

Inventing the Revolution

To make a lot of cotton cloth, you need a lot of cotton. The United States had the cotton. This huge supply of cotton was the result of an invention. It was a simple but clever machine. The story of that machine holds one of the keys to the Industrial Revolution.

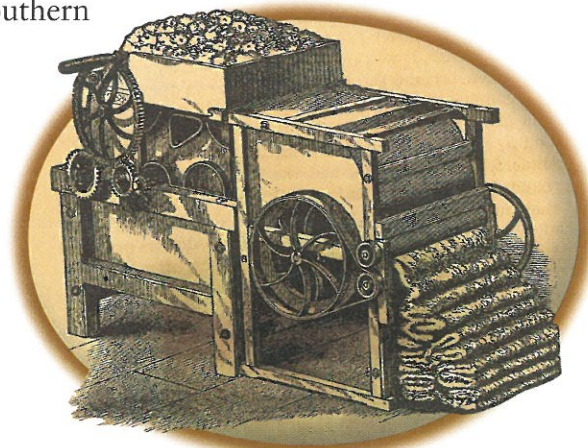
Americans had been growing cotton in the South for hundreds of years. The plants were hard to clean. It took a worker—usually an enslaved African American—a whole day to clean one pound of cotton by hand. Then, old ways of doing things changed.

Eli Whitney was visiting a **plantation** in 1793. He heard cotton planters complaining about how hard it was to clean cotton. The planters said that a machine that could clean cotton quickly would be good for them and the nation. It would also make its inventor a great deal of money. Whitney was inspired.

Since childhood, Whitney enjoyed taking machines apart. He wanted to see how they worked. He liked the idea of inventing a machine to clean cotton quickly and simply. He thought about it. He tinkered. Then, in ten days, he built a model that worked. At last, cotton could be cleaned quickly.

Eli Whitney's machine changed more than the simple act of cleaning cotton. Now that cotton could be cleaned quickly, demand for cotton increased. Southern planters needed to grow more cotton to meet this demand. They needed more slaves to work in the cotton fields. With more cotton, the spinning mills of the North produced more cloth. Eli Whitney's little machine changed American lives—the lives of planters and factory owners, of enslaved African Americans, and of Lowell mill girls.

The cotton gin could clean cotton 50 times faster than cleaning cotton by hand.



Did You Know?

The government's right to grant patents is part of the Constitution. In 1793, a patent lasted for 14 years. Today, a patent is good for 14 to 20 years, depending on the kind of patent. Renewing a patent requires a special act of Congress.

Patent Office, Washington, D.C.

Encouraging Change

Some of the planters wanted to buy the rights to Eli Whitney's new machine, but he was too smart. Whitney knew that he could get a **patent** on his invention. A patent is a certificate issued by the government. It gives the patent holder the right to be the only one to make, sell, or use an invention for a certain number of years.

In 1790, the new United States had passed its first patent law. That law was part of the Industrial Revolution, too. Revolutions are based on big changes and new ideas. By protecting an inventor's rights, patents encouraged inventions and new ideas. Soon, America became known as a nation of inventors.



The American System



Chapter 3

In the late 1790s, Eli Whitney was a famous man. His cotton gin was an enormous success. He held a patent on it, but people copied it without paying him. Whitney still had to pay for workers, supplies, and a place to work. He went into **debt**. He needed to make money.

