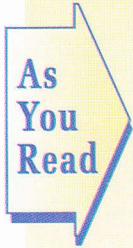




Railroads and Industry



Explore These Questions

- How did railroads expand after the Civil War?
- What effects did competition have on the railroad industry?
- How did railroads spur the growth of industry?

Define

- network
- consolidate
- rebate
- pool

Identify

- George Westinghouse
- George Pullman
- Cornelius Vanderbilt
- James Hill

SETTING the Scene

In 1873, Americans began singing a new folk song. “John Henry” tells the story of a legendary African American railroad worker who drives steel spikes into rock with a hammer. When the boss introduces a steam-powered drill, John Henry vows:

“ Before I’ll let that steam drill
beat me down
I’ll die with my hammer in my hand.”

True to his word, John Henry dies after beating the steam drill in a contest.

Railroad workers loved singing of John Henry’s victory over the machine. Still, nothing could slow down the nation’s amazing industrial growth. Of the many factors spurring this growth, none was more important than the railroad.

A Railroad Network

The Civil War showed the importance of railroads. Railroads carried troops and supplies to the battlefields. They also moved raw materials to factories. After the war, railroad companies began to build new lines all over the country. (See page 437.)

Connecting lines

Early railroads were short lines that served local communities. Many lines ran for no more than 50 miles (80 km). When passengers and freight reached the end of one line, they had to move to a train on a different line to continue their journey.

Even if the lines had been connected, the problem would not have been solved. Different lines used rails of different gauges, or widths. As a result, the trains from one line could not run on the tracks of another line. In general, the tracks of northern and southern rail lines used different gauges.

In 1886, railroads in the South decided to adopt the northern gauge. On May 30, southern railroads stopped running so that work could begin. Using crowbars and sledgehammers, crews worked from dawn to dusk to move the rails a few inches farther apart. When they had finished, some 13,000 miles (20,800 km) of track had been changed.

Once the track was standardized, American railroads formed a **network**, or system of connected lines. The creation of a rail network brought benefits to shippers. Often, rail companies arranged for freight cars on one line to use the tracks of another. For example, goods loaded in Chicago could stay on the same car all the way to New York, instead of being transferred from one car to another. As a result, the shipper had to pay only one fare for the whole distance.

New rails knit the sprawling nation together. By 1900, there were more miles of tracks in the United States than in Europe and Russia combined.

Other improvements

To simplify train schedules, the railroad companies set up a system of standard time zones in 1883. Before that, each town kept its

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own time, based on the position of the sun. Towns in Illinois, for example, had 27 different local times! The new system divided the nation into four time zones: Eastern, Central, Mountain, and Pacific. Every place within the same time zone observed the same time.

New inventions helped make railway travel safer and faster. In 1869, **George Westinghouse** began selling his new air brake. On early trains, each railroad car had its own brakes and its own brake operator. If different cars stopped at different times, serious accidents could result. Westinghouse's air brake allowed a locomotive engineer to stop all the railroad cars at once.

The air brake increased safety and allowed for longer, faster trains. By 1900, a passenger could travel from New York to San Francisco in only six days, rather than months.

Long distance travel also became more comfortable. In 1864, **George Pullman** de-

signed a railroad sleeping car. Pullman cars had convertible berths as well as lavatories. Rail lines also added dining cars. Porters, conductors, and waiters attended to the needs of passengers. A national magazine described the comforts of a rail trip in 1872:

“From Chicago to Omaha your train will carry a dining car. . . You sit at little tables which comfortably accommodate four persons; you order your breakfast, dinner, or supper from a bill of fare which contains a surprising number of dishes; you eat from snow-white linen. . . admirable cooked food, and pay a modest price.”

Consolidation

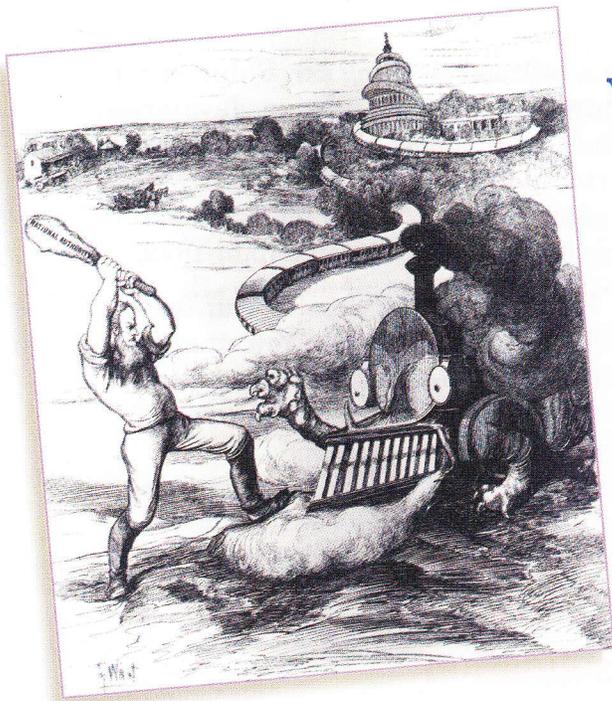
As railroads grew, they looked for ways to operate more efficiently. Many companies began to **consolidate**, or combine. Larger

Viewing A Nation Linked by Rail

By the late 1800s, a complex network of rail lines linked the nation. Freight trains, like the one below, hauled tons of coal and other resources needed by industry. Passenger lines advertised a new level of elegance and comfort (right).

★ How were the nation's local rail lines transformed into a network?





Viewing HISTORY

Farmers vs. Railroads

In this 1873 cartoon, Thomas Nast portrayed railroads as a monster snaking through American farmland. A bearded farmer bravely opposes the monster. ★ The building shown in the background is the Capitol building. Why do you think Nast showed the Capitol in the monster's coils?

Building New Lines

Railroad builders raced to create thousands of miles of new tracks. In the years after Leland Stanford hammered in the golden spike in 1869, Americans built three more transcontinental railroads. **James Hill**, a Canadian-born railroad baron, finished the last major cross-country line in 1893. (See the map on page 438.) His Great Northern Railway wound from Duluth, Minnesota, to Everett, Washington.

Unlike other rail lines, the Great Northern was built without financial aid from Congress. To make his railroad succeed, Hill had to turn a profit from the start. He encouraged farmers and ranchers to settle near his railroad. He gave seed to farmers and helped them buy equipment. He even imported special bulls to breed hardier cattle. Not only was Hill's policy generous, it made good business sense.

Abuses

With builders rushing to share in the profits of the railroad boom, overbuilding occurred. Soon, there were too many rail lines in some parts of the country. Between Atlanta and St. Louis, for example, 20 different lines competed for business. There was not nearly enough rail traffic to keep all these lines busy.

