

There's More Online!

- ✓ BIOGRAPHY James Watt
- ✓ BIOGRAPHY Robert Fulton
- ✓ IMAGE The Rocket Steam Engine
- ✓ IMAGE Women Working in an English Cotton Mill
- ✓ INTERACTIVE SELF-CHECK QUIZ
- ✓ MAP Industry in Great Britain, 1850
- ✓ PRIMARY SOURCE A Miner's Story, 1842
- ✓ PRIMARY SOURCE Condition of the Working Class in England, 1844
- ✓ VIDEO The Industrial Revolution



# LESSON 1

## The Industrial Revolution

**ESSENTIAL QUESTIONS** • How can innovation affect ways of life?  
• How does revolution bring about political and economic change?

Reading **HELPDESK**

**Academic Vocabulary**

- labor
- derived

**Content Vocabulary**

- capital
- entrepreneur
- cottage industry
- puddling
- industrial capitalism
- socialism

**TAKING NOTES:**

**Key Ideas and Details**

**Categorizing** As you read, use a table like the one below to name important inventors mentioned in this section and their inventions.

Inventors	Inventions

### IT MATTERS BECAUSE

During the late eighteenth century, the Industrial Revolution began in Great Britain. An agricultural revolution and industrialization caused a shift from an economy based on farming and handicrafts to an economy based on manufacturing by machines in factories.

## The Industrial Revolution in Great Britain

**GUIDING QUESTIONS** What was the significance of the Agricultural Revolution in Great Britain? Why did the Industrial Revolution start in Great Britain?

The Industrial Revolution began in Great Britain in the 1780s. However, it took decades to spread to other Western nations. Several factors contributed to make Great Britain the starting place.

First, an Agricultural Revolution beginning in the eighteenth century changed agricultural practices. Expansion of farmland, good weather, improved transportation, and new crops such as the potato dramatically increased the food supply. More people could be fed at lower prices with less **labor**. Now even ordinary British families could use some of their income to buy manufactured goods.

Second, with the increased food supply, the population grew. When Parliament passed enclosure movement laws in the eighteenth century, landowners fenced off common lands. This forced many peasants to move to towns, creating a labor supply for factories.

Third, Britain had a ready supply of money, or **capital**, to invest in new machines and factories. **Entrepreneurs** found new business opportunities and new ways to make profits.

Fourth, natural resources were plentiful in Britain. The country's rivers provided water power for the new factories and a means for transporting raw materials and finished products. Britain also had abundant supplies of coal and iron ore.

Finally, a supply of markets gave British manufacturers a ready outlet for their goods. Britain had a vast colonial empire, and British

ships could transport goods anywhere in the world. Also, because of population growth and cheaper food at home, domestic markets increased. A growing demand for cotton cloth led British manufacturers to look for ways to increase production.

### Cotton Production and New Factories

In the eighteenth century, Great Britain had surged far ahead in the production of inexpensive cotton goods. The manufacture of cotton cloth was a two-step process. First, spinners made cotton thread from raw cotton. Then, weavers wove the cotton thread into cloth on looms. In the eighteenth century, individuals did these tasks in their rural cottages. This production method was thus called a **cottage industry**.

A series of technological advances during this time made the cottage industry inefficient. In 1764 James Hargreaves had invented a machine called the spinning jenny, which made the spinning process much faster. In fact, spinners produced thread faster than weavers could use it.

The invention of a water-powered loom by Edmund Cartwright in 1787 made it possible for the weaving of cloth to catch up with the spinning of thread. It was now more efficient to bring workers to the new machines and have them work in factories near streams and rivers, which were used to power many of these early machines.

The cotton industry became even more productive when the steam engine was improved in the 1760s by James Watt, a Scottish engineer. In 1782 Watt made changes that enabled the engine to drive machinery. Steam power could now be used to spin and weave cotton. Before long, cotton mills using steam engines could be found throughout Britain. Because steam engines were fired by coal, not powered by water, they did not need to be located near rivers.

British cotton cloth production increased dramatically. In 1760 Britain had imported 2.5 million pounds (1.14 million kg) of raw cotton, which was used to produce cloth in cottage industries. By 1840, 366 million pounds (166 million kg) of cotton were imported each year. By this time, cotton cloth was Britain's most valuable product. Sold around the world, British cotton goods were produced mainly in factories.

The factory was another important element in the Industrial Revolution. From its beginning, the factory created a new labor system. Factory owners wanted to use their new machines constantly. So, workers were forced to work in shifts to keep the machines producing at a steady rate.