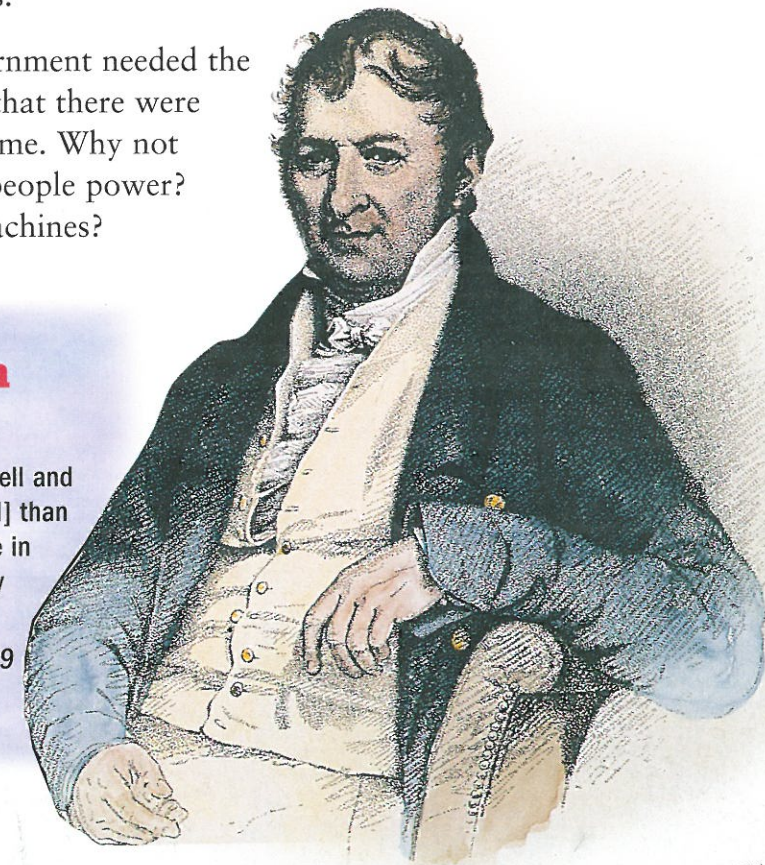
Eli Whitney considered himself a clever inventor who could create machines that solved problems. At the time, the United States government needed a large number of muskets, or guns. If the country went to war, the government was afraid that it would not have enough guns. Whitney had an idea for a new and better way to make guns.

Whitney knew that the government needed the guns quickly. He also knew that there were not enough workers at the time. Why not use water power instead of people power? Why not make guns with machines?

Voices from America

"I can do [muskets] as well and with much greater [speed] than they have ever been done in this (and I believe) in any Country. . . ."

—Eli Whitney, 1799



Eli Whitney's Good Idea

Guns were still made by hand in the late 1700s. A gunsmith made each gun individually. He made the parts by hand or with simple machines. The skilled gunsmiths at the Springfield Armory—a government gunmaker—had produced only 1,000 finished guns in three years. In 1798, Eli Whitney told the government that he would produce 10,000 muskets in 28 months!

In addition to saving time and manpower, Whitney believed that his machines could solve another problem. Eli Whitney saw the possibility of creating **interchangeable parts**. In other words, he would make identical parts that could be used in any gun.

No two handmade guns were exactly alike. The parts from one gun would not fit into another gun. This created problems when a gun broke. The entire gun had to be sent back to a gunsmith for repair. If guns were made of identical parts, they could be more easily produced and repaired. In 1798, this was a revolutionary idea.

