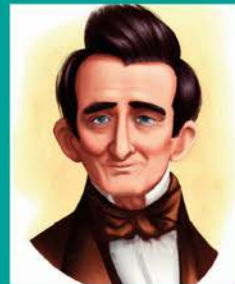


What a Character!

INVENTORS &  
SCIENTISTS

Notable Lives from History



Marilyn Boyer

First printing: September 2023

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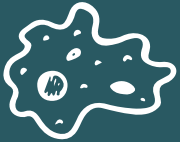
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1

# Carl Linnaeus – The Boy Who Loved Plants

1707–1778

A famous scientist who lived in Sweden

## Who Was Carl Linnaeus?

Carl Linnaeus was both an outstanding scientist and a **biblical creationist**, believing what the Bible tells us in the Book of Genesis.

**biblical creationist:** A scientist who believed the world was created by God in six days

He lived in the 1700s and he is most famous for developing an orderly system for classifying animals and plants.

It may seem strange that things like rocks and flowers would drive someone to leave his home to risk his life in wild and faraway places. Yet, when God wants to give a great gift to the world, He sometimes chooses unusual ways of sending the gift.

This was what happened in the life of Carl Linnaeus (Lin•a•us). Starting as a small child who liked flowers, Carl developed a passion to explore the wonders of creation. This great hunger to know would take him both into the world of books and on some amazing and dangerous adventures.

### In the Garden

Carl was born in 1707 in Rashult, Sweden, in a farmhouse, to parents who both loved flowers. His father was the pastor of the local church and was a highly educated man and Carl was raised with a deeply religious upbringing. Both his father and mother hoped that their son would one day be a preacher like his father. It seemed that something in baby Carl was drawn to the beauty of God's creation, and his parents found that when he was upset, he calmed down when they gave him flowers.



As soon as he could walk, he wanted to totter outdoors and play with the plants. When he learned to talk, he wanted his father to teach him the name of every one.

Like a true adventurer, Carl was also fascinated by the bugs. There were so many different types: Big-eyed bugs. Crawling bugs. Flying bugs. Fuzzy bugs. Bugs with stripes. Bugs with spots. Bugs with many legs. What were the names of all these bugs? Bugs were so much more interesting than learning Greek and Latin. Carl's parents always knew where to find him when they noticed he had left his studies and disappeared. He would be in the garden.

Carl started school with the other children, but he proved to be a problem to the teachers. He just couldn't keep his mind on his books. He wanted to be outside studying the living things there. Some of his teachers told Rev. and Mrs. Linnaeus that their son would never be a minister. He just wasn't smart enough for all the studies the ministry required. The best thing would be to **apprentice** Carl to a tradesman. He might make a good shoemaker or **tanner**, they said. But he would never be a good minister.

Thankfully, there was one special teacher in the school who saw something in Carl that the other teachers did not. He saw that the boy's love of plants could be very useful. Carl should study to become a doctor!

**apprentice:** To work for a skilled craftsman to learn the trade

**tanner:** A person who tans animal hides to create leather

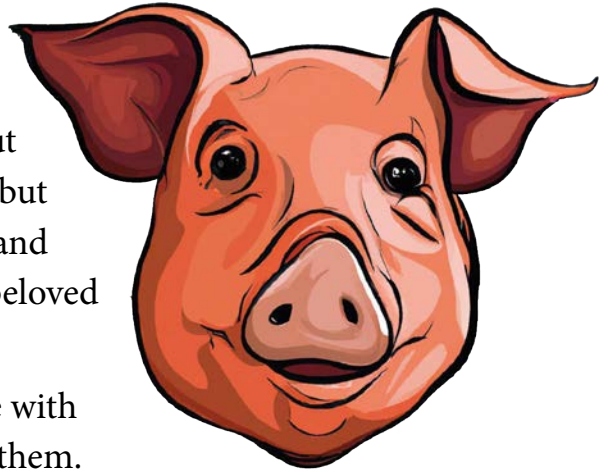
## Medical School

When Carl's father thought about this, he realized that the teacher might be right. In those days, most medicines were made out of plants.

