Great Inventors of the
Industrial Revolution

The Enclosure Movement

English farmers had raised crops and grazed their animals on open fields for centuries. However, during the late 17th century, English landowners began buying up village lands and fencing them in. They then charged people for the use of the land. This was known as *enclosure*.

The farmers were not happy.

Suddenly, they had to make a little land do as much as possible. Here's what happened.

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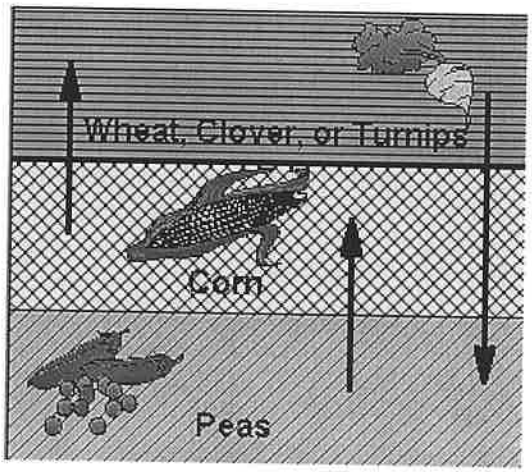
Viscount Charles Townshend

For centuries the chief way to keep a field fertile had been to let it lie fallow every two or three years. During those years, nothing was planted on the land.

Viscount Charles Townshend found the secret was just to rotate the crops. This was done by planting a different crop each year. While wheat or corn would wear out the land, turnips or clover would restore the field.

Not surprisingly, the Viscount was the nicknamed Turnip Townshend in honor of his favorite crop.

The result: Hooray! Farmers could use their fields each year without letting them lie fallow. That meant they could get more crops from each field. So what happened next?



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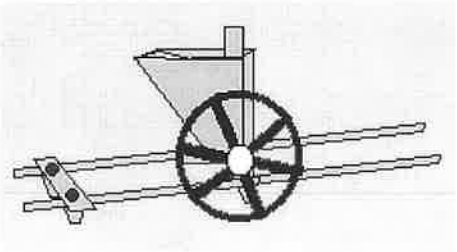
Jethro Tull

Jethro Tull was one of the first scientific farmers. He realized that the usual way of sowing seeds by scattering them on the ground was wasteful. Many seeds did not take root.

The seed drill, which he invented in 1701, allowed the farmers to sow seeds in well-spaced rows at specific depths. When his invention was used, a larger share of the seed germinated. As a result, crop yields increased even more.

Jethro Tull's seed drill



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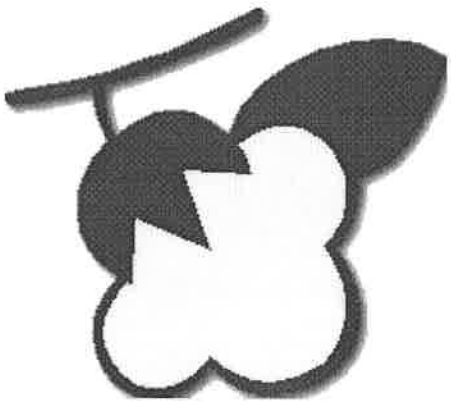
The Textile Revolution



Suddenly, farms were producing bigger crops. One of the most important of these crops was cotton.

Cotton was used for everything from clothing to sails for ships. Now that there was more cotton, people wanted to find ways to turn it into useful products more quickly. So what happened next?

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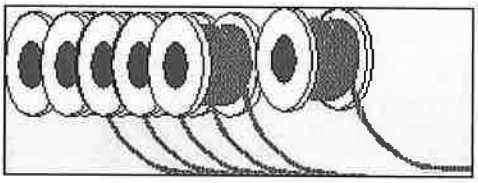
The Spinning Jenny

The spinners could not keep up with the weavers. A reward was offered to the person who could produce a better spinning machine.



In 1764 James Hargeaves invented a new spinning wheel. He called it the Spinning "Jenny" in honor of his wife. This simple machine allowed a worker to spin 6 or 8 threads at a time. Later models could spin as many as 80 threads.