Reducing competition

In the West, especially, there were too few people for the railroads to make a profit. Competition was fierce. Rate wars broke out as rival railroads slashed their fares to win customers. Usually, all the companies lost money as a result.

To win new business or keep old business, big railroads secretly offered **rebates**, or discounts, to their biggest customers. This

companies bought up smaller ones or forced them out of business. The Pennsylvania Railroad, for example, consolidated 73 companies into its system.

Tough-minded business people led the drive for consolidation. The most powerful of these "railroad barons" was **Cornelius Vanderbilt**. The son of a poor farmer, Vanderbilt earned his fortune in steamship lines. He then began to buy up railroad lines in New York State.

Vanderbilt sometimes used ruthless tactics to force smaller owners to sell to him. In the early 1860s, he decided to buy the New York Central Railroad. The owners refused to sell. Vanderbilt then announced that New York Central passengers would not be allowed to transfer to his trains. With their passengers stranded and business dropping sharply, the New York Central owners gave in and sold their line to Vanderbilt.

Vanderbilt then bought up most of the lines between Chicago and Buffalo. By the time of his death in 1877, his companies controlled 4,500 miles (7,200 km) of track and linked New York City to the Great Lakes region.

Other consolidations were soon underway. Before long, the major railroads of the nation were organized into systems directed by a handful of powerful men.

practice forced many small companies out of business. It also hurt small shippers, such as farmers, who still had to pay the full price.

Railroad barons soon realized that cut-throat competition was hurting even their large lines. They looked for ways to end the competition. One method was pooling. In a **pool**, several railroad companies agreed to divide up business in an area. They then fixed their prices at a high level.

High prices for farmers

Railroad rebates and pools angered small farmers in the South and the West. Both practices kept shipping prices high for them. Indeed, rates were so high that at times farmers burned their crop for fuel rather than ship it to market.

As you read in Chapter 17, many farmers joined the Populist party. Populists called for government regulation of rail rates. Congress and several states passed laws regulating railroad companies. However, the laws did not end abuses. Railroad barons bribed officials to keep the laws from being enforced.

Spurring Economic Growth

Despite their problems, railroads made possible the rapid growth of industry after

1865. As railroads expanded, they stimulated the whole economy.

Building rail lines created thousands of jobs. Steelworkers turned millions of tons of iron into steel for tracks and engines. Lumberjacks cut down whole forests to supply wood for railroad ties. Miners sweated in dusty mine shafts digging coal to fuel railroad engines. The railroad companies themselves employed thousands of workers. They laid tracks, built trestles across rivers, and carved tunnels through mountains.

Because they were so large, railroads also pioneered new ways of managing business. Rail companies created special departments for shipping and accounting and for servicing equipment. Expert managers headed each department, while chains of command ensured that the organization ran smoothly. Other big businesses soon copied these management techniques.

Railroads opened every corner of the country to settlement and growth. They brought people together, especially in the West. New businesses sprang up, and towns sprouted where rail lines crossed. With rail lines in place, the United States was ready to become the greatest industrial nation the world had ever seen.

★ Section 1 Review ★

Recall

1. **Identify** (a) George Westinghouse, (b) George Pullman, (c) Cornelius Vanderbilt, (d) James Hill.
2. **Define** (a) network, (b) consolidate, (c) rebate, (d) pool.

Comprehension

3. Describe three changes that took place in the railroad industry after the Civil War.
4. (a) What methods did big railroads use to win and keep business? (b) How did these practices affect small businesses and farmers?

5. List three ways that railroads spurred the growth of industry.

Critical Thinking and Writing

6. **Synthesizing Information** After the Civil War, railroads consolidated as large railroad companies took over smaller ones. (a) What were the advantages of consolidation? (b) What were the disadvantages?
7. **Linking Past and Present** Are railroads as important today as they were in the 1800s? Why or why not?



Activity Asking Questions “Tonight’s special guest: railroad baron Cornelius Vanderbilt. The phone lines are now open.” Jot down three or four questions you would ask Vanderbilt if he appeared on a talk show. The questions may concern his goals, his business practices, and his achievements.



Big Business



Explore These Questions

- Why did the steel industry become important after the Civil War?
- What new ways of doing business did Americans develop?
- What were the arguments for and against the growth of giant corporations?

Define

- vertical integration
- corporation
- stock
- dividend
- trust
- monopoly
- free enterprise system

Identify

- John D. Rockefeller
- Bessemer process
- Andrew Carnegie
- J. Pierpont Morgan
- Standard Oil Company
- Sherman Antitrust Act

SETTING the Scene

On a February day in 1865, an unusual auction was held. The owners of an Ohio oil refinery stood toe to toe, the only two people in the room. Each was bidding to buy the other's share in the company.

Bidding opened at \$500. The price swiftly jumped higher and higher. Finally, the bid reached \$72,500. "I'll go no higher, John," said one of the men. "The business is yours." John paid the \$72,500 and became sole owner of the company. It was a smart buy. When he died more than 70 years later, **John D. Rockefeller** was a multimillionaire who dominated the entire American oil industry.

Rockefeller was one of a new breed of American business leaders in the late 1800s. They were bold, imaginative—and sometimes ruthless. During the next 50 years, these leaders shaped the nation's emerging businesses and industries.

Growth of the American Steel Industry

The growth of railroads after the Civil War fueled the growth of the steel industry. Early trains ran on iron rails that wore out quickly. Railroad owners knew that steel rails were much stronger and not as likely to rust as iron. Steel, however, was costly and difficult to make.

A new way to make steel

In the 1850s, William Kelly in the United States and Henry Bessemer in England each discovered a new way to make steel. The **Bessemer process**, as it came to be called, enabled steelmakers to produce strong steel at a lower cost. As a result, railroads began to lay steel rails.

Other industries also took advantage of the cheaper steel. Manufacturers made steel nails, screws, needles, and other items. Steel girders supported the great weight of the new "skyscrapers."

Steel mills spring up

Steel mills sprang up in cities throughout the Midwest. Pittsburgh became the steel-making capital of the nation. Nearby coal mines and good transportation helped Pittsburgh's steel mills to thrive.

The thriving steel mills brought jobs and prosperity to Pittsburgh and other steel-towns. They also caused problems. The mills belched thick black smoke that turned the air gray. Soot blanketed houses, trees, and streets. Waste polluted local rivers.

Andrew Carnegie

Many Americans made fortunes in the steel industry. Richest of all was a Scottish immigrant, **Andrew Carnegie**. Carnegie's ideas on how to make money—and how to spend it—had a wide influence.

Carnegie's career reads like a history of American industry. As a child, he went to work in a textile mill. Later, he became a telegraph operator. When the railroad boom started, Carnegie got a job with the Pennsylvania Railroad.