Doctors had to like plants and know a lot about them in order to take care of sick people. Carl thought it was a good idea as well. He could help people, make a living for himself, and still spend lots of time outdoors with bugs and flowers. Could he go to medical school?

Reverend Linnaeus was wise enough to know that people tend to be good at things they enjoy doing. Perhaps medical school would be a good choice for his son. But how would he pay for his schooling? Carl's parents were not wealthy. He would have to work to support himself and pay his school bills. Carl wanted very badly to study to be a doctor, so finally, his father and mother agreed.

It was hard for the young man. In 1727, he began his studies at Lund University at Lund, Sweden. He took whatever work he could find to earn a little money. He was often hungry. His shoes wore out and he put paper inside them to protect his feet, but he was determined. He worked hard and studied hard. Soon he was using his beloved plants to help sick people get well.



One of the problems of curing people with plants was in knowing what to name them. People did not agree on what plants were called.

Some plants had 30 or more names! Depending on the town you lived in, you might call a dandelion a blow ball, a yellow daisy, or a **swine's** snout, or something else.

**swine:** Pig



Carl also discovered that dog bites could be treated using a pretty pink rose. He noticed that not all roses are the same, so it was hard to tell different doctors which rose he was using. Each doctor had his own long, Latin name for any type of rose.

It was just as bad with the animal kingdom. Scientists like to argue about whether a whale was a fish or a bat was a bird. Carl was frustrated by all the confusion. Somebody needed to figure out a system to name all the types of animals so that everyone could know what everyone else was talking about.

God's creation was so huge! There were millions of living things on earth — dogs, cats, horses, worms, flowers, jellyfish, ladybugs. Who could ever create a system to name them all and group them together with other organisms like them?

## God's Hand in It All

It was a challenging problem, yet Carl saw God's hand in the great variety of creation. It was amazing! It was beautiful! He once said, "As one sits here in summertime and listens to the cuckoo and all the other bird songs, the crackling and buzzing of insects, as one gazes at the shining colors of flowers, doth one become **dumbstruck** before the Kingdom of the Creator."<sup>1</sup> Yes, God had made a beautiful world full of wonderful plants and animals. Even though Carl was young and just out of school, he would tackle the job.

**dumbstruck:** So surprised that one is unable to speak

First, he declared that all living things belonged in two kingdoms: the plant kingdom and the animal kingdom. He divided the two kingdoms into groups called classes. He divided

plants into 24 classes, based on the different parts in their flowers. He gave each plant a Latin name.

But these Latin names would not be long and complicated. Oh no! A two-word name was enough to tell the plants apart. The names should be short and easy to remember. Safety pins, straight pins, bobby pins, hair pins. All were pins and it only took a two-word name to tell the difference. It should work for plants and animals too. The rose that healed dog bites would be *Rosa canina*: Dog rose. His first plant classification work was published in 1753.



It took a lot of time to decide on names for all the plants and animals he knew, but Carl was not satisfied. In other places, there were other creatures he had never seen. He published his first edition of his classification of animals in 1758.

The Uppsala Academy of Sciences paid for him to take journeys to faraway lands to learn about the plants and animals that lived there. Far to the north in **Lapland**, Carl searched out the natural wonders as he explored a harsh wilderness without roads.

