

Section

2

Inventions



Section Audio



Spotlight Video

Essential Question

How did the inventions of the late 1800s revolutionize society?

Reading Guide

Content Vocabulary

Model T

(p. 593)

mass production

(p. 593)

assembly line

(p. 593)

Academic Vocabulary

transmit (p. 589)

mechanism (p. 592)

Key People and Events

Cyrus Field (p. 589)

Alexander Graham Bell (p. 590)

George Eastman (p. 590)

John Thurman (p. 590)

Oliver Howard Latimer (p. 592)

Thomas Edison (p. 592)

Samuel Morse (p. 592)

Benjamin Franklin (p. 592)

Henry Ford (p. 592)

Reading Strategy

Guiding Notes As you read, use a strategy like the one below to identify the effects of major inventions.

	Effects
Telegraph	
Telephone	
Incandescent lightbulb	

American Diary

The Cleveland Plain Dealer described the lighting of a park in 1879:

"Thousands of people gathered . . . and as the light shot around and through the Park a shout was raised. . . . Soon afterward a section of artillery on the lake shore began firing a salute in honor of the occasion. The Telegraph Supply Company's establishment . . . was thrown open to as many people as could be accommodated . . . [to] inspect the machinery which sends light over the wire."

—from *Men and Volts*

Electricity lights up Luna Park on Coney Island in New York, 1890.

Differentiated Instruction



Writing Support



Skill Practice

Other Edition

Communications

Main Idea New inventions revolutionized communications, making faraway places seem closer.

History and You Do you talk on a cell phone or e-mail people in other states or countries? Read to learn how long-distance communication changed in the late 1800s.

By 1910, Americans in cities drove cars through streets lit with electric lights. They went to department stores where they bought everything from kitchen sinks to shoes. Americans also could do their shopping by mail—or pick up the telephone and order groceries from the local store. The automobile, the electric light, and the telephone were invented after 1870. Within a generation, they became part of everyday life for millions of people. These new inventions helped people communicate more quickly over long distances. Improvements in communication helped unify the country and promoted economic growth.

The Telegraph

Samuel Morse had introduced the telegraph in 1844. By 1860 the United States had thousands of miles of telegraph lines, managed mostly by the Western Union Telegraph Company. At telegraph offices, trained operators **transmitted**, or sent, messages in Morse code.

Telegrams offered almost instant communication and served many purposes. Shopkeepers relied on telegrams to order goods, and reporters used them to transmit stories to their newspapers. Americans also used telegrams to send personal messages.

The telegraph soon linked the United States and Europe. In the 1860s, news from Europe was relayed to the United States by ship and took several weeks. **Cyrus Field** wanted to speed up the process. In 1866, after several unsuccessful attempts, Field managed to lay a telegraph cable across the Atlantic Ocean. The new transatlantic telegraph transmitted messages in a matter of seconds, bringing the United States and Europe closer together.

Primary Source Lewis Latimer

Improving Technology Lewis Latimer was a draftsman and an inventor who received numerous patents for his inventions. In 1876 he was hired to draft the patent drawings for Alexander Graham Bell's telephone. Later, he improved on Edison's version of the lightbulb, creating one that lasted much longer. Latimer directed the installation of electric streetlights in New York City, Philadelphia, Montreal, and London.

Critical Thinking

Making Connections What types of technology today make your life easier?



the format works. Choose a mode

Primary Source The Wright Brothers

Taking Flight Inventors experimented with engine-powered aircraft in the 1800s, but attempts were not successful until 1903. Orville and Wilbur Wright made the world's first flight in an engine-powered glider at Kill Devil Hill, near Kitty Hawk, North Carolina.



◀ Orville and his brother Wilbur operated a bicycle shop in Dayton, Ohio, in the 1890s. Both expert mechanics, they became interested in the concept of human flight.



▲ On December 17, 1903, the Wright brothers fitted their glider with a gasoline engine. They made four flights at Kitty Hawk, the longest covering 852 feet (260 m) and lasting 59 seconds.



◀ The Wright brothers designed and tested gliders. From their experiments, they learned how to control an aircraft.

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France by cont...
his aircraft in...
types of wind...
set new dista...
altitude recor...