Traveling in England in the 1870s, Carnegie visited a factory and saw the Bessemer process at work. When he returned to the United States, he built a steel mill at Homestead, Pennsylvania, south of Pittsburgh. His friendships with railroad owners helped him win contracts for the steel he manufactured.

Controlling the steel industry

Within a short time, Carnegie was earning huge profits from his steel mill. He used the money to buy out rivals. He also bought iron mines, railroad and steamship lines, and warehouses.

Soon, Carnegie controlled all phases of the steel industry—from mining iron ore to shipping finished steel. Acquiring control of all the steps required to change raw materials into finished products is called **vertical integration**. Vertical integration gave Carnegie a great advantage over other steel companies.

In 1892, Carnegie combined all of his businesses into the Carnegie Steel Company. By 1900, it was turning out more steel than all of Great Britain.

The “gospel of wealth”

Like other business owners, Carnegie drove his workers hard. Still, he believed that the rich had a duty to help the poor and improve society. He called this idea the “gospel of wealth.” He wrote:

“Wealth, passing through the hands of the few, can be made a much more powerful force for the elevation of our race than if it had been distributed in small sums to the people themselves.”

Carnegie himself gave millions to charities. He donated \$60 million to build public libraries in towns all over the country. After selling Carnegie Steel in 1901, he spent his time and money helping people.

Rise of Corporations

Before the railroad boom, nearly every American town had its own small factories. They produced goods for people in the area. By the late 1800s, however, big factories were producing goods more cheaply than small factories could. Railroads distributed these goods to nationwide markets. As demand for local goods fell, many small factories closed. Big factories then increased their output.

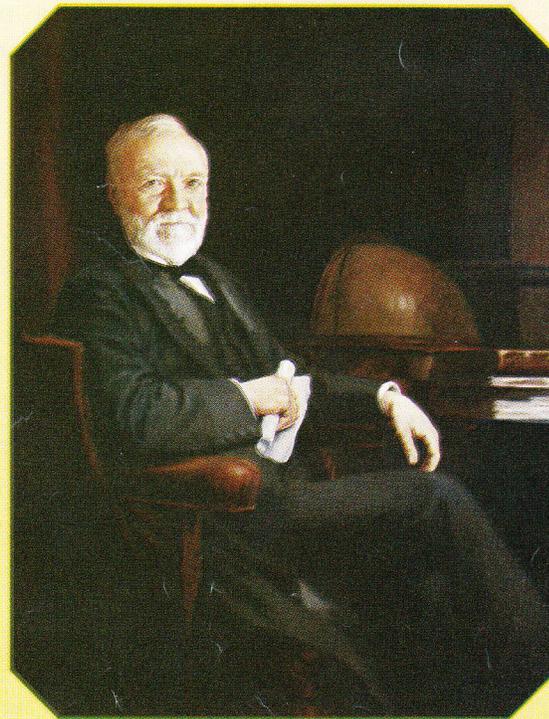
Expanding factories needed capital, or money, for investment. Factory owners used the capital to buy raw materials, pay workers, and cover shipping and advertising costs. To raise capital, Americans adopted new ways of organizing their businesses.

Biography

Andrew Carnegie

As a teenager, Andrew Carnegie worked in a textile mill for \$1.20 a week. By the age of 50, he was the nation's “Steel King.” Carnegie believed that the rich had a right to make money, and a duty to spend it for the public good. He gave away millions to schools, libraries, and the cause of world peace.

★ **What business methods did Carnegie use to build his steel company?**



Many expanding businesses became corporations. A **corporation** is a business that is owned by investors. A corporation sells **stock**, or shares in the business, to investors, who are known as stockholders. The corporation can use the money invested by stockholders to build a new factory or buy new machines.

In return for their investment, stockholders hope to receive **dividends**, or shares of a corporation's profit. To protect their investment, stockholders elect a board of directors to run the corporation.

Thousands of people bought stock in corporations. Stockholders faced fewer risks than owners of private businesses. If a private business goes bankrupt, the owner must pay all the debts of the business. By law, stockholders cannot be held responsible for a corporation's debts.

Banks and Industry

In the years after the Civil War, corporations attracted large amounts of capital from American investors. Corporations also borrowed millions of dollars from banks. These loans helped American industry grow at a rapid pace. At the same time, the banks made huge profits.

The most powerful banker of the late 1800s was **J. Pierpont Morgan**. Morgan's influence was not limited to banking. He used his banking profits to gain control of major corporations.

During economic hard times in the 1890s, Morgan and other bankers invested in the stock of troubled corporations. As large stockholders, they easily won seats on the boards of directors. They then adopted policies that



Connections With Arts

J. Pierpont Morgan used much of his wealth to collect manuscripts and rare books—some of them more than 400 years old. By 1906, his collection could no longer fit into his private library. Morgan then had a separate building constructed. After Morgan's death, the Pierpont Morgan Library in New York City was opened to the public.

reduced competition and ensured big profits. "I like a little competition, but I like combination more," Morgan used to say.

Between 1894 and 1898, Morgan gained control of most of the nation's major rail lines. He then began to buy up steel companies, including Carnegie Steel, and merge them into a single large corporation. By 1901, Morgan had become head of United States Steel Company. It was the first American business worth more than \$1 billion.

The Oil Industry

Industry could not have expanded so quickly in the United States without the nation's rich supply of natural resources. Iron ore was plentiful, especially in the Mesabi Range of Minnesota. Pennsylvania, West Virginia, and the Rocky Mountains had large deposits of coal. The Rockies also contained minerals such as gold, silver, and copper. Vast forests provided lumber for building.

In 1859, Americans discovered a valuable new resource—oil. Drillers near Titusville, Pennsylvania, made the nation's first oil strike. An oil boom quickly followed. Hundreds of prospectors rushed to western Pennsylvania ready to drill wells in search of a "gusher."

Rockefeller and Standard Oil

Among those who came to the Pennsylvania oil fields was young John D. Rockefeller. Rockefeller, however, did not rush to drill for oil. He knew that oil had little value until it was refined, or purified, to make kerosene. Kerosene was used as a fuel in stoves and lamps.

The son of a humble New York peddler, Rockefeller moved with his family to Ohio when he was 14. At 23, he invested in his first oil refinery.

Rockefeller believed that competition was wasteful. He used the profits from his refinery to buy up other refineries. He then combined the companies into the **Standard Oil Company** of Ohio.

Rockefeller was a shrewd businessman. He was always trying to improve the quality of his oil. He also did whatever he could to get rid of competition. Standard Oil slashed

Linking Past and Present

Past

No. 15H142
\$3.00
PER PAIR

DON'T FAIL TO STATE SIZE.

A most dainty button boot is this new style patent Eclair's golden beauty. Made with three-hand laced and the latest shimmery tip. A thoroughly hand made shoe and an exclusive pattern of both quality. Size and half sizes, 2 1/2 to 7. Widths, C, D and E. Weight average 28 ounces.