**labor** work performed by people that provides the goods or services in an economy

**capital** money available for investment

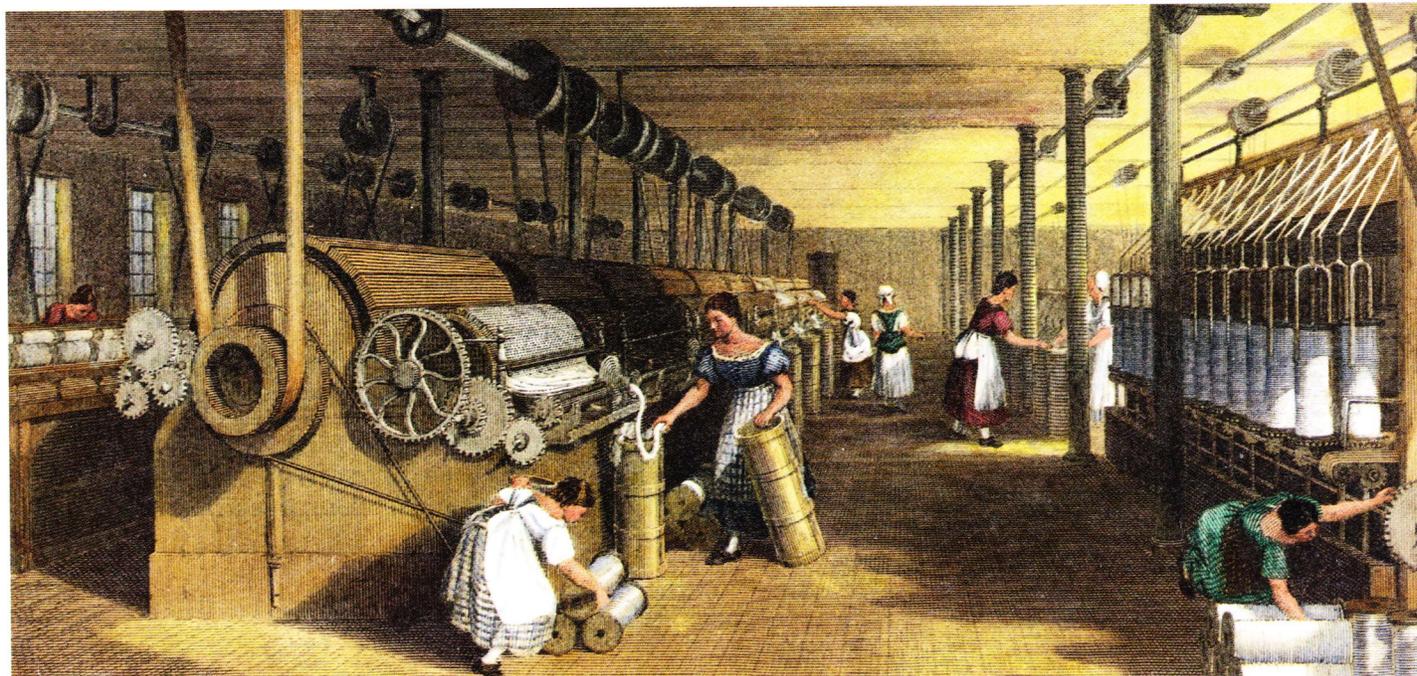
**entrepreneur** a person who finds new business opportunities and new ways to make profits

**cottage industry** a method of production in which tasks are done by individuals in their rural homes

▼ Titled *Carding, Drawing, and Roving*, this print shows girls and women working in an English cotton mill.

#### ► CRITICAL THINKING

**Analyzing Information** In what way does this image depict factory work?



Early factory workers came from rural areas where they were used to periods of hectic work, such as harvest time, followed by periods of inactivity. Early factory owners therefore disciplined workers to a system of regular hours and repetitive tasks. For example, adult workers were fined for being late and were dismissed for more serious misconduct, especially being drunk. Child workers were often beaten with a rod or whipped to keep them at work. One early industrialist said that his aim was “to make such machines of the Men as cannot err.”

### Coal, Iron, and Railroads

The steam engine was crucial to Britain’s Industrial Revolution. For fuel, the engine depended on coal, which seemed then to be unlimited in quantity. The success of the steam engine increased the need for coal and led to an expansion in coal production. New processes using coal aided the transformation of another industry—the iron industry.

Britain’s natural resources included large supplies of iron ore. A better quality of iron was produced in the 1780s when Henry Cort developed a process called **puddling**. In this process, coke, which was **derived** from coal, was used to burn away impurities in crude iron, called pig iron, and to produce an iron of high quality.