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Great Inventors of the Industrial Revolution

Richard Arkwright

In 1769 Richard Arkwright invented the Water Frame. The water frame used water from a near-by stream to operate the spinning wheels.

Result: spinning could be done by a machine instead of a person, so owners could spin more cotton.

What happened next?

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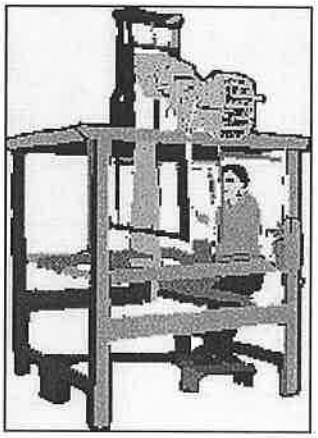
Samuel Crompton



In 1779, Samuel Crompton combined features of the spinning jenny and the water-frame to produce the Spinning Mule. It was so named because, just as a mule is the offspring of a horse and a donkey, this machine was the offspring of two inventions. The mule made thread stronger and finer than earlier machines.

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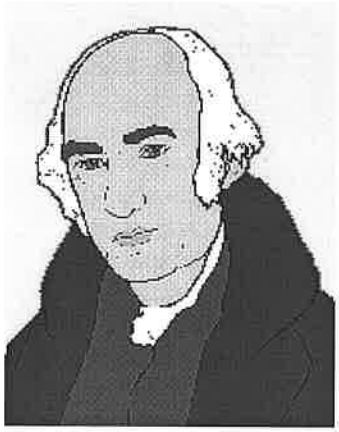
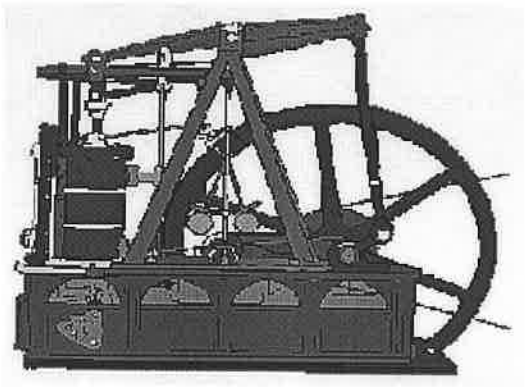
James Watt



James Watt was a repair man for Thomas Newcomen. Watt figured out a way to make a steam engine which got four times as much power from the same amount of coal. That was a big improvement, and a more powerful engine could do more work.



What happened next?

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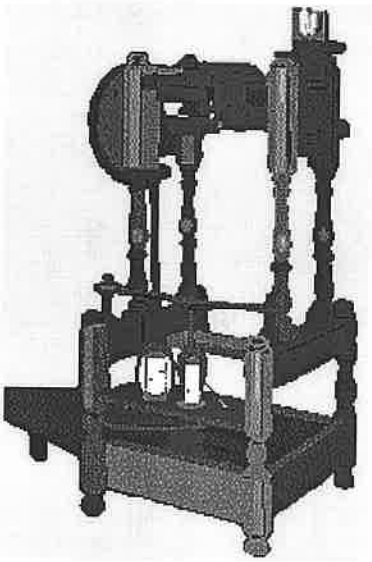
Home Agriculture Textiles Steam Steel Transportation Technology

Edmund Cartwright

The water-frame and the spinning mule were too large and expensive for people to use at home. Spinning and weaving slowly stopped as something families did at home.



Factories began to hold these new machines. And Mr. Watt's steam engine gave the factories a way to power their new machines.

In 1785, Edmund Cartwright, invented the Power Loom which boosted weaving. In 1833, over 100,000 machines were in use.

This meant that people were not working at home. Instead they worked in factories. Big change!

So what happened next?

