

# Spirit of Invention

## Getting Energy to Work for You

Machines make your life easier by transferring energy to do something useful. But how did these machines come to be? Inventors used their *creativity*, *determination*, and *resourcefulness* to invent the machines that we depend on everyday. For example, Thomas Edison invented the first practical light bulb. Charles Strite invented the modern timer and pop-up toaster. Percy Spencer invented the first microwave oven. We owe a lot to them and to many others who saw a need and came up with an **invention** to address that need.

### Word Connections

Inventors use creativity, determination, and resourcefulness as they work.

**creativity**—the ability to imagine and come up with something original.

**determination**—to decide to do something and work hard to follow through and succeed.

**resourcefulness**—the ability to meet challenges and overcome obstacles to get something done.

### Word Connection

The word **invent** comes from the Latin word *inventus*, meaning “to come upon.” To discover is also to come upon. Can you see the link between inventing and discovering?

## What Does It Take To Be an Inventor?

Inventors come in all “shapes and sizes.” It doesn’t matter if you are a man or a woman; young or old; famous or unknown; highly educated or self-taught. What does matter is that you have an inventive mind.

Read about some inventors and their inventions on the following pages. See if you can tell what makes an inventive mind.

## History and Biographies

### Words from an Inventor

“Always listen to children...they might have ideas we’ve never thought of.”

—Alexander Graham Bell, inventor of the telephone

### Margaret (“Mattie”) Knight—Hero to Mill Workers

When Mattie Knight was only ten years old, she began working at a textile mill (a factory that makes fabrics). At textile mills, a machine called a loom takes in thread and weaves it into cloth. In the 1800s these looms were very dangerous to operate. They often caused accidents and even deaths.

When Mattie saw a worker get injured she decided to do something about it. Others in her situation might have felt helpless, but Mattie was determined to find a solution. After several attempts, she succeeded. At the age of twelve, she designed a gadget that would stop the looms before they could cause serious injury. Many lives were saved because of her invention.

Mattie went on to develop several more inventions. Her most famous is the paper bag machine, which makes the flat-bottomed paper bags that we still use today. Next time you “brown bag it” for lunch, think about Mattie Knight.



## Chester Greenwood and the Invention of the Earmuff

When he was only fifteen years old, Chester Greenwood invented the earmuff. Growing up in Farmington, Maine, he knew from experience how uncomfortable the cold could make your ears feel. He decided to do something about it. He had his grandmother help him sew together the first earmuffs ever made. He used materials he had around the house—beaver fur on the outside, black velvet on the inside, and a soft wire for the headband. He called this invention the Ear Protector.

Soon all his friends wanted a pair. Chester was pleased but thought that some improvements were needed. He revised them several times, using better materials and changing the design. His final version was collapsible and could fit inside a coat pocket.

In 1877, when he was eighteen years old, he was granted (given) a *patent* by the United States Patent Office for his earmuff. Shortly afterwards, he set up his own earmuff factory and supplied his Ear Protectors to U.S. soldiers during World War I.



### Words from an Inventor

“To invent, you need a good imagination and a pile of junk.”

—Thomas Edison,  
inventor of the first  
practical light bulb

### Word Connection

A **patent** is a document that gives an inventor the sole right to manufacture or sell their invention. A patent gives inventors legal protection. It makes sure that, for a set period of time, they benefit (earn money, fame, etc.) from their invention by limiting other people’s right to manufacture the same thing.

### Words from an Inventor

“There are at least three steps for success. First, you think that you can do it. Second, you set your mind to it. Third, you do it.”

—Stefanie Lynn Garry,  
inventor of the  
adjustable broom

## Marion Donovan—Inventor of the Disposable Diaper

One of the most famous sayings about the inventive mind is “Necessity is the mother of invention.” This saying means that most inventions happen because there was a need for them.

This is particularly true for Marion Donovan’s invention. When Marion became a young mother she struggled, like all mothers, to keep her baby dry. In those days, when babies wet their diapers, it wasn’t just the diaper that got wet! The clothes they were wearing and the sheets or blankets they were lying on also got wet. Can you imagine how much time this took out of a busy mother’s day?

Rather than complaining, Marion Donovan did something about it—she designed a waterproof diaper cover. Using shower curtains and her sewing machine, Marion created a reusable, leak-proof diaper cover that also kept babies from getting diaper rash. Then she improved on her original design by using better materials (nylon parachute cloth) and adding extra features (snaps instead of safety pins). She was given a patent for her diaper covers in 1951.

But Marion did not stop there. She began working on a disposable paper diaper. It was not easy to convince companies to take her idea seriously. Eventually, though, ten years after she began working on it, Marion’s idea led to the creation of Pampers®. The rest is history!

