SECTION 1

Alexander Graham Bell's telephone ▶

WITNESS HISTORY AUDIO

Celebrating the Nation's Centennial

On May 10, 1876, the United States celebrated its 100th anniversary by opening the Centennial Exhibition in Philadelphia. At a time when the total population of the country was only 46 million people, the exhibition drew nearly 9 million visitors. The event stunned Americans and foreign visitors alike with its demonstration of new technology, including an icemaker and a telephone. It also introduced the United States to the world as a new industrial and innovative powerhouse.

◀ President Grant and foreign visitors look in amazement at the Corliss steam engine, shown for the first time at the Centennial.

Technology and Industrial Growth

Objectives

- Analyze the factors that led to the industrialization of the United States in the late 1800s.
- Explain how new inventions and innovations changed Americans' lives.
- Describe the impact of industrialization in the late 1800s.

Terms and People

entrepreneur
protective tariff
laissez faire
patent
Thomas Edison
Bessemer process
suspension bridge
time zone
mass production

NoteTaking

Reading Skill: Identify Causes and Effects
As you read, record the causes and effects of industrialization in a chart like the one below.

Causes		Event		Effects
•	→	Industrialization	→	•
•				•
•				•

Why It Matters The end of the Civil War marked the beginning of a major transformation in American society. Americans enthusiastically embraced innovation and technology with the goals of expanding business and improving people's daily lives. American industrialization grew out of the English Industrial Revolution, but it had a distinctly American character. Backed by business leaders and shaped by a huge number of creative inventors and scientists, this "second industrial revolution" turned the United States into an industrial powerhouse. **Section Focus Question: How did industrialization and new technology affect the economy and society?**

Encouraging Industrial Growth

The Civil War challenged industries to make products more quickly and efficiently than they had been made before. Factories stepped up production, employing new tools and methods to produce guns, ammunition, medical supplies, and uniforms in large numbers. The food industry transformed itself, developing ways to process foods so they could be shipped long distances. Railroads expanded, and more efficient methods of creating power were developed. Meanwhile, the government encouraged immigration to meet the increasing demand for labor in the nation's factories.

Natural Resources Fuel Growth The country's growth was fueled, in part, by its vast supply of natural resources. Numerous

coal mines along the eastern seaboard provided fuel to power steam locomotives and factories. Thick forests across the country were cut into lumber for construction. The nation's many navigable riverways transported these and other resources to cities and factories. Then, in 1859, Edwin Drake drilled what became the world's first oil well in Titusville, Pennsylvania. Before Drake's invention, oil, which was used for light and fuel, was mainly obtained from boiling down whale blubber. But whale hunting was time-consuming, and whales were becoming scarce. Drilled oil was relatively cheap to produce and easy to transport. The oil industry grew quickly after 1859 and encouraged the growth of related industries such as kerosene and gasoline.

The Workforce Grows After the Civil War, large numbers of Europeans, and some Asians, immigrated to the United States. They were pushed from their homelands by factors such as political upheaval, religious discrimination, and crop failures. In 1881 alone, nearly three quarters of a million immigrants arrived in America. That number climbed steadily, reaching almost one million per year by 1905. Immigrants were willing to work for low wages because competition for jobs was fierce. And they were prepared to move frequently in pursuit of economic opportunity. All of these factors meant that industries had a huge, and willing, workforce to fuel growth. The potential workforce grew even larger in the 1890s, when droughts and competition from foreign farmers drove American farmers in large numbers to seek jobs in the cities.

Capitalism Encourages Entrepreneurs In 1868, Horatio Alger published his first novel, *Ragged Dick, or Street Life in New York.* This wildly successful novel told the story of a poor boy who rose to wealth and fame by working hard. Alger's novels stressed the possibility that anyone could vault from poverty and obscurity to wealth and fame. In this excerpt, he describes how Ragged Dick starts his climb to success.

Primary Source

"Ten dollars a week was to him a fortune. . . . Indeed, he would have been glad, only the day before, to get a place at three dollars a week. . . . Then he was to be advanced if he deserved it. It was indeed a bright prospect for a boy who, only a year before, could neither read nor write. . . . Dick's great ambition to "grow up 'spectable" seemed likely to be accomplished after all."