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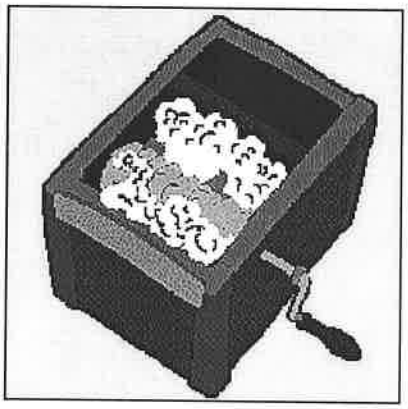
Eli Whitney

Well, everybody was working like crazy. Now, American factories had been built, and they needed more cotton. Removing the seeds was the most time consuming jobs on the plantation.

In 1793, educator Eli Whitney made a machine to remove the seeds from the cotton. This allowed the workers to pick and clean ten times as much cotton as they had before.

The increased productivity from the cotton gin fueled further advances in automating the production of cotton and other cloths.



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Eli Whitney

Eli Whitney made one more important innovation. He invented *interchangeable parts*.

This was a way of standardizing parts of a machine so that they could easily be replaced.

Whitney's innovation allowed him to win a contract for the production of muskets. It was the first step in the era of mass production.

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Great Inventors of the
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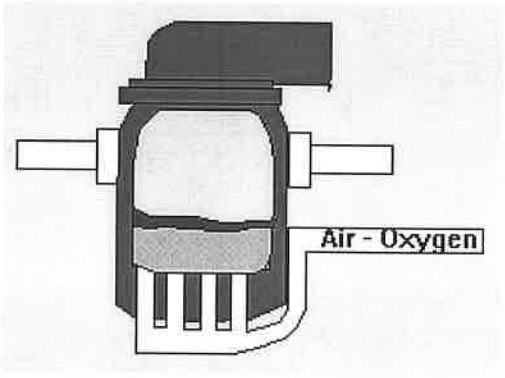
Working with Steel

Inventors realized that they needed strong metals to build complicated machinery. Steel was the best choice, but it took some time to get it right.

At the beginning of the 18th Century - about 1700, **Abraham Darby** discovered that coal could be partially burned to create coke, which would create the steady, hot flame required to work with iron and steel.

In the 1740s, **Henry Cort** discovered "puddling" as a way of making stronger pig iron. He also was able to produce sheets of iron.



It wasn't until a hundred years later that **Henry Bessemer** figured out a way to mix cold air to remove the impurities that weakened steel. His Bessemer converter was able to produce stronger steel that could be used in a wider variety of ways.

Now, things really started humming.

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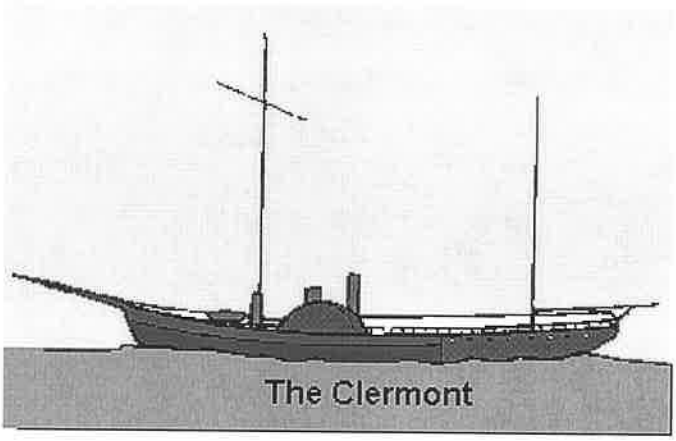
Robert Fulton

There were advances in water transportation as well.

In 1807, Robert Fulton, added a steam engine to the ship "Clermont." The steam engine powered a paddle wheel. The ship made i's first test run on the Hudson River.



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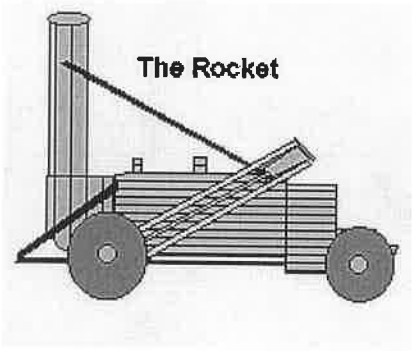
George Stephenson

Then there was the railroad.