No. 15H144
\$3.50
PER PAIR

DON'T FAIL TO STATE SIZE.

An advanced style, never before seen for less than \$3.00. It is the latest craze in fashionable footwear. Made of best patent Eclair's oxford and the very high wave top of full real cord. The shoe is up, independently finished throughout, with a soft, lustrous finish. Eclair's latest "Eclair" shoe has a scientific, perfect fitting pattern. Size and half sizes, 2 1/2 to 7. Widths, C, D and E. Weight average 28 ounces.

No. 15H146
\$3.00
PER PAIR

DON'T FAIL TO STATE SIZE.

A new blucher style in a bench made button boot. Made of best patent Eclair's oxford, with three-hand laced, with real cord and a quality rubber sole. Handmade on all sides. "Eclair's" shoe has a scientific fitting pattern. Size and half sizes, 2 1/2 to 7. Widths, C, D and E. Weight average 28 ounces.

THE COUNTESS.

No. 15H150
\$3.00
PER PAIR

DON'T FAIL TO STATE SIZE.

QUEEN OF BEAUTY.

No. 15H151
\$3.50
PER PAIR

DON'T FAIL TO STATE SIZE.

THE LADIES' FASHIONABLE FOOTWEAR

ON THIS PAGE REPRESENTS A GRADE OF SHOES NEVER BEFORE FURNISHED BY A MAIL ORDER HOUSE.

as they are of the most exclusive styles, usually found only in the high class stores. They are all genuine bench made, hand sewed soles, while the materials and workmanship used are the best that money

Present



Shopping at Home

In the late 1800s, manufacturers pioneered new ways to sell their products nationwide. Companies like Sears, Roebuck used mail order catalogs (left) to sell goods to isolated western farmers. Today, Americans can turn on their televisions and instantly order anything from jewelry to cookware (right). ★ What are the advantages and disadvantages of shopping at home?

its prices to drive rivals out of business. It pressured its customers not to deal with other oil companies. Rockefeller even persuaded railroad companies eager for his business to grant rebates to Standard Oil. Lower shipping costs gave Rockefeller an important edge over his competitors.

Creating a trust

To tighten his hold over the oil industry, Rockefeller formed the Standard Oil trust in 1882. A **trust** is a group of corporations run by a single board of directors.

Stockholders in dozens of smaller oil companies turned over their stock to Standard Oil. In return, they got stock in the newly created trust. The trust stock paid the stockholders high dividends. However, the stockholders gave up their right to choose the board of directors. The board of Standard Oil, headed by Rockefeller, managed all the companies, which before had been rivals.

The Standard Oil trust created a monopoly in the oil industry. A **monopoly** controls all or nearly all the business of an industry. The Standard Oil trust controlled 95 percent of all oil refining in the United States.

Other businesses followed Rockefeller's lead. They set up trusts and tried to build monopolies. By the late 1890s, monopolies and trusts controlled some of the nation's most important industries.

Big Business: Two Viewpoints

Some Americans charged that the leaders of giant corporations were abusing the free enterprise system. In a **free enterprise system**, businesses are owned by private citizens. Owners decide what products to make, how much to produce, where to sell products, and what prices to charge. Companies compete to win customers by making the best product at the lowest price.

Opposition to trusts

Critics argued that trusts and monopolies reduced competition. Without competition, there was no reason for companies to keep prices low or to improve their products. It was also hard for new companies to start up and compete against powerful trusts. Workers, moreover, often felt that large corporations treated them badly.

Critics were also upset about the political influence of trusts. Leaders of big business were richer than Americans had ever been before. Some people worried that millionaires were using their wealth to buy favors from elected officials. The *Chicago Tribune* warned that “liberty and monopoly cannot live together.” John Reagan, a member of Congress from Texas, said:

“There were no beggars till Vanderbilts and . . . Morgans . . . shaped the actions of Congress and molded the purposes of government. Then the few became fabulously wealthy, the many wretchedly poor.”

Under pressure from the public, the government slowly moved toward controlling giant corporations. Congress approved the **Sherman Antitrust Act** in 1890. The act

banned the formation of trusts and monopolies. However, it was too weak to be effective. Some state governments passed laws to regulate business, but the corporations usually sidestepped them. Later reformers began to demand even stronger measures.

Support for trusts

Naturally, business leaders defended trusts. Andrew Carnegie published articles arguing that too much competition ruined businesses and put people out of work. In an article titled “Wealth and Its Uses,” he wrote:

“It will be a great mistake for the community to shoot the millionaires, for they are the bees that make the most honey, and contribute most to the hive even after they have gorged themselves full.”

Defenders of big business argued that the growth of giant corporations brought lower production costs, lower prices, higher wages, and a better quality of life for millions of Americans. By 1900, Americans enjoyed the highest standard of living in the world. Innovative business leaders also helped usher in a new age of technology and invention that revolutionized American life.

★ Section 2 Review ★

Recall

1. **Identify** (a) John D. Rockefeller, (b) Bessemer process, (c) Andrew Carnegie, (d) J. Pierpont Morgan, (e) Standard Oil Company, (f) Sherman Antitrust Act.
2. **Define** (a) vertical integration, (b) corporation, (c) stock, (d) dividend, (e) trust, (f) monopoly, (g) free enterprise system.

Comprehension

3. Name three uses for cheap steel in the 1800s.
4. Why did many American businesses become corporations?

5. Why did some Americans think that big business threatened the free enterprise system?

Critical Thinking and Writing

6. **Understanding Causes and Effects** (a) What were two causes of the growth of the steel industry? (b) What were two effects?
7. **Applying Information** Andrew Carnegie once said of people who held onto their fortunes, “The man who dies thus rich, dies disgraced.” (a) Restate Carnegie’s meaning in your own words. (b) Did Carnegie carry out this philosophy in his own life? Explain.



Activity Creating a Business Plan You are a clever business owner in the late 1800s. Describe the business you would choose to build. Then, outline a plan showing how you would go about doing it.

3

A Flood of Inventions

As You Read

Explore These Questions

- What inventions improved communication in the 1800s?
- Why was Menlo Park called an “invention factory”?
- How did Henry Ford revolutionize the automobile industry?

Define

- assembly line
- mass production

Identify

- Cyrus Field
- Alexander Graham Bell
- Thomas Edison
- Jan Matzeliger
- Gustavus Swift
- George Eastman
- Henry Ford
- Orville and Wilbur Wright

SETTING the Scene

Josephine Cochrane was annoyed. The wife of an Illinois politician, she hosted many elegant dinners. Her fine china, though, often broke when being washed.

Cochrane took a hose, some wire, a motor, and a large copper boiler to the woodshed. There, she built the first automatic dishwasher. Soon, Cochrane was selling her machine to restaurants. She patented her invention in 1886.