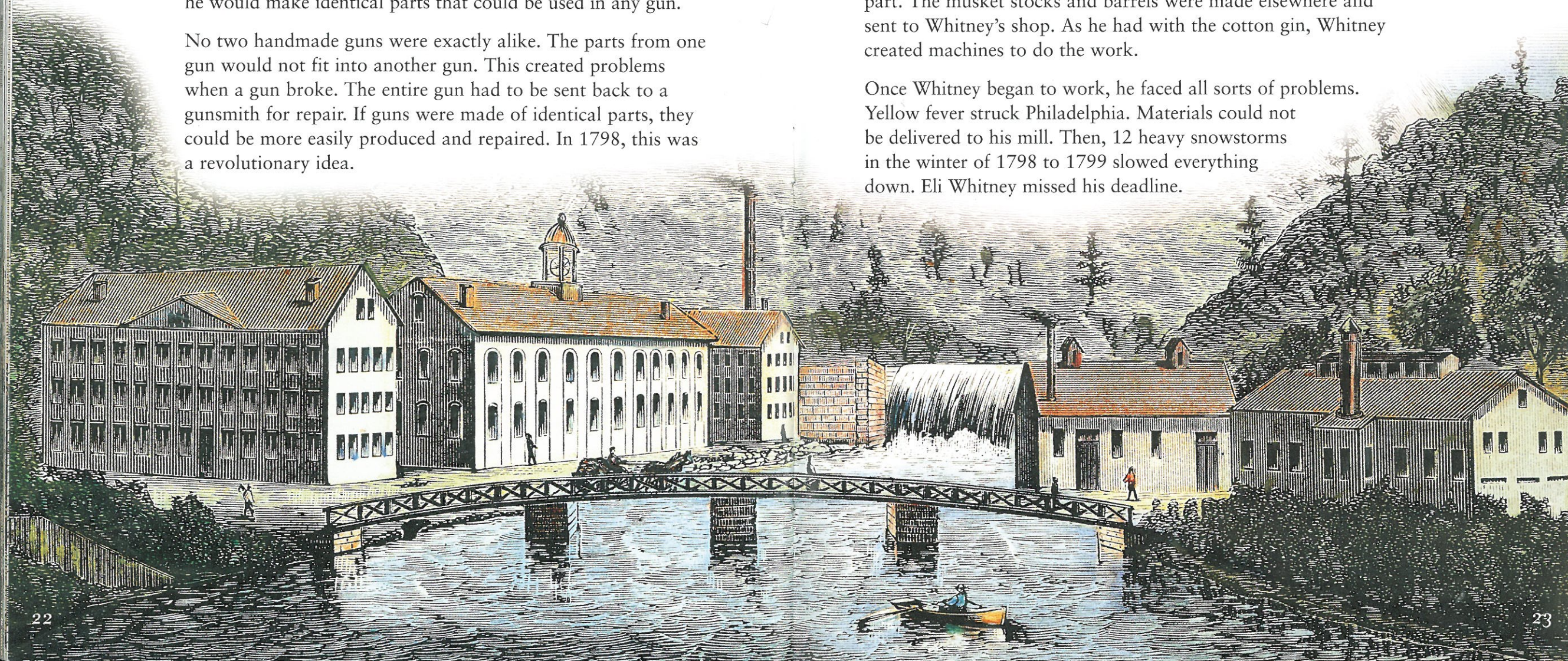
From Idea to Reality

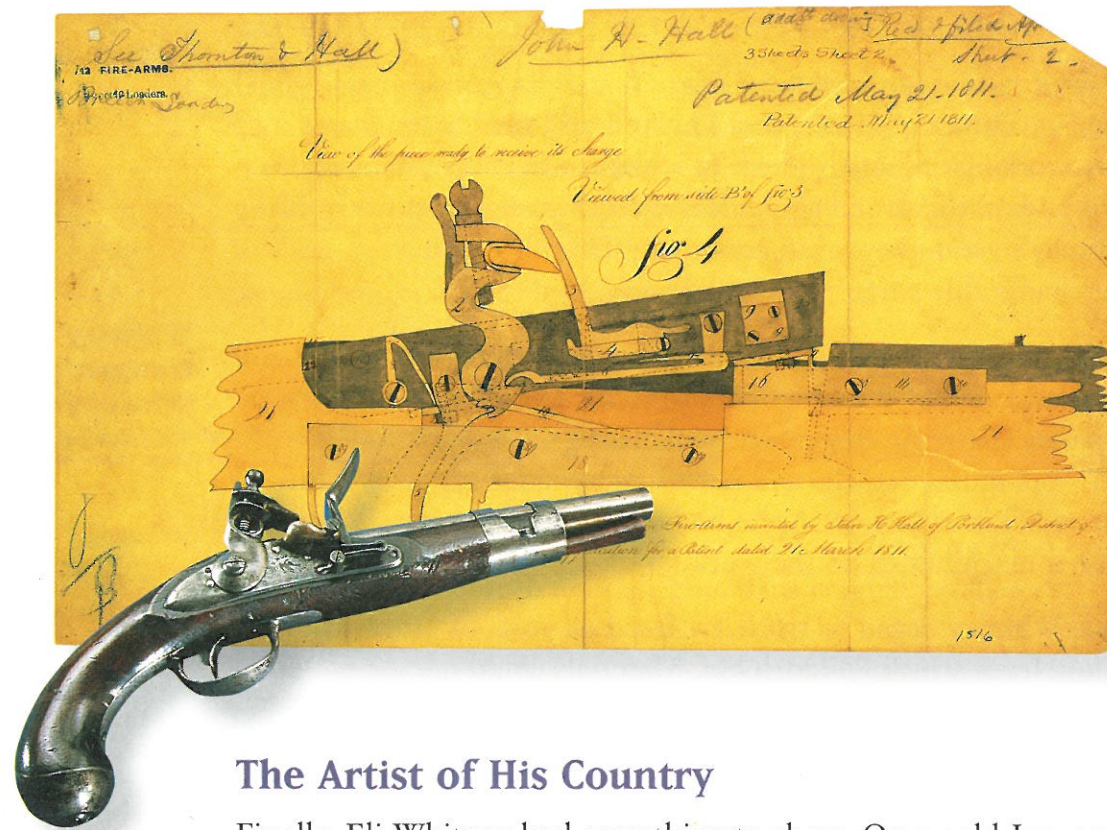
Eli Whitney did not invent the *idea* of interchangeable parts. Other inventors in France and England and the United States were working on similar ideas. In a world where communication went by horseback and ship, ideas didn't travel very quickly. Eli Whitney's great gift was to create a system for making interchangeable parts.

Whitney got a government **contract** to make guns. He went home and started thinking. He broke the gun lock down into its parts. He began designing machines to make each and every part. The musket stocks and barrels were made elsewhere and sent to Whitney's shop. As he had with the cotton gin, Whitney created machines to do the work.

Once Whitney began to work, he faced all sorts of problems. Yellow fever struck Philadelphia. Materials could not be delivered to his mill. Then, 12 heavy snowstorms in the winter of 1798 to 1799 slowed everything down. Eli Whitney missed his deadline.

**Whitney Arms
Company in
Whitneyville,
Connecticut**





▲ A pistol and rifle with interchangeable parts

The Artist of His Country

Finally, Eli Whitney had something to show. On a cold January day in 1801, he staked his reputation on a pile of metal. President Thomas Jefferson watched as Whitney randomly picked up parts from the table and put together a musket lock. Mixed up on the table were the parts needed to make a musket lock. Following Whitney, the government officials in the room did the same thing. The men could put together locks, take them apart, or substitute other pieces. All of the parts fit any lock.

Standing in an office in the nation's new capital, Washington, D.C., the men could not believe their eyes. Eli Whitney is "the Artist of his Country," they decided.

What had Eli Whitney done? He had successfully created the basis for **mass production**, the making of identical goods in large quantity. Eli Whitney's methods would revolutionize American industry.

Whitney was more interested in the process and the machines than in the guns. He had missed his deadlines but he had created machines that could cut and shape parts for other machines. The President of the United States could put together a gun lock from the identical parts he had made. Whitney had accomplished his goal.

Eli Whitney finally delivered his 10,000 guns. They were almost 10 years late! Eli Whitney had created a remarkable new way of making things. He had created a system of interchangeable parts and mass production. His system did not work just for guns. It worked for clocks and locomotive engines, for bicycles and sewing machines. It laid the foundation of modern industry.

▼ Mass production in a cotton mill in the 1890s