In 1829, George Stephenson, a mining engineer, developed a locomotive called the "Rocket." It ran on iron rails at an amazing 36 miles per hour (58 km/h).

The further development of the railroad would revolutionize transportation in Europe and the United States. In 1869, the first trans-continental American railroad was completed.



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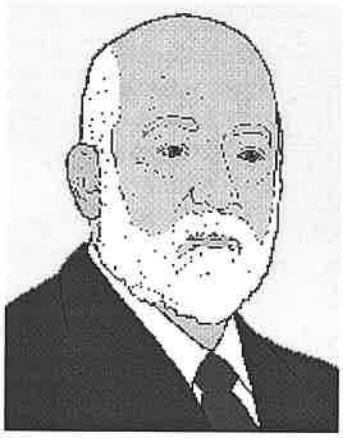
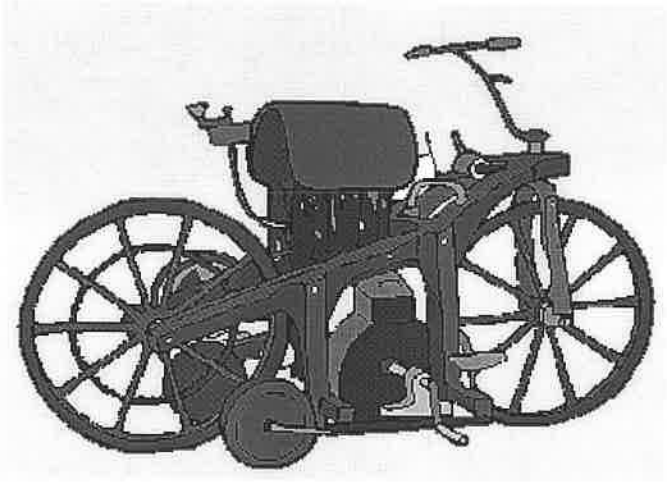
The Automobile



During the late 19th century, lots of people in Europe and the United States were trying to figure out how to put some sort of motor onto a carriage or bicycle.

In 1886, the German scientist, Gottlieb Daimler, built the first internal combustion engine. It was fueled by gasoline. Later he put the engine in one of the first automobiles.



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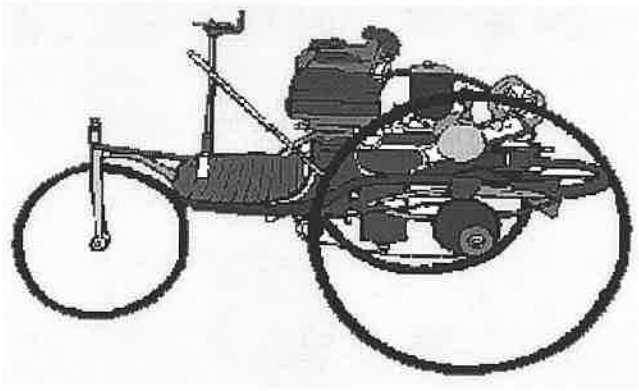
The Automobile

Rudolf Diesel also built an internal combustion engine. However Diesel's engine ran off petroleum oil instead of gasoline.

Diesel engines are still in use today in large trucks, heavy machinery, and some cars. This is because a properly maintained diesel engine will last far longer than a gasoline engine.



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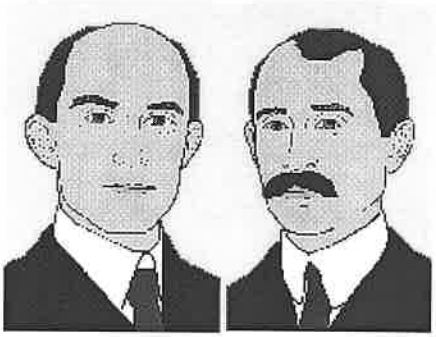
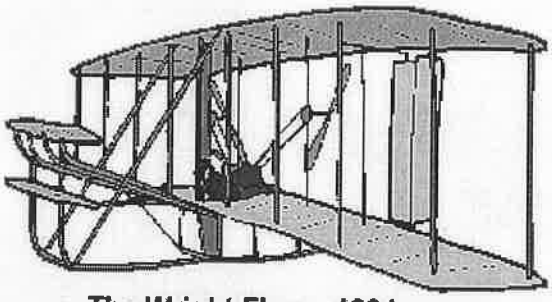
The Airplane