**Lapland:** A region in northern Norway, northern Sweden, and Northern Finland

Sometimes he waded through icy water. Sometimes he nearly froze while searching for tiny mosses on his hands and knees. Treasures were to be found far above his head too, so Carl climbed trees to look for pinecones and nuts. Some of the

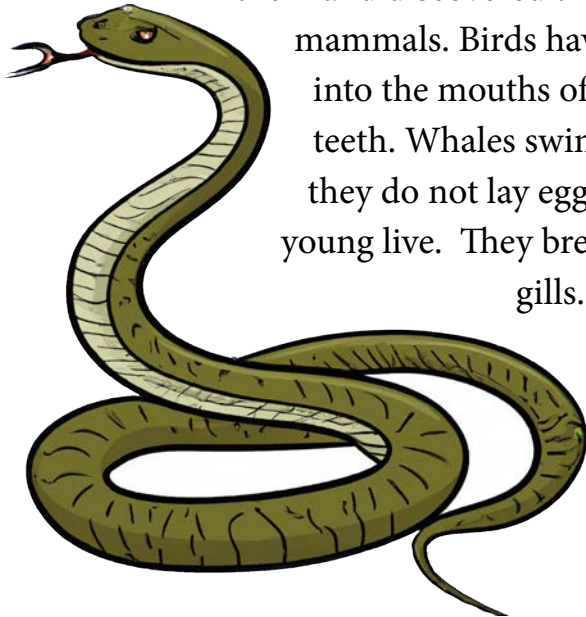
plants he found had never been written about by scientists before.

All that he saw delighted him. The amazing variety of plants and animals, and the beauty of nature all around him, all reminded him of the greatness of the Creator. He once said: “Blessed be the Lord for the beauty of summer and spring, for the air, the water, the **verdure**, and the song of birds.”<sup>2</sup> Yes, it was a big job he had undertaken, but the Creator deserved the best efforts the young scientist could offer.

**verdure:**  
Vegetation

Animals were just as interesting to Carl as plants. He wanted to choose names for them all and group them into classes. What a collection! Carl felt that living things had feelings. He was fascinated with things that ran or flew, crawled or swam. Among those creatures were eagles, catfish, raccoons, beetles, frogs, lions, elephants, snakes, and many more.

In the 1700s, scientists were confused about some animals. Some of them thought whales were fish and bats were birds. Carl studied them and discovered that bats and whales are both mammals. Birds have beaks but Carl, peering into the mouths of bats found not beaks but teeth. Whales swim in the ocean as fish do, but they do not lay eggs as fish do. They bear their young live. They breathe air through lungs, not gills. It seemed very strange that whales were in the same group as bats, but Carl learned that they had much the same organs on the inside of their bodies.



As he had done with the plants, Carl gave each animal two names. He named dogs *Canis familiarus*. Then he moved on to the insect world. He looked at the differences and similarities between the insects, grouped them into groups, and gave names to the groups.



It would seem that other scientists would love Carl for all the work he had done. He had worked day and

***Canis familiarus:***  
Dog familiar

night with little time for rest or sleep. He made science simpler for everyone by organizing plants and animals with simple names that

everyone could agree on. He went to the trouble of writing books to share his ideas with others. On the contrary, instead of praising him for his service to science, some people got angry.

Famous scientists who had spent their lives studying plants and animals were not happy with Carl. Who was this young upstart who thought their long Latin names for things were useless? A botanist named Siegesbeck (syg•es•beckia) said that Carl's work was

**“loathsome.”** He wrote angry letters to Carl and Carl wrote angry letters in return. Finally, Carl paid Siegesbeck back for his hostility by naming a plant *Sigesbeckia orientalis*. The plant was an ugly, smelly weed.

**loathsome:**  
Repulsive or  
disgusting

## **An Interesting Teacher**

When, in 1750, he was offered a job as a teacher at Uppsala University in Uppsala, Sweden, Carl accepted. He did not want his students to be bored and frustrated as he had been when he was a young scholar. He used his garden as a textbook. He had thousands of interesting plants for his pupils to study. In addition, he led them on field trips into the fields and woods. These were lively, exciting events lasting all day long. Sometimes he would take hundreds of students along. They traveled as in a parade, with musical instruments playing and banners flying. Whenever one of the students found a rare plant, he would order the bugles sounded to celebrate.

As years went by and his students became adults, some of them traveled to faraway lands to do nature studies, just as Carl had done in his youth. In China, Africa, Russia, Japan, India, and many other places they explored plant and animal life and taught people the ideas Carl had taught them.