The Telephone Rings In

Alexander Graham Bell invented a device that revolutionized communications even more. Born and educated in Scotland, Bell moved to the United States, where he studied methods for teaching hearing-impaired people to speak. He also experimented with sending voices through electrical wires.

D By 1876 Bell developed a device that transmitted speech—the telephone. While preparing to test the device, he accidentally spilled battery acid on his clothes. Panicked, Bell called out to his assistant in another room: “Mr. Watson, come here. I want you!” Watson heard Bell’s voice coming through the telephone. The invention was a success.

Bell formed the Bell Telephone Company in 1877. By the 1890s, he had sold hundreds of thousands of phones. Businesses were the first customers to use telephones. Before long, though, telephones were common in homes.

✓ Reading Check **Comparing** Describe the difference between a telegraph and a telephone.

W1 The Genius of Invention

Main Idea Revolutionary new inventions changed business and everyday life in the 1800s.

W2 History and You Have you ever had an idea for an invention that would make life easier? Read about inventions that improved people’s lives.

The late 1800s saw a burst of inventiveness in the United States. Between 1860 and 1890, the United States government granted more than 400,000 patents for new inventions.

Many of the inventions were designed to help businesses operate more efficiently. Among these were Christopher Sholes’s typewriter (1868) and William Burroughes’s adding machine (1888).

Other inventions affected everyday life. In 1888 **George Eastman** invented a small box camera—the Kodak—that made it easier and less costly to take photographs. **John Thurman** developed a vacuum cleaner in 1899 that simplified housework.

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Air Travel

aviation history

Differentiated Instruction Strategies

BL Ask students to research images of some of the airplanes mentioned in the activity.

AL Have students select a foreign city they would like to visit and use the Internet to create a travel itinerary to fly there.

ELL Tell students to use available

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history

In 1908 Wilbur created a sensation in France by controlling his aircraft in different types of wind. He also set new distance and altitude records. ▶



◀ As shown by this aerial bomb test in 1911, the Wrights' invention soon attracted the attention of the U.S. military as well as militaries around the world.

"The airplane became the promise of the future, and pilots were the popular heroes. . . . Even the routine flights of today retain a touch of magic, reminiscent of the Wright brothers' real intent, which was not speed, money, or military might but simply to break the bonds of Earth and see the world in a new way."

—Astronaut Edwin "Buzz" Aldrin, May 1998

Critical Thinking

Analyzing Primary Sources According to Buzz Aldrin, what was the Wright brothers' greatest accomplishment?

The Wizard of Menlo Park

Thomas Edison was called "dull" by his teachers. Because of his poor hearing, he had trouble in school and often did not attend. His mother finally removed him from school and taught him at home. Edison loved anything related to science, and his mother allowed him to set up a chemistry lab in the family's basement.

When he was 12, Edison got a job working for the railroad, where he set up a new lab in an empty freight car. One day, Edison saved the life of a child who had fallen onto the tracks of an oncoming train. The child's father took an interest in Edison and taught him to use the telegraph. Edison's first invention was a gadget that sent automatic telegraph signals—which he invented so he could sleep on the job.

While still in his 20s, Edison decided to go into the "invention business." In 1876 he set up a workshop in Menlo Park, New Jersey. Out of this famous laboratory came the phonograph, the motion picture projector, the

C telephone transmitter, and the storage battery. Edison's most important invention by far, though, was the electric lightbulb.

Edison developed the first workable lightbulb in 1879. He then designed power plants that could produce electric power and distribute it to lightbulbs. For Christmas in 1880, Edison used 40 bulbs to light up Menlo Park. Visitors flocked to see the "light of the future." Then, in 1882, Edison built the first central electric power plant in New York City—illuminating 85 buildings!

D Inventor George Westinghouse took Thomas Edison's work with electricity even further. In 1885 Westinghouse developed and built transformers that could send electric power more cheaply over longer distances. As a result of Westinghouse's work, factories, trolleys, streetlights, and lamps throughout the United States could be powered by electricity. Westinghouse also created a method for transporting natural gas and invented many safety devices.

