteenth and nineteenth centuries, the British were very inventive! Some of Britain's greatest inventors and designers created new machines that did things better, faster and for longer. Britain's technology became the envy of the world and Britain was known as 'the workshop of the world'.

## Objectives

- Identify some of the achievements of Britain's great inventors, designers and scientists.
- Judge who you think deserves the title 'Greatest Inventor and/or Designer'.

## Significance

The next four pages look at seven influential British inventors, designers and scientists. You will decide which of these was the most significant figure during this time. Think about:

- Why were they important *at the time*?
- How did they change things?
- Are they still important *now*?
- Are they more important than any of the other people?

### No. 1: James Watt

- Born in Greenock, Scotland, in 1736, and worked as an instrument maker at the University of Glasgow.
- In 1764, Watt repaired an old steam engine. These engines were used mainly in mines to pump out water, but were slow and kept breaking down. He greatly improved the engine, making it faster and more reliable. It used less coal too.
- In 1781, Watt designed a new steam engine that could turn a wheel. Now steam power could be used to drive machinery.
- By 1800, Watt and his business partner Matthew Boulton's factory in Birmingham was producing some of the world's finest steam engines. These steam engines helped develop Britain's industry so Britain became a world power.

▼ **INTERPRETATION B** Adapted from an article on a history website, written by Daniel Rennie (2019).

'James Watt's steam engine not only streamlined travel and manufacturing, but was also a defining development for the Industrial Revolution. Without Watt, the revolution may not have been possible. His very name was honoured as the unit for which we measure the strength of power worldwide: the watt. His contribution to science, especially his steam engine, brought the world from a farming-based society to one centred around technology and invention. Indeed, James Watt is the creator of the modern world of manufacturing.'

▼ **SOURCE A** In 2011, James Watt (right) and Matthew Boulton (left) appeared on a £50 note. The famous steam engine Watt designed and a factory appeared on the note too.



## Meanwhile...

The inventors featured on these pages are British – but other important inventors and designers from around the world at this time include Alfred Nobel (from Sweden) who invented dynamite, Thomas Edison (from the USA) who invented a long-lasting, practical electric light bulb, and Jeanne Villepreux-Power (from France) who invented the aquarium so she could study marine life.

### No.2: George Stephenson

- Born in Wylam, Northumberland in 1781, his first job at 14 was working at the local coal mine with his father.
- In 1814, he designed his first steam locomotive, the Blücher.
- In 1815, he produced a safety lamp for miners, which could be used safely in areas where methane gas had collected.
- In 1821, he was given the job of designing the Stockton and Darlington Railway. It opened in 1825 and used his locomotives.
- He designed and made locomotives for the first city-to-city line – Liverpool to Manchester – which opened in 1830. His success paved the way for other British railway engineers, helping Britain to become the leader in railways.

► **SOURCE C** George Stephenson, with images of his most famous train (the Rocket) and a bridge over the Stockton and Darlington Railway, appeared on British £5 notes between 1990 and 2003.



▼ **INTERPRETATION D** Written by modern historian Bob Fowke, in *Who? What? When? Victorians* (2003).

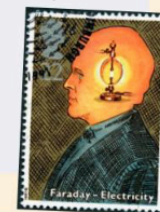
'Before the coming of the railways, the fastest anyone could travel was the speed of a galloping horse. By the time George Stephenson retired, you could travel from London to Newcastle by train in just nine hours, at an average speed of approximately 28 miles per hour [about 45km]. It was Stephenson, the son of a miner in the Northumberland mines, more than anyone else, who created the British railway system... before he retired in 1845, he had designed most of the railway which connects the major cities of the North of England.'

### No. 3: Michael Faraday

- Born in Newington in 1791.
- He worked in a bookshop where he became fascinated by science.
- He was most interested in electricity and magnetism and, in 1831, discovered how to generate electricity.
- His generator worked on the same basic principle that electric power stations work on today.

#### ▼ SOURCE E

A British stamp from 1991 showing Faraday.



▼ **INTERPRETATION F** Adapted from the Royal Society of Chemistry website (2019), an organisation set up in 1848 to advance excellence in the chemical sciences.

'[Faraday was] perhaps one of the most influential scientists who ever lived, whose ground-breaking research into the relationship between electricity and magnetism ultimately led to the invention of the electric motor.'

One of his most well-known creations, the Faraday cage, is the basis of MRI machines [machines in hospitals that detect medical problems]. He also discovered benzene [a chemical that had many uses before it was linked to ill-health in humans], pioneered research into nanotechnology [looking at things on a very small scale], and gave his name to the Faraday Effect and Faraday's Law.'

## Over to You

- Complete the following sentences with the correct term:
  - In 1781, a new steam engine that could turn a wheel was designed by \_\_\_\_\_.
  - James Watt and Matthew Boulton's steam engine factory was in \_\_\_\_\_.
  - George Stephenson designed and made locomotives for the first city-to-city line – the \_\_\_\_\_ Railway.
  - As well as railway engineering, Stephenson also designed a safety lamp for \_\_\_\_\_.
  - Michael Faraday discovered a way to generate electricity in \_\_\_\_\_.
  - Faraday's basic idea of generating electricity is one that is still used today in \_\_\_\_\_.
- Look through the great inventors and designers featured so far and make brief notes on:
  - why they were important
  - how they changed things.

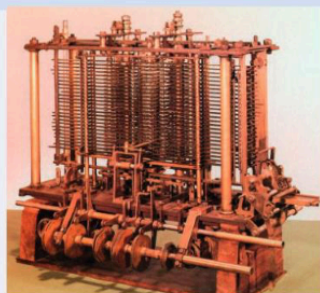


## 7.7B An age of invention

### No. 4: Ada Lovelace

- Born in 1815, she studied mathematics and science from the age of four.
- Aged 17, she met inventor and mathematician Charles Babbage, who had designed an enormous mathematical calculating machine.
- She worked out how the machine could be programmed with a code to calculate numbers.
- Some consider Lovelace's plans for a machine to carry out an instruction to be the world's first ever computer program.