Like many inventors, Marion continued inventing throughout her life, earning over a dozen patents in all.



## Alexander Fleming and the Accidental Invention of Penicillin

Not all inventions are planned. Some actually result from mistakes. The genius of “accidental” inventors lies in their ability to recognize the promise that lies hidden in their “mistake.”

An example of a mistake that has saved millions of lives is the invention of the antibiotic called penicillin. Penicillin is a medicine doctors prescribe to treat harmful infections (illnesses) caused by bacteria, such as strep throat. In 1928 Alexander Fleming, a scientist studying bacteria, was about to throw out a sample of bacteria that had been contaminated by mold, when he noticed something amazing—the bacteria did not grow in places where the mold was growing. Fleming realized that he had stumbled on something very important. He ran lots of tests to try to figure out what the mold was producing that seemed to stop the bacteria. His hard work paid off when he found the answer—the mold produced a substance that stopped the bacteria from growing. When the miracle drug penicillin was finally introduced—ten years after Fleming first noticed the mold’s affect on bacteria—his discovery changed the world. Since that time many other antibiotics have been discovered, but penicillin was the first.



The white zigzag lines on this petri dish are bacteria. The white circular mass at the bottom of the plate is mold. Notice how the bacteria do not grow around the mold.

### Words from an Inventor

“Where observation is concerned, chance favors only the prepared mind.”

—Louis Pasteur,  
Inventor of pasteurization, a process used to sterilize food

### Word Connection

An **antibiotic** is a natural substance that kills or limits the growth of bacteria. Doctors prescribe antibiotics when people have bacterial infections. Antibiotics do not affect viruses so they are not given to fight infections caused by viruses such as the common cold.



### Words from an Inventor

“Anyone can become an inventor, as long as they keep an open and inquiring mind and never overlook the possible significance of an accident or an apparent failure.”

—Patsy Sherman,  
inventor of the fabric  
protector Scotchgard

### Words from an Inventor

“All sorts of things can happen when you’re open to new ideas and playing around with things.”

—Stephanie Kwolek,  
inventor of Kevlar  
(a very strong, very  
light substance used  
in bulletproof vests,  
airplanes, and other  
things)

## George Crum—Inventor of the Potato Chip

George Crum, an African-American chef working at a resort in Saratoga Springs, New York, invented the potato chip in 1853 while trying to please a picky diner. The diner felt that his French fries were too thick and asked for a thinner batch. After repeated attempts to please the diner, an irritated Crum made the “fries” so thin that the diner wouldn’t even be able to pick them up with a fork. Surprisingly, the customer didn’t mind and actually loved the finger food. The result was the invention of the potato chip. Crum took advantage of his lucky invention, calling these first chips Saratoga Chips and potato crunches, and selling them throughout New England. His hard work paid off and Crum opened his own restaurant.



## Thomas Edison—Great American Inventor

Thomas Edison is one of the greatest and most successful inventors of all time. Edison had very little formal schooling—only 3 months in all! Instead, he was taught reading, writing, and arithmetic by his mother. What Edison did have was amazing curiosity and a belief in self-improvement (making one's life better). These qualities drove him to invent. He also had the determination and persistence necessary to succeed.

To develop the first practical light bulb he tested thousands and thousands of materials to find a filament that would last. Eventually he narrowed his search down to a filament made from plant fiber, and then proceeded to test filaments from every plant he could find—6,000 in all. He even had plant fibers sent from the tropics for testing. Eventually, his efforts were rewarded. He discovered that a fiber filament from the cotton plant produced not only a pleasing, soft orange light, but could glow for fifteen hours before burning out.

Edison is famous for saying “Genius is 1 percent inspiration and 99 percent perspiration.” He lived by these words and went on to obtain 1,093 United States patents—the last when he was 83 years old. This is the largest number of patents ever issued to one person. His inventions were legendary and included not only the first practical light bulb, but also the movie camera and the phonograph. His contributions were so monumental that when he died at the age of 84, people throughout the world dimmed their lights in his honor.

### Words from an Inventor

“Genius is 1 percent inspiration and 99 percent perspiration.”

—Thomas Edison,  
inventor of the first  
practical light bulb



# The Inventive Mind

As you can see from the stories you have just read, there is no single way to become an inventor. Some inventions come about to solve a specific need or problem. Some occur by chance. Sometimes, a material made for one purpose is simply put to another use. (Play-Doh®, for example, was originally used to clean wallpaper!)

While there is no single path to becoming an inventor, these stories do highlight certain characteristics, qualities, and practices shared by many inventors. A few of these are listed below. See if you have what it takes to think and work like an inventor!