C Critical Thinking

Making Inferences A newspaper printed an advertisement for a new Human Race. The advertisement listed Human Race as Meat, Vegetables, Water, and Air. **Does this advertisement do anything about what you know about miracles?**

D Dialectical Thinking

Verbal/Literary A newspaper printed an advertisement for a new Human Race. The advertisement listed Human Race as Meat, Vegetables, Water, and Air. **How do you think the newspaper felt about the advertisement?**

Pri

Critical Thinking A newspaper printed an advertisement for a new Human Race. The advertisement listed Human Race as Meat, Vegetables, Water, and Air. **What do you think the newspaper felt about the advertisement?**

Ski

Assessment A newspaper printed an advertisement for a new Human Race. The advertisement listed Human Race as Meat, Vegetables, Water, and Air. **What do you think the newspaper felt about the advertisement?**

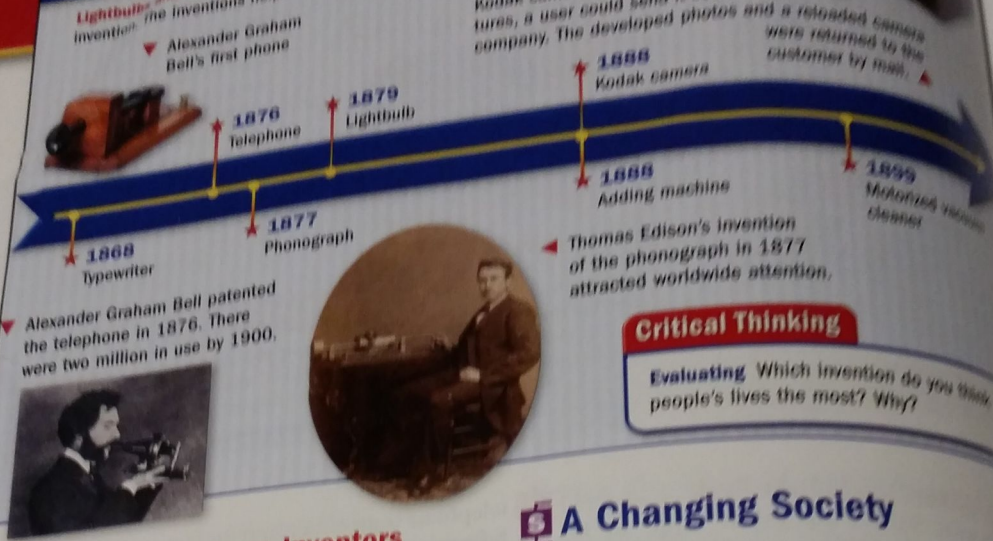
Activity: Technology Connection

Comparing and Contrasting Have students make a list of all the electrical appliances in their homes, such as the refrigerator, TV, computer, and radio. Then have students research to discover when each was invented and present the information

in a time line. Students can interview adults they know at home or at school to find out what life was like before each new innovation became popular. **Ask:** What does the time line tell you about the explosion in the number of inventions in the

Primary Source **An Age of Invention**

Lightbulbs and Vacuum Cleaners The late 1800s could be called the age of invention. The inventions helped change the everyday lives of Americans.



Critical Thinking
Evaluating Which invention do you think altered people's lives the most? Why?

African American Inventors

A number of African Americans contributed to the era of invention. Engineer **Lewis Howard Latimer** developed an improved wire for the lightbulb and joined Thomas Edison's company. **Granville Woods**, an electrical and mechanical engineer from Ohio, patented dozens of inventions. Among them were an electric incubator and railroad improvements such as an electromagnetic brake and an automatic circuit breaker. **Elijah McCoy** invented a **mechanism**, or mechanical device, for oiling machinery.

Jan E. Matzeliger, another African American inventor, developed a shoe-making machine that performed many steps previously done by hand. His device, which revolutionized the shoe industry, was used in the United States and overseas.

Reading Check Evaluating Which of Edison's inventions do you think is the most valuable to our world today? Explain your reasoning.

A Changing Society

Main Idea Henry Ford's automobile and assembly line changed industry and society forever.

History and You How might your life be different if the automobile had never been invented? Read to learn about the invention of the automobile.