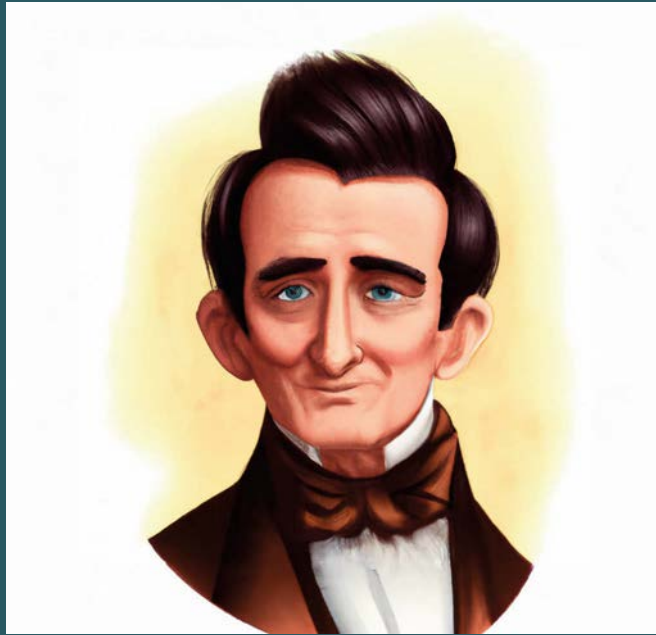
From tropical jungles, blazing deserts, and snowy mountain peaks, these scientists sent thousands of plant and animal specimens for their teacher to name. It seemed his work of naming living things would never be done.

Eventually, Carl Linnaeus classified and named over 12,000 plant and animal species. Now, scientists around the world had a common language. Now they could all use the same name for a specimen whether they had grown up speaking German, English, Swedish, or Chinese. As the simple new system spread around the world, Carl became wealthy and famous. He was given many awards. Famous people and even kings and queens read his books. In 1757, the king

of Sweden made Carl a knight — the first scientist ever to receive that honor.

Even with all this success, Carl did not retire and rest. He still kept busy in his garden, planting thousands of species from all around the world. Along with his plants, he enjoyed seeing his parrots, peacocks, and monkeys wandering among the beds and fountains at Uppsala, which became known as the Linnaean Gardens of Uppsala. He also kept on teaching others about the wonders of God's creation.

Quote by Linnaeus: “The observer of nature sees, with admiration, that ‘the whole world is full of the glory of God.’” He further noted, “God infinite, omniscient and omnipotent, woke me up and I was amazed! I have read some clues through His created things, in all of which, is His will; even in the smallest things, and the most minute! How much wisdom! What an inscrutable perfection!”<sup>3</sup>



2

# Eli Whitney – Creative Inventor

1765–1825

American inventor

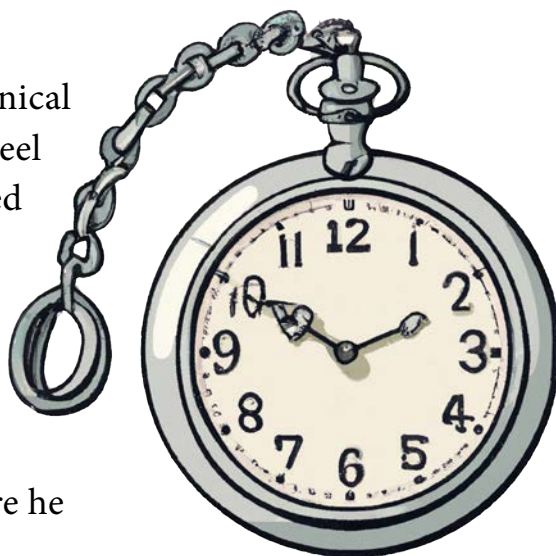
## Who Was Eli Whitney?