Inventors are often:

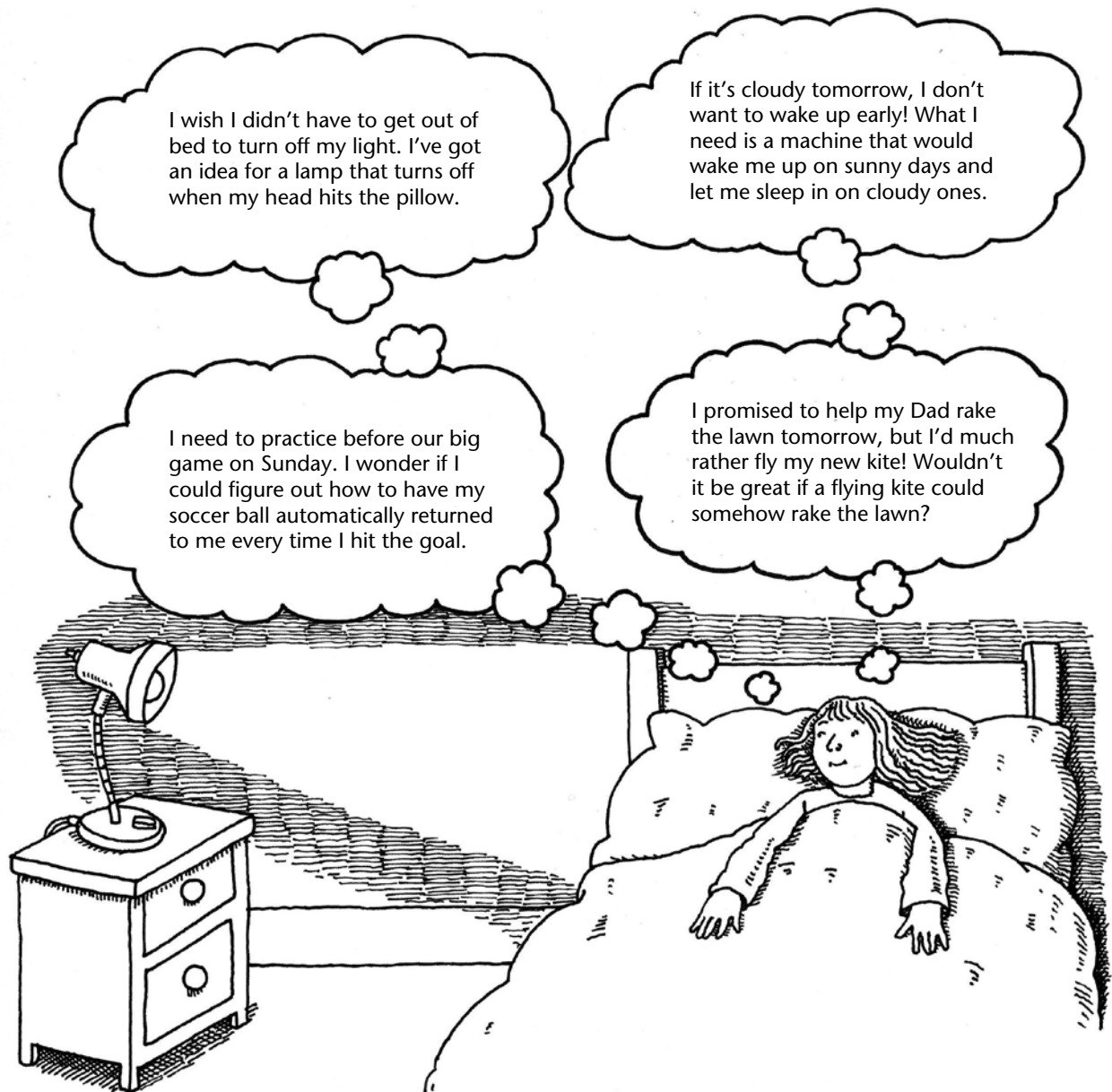
- Creative
- Curious
- Imaginative
- Critical thinkers
- Not easily discouraged
- Observant
- Risk takers
- Open-minded
- Questioning
- Motivated
- Determined
- Persistent
- Thorough
- Confident
- Problem-solvers

Inventors also test and refine their ideas, and learn from their mistakes.



## Thinking Like an Inventor

Amanda, shown below, is a natural inventor. She has a great imagination, likes to think of better ways to get things done, and loves to solve problems. What do you think of her invention ideas?



# Glossary

## **invention**

An original creation. An invention can be a thing, such as a machine, or a process, such as a new way of doing something.

## **Credits**

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