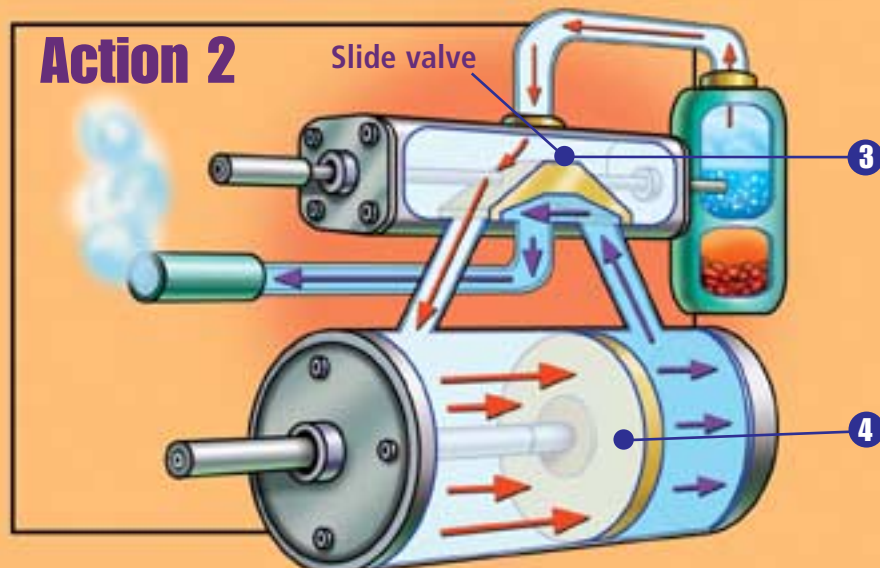
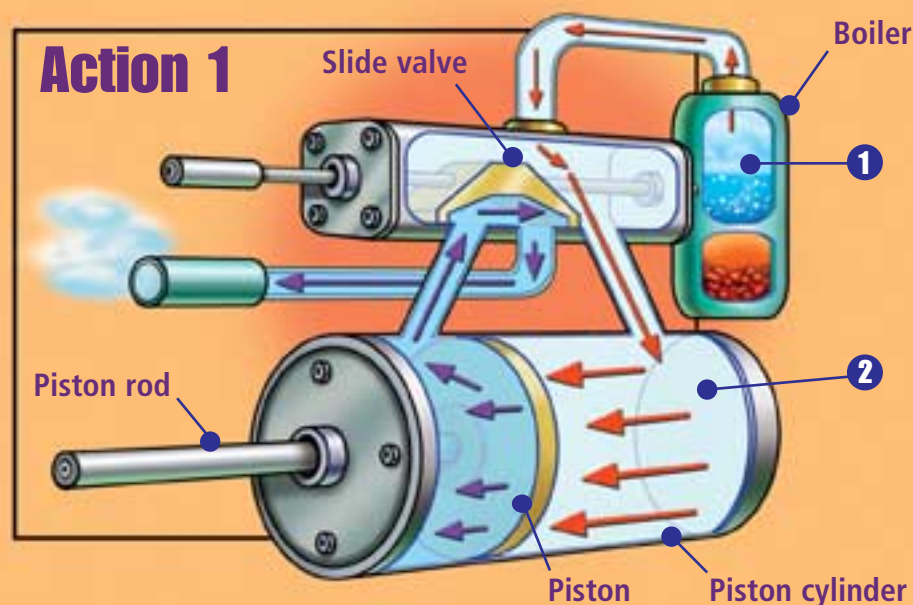


Technology: 1781

James Watt's Double-Action Steam Engine

Amid the excitement of the Industrial Revolution, James Watt (1736–1819), a Scottish inventor, patented a new steam engine. Steam power had been used for many years, but Watt's invention was an improved, double-action steam engine. This system, in which the steam pushes from both sides of the piston rather than from just one, enhanced efficiency and increased power. Watt's invention helped to advance manufacturing and transportation and influenced later inventions. Watt's double-action steam engine was one of the most important inventions of the Industrial Revolution.



How the Engine Works

Steam from the **boiler** enters the **piston cylinder**. The pressure of the steam pushes the **piston** to one side, moving the **piston rod**. When the piston reaches the end of the stroke, the **slide valve** shifts the steam to the other side of the piston, forcing it back and releasing the steam it compresses as exhaust.

1 As water is converted to steam, its volume increases 1,600 percent.

2 When the steam enters the piston cylinder, it forces the piston rod to one side.

3 As the piston reaches the end of its stroke, the slide valve channels steam to the other side of the piston.

4 The piston rod is pushed back, forcing the "old" steam out as exhaust.

Key: Steam Exhaust

THINKING



1. Drawing Conclusions

How did the steam engine help power the Industrial Revolution?

2. Recognizing Effects

How did Watt's steam engine change the lives of working people?