A flood of invention swept the United States in the late 1800s. By the 1890s, Americans were patenting 21,000 new inventions a year. These inventions helped industry to grow and become more efficient. New devices also made daily life easier in many American homes.

Advanced Communication

Some remarkable new devices filled the need for faster communication. The telegraph had been in use since 1844. (See Chapter 12.) It helped people around the nation stay in touch. It also helped business. For example, a steelmaker in Pittsburgh could instantly order iron ore from a mine in Minnesota.

Transatlantic cable

The telegraph speeded communication within the United States. It still took weeks, however, for news from Europe to arrive by boat.

In 1866, **Cyrus Field** ran an underwater telegraph cable across the Atlantic Ocean. Field marveled at his success:

“In five months . . . the cable had been manufactured, shipped . . . stretched across the Atlantic, and was sending messages . . . swift as lightning from continent to continent.”

Field’s transatlantic cable brought the United States and Europe closer together.

The telephone

Morse and Field used a dot and dash code to send messages over telegraph wires. Meanwhile, **Alexander Graham Bell**, a Scottish-born teacher of the deaf, was trying to transmit sound.

In March 1876, Bell was ready to test his “talking machine.” Before the test, Bell accidentally spilled battery acid on himself. His assistant, Thomas Watson, was in another



Alexander Graham Bell's telephone

room. Bell spoke into the machine, “Watson, come here, I want you!” Watson rushed to Bell’s side. “Mr. Bell,” he cried, “I heard every word you said, distinctly!” The telephone worked.

Bell’s telephone aroused little interest at first. Scientists praised the invention. Most people, however, saw it as a toy. Bell offered to sell the telephone to the Western Union Telegraph Company for \$100,000. The company refused—a costly mistake. In the end, the telephone earned Bell millions.

Bell formed the Bell Telephone Company in 1877. By 1885, he had sold more than 300,000 phones, mostly to businesses. The telephone speeded up the pace of business even more. Instead of having to go to a telegraph office, people could find out about prices or supplies simply by talking on the telephone.

Thomas Edison

In an age of invention, **Thomas Edison** was right at home. In 1876, he opened a research laboratory in Menlo Park, New Jersey. There, Edison boasted that he and his 15 co-workers set out to create “minor” inventions every 10 days and “a big thing every 6 months or so.”

The “invention factory”

The key to Edison’s success lay in his approach. He turned inventing into a system. Teams of experts refined Edison’s ideas and translated them into practical inventions. Menlo Park became an “invention factory.”

The results were amazing. Edison became known as the “Wizard of Menlo Park” for inventing the light bulb, the phonograph, and hundreds of other devices.

One invention from Edison’s laboratory launched a new industry—the movies. In 1893, Edison introduced his first machine for showing moving pictures. Viewers watched short films by looking through a peephole in a cabinet. Later, Edison developed a motion picture projector, making it possible for many people to watch a film at the same time. By 1905, thousands of silent movie houses called nickelodeons were opening in cities across the United States.



▲ Electric light bulb

▲ Phonograph

Biography

Thomas Alva Edison

A poor student, Thomas Edison grew up to invent the light bulb, the phonograph and dozens of other devices. The photo above was taken after Edison went without sleep for three days working on his phonograph. At last, he heard his own voice reciting “Mary Had a Little Lamb.” ★ Edison said, “Genius is one percent inspiration and ninety-nine percent perspiration.” What do you think he meant?

Electric power

One of Edison’s most important creations was the electric power plant. Edison built the first power plant in New York City in 1882. He wired the business district first in hopes of attracting investors. With the flip of a switch, Edison set the district ablaze in light.

Within a year, Edison’s power plant was supplying electricity to homes as well as businesses. Soon, more power plants were built. Factories replaced steam-powered engines with safer, quieter electric engines. Electric energy powered streetcars in cities and lighted countless homes. The modern age of electricity had begun.

A Rush of Technology

Almost every day, it seemed, American inventors were creating new devices that made business more efficient and life more pleasant. The United States became known as the land of invention.

Inventions by African Americans

African Americans contributed to the flood of inventions. In 1872, Elijah McCoy created a special device that oiled engines automatically. It was widely used on railroad engines and in factories. Granville T. Woods found a way to send telegraph messages between moving railroad trains.

Jan Matzeliger invented a machine that could perform almost all the steps in

shoemaking that had been done before by hand. Patented in 1883, Matzeliger's machine was eventually used in shoe factories everywhere.

Many African American inventors had trouble getting patents for their inventions. Even so, in 1900, an assistant in the patent office compiled a list of patents issued to African American inventors. The list, together with drawings and plans of all the inventions, filled four huge volumes.

Refrigeration

In the 1880s, **Gustavus Swift** came up with an idea that transformed the American diet. Swift introduced refrigeration to the meatpacking industry. In the past, cattle, pigs, and chickens had been raised and sold

A Time of Invention

Inventor	Date	Invention
Elisha Otis	1852	passenger elevator brake
George Pullman	1864	sleeping car
George Westinghouse	1869	air brake
Elijah McCoy	1872	automatic engine-oiling machine
Andrew S. Hallidie	1873	cable streetcar
Stephen Dudley Field	1874	electric streetcar
Alexander Graham Bell	1876	telephone
Thomas Alva Edison	1877	phonograph
Anna Baldwin	1878	milking machine
Thomas Alva Edison	1879	first practical incandescent light bulb
James Ritty	1879	cash register
Jan E. Matzeliger	1883	shoemaking machine
Lewis E. Waterman	1884	fountain pen
Granville T. Woods	1887	automatic air brake
Charles and J. Frank Duryea	1893	gasoline-powered car
King C. Gillette	1895	safety razor with throwaway blades
John Thurman	1899	motor-driven vacuum cleaner
Leo H. Baekeland	1909	plastic

Chart Skills

New inventions transformed daily life in the United States. They also helped the American economy grow.

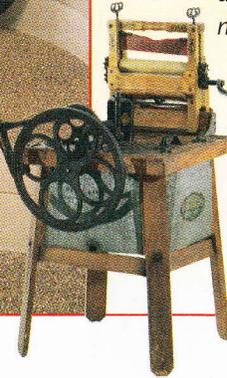
- 1. Comprehension** (a) What did George Westinghouse invent? In what year?
(b) Who improved on Westinghouse's invention? In what year?
- 2. Critical Thinking** (a) Which of these inventions made transportation easier? (b) Which of these inventions might be found in a home today?



The Henry Ford Museum

Not far from his Detroit auto plant, Henry Ford built a place to display "every household article, every kind of vehicle, every sort of tool." Today at the Henry Ford Museum, you can explore the world's largest transportation collection, from canoes to giant locomotives to classic cars. You can also see devices you might have had in your home 100 years ago.