The Wright Flyer - 1904

Well, it had to happen. People also tried to put an engine in a flying machine. Finally, in 1904, Wilbur and Orville Wright successfully flew their Wright Flyer at Kitty Hawk, North Carolina. Another new era had begun.

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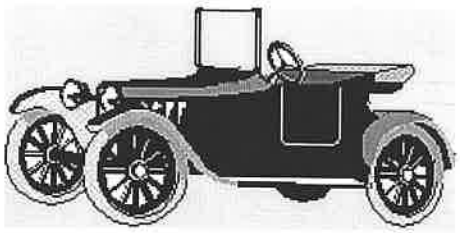
Mass Production

In 1913, Henry Ford, introduced the assembly line to speed up production. The assembly line broke each job down to small tasks. It was efficient and produced more goods at a cheaper price.



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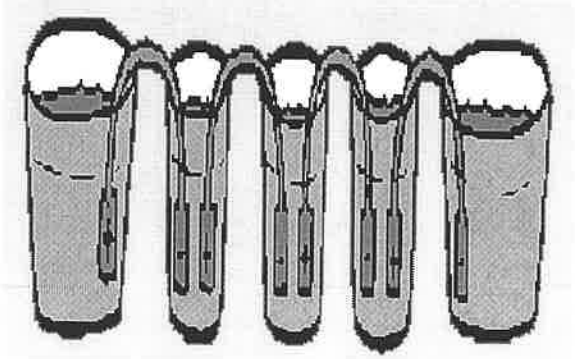
Alessandro Volta

Advances in science and technology were taking place at the same time that people were inventing new machinery. In 1800, Alessandro Volta built one of the first electric batteries and demonstrated it to Napoleon, ruler of France.



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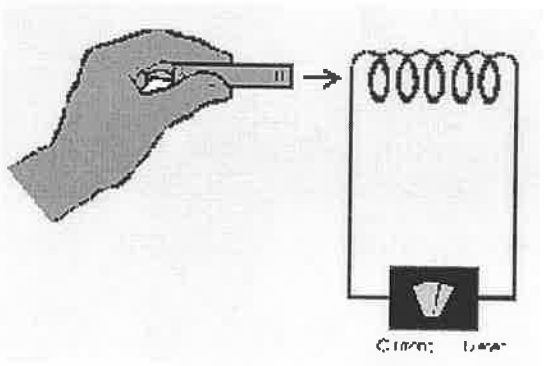
Michael Faraday



In 1831, English scientist Michael Faraday discovered that moving a magnet through a coil of copper caused an electric current. This discovery led to the development of the first electric generator and the use of electricity.

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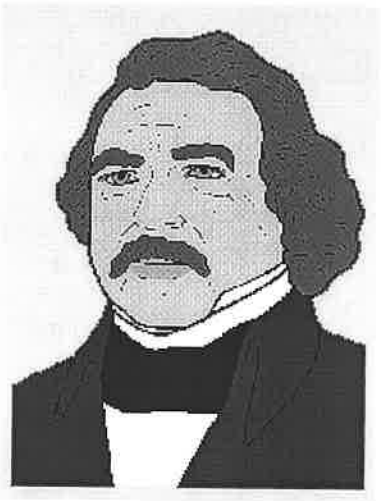
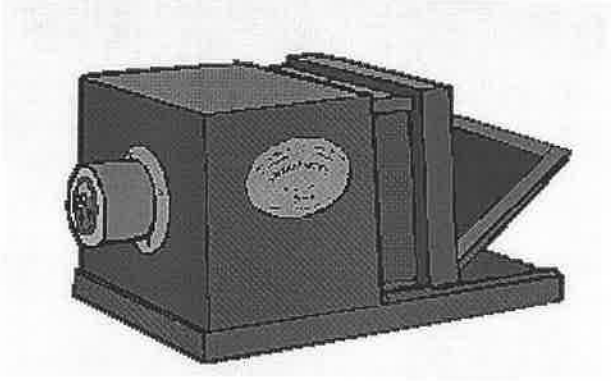
Photography



In 1839, Frenchman Louis Daguerre invented the first camera. The Daguerreotype, a metal plate coated with silver iodide, was exposed to light through a small hole in the camera.