—Horatio Alger, 1868

The "rags to riches" idea depended on the system of capitalism, or free enterprise, in which individuals own most businesses. The heroes of this system were **entrepreneurs,** or people who invest money in a product or enterprise in order to make a profit. Entrepreneurs fueled industrialization. The factories, railroads, and mines they established created jobs and also attracted foreign investment.

Doing Business
Store owners in 1896 seek to expand their business by advertising and offering delivery.

Government Policies Encourage Free Enterprise Government policies encouraged the success of businesses in the late 1800s. For example, the government gave railroad builders millions of acres of land in return for their promise to quickly link the East and West coasts. To encourage the buying of American goods, Congress enacted **protective tariffs,** or taxes that would make imported goods cost more than those made locally. The government also encouraged **laissez-faire** policies, which allowed businesses to operate under minimal government regulation. Such policies, along with a strong legal system that enforced private property rights, provided the predictability and security that businesses and industries needed to encourage investment and growth.

✓ **Checkpoint** **What factors spurred industrial growth in the late 1800s?**

Innovation Drives the Nation

By the late 1800s, the drive for innovation and efficiency seemed to touch every sphere of life in the United States. The number of patents increased rapidly during this time. A **patent** is a grant by the federal government giving an inventor the exclusive right to develop, use, and sell an invention for a set period of time. Businessmen invested heavily in these new innovations, hoping to create new industries and expand old ones.

Electricity Transforms Life In 1876, inventor **Thomas Edison,** supported by wealthy industrialists like J. P. Morgan, established a research laboratory at Menlo Park, New Jersey. Edison, a creative genius who had had only a few months of formal education, would receive more than 1,000 patents for new inventions. In 1880, for example, with the goal of developing affordable lighting for homes, Edison and his team invented the light bulb. Within a few years, they had also developed plans for central power plants to light entire sections of cities. Other inventors later improved upon Edison's work. George Westinghouse, for example, developed

Major Inventions of the 1800s

▲ **Telegraph** Samuel Morse's telegraph sends the first message from Washington, D.C., to Baltimore, Maryland, on May 24, 1844. Before the telegraph, messages were sent by horse and rider. In the early 1860s, the telegraph replaced the Pony Express—the long distance mail service in the West.

▼ **Sewing Machine** Elias Howe's sewing machine revolutionizes the way clothes are made in homes and factories. In his original design, a hand-turned wheel moved the needle up and down.

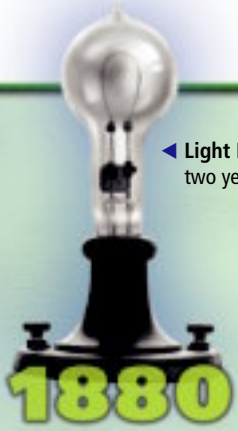
technology to send electricity over long distances. Electricity lit city streets and powered homes and factories, extending the number of hours in the day when Americans could work and play.

Revolutionizing Communications In 1844, inventor Samuel Morse perfected telegraph technology, or the process of sending messages over wire. In 1876, Alexander Graham Bell patented the telephone. Within a few years, 148 telephone companies had strung more than 34,000 miles of wire, and long-distance lines linked several cities in the Northeast and Midwest. By 1900, there were more than one million telephones in the United States, and more than 100,000 miles of telegraph wire linked users across the land. In 1896, Guglielmo Marconi invented the wireless telegraph. Future inventors would build on this innovation in developing the radio.

Steel: A Practical Wonder In the 1850s in England, a man named Henry Bessemer developed a process for purifying iron, resulting in strong, but lightweight, steel. American industries quickly adopted the **Bessemer process,** and by 1890 the United States was outproducing British steel manufacturers. Strong steel made possible a host of innovations, including skyscrapers and the elevators to service them. However, one of its most dramatic uses was in the construction of **suspension bridges,** bridges in which the roadway is suspended by steel cables. The first suspension bridge was the Brooklyn Bridge, spanning the East River in New York City. Completed in 1883, it was at the time of its construction the longest bridge in the world.

