POTTED HISTORIES

JAMES WATT FRS, FRSE

Inventor, Industrial Pioneer & Engineer

BLUE PLAQUE - Soho House,
Regent Street,
Ladywood
Birmingham

Erected 1 JANUARY 2003

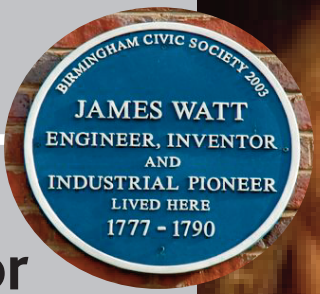
Famous for:

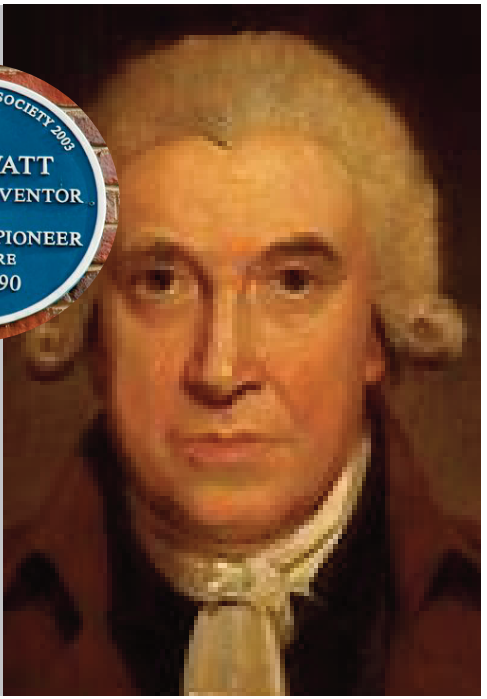
- Inventing the Watt steam engine which converted steam back to water
- Developing a rotary engine which mechanised weaving, spinning and transport
- The term 'horsepower'
- The rev counter.
- A measure of electricity – the 'Watt

THE SLOW COOKER THAT BECAME A STEAM ENGINE

James Watt

The Inventor of more than just a steam engine!





James Watt was born on 19 January 1735 in Grennock, Scotland to a ships carpenter James Watt and his wife Agnes Muirhead. It appears that throughout his early years James was not fit and well and although at school age he attended a primary school, much of his subsequent knowledge was gained from reading books.
His attendance at elementary school may well have taught him geometry, Latin and Greek but to a large extent his education came from his parents. His father taught him to write and the principles of mathematics. His mother taught him to read.

James, like so many inventors, started at an early age to take his toys apart and put them back together or made new ones. As a teenager, James developed a great interest in his fathers' workshop and eventually was provided with his own set of tools. His father taught him how to make things in wood and metal.
James's mother unfortunately died along with her second son just after giving birth when James was in his teens . It appears that James' father then lost his inheritance and James moved to Glasgow where he met Robert Dick who seeing his skills as an engineer, encouraged him to become an apprentice to John Morgan in London.

James moved to London in 1755 and began his apprenticeship as an instrument maker. Instruments at the time were very skillfully crafted for scientific, navigation and surveying applications.
James was a skilled craftsman and engineer

but didn't like living in London and although he only stayed for one year, did complete his indentures before returning to Glasgow in 1756 at the age of just 19.On his return to Scotland, James wanted to continue as an instrument maker, but it appears the Tradesmans Guild of Glasgow prevented him from starting his own business.
He was, however, recognised as a high-quality engineer, and soon employed on the Forth and Clyde Canal and the Caledonian Canal.

James still had connections at the University and was also appointed in 1757 as 'mathematical instrument maker' to Glasgow University.
Here James met Joseph Black, who was Professor of Chemistry at the University and had already laid the foundation of modern chemistry and of the study of heat. The men became friends, and Watt provided model engines for Joseph Black to use in his lectures on the properties of heat.

In 1763 John Anderson asked James Watt to repair an early steam engine he had acquired. This early model, known as a Newcomen engine, was not very efficient.