The plate was removed and treated with mercury fumes. Later the plate was washed and treated with table salt to prevent fading.



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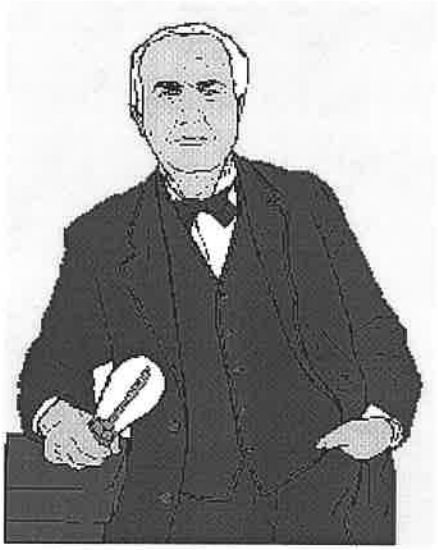
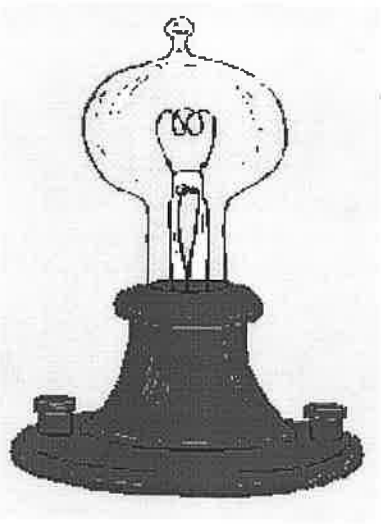
Thomas Edison



Thomas Edison invented hundreds of things we use today. The photograph, incandescent light bulb and electric generating are just a few of the inventions of Thomas Edison.

Edison was one of the first to actually make a business out of inventing things. His laboratory in New Jersey was one of the first created just to develop new inventions.



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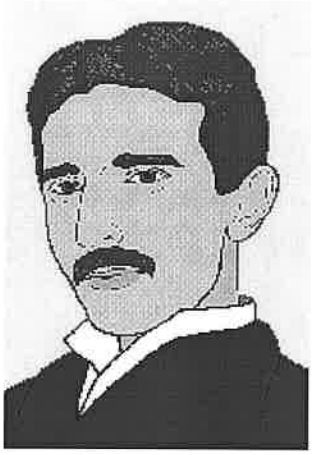
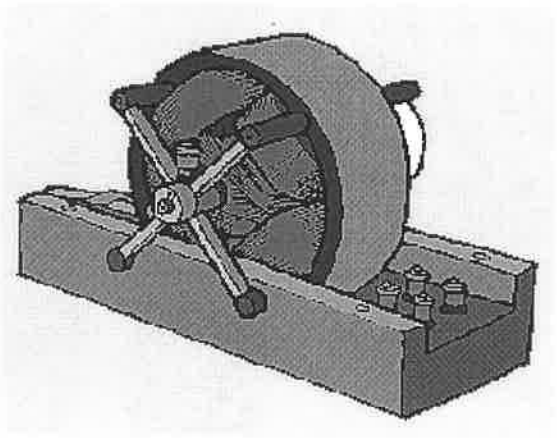
Nicholas Tesla





Electrical engineer Nicholas Tesla is the reason we all have electricity at our homes. Working in the 1880s, he perfected the principles of alternating current. The electric coil or the Tesla coil keeps the current consistent on the power lines.

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