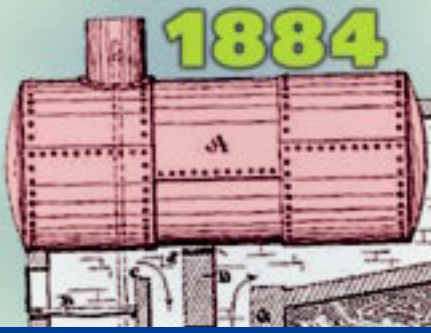
History Makers

Thomas Edison (1847–1931)
One of history's most prolific inventors, Thomas Edison lost much of his hearing as a child, which led to poor performance in school. He began working at an early age and by 16 was a telegraph operator. His hearing problems—and an interest in machines—led him to try to invent new equipment that relied on sight rather than sound. Edison produced his first major invention, a machine to report stock prices, at the age of 22. He used the money earned from selling this and other machines to build the Menlo Park complex, where he and his team of workers developed hundreds of new devices or improved old ones.



◀ **Light Bulb** Thomas Edison patents the electric light bulb. Within two years, he installs a street-lighting system in New York City.

▼ **Steam Boiler Furnace** African American inventor Granville Woods invents an improved steam-powered furnace for running trains.



◀ **Safety Elevator** Elisha Otis develops a safety mechanism to prevent elevator cars from suddenly falling. He demonstrates his invention at an exposition in New York.

Establishing Time Zones
A map shows an early railroad route covering three time zones. *Why would making railroad schedules be difficult without time zones?*

Technology and Transportation As railroads expanded, they made use of new technologies and also encouraged innovation. George Westinghouse patented air brakes for trains in 1869, while Granville Woods patented a telegraph system for trains in 1887. Meatpacker Gustavus Swift developed refrigerated cars for transporting food. By 1883, there were three transcontinental railroad lines in the United States. The expanding transportation network caused some problems. Throughout most of the 1800s, most towns set their clocks independently. When trains started regular passenger service between towns, time differences made it hard to set schedules. In 1884, delegates from 27 countries divided the globe into 24 **time zones,** one for each hour of the day. The railroads adopted this system, which is still used today.

Technology affected how Americans traveled and where they lived. Electric streetcars, commuter trains, and subways appeared in major cities. As a result, Americans living in neighborhoods outside the city could commute to work. Factory production of automobiles with gas-powered engines began in 1902. The first successful airplane flight in 1903 by brothers Orville and Wilbur Wright, two bicycle manufacturers, marked the birth of a new industry.

A Spiral of Growth Railroads played a key role in transforming American industries and businesses. They could transport large amounts of goods quickly, cheaply, and efficiently. Because they linked the nation, they allowed businesses to obtain raw materials easily and to sell finished goods to larger numbers of people. They encouraged new methods for management and administration, which were soon adopted by the business community. In addition, the expanding railroad network stimulated innovation in many other industries.

Vocabulary Builder
stimulate–(STIHM yoo layt) *v.* to excite to action

An abundance of natural resources and an efficient transportation system to carry raw materials and finished goods set up a spiral of related growth. For example, factories turned out plate glass for windows of passenger rail cars. The factories needed freight cars to carry the windows to their destinations. Those freight cars were created in factories that used railroads to transport fuel to supply the furnaces that turned out more railroad cars. In this way, factory production generated more factory production. To meet the growing demand, factory owners developed systems for turning out large numbers of products quickly and inexpensively. Known as **mass production,** these systems depended upon machinery to carry out tasks that were once done with hand tools.

✓ **Checkpoint** **How did new technologies shape industrialization?**

The Impact of Industrialization

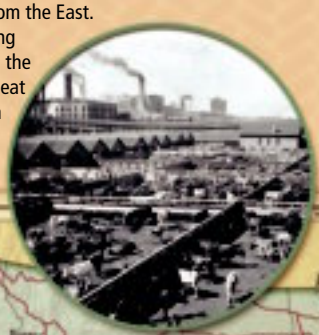
Industrialization touched every aspect of American life, from the way businesses and farms operated to the kinds of products Americans used. It also affected the country's relationship with the world and with its own environment.