Eli Whitney was an American inventor, best remembered as the inventor of the cotton gin, but most importantly for developing the concept of mass production of interchangeable parts. He was born in 1765 in Westboro, Massachusetts. Eli prepared for Yale at Leicester Academy (now Becker College) and under the tutelage of Rev. Elizur Goodrich of Durham, Connecticut. Whitney attended Yale College and graduated in 1792.

## The Watch

Ten-year-old Eli Whitney looked down at the dozens of tiny metal pieces on the table before him. He had really done it this time. Here was his father's prize silver watch, taken apart and scattered across the tabletop. It had been so easy to open the case and remove the little bits of metal that produced the steady tick-tick-tick that so fascinated a little boy. But now it was time to put all those little bits back together again. Could he do it? He swallowed hard. He was not sure anybody could do that.

The watch was just one more mechanical thing that drew Eli's attention like steel to a magnet. Born in 1765, and raised on the family farm in Westboro, Massachusetts, he had always been more interested in the farm workshop than what was growing in the fields. He examined all the farm equipment until he was sure he





understood how it worked. He wanted to know how everything was made and what made it do its job. His restless mind could not be at peace until he solved each mystery.

That was why he had always wanted to examine his father's watch. It was so beautifully put together! So small and so shiny, so perfectly round. It ticked steadily all day and all night and all that his father did to make it keep on ticking was to wind it. What mysteries must be inside that silver circle! What magic it must contain!

He hadn't meant to take the watch all apart. He just wanted to get his hands on it — to pry off the back cover and look his fill at the marvels that must be between the two silver disks. And oh, how wonderful it was when he had done so! All those tiny wheels and levers, each mysteriously doing its little part to produce the wonderful, steady tick-tick-tick. But some parts were hidden by other parts. There was no way to see them but to remove some things. And now — he felt a queasy churning in his stomach.

How much time did he have? He had stayed home with his sick mother while Father took his brothers and sister to church. It was a good thing that church lasted a long time in those days. Still, surely there was no time to be wasted. Eli took a deep breath and began putting little pieces back in place, one by one. He hoped with all his heart that he was doing it right, but there were so many pieces. And some of them looked just like others. How could he be sure he was doing it right?

Finally, he placed the back cover on the watch and snapped it into place. Holding it carefully and hardly daring to breathe, he quietly walked into the living room. Nervously he listened for the hoof beats of his father's team returning from church. No sound came from the road. He set the

watch to exactly the time showing on the big clock on the mantelpiece. Now, for the final test. He began to wind the spring as far as it would go. When the stem would turn no farther, Eli took his fingers off.

It worked! Joyously the little mechanic listened to the ticking. It seemed to him that it was the most beautiful sound he had ever heard. He could hardly believe that he had taken all those shiny little parts out of the watch and made them all go back into their proper places, but he had. It had been a frightening task, but he had done it. Now he would have more confidence than ever before in working with machines — even tiny ones with lots of parts.

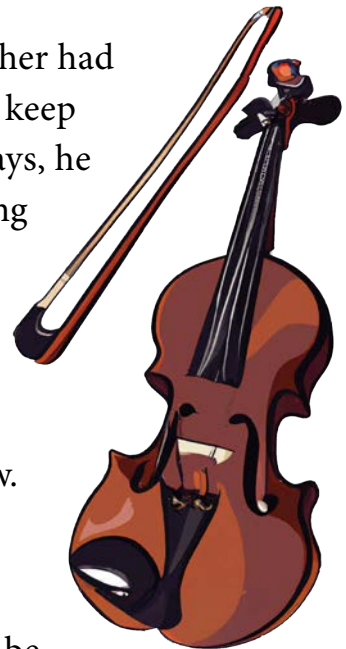
### **An Inventor at Heart**

Two years later, Eli was still at it. His sickly mother had died, and a housekeeper had been hired to help keep house. When Father had to be away for a few days, he returned and asked what his sons had been doing around their Connecticut farm in his absence. “Well,” she replied, “one of the boys mended that stone wall between two fields. Another one hoed the onion patch.”