In the 1900s, improvements ushered in a new era of transportation. After much experimentation, the automobile became a practical machine for traveling from place to place.

Henry Ford's Automobiles

Henry Ford had a vision. He wanted to build an inexpensive car that would last a lifetime. While working as an engineer in Detroit, Michigan, in the 1890s, Ford experimented with an automobile engine that was powered by gasoline. In 1903 he established his own auto-making company in Detroit and began designing cars.

Leveled Activities

OL Social Studies Skills Activity, URB p. 53

EL Academic Vocabulary Activity, URB p. 47

Name: _____ Date: _____ Class: _____

Social Studies Skills Activity
The Industrial Age

Reading a Table

Learning the 5R's

Learning to read tables helps you organize information in an organized way. Tables have rows or lines of items and cells. When reading a table, use the following steps:

1. Read the table title to find the subject of the table.
2. Read the labels in the top-left column.
3. Read the information on the table of each row.
4. Study and compare the information on the columns and rows. To compare information in one row or a few rows, read across each row. To compare information in one column or a few columns, read down each column.

Name: _____ Date: _____ Class: _____

Academic Vocabulary Activity
The Industrial Age

Academic Words in This Chapter

Word	Meaning	Context	Identify
invention	something new	the telephone	invention
mechanism	device	the lightbulb	mechanism

A Word-Meaning Activity: Matching Definitions

Directions: Match the academic words in Column A to their definitions in Column B.

Column A: **invention**, **mechanism**

Column B: **something new**, **device**

In 1906 Ford had an idea for a new type of car. He told Charles Sorenson, later Ford's general superintendent, "We're going to get a car now that we can make in great volume and see the prices way down." For the next year, Ford and Sorenson worked on the **Model T**, building the car and testing it on rough roads. In 1908 Ford introduced the Model T to the public. Sorenson described the sturdy black vehicle as "a car which anyone could afford to buy which anyone could drive anywhere, and which almost anyone could keep in repair." These qualities made the Model T immensely popular. During the next 18 years, Ford's company sold 15 million Model Ts.

Henry Ford also pioneered a new, less expensive way to manufacture cars—the **assembly line**. On the assembly line, each worker performed an assigned production task again and again. The assembly line revolutionized other industries as well. It enabled manufacturers to produce large quantities of goods more quickly. This **mass production** of goods decreased manufacturing costs, so products could be sold more cheaply.

Selling Goods

Merchants looked for more efficient ways to sell their goods. One method was through the mail. Before 1863 people picked up their mail at post offices. After 1863 mail was delivered directly to people's homes.

Merchants could now send goods cross country nearly as easily as across town. Some firms developed mail order businesses—receiving and shipping orders by mail. Companies such as Montgomery Ward and Sears Roebuck published catalogs that offered a wide range of goods from shoes to farm equipment.

Chain stores—stores with identical branches in many places—grew rapidly. F. W. Woolworth's chain of "five-and-ten-cent stores" specialized in the sale of everyday household and personal items at bargain prices. By 1911, more than 1,000 Woolworths were in operation. The Woolworth Building, erected in New York City in 1913, stood 792 feet (241 m) tall—the tallest building in the world at that time.

Reading Check **Identifying** What was Henry Ford's vision?

Section 2 Review

History ONLINE

Study Central™ To review this section, go to glencoe.com.

Vocabulary

- Use each of these terms in a sentence that will help explain its meaning: **transmit**, **mechanism**, **Model T**, **assembly line**, **mass production**.

Main Ideas

- Assessing** What was the significance of the transatlantic telegraph cable?

- Explaining** How did George Westinghouse build upon Thomas Edison's inventions?

Analyzing What effect did the

Critical Thinking

- Evaluating** In your opinion, what were the five most important inventions of this time? List them in order in a chart, and provide your reasons.

Top 5 Inventions	Reasons

- Concluding** How did companies change the way goods were sold to the public in the late 1800s?

- Expository Writing** Some people believe that the Internet has been the most revolutionary invention in communications since the telegraph. Write a paragraph in which you compare the two inventions and explain whether you support this view.

- Answer the Essential Question**
How did the inventions of the late 1800s revolutionize society?