► **SOURCE G** A model of Babbage's 'calculating machine' constructed in the 1860s. It was for this machine (sometimes called the 'first computer') that Lovelace designed her program. Only part of the machine had been built by the time of Babbage's death in 1871.



### ▼ INTERPRETATION H

Adapted from an article by Terry MacEwen for [www.historic-uk.com](http://www.historic-uk.com). He refers to Alan Turing (the famous Second World War code-breaker) who used Lovelace's notes when he was thinking about designs for the first computer.

'Lovelace's influence has continued after her death and is still felt in the world of technology today. She was such a brilliant mathematician and programmer that her notes were actually used by codebreakers in World War Two and in future computer design. It is clear that her legacy lives on even today. She has become such an iconic woman in technology.'

### No. 5: Isambard Kingdom Brunel

- Born in Portsmouth in 1806.
- In 1829, aged 23, he designed the Clifton Suspension Bridge in Bristol.
- In 1833, he designed and built the Great Western Railway, said by some to be the best railway ever built. He also built two grand stations – Paddington (London) and Temple Meads (Bristol).
- As a shipbuilder, Brunel designed three huge record-breaking iron ships – *Great Western* (1837), *Great Britain* (1843) and *Great Eastern* (1858). *Great Eastern* was by far the largest ship ever built at the time. It also laid the first underwater communications cable between America and Britain.
- In 2002, BBC TV asked people to vote for 'the Greatest Briton'. In the end, Winston Churchill came first... but Brunel came second.

▼ **INTERPRETATION I** From a website set up by Bristol City Council in 2006 to celebrate Brunel's achievements.

'Brunel's significance today is twofold. First, there is his lasting engineering legacy, visible in the bridges, tunnels, viaducts, buildings and rail routes he left behind. Second, is the example he has set for the engineers and innovators who followed him and who are inspired to translate their creative thought into action.'

▼ **SOURCE J** A 2006 £2 coin, commemorating the birth of Brunel in 1806.



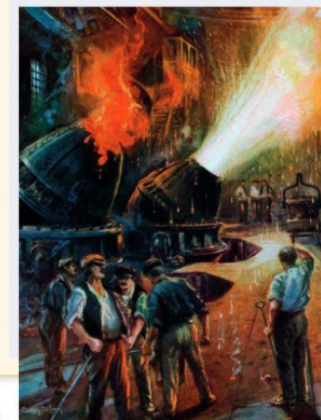
### No. 6: Henry Bessemer

- Born near Hitchin, Hertfordshire, in 1813.
- He designed a machine for putting perforations on postage stamps and a new method of producing glass.
- He invented a 'converter', a machine for turning iron into steel – steel is stronger and more durable than iron (see K). Soon many of the pots, pans, railway lines and machines that had been made from iron were made from steel instead.
- In 1850, Britain produced 60,000 tons of steel. By 1880, 1.25 million tons were produced each year.
- In America, where his ideas were copied, at least eight cities and towns are named after him.

▼ **INTERPRETATION K** Adapted from a 2013 lecture given to the Royal Society (an organisation set up in 1660 to promote scientific understanding) by a Tata Steel representative. Tata Steel is a large European steel producer.

'Despite modest educational beginnings, Sir Henry Bessemer rose to the highest rank of nineteenth-century industrialists. His lasting legacy resulted from his pioneering and visionary re-engineering of the steelmaking process, which laid the foundations for global mass production of this versatile material, underpinning our modern world.'

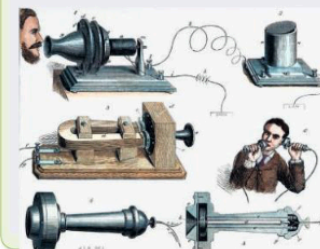
▼ **SOURCE L** An illustration of workers using a Bessemer Converter. The huge container is filled with liquid iron. It removes impurities and adds chemicals to make steel.



### No. 7: Alexander Graham Bell

- Born in Edinburgh, Scotland, in 1847.
- He worked all his life on making electrical hearing aids for deaf people – his wife was deaf.
- The idea for a telephone – a machine that converts speech into an electrical signal that travels down a wire and is then turned back into sound – came to him while working on designs to help deaf people.
- He invented the telephone in 1876. Lots of people were trying to make telephones at this time and Bell was accused of copying some of the designs of other inventors.

▼ **SOURCE M** An 1877 illustration from an English newspaper explaining Bell's invention.



### ▼ INTERPRETATION N

Adapted from an article (2003) by John H. Lienhard, author and former Engineering and History professor.

'The telephone is such a huge monument to Bell's inventive genius. But he also developed an early version of the iron lung [a machine that helps people breathe]. He invented the ancestor of the fax machine [a machine that sends instant letters]. He pushed for the use of ethyl alcohol in place of fossil fuels.'

He also invented the hydrofoil [a boat that skims quickly over the water on narrow 'feet']. For years it was the fastest thing on water. He left us a legacy of invention that reached far beyond the telephone.'

### Over to You

- 1 Look through the great inventors and designers on these pages and make brief notes on:

- why they were important
- how they changed things.

### Significance

To decide if a person is historically significant, you have to assess whether they were important at the time they lived, and whether they are also important over a long time, perhaps even until now.

- 1 Choose your favourite inventor/designer from pages 138–141. Write a persuasive speech about your choice to convince others that they are significant.
  - Mention how important their contribution was at the time.
  - Include information about why they are still important now.