“And what did Eli do?” his father wanted to know.

“He made a fiddle,” was the reply.<sup>4</sup> The father sighed. The boy was not much of a farmer.

Instead, he was an inventor. The fiddle proved to be made much like other violins. The music it produced was fairly good. Everyone who saw it was amazed that it had been made by a 12-year-old boy. Soon fiddlers from all around were bringing their



instruments to Eli when they needed fixing. He could usually take care of the problem.

When Eli was 14 years old, his father remarried. His new stepmother owned a beautiful set of knives which she said had been made in England. She said such fine knives could not be made in America.

“I could make them myself if I had the tools,” Eli replied.<sup>5</sup> This sounded like foolish bragging to the rest of the family, but a few weeks later Eli got the chance to do just that. One of the fancy knives broke. Eli took the pieces of the knife to the workshop and went to work. With his clumsy set of tools, he produced a new knife. When he showed it to his stepmother she was amazed. The only way she could tell the difference between her knives and the new one was that the rest of the set was stamped with the **trademark** of the English maker.

Two years later, Eli’s handyman skills started adding to the family’s income. He became a nail maker. The Revolutionary War was underway and trade with England had stopped. Because there were no nail factories in America, nails

**trademark:** A symbol or word legally registered to represent a company

had always been bought from England. Now they had to be made by hand if Americans were to get nails at all. Eli put his curious mind to work and quickly figured out how to make nails in his father’s shop. Soon the Whitney family was selling nails by the hundreds.

With the end of the war, trade with the mother country began again. Now it was cheaper to buy nails from England than to pay for hand-made American nails. Eli’s sales **tapered off** to a trickle. It was time to find another job.

**tapered off:** Slowed down

He turned back to his tools and began making walking sticks and hat pins for sale. He was successful again, partly because he had very high standards for his work. He would say, "Whatever is worth doing at all, is worth doing well."

### **Determination Pays Off**

At the age of 19, Eli began longing to study other things. He decided to go to Yale College in New Haven. He lacked schooling, for he had never worked very hard studying books. He also lacked money. A college education was expensive, but Eli Whitney was a determined young man. He took some more schooling. He worked hard on the farm and in the shop. After a while, he was able to learn enough to get a job as a schoolteacher. Finally, at the age of 23, he went to Yale.



Eli had to work hard at his studies and also take on work to pay for his schooling. While at Yale he repaired a machine used in one of his classes. The teacher said it would have to be sent to England for repair, but when Eli offered to try to fix it, he was allowed to try. He succeeded as usual, and the professor was amazed.

After college, Eli set his sights on a career as a lawyer. But that would mean more years of study and more money for room and board. When he was offered a job teaching school in Georgia, he decided to take it. He had never seen the South. It would be interesting and he would escape the cold winters of Connecticut for a time.

When his ship stopped in New York, Eli met the wife of a very famous man. She was Mrs. Greene, the widow of General Nathaniel Greene of Washington's army. Mrs. Greene and her children were on their way home to their plantation, Mulberry Grove, near Savannah, Georgia. The widow quickly took a liking to the young man and found that her children soon came to love him. He was no ordinary young man. Before the trip was over, Eli and the Greene family had become very close friends.

But disappointment awaited young Whitney at Savannah. The job which had been offered to him was not what it had seemed. The salary was only half what he had been told it was. He had traveled all those hundreds of miles for a job he could not afford to accept!

Mrs. Greene came to his rescue. "Do not even think of taking the position," she said earnestly.<sup>6</sup> She invited him to come to Mulberry Grove and stay with her family until a better opportunity came his way. He could study law in the meantime, she told him. Eli accepted her kind offer.