★ To learn more about this historic site, write: Henry Ford Museum, P.O. Box 1970, Dearborn, MI 48121.



Early American washing machine ➤

locally. Meat spoiled quickly, so it could not be shipped over distances.

Swift set up a meatpacking plant in Chicago, a railroad hub midway between the cattle ranches of the West and the cities of the East. Cattle were shipped by train to Chicago. At Swift's plant, the animals were slaughtered and carved up into sides of beef. The fresh beef was quickly loaded onto refrigerated railroad cars and carried to market. Even in summer, Swift sent fresh meat to eastern cities. As a result, Americans began to eat more meat.

Inventions for home and office

New inventions also affected life at home and in the office. Christopher Sholes perfected the typewriter in 1868. This invention made office work easier.

In 1888, **George Eastman** introduced the lightweight Kodak camera. No longer did photography require bulky equipment and chemicals. The cost was only \$25, including a roll of film. After 100 snaps of the shutter, the

owner returned the camera to Kodak. The company developed the pictures and sent them back, along with a reloaded camera. Taking pictures became a popular pastime.

The Automobile

No single person invented the automobile. Europeans had produced motorized vehicles as early as the 1860s. Several Americans began building cars in the 1890s. Still, only the wealthy could afford them.

Ford and mass production

It was **Henry Ford**, with his "motor car for the multitude," who made the auto a part of everyday American life. In 1913, Ford introduced the **assembly line**. In this method of production, workers are stationed in one place as products edge along on a moving belt. At Ford's auto plant, one group of workers would bolt seats onto a passing car frame, the next would add the roof, and so on. The assembly line greatly reduced the time

needed to build a car. Other industries soon adopted it.

Ford's assembly line allowed mass production of cars. **Mass production** means making large quantities of a product quickly and cheaply. Because of mass production, Ford could sell his cars at a lower price than other auto makers.

Cars become popular

At first, most people laughed at the "horseless carriage." Some thought automobiles were dangerous. A backfiring auto engine could scare a horse right off the road. Towns and villages across the nation posted signs: "No horseless carriages allowed."

Slowly, attitudes toward the automobile changed. No other means of travel offered such freedom. As prices dropped, more people could afford to buy cars. In 1900, only 8,000 Americans owned cars. By 1917, more than 4.5 million autos were chugging along American roads.

Automobiles were at first regarded as machines for men only. Auto makers soon realized, however, that women could drive—and buy—cars. Companies began to direct advertisements to women, stressing the comfort and usefulness of automobiles. Driving gave women greater independence.

A hit song from 1905 shows the growing popularity of the automobile. "In My Merry

Oldsmobile" is a love story about a boy, a girl, and a car:

“ Johnnie Steel has an Oldsmobile;
He loves a dear little girl:
She is the queen of his gas machine;
She has his heart in a whirl.
Now when they go for a spin, you
know,
She tries to learn the auto, so
He lets her steer while he gets her ear
And whispers soft and low:
'Come away with me Lucile,
In my merry Oldsmobile...’”

The Airplane

Meanwhile, two Ohio bicycle mechanics, **Orville and Wilbur Wright**, were experimenting with another new method of transportation—flying. After trying out hundreds of designs, the Wright brothers tested their first “flying machine” on December 17, 1903. At Kitty Hawk, North Carolina, Orville took off. The plane, powered by a small gasoline engine, stayed in the air for 12 seconds and flew a distance of 120 feet (37m).

The Wrights' flight did not attract much attention. Most people saw little use for flying machines. Slowly, however, air pioneers built better planes and made longer flights. In time, the airplane changed the world.

★ Section 3 Review ★

Recall

1. **Identify** (a) Cyrus Field, (b) Alexander Graham Bell, (c) Thomas Edison, (d) Jan Matzeliger, (e) Gustavus Swift, (f) George Eastman, (g) Henry Ford, (h) Orville and Wilbur Wright.
2. **Define** (a) assembly line, (b) mass production.

Comprehension

3. Describe two inventions that transformed communication in the 1800s.

4. Why was Edison's electric power plant important?
5. How did the assembly line change auto making?

Critical Thinking and Writing

6. **Drawing Conclusions** Why might inventors be more creative working in an “invention factory” than working on their own?
7. **Ranking** Which invention discussed in this section had the greatest impact on American life? Explain your answer.



Activity Playing a Role Which invention mentioned in this section would have amazed you the most if you lived at that time? In a brief skit, play the role of a person seeing that invention for the first time.

Labor in the Age of Industry

As You Read

Explore These Questions

- How did the role of the worker change in the new industrial age?
- What were the goals of early unions?
- Why was progress slow for labor?

Define

- sweatshop
- strikebreaker
- anarchist
- collective bargaining
- injunction

Identify

- Knights of Labor
- Terence Powderly
- Haymarket Riot
- Samuel Gompers
- American Federation of Labor
- Mother Jones
- International Ladies' Garment Workers Union
- Triangle Fire
- Western Federation of Miners

SETTING the Scene

In 1896, Frederick Taylor observed workers at a steel plant. He wrote down the number of

times a worker picked up a shovel and the amount of time he took to swing it. Taylor then redesigned the shovels and work pattern in order to make the workers more productive.

Many factory owners adopted Taylor's system of "scientific management." Workers, however, often complained that they were being treated as parts of the machinery.

The rise of industry changed the workplace. By the late 1800s, harsh new conditions led workers to organize.

A Changing Workplace

Factories drew workers from many different backgrounds. Most workers were native-born white men. Many had left farms to take jobs in large cities.

Some northern factory workers were African Americans who had migrated from the South. Large numbers of immigrants from Europe, Asia, and Mexico also found jobs in factories. Women and children worked

in factories, too. All of these groups earned lower wages than native-born white men.

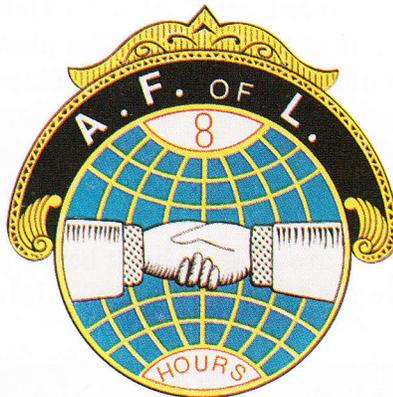
Workers and employers

Workers had to adjust to the new kinds of factories of the late 1800s. Before the Civil War, most factories were small and family-run. Bosses knew their workers by name and chatted with them about their families. Because most workers had skills that the factory needed, they could bargain with the boss for wages.

By the 1880s, the relationship between worker and boss declined. Workers stood all day tending machines in a large, crowded, noisy room. Their skills were no longer needed, and they worked for wages fixed by their bosses. In the garment trade and other industries, sweatshops became common. A **sweatshop** is a workplace where people labor long hours in poor conditions for low pay. Most sweatshop workers were immigrants, young women, or children.

