



# A New Industrial Revolution

## Objectives

1. List reasons industry grew rapidly after the Civil War.
2. Identify inventions and inventors that changed the way Americans lived.
3. Describe the advances that revolutionized transportation.

## Prepare to Read

### Reading Skill

#### Use Greek Word Origins

English words may be built on several Greek roots, and each of these may be adapted to modern usage. Thus, once you know the roots of a word, you may need to experiment with different ways to shape an up-to-date word. Use the modern context as your final clue to a word's modern English meaning.

## Vocabulary Builder

### High-Use Words

factor, p. 608

alter, p. 613

### Key Terms and People

patent, p. 610

Thomas Edison, p. 610

Alexander Graham Bell, p. 611

Henry Ford, p. 612

assembly line, p. 613

Wilbur and Orville Wright, p. 613

## Main Idea

Abundant resources, new technology, government aid to business, and a railroad boom all contributed to industrial growth.

## Vocabulary Builder

factor (FAK tor) *n.* condition or quality that causes something else to happen

★ **Background Knowledge** You have seen how the Industrial Revolution of the early 1800s changed the way Americans lived and worked. In this section, you will learn how a new Industrial Revolution changed life after the Civil War.

## Why Industry Boomed

As the nation expanded westward, conditions were ripe for industrial growth. Vast deposits of coal, iron, lead, and copper now lay within reach of the miner's pickax. The towering forests of the Pacific Northwest furnished lumber for building.

Government policy favored industrial growth. Congress gave generous land grants and other subsidies to railroads and other businesses. The government also kept high tariffs on imports. Tariffs helped American industry by making foreign goods more expensive.

**Steel and Oil** Technology was another factor that spurred industrial growth. In the 1850s, inventors developed the Bessemer process, a method to make stronger steel at a low cost. Steel quickly replaced iron as the basic building material of cities and industry.

Pittsburgh became the nation's steel-making capital. Nearby coal mines and good transportation helped Pittsburgh steel mills thrive. Other steel mills sprang up across the Midwest.

Workers near Titusville, Pennsylvania, tapped a new source of energy in 1859. As they drilled into the ground, a stream of dark liquid gushed upward. It was the nation's first oil strike. The oil industry soon devised methods to refine crude oil into lubricants for machines—and, later, into gasoline to power engines and automobiles. Oil was so valuable it became known as “black gold.”

**A Railroad Boom** Railroads fueled industrial growth. Trains carried people and goods to the West and raw materials to eastern factories. Companies improved service by adding sleeping and dining cars and laying down thousands of miles of new tracks.

As more lines were built, railroads sought ways to limit competition and keep prices high. Some big lines consolidated, or combined. They bought up smaller lines or forced them out of business. The Pennsylvania Railroad, for example, consolidated 73 smaller companies. Railroads also gave secret rebates, or discounts, to their best customers. In some places, rival rail lines made agreements to fix rates at a high level.

Such practices helped giant railroads control grain traffic in the West and South. However, high rates angered small farmers, who relied on the railroads to get their goods to market. As a result, many farmers joined the Granger and Populist movements.

**Checkpoint** How did the government support business?

## Industrial Centers, 1865–1914

## MAP MASTER

### Skills Activity

Resources such as iron, coal, and oil became vital to industry. Iron and coal were especially important resources for the production of steel.

- Read a Map** Name two areas that had reserves of oil.
- Draw Conclusions** Based on the map, why do you think Pittsburgh became a center of the steel industry?

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### KEY

- ⊗ Iron mines
- ⊗ Coal mines
- ⊗ Oil wells
- ⊗ Steel industry

CANADA

ATLANTIC OCEAN

Gulf of Mexico

MEXICO

0 km 500  
0 miles 500  
Albers Conic Equal-Area Projection

Still, such inventions would be worthless without a reliable source of energy. In 1882, Edison opened the nation's first electrical power plant in New York City. Other power plants soon sprang up all over the country. They supplied the electricity that lit up homes, powered city streetcars, and enabled factories to replace steam engines with safer electric engines. The modern age of electricity had begun.

Around the world, the United States became known as a land of invention. Almost every day, it seemed, American inventions made business and life easier.

In the late 1800s, enterprising Americans created an astonishing flood of new inventions. In fact, the government issued more patents in 1897 alone than in the ten years before the Civil War! A patent is a document giving someone the sole right to make and sell an invention.

## Inventors and Inventions

Thomas Edison and other inventors created hundreds of devices that made life easier.

### Main Idea

## America: Land of Inventors

Thomas Edison once said, "Genius is one percent inspiration and ninety-nine percent perspiration." This combination of imagination and hard work enabled Americans to produce a flood of new inventions in the late 1800s. Critical Thinking: Evaluate Information Which of the inventions shown here do you think did the most to change daily life? Explain your answer.



Alexander Graham Bell  
Telephone, 1876  
Instant communication  
over the miles!

Thomas Edison  
Electric light bulb, 1879  
Extra daylight for  
work and leisure!



**A Communications Revolution** Improved communication was vital to growing American businesses. The telegraph, in use since 1844, helped people stay in touch with one another. But Americans still had to wait weeks for news from Europe to arrive by boat. In 1866, Cyrus Field had an underwater telegraph cable laid across the Atlantic Ocean that sped communications from Europe. The telegraph used a code of dots and dashes. Alexander Graham Bell wanted to build a device that would carry the human voice. Bell worked for years inventing this device, which he called the telephone. Finally, in 1876, he sent the first telephone message to his assistant in another room: "Mr. Watson, come here. I want you."