He found Mulberry Grove to be a beautiful place. The house was a mansion, once owned by the **Tory** governor of Georgia before America won her freedom. He especially loved the library with its thousands of books. Here was a place where he could study happily until he found a job. The farm itself was also lovely, with broad fields and pretty fruit trees. Yes, Eli was glad he had turned down the deceitful offer from the school.

**Tory:** American colonist who supported the British side

## A Machine Is Needed

It was not long before Mrs. Greene discovered that Eli was a good mechanic. When her embroidery frame started tearing the cloth she was working on, he took it and told her he could make a better one. He did, and even though the new frame was of a very different design than the old one, it worked much better. The kindly widow was delighted and often told her visitors what a brilliant young man Mr. Whitney was.

One group of guests was eager to meet Eli when their hostess praised him to them. They were former army officers and local planters who had been discussing the problems of growing cotton in Georgia. A variety called short-staple cotton grew well in their red soil but was hard to use. The cotton seeds inside the bolls were hard to remove. They had to be picked out by hand so the cotton lint could be spun into cloth. This was a very slow process. It would take a worker several hours to clean a pound or two of cotton.

What they needed, the planters said, was a machine that could separate cotton from its seeds quickly. A machine like that could do more work in a day than a dozen men.

Mrs. Greene showed them her embroidery frame. “Gentlemen,” she told her guests, “I have a friend who has just come from the North, a graduate of Yale College. He is a perfect genius at contriving machinery. Explain to him what is needed, and I’m sure he can help you.”<sup>7</sup>

A servant called for Eli, and he happily went to meet the gentlemen. He eagerly listened as they explained their need



for a new machine. Yes, he told them, he thought he could invent one. The planters were very excited and told him they would return after a while and check on his progress.

Weeks went by but the new machine had not been created. Eli needed money for materials to build his new “cotton gin” (short for engine) and he had none.

Mrs. Greene continued to believe in Eli. So did her farm manager, Mr. Miller. He offered to become Eli’s partner and lend the money to start their new business. Soon Eli was hard at work in a workshop Mrs. Greene had set up in her basement. Eagerly, she and Mr. Miller watched his progress from day to day. No one else was allowed to see what Whitney was doing in the shop. He wanted to finish his machine and get a **patent** before anyone could see it and create their own cotton gin.

Finally, the first model was finished. It had little wire teeth on a cylinder that was turned by hand. The teeth pulled the cotton fibers off the seeds and the seeds dropped away. When the design had been perfected, Eli planned to build gins big enough to be turned by horses or by water power. He and Mr. Miller planned to gin the cotton themselves rather than sell the gins. They would let the farmers pay them in cotton. The farmers would keep most of the cotton and Whitney and Miller would keep the rest to sell.

**patent:** A legal document protecting his invention from copycats

Things went wrong from the very first. Others heard how the gin worked and started building gins of their own using Whitney’s ideas. Miller and Whitney went to court to protect their patent rights,

but there were many imitators using their idea. It took 13 years of fighting in court to finally win protection for their patent. But patents only last for 14 years, so they had very little time to earn money for their invention.

Not all was lost. The cotton gin did make Eli Whitney famous. In 1798, when the United States needed thousands of rifles for their army, Whitney was able to get the job of making rifles. Again he put his creative mind to work and found better ways to make rifles. Instead of making the rifles one by one as they had always been, Eli made “interchangeable” parts. That meant that a part made for one of his rifles would fit any rifle made in his factory. Instead of needing an experienced gunsmith to make each rifle individually, he could hire unskilled men and teach them to quickly put together a rifle from his parts. It took several years to make his system work, but finally, Eli Whitney was selling rifles to the government by the thousands.

The wealth that had never come to Eli Whitney from the invention of the cotton gin finally caught up with him. His system of interchangeable parts produced rifles so quickly that he became a rich and famous man. Other types of factories also began to use his system to produce their products. In the years to come, Whitney’s genius would make a tremendous difference in America. Now his ideas, such as how to manufacture muskets by machine so that the parts were interchangeable, would be used to produce the goods needed for a rapidly growing nation.