Child labor

The 1900 census reported nearly 2 million children under age 15 at work through-



The American Federation of Labor and other unions fought to win workers an eight-hour day.



Viewing Children at Work

Children—many of them from immigrant families—labored in the nation's industries. “Breaker boys” hand-sorted slate from coal in grimy mines (right). Young girls operated heavy machinery in textile mills (left). ★ **How do you think the lives of these children were affected by having to go to work at an early age?**

out the country. Boys and girls labored in hazardous textile mills, tobacco factories, and garment sweatshops. In coal mines, they picked stones out of the coal for 12 hours a day, 6 days a week.

Working children had little time for schooling. Lack of education reduced their chance to build a better life as adults.

Many Americans believed that child labor was wrong. However, as long as factory owners could hire children at low pay, and as long as their families needed the money, child labor continued.

Dangerous conditions

Factories brimmed with hazards. Lung-damaging dust filled the air of textile mills. Cave-ins and gas explosions plagued mines. In steel mills, vats of red-hot metal spilled without warning.

Owners were more concerned with profits than with worker safety. They spent little to improve working conditions. Some workers had their health destroyed. Others were severely injured or killed in industrial accidents. In one year, 195 workers died in the steel mills of Pittsburgh.

Workers Organize

Low pay, long hours, and unhealthy conditions threatened the well-being of workers. Many found ways to fight back. Some workers took days off or slowed their work pace. Others went on strike. Strikes were usually informal, organized by workers in individual factories.

Sometimes, workers banded together to win better conditions. Most early efforts to form unions failed, however. (See page 307.)

Knights of Labor

In 1869, workers formed the **Knights of Labor**. At first, the union was open to skilled workers only. Members held meetings in secret because employers fired workers who joined unions.

In 1879, the Knights of Labor selected **Terence Powderly** as their president. Powderly worked to strengthen the union by opening membership to immigrants, blacks, women, and unskilled workers.

Powderly wanted the Knights to make the world a better place for both workers and employers. He did not believe in strikes.

Rather, he relied on rallies and meetings to win public support. Goals of the Knights included a shorter workday, an end to child labor, and equal pay for men and women.

In 1885, some Knights of Labor launched a strike that forced the Missouri Pacific Railroad to restore wage cuts. The Knights did not officially support the strike. Still, workers everywhere saw the strike as a victory for the union. Membership soared to 700,000, including 60,000 African Americans.

Haymarket Riot

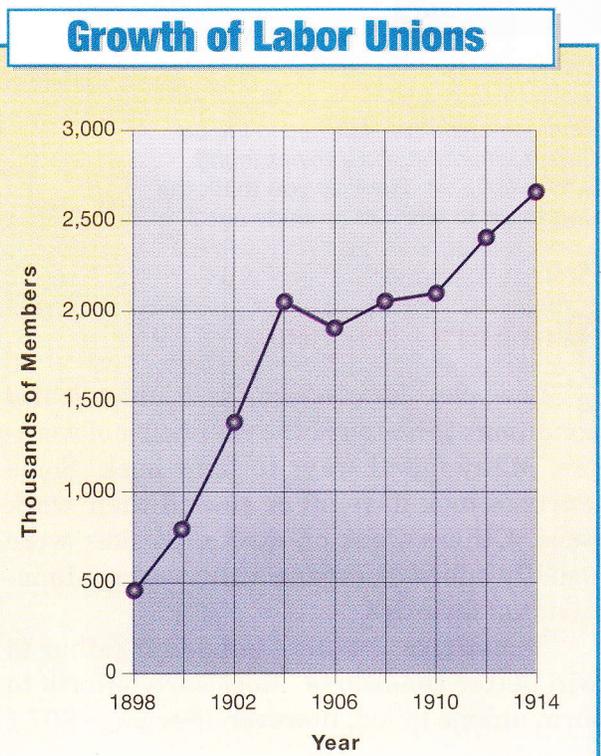
The following year, the Knights of Labor ran into serious trouble. Workers at the Mc-

Cormick Harvester Company in Chicago went on strike. Again, the Knights did not endorse the strike.

Like many companies at the time, the McCormick company hired **strikebreakers**, or replacements for striking workers. On May 3, 1886, workers clashed with strikebreakers outside the factory. Police opened fire. Four workers were killed.

The next day, thousands of workers gathered in Haymarket Square to protest the killings. The rally was led by **anarchists**, people who oppose all forms of organized government. Suddenly, a bomb exploded, killing one police officer and wounding others. Police peppered the crowd with bullets, killing or wounding many more people.

Eight anarchists were arrested for their part in the **Haymarket Riot**, as the incident was called. No real evidence linked these men to the bombing, but four were tried, convicted, and hanged. A wave of anti-labor feeling swept the nation. Membership in the Knights of Labor dropped sharply.



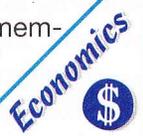
Source: Historical Statistics of the United States

Graph Skills

A growing number of workers joined unions in the late 1800s and early 1900s.

1. Comprehension (a) How much did union membership increase between 1898 and 1914? (b) What years showed a decrease in membership?

2. Critical Thinking Why did membership in unions grow so much?



American Federation of Labor

Despite the failure of the Knights of Labor, the labor movement continued to grow. In 1886, a British-born cigarmaker named **Samuel Gompers** organized a new union in Columbus, Ohio. The **American Federation of Labor**, or AFL, was open to skilled workers only.

Workers did not join the AFL directly. Rather, they joined a trade union, a union of persons working at the same trade. For example, a typesetter would join a typesetter's union. The union then joined the AFL. In effect, the AFL was a union made up of other unions.

Limited goals

Unlike the Knights of Labor, the AFL did not set out to change the world. It stressed practical goals. As one AFL leader said:

“ Our organization does not consist of idealists. We are going on from day to day. We are fighting only for immediate objects—objects that can be realized in a few years.”

The AFL stressed higher wages, shorter hours, and improved working conditions. It led the fight for **collective bargaining**, the right of unions to negotiate with management for workers as a group.

A powerful union

Unlike the Knights of Labor, the AFL supported the use of strikes to achieve its goals. The AFL collected money from its member unions. Some of it went into a strike fund. When AFL members went on strike, they were paid from the fund so that they could still feed their families.

Its practical approach helped the AFL become the most powerful union in the nation. Between 1886 and 1910, membership in the AFL swelled from 150,000 to more than 1.5 million. However, because African Americans, immigrants, and unskilled workers were barred from most trade unions, they could not join the AFL.

Women in the Labor Movement

By 1890, one million women worked in American factories. In the textile mills of New England and the tobacco factories of the South, women formed the majority of workers. In New York City, women outnumbered men in the garment industry.

