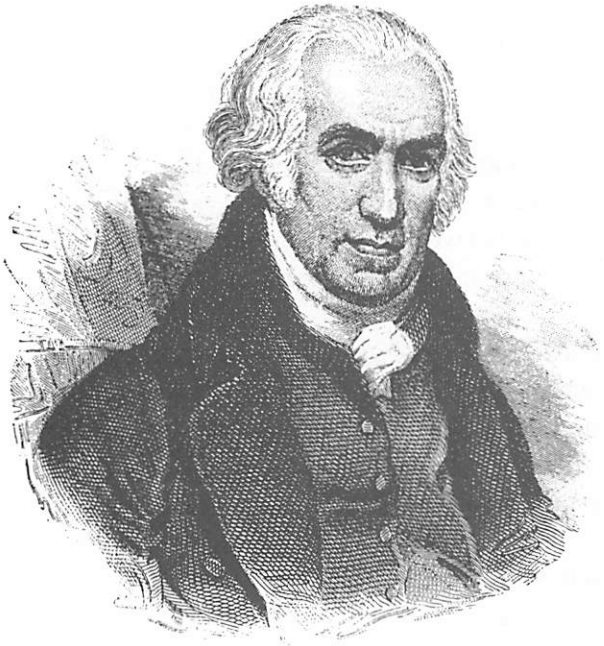

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JAMES WATT

1736-1819

The Scottish inventor James Watt, the man who is often described as the inventor of the steam engine, was the key figure of the Industrial Revolution.

Actually, Watt was not the first man to build a steam engine. Similar devices were described by Hero of Alexandria in the 1st century. In 1698, Thomas Savery patented a steam engine that was used for pumping water, and in 1712 an Englishman, Thomas Newcomen, patented a somewhat improved version. Still, the Newcomen engine had such a low efficiency that it was useful only for pumping water out of coal mines.

Watt himself became interested in the steam engine in 1764, while repairing a model of Newcomen's device. Watt, although he had received only one year's training as an instrument maker, had great inventive talent. The improvements which he made upon Newcomen's invention were so important that it is fair to consider Watt the inventor of the first practical steam engine.

Watt's first great improvement, which he patented in 1769,

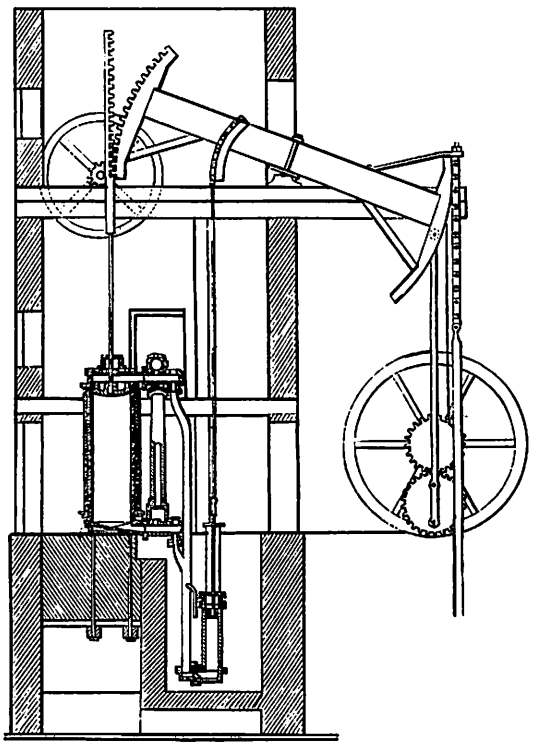
was the addition of a separate condensing chamber. He also insulated the steam cylinder, and in 1782 he invented the double-acting engine. Together with some smaller improvements, these innovations resulted in an increase in the efficiency of the steam engine by a factor of four or more. In practice, this increase of efficiency meant the difference between a clever but not really very useful device, and an instrument of enormous industrial utility.

Watt also invented (in 1781) a set of gears for converting the reciprocal motion of the engine into a rotary motion. This device greatly increased the number of uses to which steam engines could be put. Watt also invented a centrifugal governor (1788), by which the speed of the engine could be automatically controlled; a pressure gauge (1790); a counter; an indicator; and a throttle valve, in addition to various other improvements.

Watt himself did not have a good head for business. However, in 1775 he formed a partnership with Matthew Boulton, who was an engineer and a very capable businessman. Over the next twenty-five years, the firm of Watt and Boulton manufactured a large number of steam engines, and both partners became wealthy men.

It would be difficult to exaggerate the importance of the steam engine. True, there were many other inventions which played a role in the Industrial Revolution. There were developments in mining, in metallurgy, and in many sorts of industrial machinery. A few of the inventions, such as the fly shuttle (John Kay, 1733) or the spinning jenny (James Hargreaves, 1764) had even preceded Watt's work. The majority of the other inventions, however, represented small improvements, and no one of them alone was vital to the Industrial Revolution. It was quite different with the steam engine, which played an absolutely crucial role, and without which the Industrial Revolution would have been vastly different. Previously, although some use had been made of windmills and waterwheels, the main source of power had always been human muscles. This factor severely limited the productive capacity of industry. With the invention

of the steam engine, however, this limitation was removed. Large quantities of energy were now available for production, which accordingly increased enormously. The oil embargo of 1973 made us aware of how severely a shortage of energy can



Watt's double-acting steam engine, 1769.

hamper an industrial system, and this experience might, in some slight degree, give us an idea of the importance to the Industrial Revolution of Watt's inventions.

Aside from its usefulness as a source of power for factories, the steam engine had many other important applications. By 1783, the Marquis de Jouffroy d'Abbans had successfully used a steam engine to power a boat. In 1804, Richard Trevithick built the first steam locomotive. Neither of those early models was

commercially successful. Within a few decades, however, the steamboat and the railroad were to revolutionize both land and water transportation.

The Industrial Revolution occurred at about the same time in history as the American and French revolutions. Though it might not have seemed obvious at the time, today we can see that the Industrial Revolution was destined to have a far greater impact on the daily lives of human beings than either of those important political revolutions. James Watt, accordingly, has been one of the most influential persons in history.

Watt, as a boy, notices the condensation of steam.