In 1712 Thomas Newcomen had built the first successful steam engine in the world. It was mainly used for pumping water from coal mines.

The repair project would tax James' brain long after he returned the engine to Anderson. In fact, it is said, that while wandering aimlessly through Glasgow Green two years later, he hit upon the idea of improving the original concept for the engine, by condensing the steam in a separate chamber. This would solve the original problem caused by constantly heating and cooling the piston. The improvements made the engine perform faster, safer, and more fuel-efficiently.

Pre-Industrial Revolution the 1700's saw the birth of many inventions including in 1733, the flying shuttle for mass production weaving, 1745, the electrical capacitor, 1752, the lightening conductor and in 1761 the Marine Chromometer.
In 1764 the spinning jenny was invented by James Hargreaves in Stanhill, Oswaldtwistle, Lancashire.

A 'true age of invention' with many Engineers and Scientists applying for patents as they tackled the problems involved in meeting the growing demand for mechanization and increased productivity.

It was a gradual process for James to turn his idea for a commercial steam engine invention into reality and a decade passed before Watt solved all the mechanical problems. During this time, Joseph Black loaned him money to carry out his experiments and perfect his methods

of application. Black also introduced him to John Roebuck of the Carron ironworks in Scotland and in 1765 Roebuck and Watt entered into a partnership.

Watt prepared a patent application on his invention of a steam engine with a condensing chamber. The patent was granted on January 5, 1769. n his capacity as surveyor of canals, in 1773 James surveyed the route of the Caledonian Canal which bisects Scotland, linking the Irish Sea to the North Sea via the Great Glen.
Its design and construction was state-of-the-art for the time, and advanced 19th century engineering methods considerably. James was also involved in the improvement of harbours and in the deepening of Scottish rivers, including the Forth and the Clyde.

In 1773 Roebuck's financial difficulties brought not only Watt's work on the engine to a standstill but also Roebuck's own business.

WATT & BOULTON

In 1774 Watt went into business with Matthew Boulton, a Birmingham engineer, producing engines based on this new approach. He moved from Glasgow to Birmingham and was now able to work full time on his invention. The business was very successful and engineers from all the industrialised countries flocked to see their factories.

In 1774 James Watt married his cousin Margaret Miller. He had five children with her, but only two survived, and tragically his wife Margaret died in childbirth.

In 1775 the improved James Watt steam engine was presented to the World too much acclaim.

In 1775 Boulton accepted two orders to build Watt's steam engine. The two engines were set up in 1776 and their success led to many other orders.

In the same year, English inventor Alexander Cumming had the first patent for a flush toilet. In 1777 Watt again married, this time to Ann MacGregor.

In 1779 the spinning mule was invented by Samuel Crompton - The spinning mule is a machine used to spin cotton and other fibres. They were used extensively from the late 18th to the early 20th century in the mills of Lancashire and elsewhere.

In 1780 bi-focal glasses were developed by Benjamin Franklin.

He wrote in one of his journals, "I therefore had formerly two pairs of spectacles, which I shifted occasionally, as in traveling I sometimes read, and often wanted to regard the prospects. Finding this change troublesome, and not always sufficiently ready, I had the glasses cut and a half of each kind associated in the same circle. By this means, as I wear my own spectacles constantly, I have only to move my eyes up or down, as I want to see distinctly far or near, the proper glasses being always ready,"

Gradually, the mills that produced flour from grain became automated and the mills producing cloth, began to be powered by steam and expand into factories with more workers and this made it necessary for them to move toward the centres of population. Steam power was used mainly for spinning at first, but the process of weaving gradually became powered by engines.

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Between 1781 and 1788 Watt modified and further improved his engine. These changes combined to make as great an advance over his original engine as the latter was over the Newcomen engine. The most important modifications were a more efficient use of the steam, the use of a double-acting piston, the replacement of the flexible chain connection to the beam by the rigid three bar linkage, the provision of another mechanical device to change the reciprocating motion of the beam end to a Rotary motion, and the provision of a device to regulate the speed.