During the 1800s, women formed their own unions. A few, like the all-black Washerwomen's Association of Atlanta, struck for higher wages. None of these unions succeeded, however.

Mother Jones

The best-known woman in the labor movement was Irish-born Mary Harris Jones, known as **Mother Jones**. Jones worked as a



Biography **Mother Jones**

"Join the union, boys!" urged Mary Jones. Traveling from strike to strike, she moved in with miners' families, organized marches, and cared for the sick. She always urged strikers to avoid violence. When she died in 1930—at the age of 100—Mother Jones had become a legend. ★ Jones was jailed many times. Why do you think this was so?

dressmaker in Chicago until the Chicago fire of 1871 destroyed her business. Faced with the need to start all over again, she devoted the rest of her life to the cause of workers.

In 1877, Jones supported striking railroad workers in Pittsburgh. Later, she traveled around the country, organizing coal miners and campaigning for improved working conditions.

Jones spoke out about the hard lives of children in textile mills, "barefoot . . . reaching thin little hands into the machinery." By calling attention to such abuses, Mother Jones helped pave the way for reform.

Organizing garment workers

In 1900, garment workers organized the **International Ladies' Garment Workers Union**, or ILGWU. More than 20,000 women and men in the ILGWU walked off their jobs

\$ Connections *With* Economics

Some immigrant workers banded together to demand higher wages. In 1903, Mexican and Japanese farm workers in Oxnard, California, organized the Japanese-Mexican Labor Association. Their strike forced farmers to pay them \$5 per acre for thinning beets.

Cause and Effect

Causes

- Railroad boom spurs business
- Businesses become corporations
- Nation has rich supply of natural resources
- New inventions make business more efficient

The Rise of Industry

Effects

- Steel and oil become giant industries
- Monopolies and trusts dominate important industries
- Factory workers face harsh conditions
- Membership in labor unions grows

Effects Today

- United States is world's leading economic power
- American corporations do business around the world
- Government laws regulate monopolies

Graphic Organizer Skills

American industry boomed after the Civil War. The effects of industrial growth are still being felt today.

- 1. Comprehension** List two causes for the rise of industry.
- 2. Critical Thinking** Why do you think the government now tries to regulate monopolies?

Economics



in 1910. After a few weeks, employers met union demands for better pay and shorter hours. The ILGWU became a key member of the AFL.

Despite the efforts of the ILGWU and other labor groups, most women with factory jobs did not join unions. They continued to work long hours for low pay. Many labored under unsafe conditions. Then, a tragic event focused attention on the dangers faced by women workers.

The Triangle Fire

In 1911, a fire broke out in the Triangle Shirtwaist Factory, a sweatshop in New York City. Within minutes, the upper stories were ablaze. Hundreds of workers raced for the exits, only to find them locked. The company had locked the doors to keep workers at their jobs. In their panic, workers ran headlong into the doors, blocking them with their bodies.

Fire trucks arrived almost immediately, but their ladders could not reach the upper floors. One after another, workers trying to escape the flames leaped to their deaths. One reporter wrote:

“As I looked up . . . there, at a window, a young man was helping girls to leap out. Suddenly one of them put her arms around him and kiss[ed] him. Then he held her into space and dropped her. He jumped next. Thud . . . dead. Thud . . . dead.”

Nearly 150 people, mostly young women, lost their lives in the **Triangle Fire**. The deaths shocked the public. As a result, New York and other states approved new safety laws to help protect factory workers.

Slow Progress for Labor

The new era of industry led to vast economic growth. At the same time, it created economic strain. In the rush for profits, many industries overexpanded. As goods flooded the market, prices dropped. To cover their losses, factory owners often fired workers. In time, factories geared up again, and the cycle was repeated.

The economy swung wildly between good times and bad. Between 1870 and 1900, two major depressions and three smaller recessions rocked the country. Workers lost their jobs or faced pay cuts. Often, they had no money to pay rent or buy food.

Violent strikes

During a severe depression in the 1870s, railroad workers were forced to take several cuts in pay. In July 1877, workers went on strike, shutting down rail lines across the country. Riots erupted in many cities as workers burned rail yards and ripped track from the ground. In Pittsburgh, a battle between strikebreakers and strikers left more than 20 people dead.

Violent strikes also broke out in the West. In the 1870s, miners in Idaho tried to shut down two large mines. Violence flared until the territorial governor threatened to bring in troops. In 1893, after another bitter strike, miners formed the **Western Federation of Miners**. This militant union gained great strength in the Rocky Mountain states. Between 1894 and 1904, it organized strike after strike when owners refused to negotiate.

A major setback

The federal government usually sided with factory owners. Several Presidents sent in troops to end strikes. Courts ruled against strikers, too.

In 1894, a Chicago court dealt a serious blow to unions. A year earlier, George Pullman had cut the pay of workers at his railroad car factory. Yet, he did not reduce the

rents he charged them for company-owned houses. Workers walked off the job in protest.

A federal judge issued an injunction against the strikers. An **injunction** is a court order to do or not to do something. The judge ordered the Pullman workers to stop their strike. Leaders of the strike were jailed for violating the Sherman Antitrust Act. This act had been meant to keep trusts from limiting free trade. The courts, however, said that the strikers were limiting free trade. This decision was a major setback for unions.

Small gains

Union workers staged thousands of strikes during the late 1800s. Strikers won little sympathy at first. Few Americans supported unions. They believed that individuals who worked hard would be rewarded. Many were afraid that unions were run by foreign-born radicals. Because unions were unpopular, owners felt free to crush them.

Workers did make some gains. Skilled workers in the AFL won better conditions and higher pay. Overall, wages for workers rose slightly between 1870 and 1900. Still, progress was slow. In 1910, only one worker in 20 belonged to a union. Some 30 years would pass before large numbers of unskilled workers were able to join unions.

★ Section 4 Review ★

Recall

1. **Identify** (a) Knights of Labor, (b) Terence Powderly, (c) Haymarket Riot, (d) Samuel Gompers, (e) American Federation of Labor, (f) Mother Jones, (g) International Ladies' Garment Workers Union, (h) Triangle Fire, (i) Western Federation of Miners.
2. **Define** (a) sweatshop, (b) strikebreaker, (c) anarchist, (d) collective bargaining, (e) injunction.

Comprehension

3. How did factory work change in the late 1800s?

4. What were the goals of (a) the Knights of Labor? (b) the AFL?
5. How did the public view labor unions in the late 1800s?

Critical Thinking and Writing

6. **Making Inferences** Why did machines make some workers' skills useless?
7. **Drawing Conclusions** Why do you think workers gained so little from strikes in the late 1800s and early 1900s?



Activity Drawing a Cartoon Choose one of the events or issues you have read about in this section. Draw a political cartoon illustrating the topic you have chosen.