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## *PART 1*

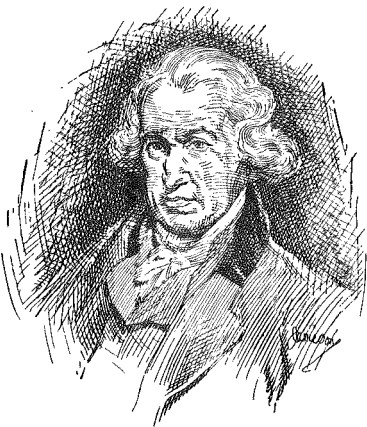
### *Inventions of Steam and Electric Power*

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#### *Chapter 1*

#### *James Watt and the Invention of the Steam Engine*

Until a little more than two hundred years ago, the chief power used in the production of food, clothing, and shelter was hand power. Cattle and horses were used to cultivate the fields. Windmills and water wheels were employed to grind corn and wheat. But most tools and machines were worked by hand.



JAMES WATT

Men had, for many years, dreamed of a new power that would be more useful than work

## *The Story of Inventions*

animals, sails, windmills, or water wheels. Around the year 1750, a new power was found. This new power was steam. Yet no one had been able to apply the power of steam to grind corn and wheat, or spin and weave cotton and wool, or do anything useful at all. The man who succeeded in giving this new power to the world was James Watt. Thanks to the efforts of Mr. Watt, the power of steam was harnessed and by the mid-1800's was propelling large ships around the world and operating hundreds of steam-powered express trains. Numerous other inventions were created from steam power as well. Although we seldom think of steam power today, we must not forget how much it helped America years ago.

### *Childhood and Early Education*

James Watt was born in 1736, at Greenock, Scotland, not far from Glasgow. His early education was received at home, his mother giving him lessons in reading, and teaching him to draw with pencil and chalk. His father drilled him in arithmetic and encouraged him in the use of tools. A few years later James went to school, although he did not at first get along well. This was due to illness, which often kept him at home for weeks at a time. Still, he always did well in arithmetic and geometry, and after the age of fourteen he made rapid progress in all his studies.

*James Watt and the Invention of the Steam Engine*



WATT AND THE TEAKETTLE

## *The Story of Inventions*

Even as a small boy, James liked to tinker with things. This tinkering was not always appreciated by members of his family. His aunt would scold him: "James Watt, I never saw such an idle boy; read a book or employ yourself usefully; for the last hour you have not spoken a word, but taken off the lid of that kettle and put it on again. Why are you holding a cup and then a silver spoon over the steam while staring at the drops of water it turns into? Are you not ashamed to spend your time in this way?"

Much of his time, as he grew older and stronger, was spent in his father's shop, where supplies for ships were kept, and where ship repairing was done. He had a small forge and also a workbench of his own. Here he made cranes, pulleys, and pumps, and learned to work with different metals and woods. He was so skillful that the men remarked, "James has a fortune at his fingers' ends."

The time at last came for choosing a trade. His father had wished James to follow him in his own business. But Mr. Watt had recently lost considerable money, and it now seemed best for the youth to choose a trade in which he could use his mechanical talents. So James travelled to the city of Glasgow to become an instrument maker.

### *Learning Instrument Making*

He began to work for a mechanic who dignified himself with the name of "optician." This mechanic, though the best in Glasgow, was a sort of Jack-of-all-trades, who earned a simple living by mending glasses, repairing fiddles, and making fishing tackle. Watt was useful enough to his master, but there was little that a skillful boy could learn from such a workman. So he decided to seek a teacher in London.

There were plenty of instrument makers in London, but they were bound together in a guild. A boy wishing to learn the trade must train from five to seven years. Watt had no desire to bind himself for so long a period. He wished to learn what he needed to know in the shortest possible time; he wanted a "short cut." Master workman after master workman for this reason turned him away. Only after many weeks did he find a master teacher who was willing to take him. For a year's instruction, he paid one hundred dollars and agreed to work without pay for one year.

The hours in the London shops were long. "We work," wrote Watt, "until nine o'clock every night, except Saturdays." To relieve his father of the burden of supporting him, he got up early and did extra work.

## *The Story of Inventions*

Towards the end of the year he wrote, with no little pride: "I shall be able to get my bread anywhere, as I am now able to work as well as most journeymen, though I am not so quick as many."

### *Jack-Of-All-Trades*

In order to open a shop of his own, Watt returned to Glasgow. He was opposed in this by the hammermen's guild. The hammermen said that he had not served an apprenticeship and had no right to begin a business. They would have succeeded in keeping him from making a start, had not a friend, a teacher in the University of Glasgow, come to his aid, providing him with a shop in a small room of one of the college buildings.

Watt soon became a Jack-of-all-trades. He cleaned and repaired instruments for the university. Falling into the ways of his first master, he made and sold eyeglasses and fishing tackle. Though he had no ear for music and scarcely knew one note from another, he tried his hand at making organs. He was so successful that many "dumb flutes and gouty harps, dislocated violins, and fractured guitars" came to him to be cured of their ills.

All the while, Watt spent his leisure time in reading. The college library was close at hand, so there was no lack of



## *James Watt and the Invention of the Steam Engine*

books. He studied chemistry, mathematics, and mechanics. By learning all he could and by doing everything well, Watt came to be known as a man "who knew much and who could make anything."

### *Captured By Steam*

Coal and tin mining had for a long time been important industries in Great Britain. Shallow mines were easy to work. Men and women carried out the coal or tin ore in buckets, by winding stairs. Or a windlass was used, turned by hand or with the aid of a horse. Water was taken out in the same way. As the shallow mines became exhausted, deeper ones were opened. The deeper the mine, the harder it was to lift out the coal or tin ore. Into

these deeper mines also came quantities of water, flooding many of them. Unless a machine could be invented to easily and cheaply pump out the water and hoist the coal or tin, these mines would have to be closed. The need for such a machine led to the invention of the first successful steam