In the design of the Rotary steam engine he solved the problem of how to convert the up-and-down piston movement to rotary movement for the engines to power looms, bellows, and other mechanical devices with circular drives. The new rotary engines were more efficient and the partners set about establishing how to measure the dynamic power.

Rotary steam engines replaced animal power, and it was only natural that the new engine should be measured in terms of the number of horses it replaced. By using measurements that millwrights who set up horse driven carriages had determined,

Watt found the value of one "horse power" to be equal to thirty-three thousand pounds lifted one foot high per minute. This value is still used as the standard for American and English horsepower. The measurement also helped the partners to determine the charge of building the new type of steam engine and horsepower has continued to be used for size, performance and cost. Despite his success,

Watt was a rather insecure and jealous man, who did not like others having their own ideas.

When one employee of the company, a man named William Murdoch, experimented with high pressure steam engines,

Watt discouraged him from patenting and continuing his work, even though his engines were potentially much better and smaller than the ones Watt himself had invented. Murdoch never patented his design, and returned to fixing Watt's own engines.

(However, Murdoch did make another important contribution, to gas lighting.)

Watt patented his own engine design and also the designs for a steam locomotive.
Apart from his steam research, which he originally carried out in the grounds of Kinneil House near Linlithgow,
Watt was involved in many other projects.

Other inventions

On Watt's many business trips, there was
always a good deal of correspondence that had to be copied. To avoid this tiresome task, he devised letter-press copying.
This works by writing the original document with a special ink. Copies are then made by simply placing another sheet of paper on the freshly written sheet and then pressing the two together.
Watt's interests in applied chemistry led him to introduce chlorine bleaching into Great Britain and to devise a famous iron cement. In theoretical chemistry, he was one of the first to argue that water was not an element (basic substance of matter made up of only one kind of atom) but a
compound (substance made up of two or more elements). His achievements were recognised by fellow scientists.
He was a fellow of the Royal Society of Edinburgh and the Royal Society of London, and became a Foreign Associate of the French Academy of Sciences.

In 1793 the cotton gin (after engine) was invented by American Eli Whitney.
This invention made it possible to remove cotton seeds when processing cotton.
Some historians believe plantation worker Catherine Greene devised the cotton gin and Whitney merely built it and applied for the patent. At that time women were not allowed to file for patents.

The process was eventually powered by steam engines for increased production.
Although Watt's engines were initially used for pumping water from Cornish tin and copper mines, the new cotton mills, which had been built near fast-flowing rivers to take advantage of water power, soon switched to steam. Gradually, mills began to move toward the centres of population. At first, steam power was used mainly for spinning, but eventually weaving was also powered by steam engine. By 1819, the year of Watt's death, there were 18 steam weaving factories in Glasgow, with 2800 looms. The increased power-to-weight ratio of the new engines also permitted their use for marine propulsion and in 1788 a steam-powered catamaran was taken across Dalswinton loch by William Symington.

In 1794 Watt and Boulton turned over their flourishing business to their sons.

Watt's achievements in perfecting the steam engine have been recognized worldwide and by the time Watt retired in 1800, he had become a very rich man.
In August 1812 the engineer and inventor Henry Bell made the initial voyage on his steam boat Comet. He was able to shorten the time it had taken to make the journey from Port Glasgow to Broomielaw and brought to an end the reliance upon good wind and the right tide. He began to provide reliable journeys between various parts of the greater Glasgow area. It was the first time that a steam boat business provided regular passenger travel in Europe. Though he was soon passed by his rivals in business, he had paved the way for the shipbuilding industry in Glasgow.

James Watt always maintained a workshop where he continued his inventing activities until he died on August 25, 1819.

In 1882, 63 years after Watt's death, the British Association gave his name to the unit of electrical power - and today James Watt's name is to be found written on almost every lightbulb in the world.

James Watt has been voted the eighth most popular Scottish scientist from the past.