Bell's patent for the telephone was the most valuable patent ever issued. By 1885, more than 300,000 phones had been sold, most of them to businesses. Instead of going to a telegraph office, people could buy, sell, and get information about prices or supplies simply by picking up the telephone. In time, Bell organized over 100 local companies into the Great American Telephone and Telegraph Company.

**Devices for Home and Office** Some inventions made office work faster and cheaper. In 1868, Christopher Sholes invented a letter-writing device called the "Type-Writer." Soon, female typists in offices were churning out letters at 60 words per minute.

**Use Greek Word Origins**

Phon means "sound" in Greek. Tele means "far away." Explain how Greek roots create the meaning we use for telephone.



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**The Kodak Camera.**  
 "You press the button, we do the rest."  
 (on you can do it yourself)  
 The only camera that anybody can use without instructions. Send for the Primer, free.  
 The Kodak is for sale by all Photo stock dealers.  
 The Eastman Dry Plate and Film Co.  
 ROCHESTER, N. Y.  
 Price, \$25.00—Loaded for 100 Pictures. Re-loading, \$2.00.



**George Eastman**  
 Lightweight camera, 1888  
 Anyone can be  
 a photographer!

**Jan Matzeliger**  
 Shoe-making machine, 1883  
 Cheaper stronger shoes!

**Jan E. Matzeliger**  
 Shoe Lasting Machine No. 27  
 Patented March 21, 1883

**Black Heritage USA**  
 29

**Henry Ford** Only 8,000 Americans owned automobiles in 1900. Then, Henry Ford, an American manufacturer, made the automobile available to millions. Ford perfected a system to mass-produce cars and make them available at a lower price.

Then, in the late 1800s, European engineers developed the automobile. Suddenly, people were able to travel almost anywhere and at any time. The development of the automobile ushered in an era of freer and faster transportation.

Technology also revolutionized transportation. For thousands of years, people had traveled by foot or by horse. Railroads went faster and farther but only where tracks ran.

## A Transportation Revolution

### Checkpoint Why was Edison's power plant important?

Some inventions, such as the camera, affected individuals more than businesses. George Eastman introduced a lightweight camera in 1888. It replaced hundreds of pounds of chemicals and equipment. Because Eastman's camera sold at a low price, ordinary people could record their lives on film. African Americans contributed to the flood of inventions. Jan Matzeliger revolutionized the shoe industry with a machine that sewed the tops to the soles. Granville Woods devised a way to send telegraph messages between moving trains.

The automobile and the airplane launched an age of fast transportation.

### Main Idea

### Human Flight

Until the Wright brothers invented the airplane, people had flown only by wind power, in balloons and gliders. The airplane was revolutionary because it powered itself. In addition, the pilot controlled the movement of the plane. This photograph shows the Wright brothers' first flight on December 17, 1903. **Critical Thinking: Contrast** Identify two ways that the Wright brothers' airplane differed from modern airplanes.

The Wright brothers' design included a propeller, a lightweight gas engine, a rudder, and a set of controls that allowed the pilot to move the plane up, down, left, and right. Orville had to lie face down, working the controls with his hands and feet.

The first flight lasted only 12 seconds and flew 120 feet—but the plane landed in one piece!

## Links to Science and Technology




To speed construction and lower costs, Ford introduced the assembly line in 1913. The assembly line is a manufacturing method in which a product is put together as it moves along a belt. As each car frame moved along the belt, one set of workers hooked up the engine, another attached the wheels, and so on. The assembly line sliced production time in half. Lower costs allowed Ford to charge lower prices. By 1917, more than 4.5 million Americans owned cars. Cars changed the nation's landscape. A web of roads spread across the country. Cities began sprawling into the countryside.

**The Wright Brothers** Another transportation revolution took place in 1903. Wilbur and Orville Wright tested a gas-powered airplane at Kitty Hawk, North Carolina. On its first flight, the plane stayed in the air for 12 seconds and flew 120 feet. Orville made four flights that day. His longest flight lasted 59 seconds. Surprisingly, the first flights did not attract much interest. No one could see any practical use for a flying machine. The military uses of the airplane did not become clear until World War I (1914–1918). By the 1920s, the airplane had begun to alter the world by making travel quicker and trade easier.

**Checkpoint** Why did the cost of automobiles decrease?

**Looking Back and Ahead** Resources and technology set the stage for growth. In the next section, you will see how business leaders built on this foundation to create giant industries.

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**Comprehension**

- (a) Identify** What factors were in place at the end of the Civil War that helped create a surge in industrial growth?  
**(b) Analyze Cause and Effect** What effect did the discovery of new energy sources have on the industrial Revolution?
- (a) List** What inventions revolutionized American life in the late 1800s?  
**(b) Make Predictions** What impact did Ford's assembly line have on changing American lifestyles?

**Reading Skill**

- Use Greek Word Origins** The Greek root *graph* means "writing," and the Greek root *phon* means "sound." The name of what Edison invention combines these roots?

**Vocabulary Builder**

- Answer the following questions in complete sentences that show your understanding of the key terms.
- How does a patent protect inventors?
  - How did the assembly line revolutionize factories?
- (a)** Abundant natural resources aid economic growth because they provide energy and raw materials for manufacturing.
- (b)** Secret rebates are unfair because they encourage business but not the arts.
- (c)** Secret rebates are unfair because they were given to some customers but not to others.
- (d)** Inventions aid industrial growth because they show Americans' special ingenuity.

**Writing**

- Which of the following statements are logical, and which are not logical? Explain why.  
**Statements:**