Linking World Markets By the 1880s, American exports of grain, steel, and textiles dominated international markets. With almost as many miles of railroad track as the rest of the world combined, the United States could easily

Focus On Geography

The Railroads: Shaping American Cities More than any other factor, the growth of the United States in the mid-to late-1800s can be linked directly to the railroads. As the railroads expanded, they created some cities or greatly influenced the physical and economic growth of others.

Chicago, Illinois Within twenty years after the arrival of the railroads, Chicago had become the nation's main railroad hub. Livestock and grain came to Chicago from the West, while manufactured goods came from the East. Industries such as meatpacking flourished, in turn influencing the railroads. The need to keep meat fresh, for example, resulted in the development of the refrigerated train car. ►



Pittsburgh, Pennsylvania ► With its extensive natural resources, Pittsburgh grew into an industrial powerhouse in the 1800s. Railroads shipped steel and other products to the rest of the country and brought immigrants into the city to begin new lives. With its strong steel-based economy, Pittsburgh became known as "The Steel City."

Geography and History

- Why is it accurate to refer to Chicago as a railroad "hub"?
- How did the railroads contribute to the growth of American cities?

Las Vegas, Nevada Once an army fort, new railroad track laid in the late 1800s turned Las Vegas into a bustling railroad town. The city's water resources allowed trains to refuel and served as a rest stop for passengers. In 1905, Las Vegas became a city. ▼

◄ **Atlanta, Georgia** Atlanta literally got its name from the railroads. It was founded in 1837 as a transportation hub where the Georgia and Atlantic rail lines began. Burned by Union forces during the Civil War, within thirty years Atlanta was once again the proud "railroad center of the southeast."

A Pleasant Scene
An attractive 1879 print of a Massachusetts factory gives no hint of the pollution the factory regularly produced.

transport goods from where they were made or grown to ports where they could be shipped around the world. Exports of food and goods greatly expanded the American economy. As the United States grew as a world economic power, it often clashed with the economic views and political policies of other countries.

Changing American Society Massive changes in industry altered how Americans lived and worked. Even farms became mechanized, meaning that fewer farm laborers were needed to feed the nation. Out-of-work farmers and their families moved to urban areas to find work, especially in the increasingly industrial North. Many moved to manufacturing centers that had sprung up around growing factories or industries. The mass production of goods meant that these new urban dwellers had easy access to clothing and supplies that they would have had to make by hand in the past. Yet they faced higher costs of living, were dependent upon cash wages to buy food, and performed repetitive work in factories.

Thinking About the Environment In the early 1800s, few worried about how industry might affect the environment. However, by the late 1800s, industrial waste had risen dramatically and mining had begun to destroy the land. In the Midwest, increasing agricultural production had led to soil erosion and dust storms. People began to raise concerns about protecting natural resources. Congress responded by setting aside protected lands that would eventually become part of the National Park Service. Its creation of Yellowstone Park in 1872 was one of the first federal responses to concerns about the environment.

✓ **Checkpoint** **What impact did industrialization have on Americans?**

SECTION 1 Assessment

Progress Monitoring *Online*
For: Self-test with vocabulary practice
Web Code: nca-1311

Comprehension

1. **Terms and People** For each item below, write a sentence explaining how it relates to industrialization.
   - entrepreneur
   - protective tariff
   - laissez faire
   - patent
   - Thomas Edison
   - Bessemer process
   - suspension bridge
   - time zone
   - mass production

2. **NoteTaking Reading Skill: Identify Causes and Effects** Use your completed chart to answer the Section Focus Question: How did industrialization and new technology affect the economy and society?

Writing About History

3. **Quick Write: Define Your Audience** Suppose that you are Thomas Edison writing a memo to J. P. Morgan requesting more financial support for work being done in your lab. Think about how much information Morgan needs to know, and summarize it in bullets.

Critical Thinking

4. **Recognize Ideologies** Would you characterize all of the government's policies in the late 1800s toward business as laissez faire? Explain your answer.
5. **Determine Relevance** How did the system of patents encourage innovation and investment?
6. **Distinguish Fact From Opinion** Explain why you agree or disagree with this statement: "The late 1800s was a time of great progress for all Americans."