**puddling** the process in which coke derived from coal is used to burn away impurities in crude iron to produce high quality iron

**derived** obtained from; came from

The British iron industry boomed. In 1740 Britain had produced 17,000 tons (15,419 metric tons or t) of iron. After Cort’s process came into use in the 1780s, production jumped to nearly 70,000 tons (63,490 t). In 1852 Britain produced almost 3 million tons (2.7 million t)—more iron than was produced by the rest of the world combined. High-quality iron was used to build new machines, especially trains.

In the eighteenth century, more efficient means of moving resources and goods developed. Railroads were particularly important to the success of the Industrial Revolution. Richard Trevithick, an English engineer, built the first steam locomotive. In 1804 Trevithick’s locomotive ran on an industrial rail line in Britain. It pulled 10 tons (9 t) of ore and 70 people at 5 miles (8.05 km) per hour. Better locomotives soon followed. One called the *Rocket* was used on the first public railway line, which opened in 1830 and extended 32 miles (51.5 km) from the cotton-manufacturing town of Manchester to the thriving port of Liverpool.

The *Rocket* sped along at 16 miles (25.7 km) per hour while pulling a 40-ton (36-t) train. Within 20 years, locomotives were able to reach 50 miles (80.5 km) per hour, an incredible speed. In 1840 Britain had almost 2,000 miles (3,218 km) of railroads. In 1850 more than 6,000 miles (9,654 km) of railroad track crisscrossed much of the country.

Building railroads created new jobs for farm laborers and peasants. Less expensive transportation led to lower-priced goods, thus creating larger markets. More sales meant more demand and the need for more factories and more machinery. Business owners could

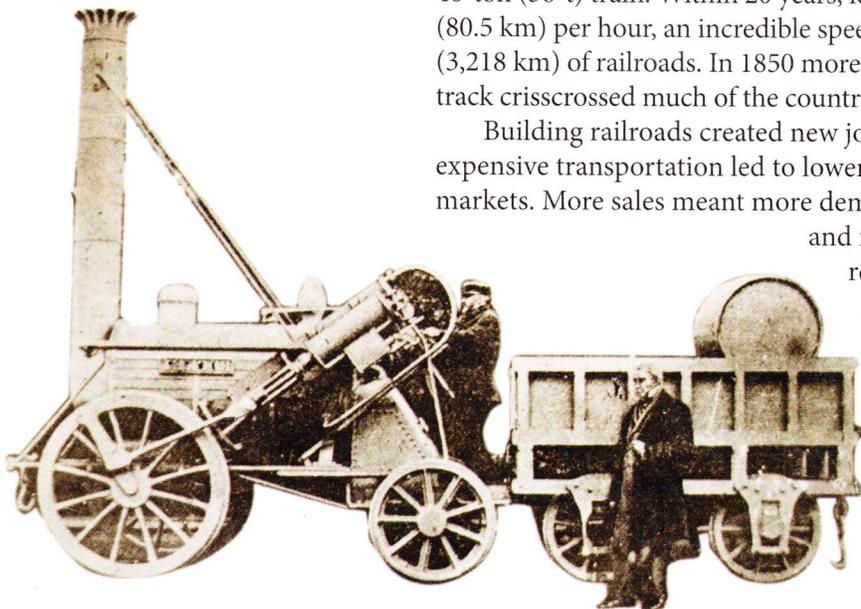
reinvest their profits in new equipment, adding to the growth of the economy.

This type of regular, ongoing economic growth became a basic feature of the new industrial economy.

#### READING PROGRESS CHECK

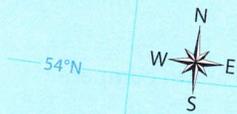
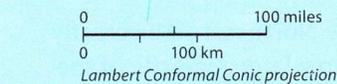
**Making Inferences** Why might it be important to have fast, reliable transportation between Manchester and Liverpool?

▼ The *Rocket* locomotive





## Industry in Great Britain 1850



ATLANTIC OCEAN

IRELAND

### GEOGRAPHY CONNECTION

By 1850, Great Britain was an industrial nation.

- 1 THE WORLD IN SPATIAL TERMS** Which major ports are located along coalfields?
- 2 THE USES OF GEOGRAPHY** What geographical factors help explain why industrialization began in Great Britain?

12°W 9°W 6°W 3°W 0° 3°E



## The Spread of Industrialization

**GUIDING QUESTION** What factors fed the spread of industrialization in Europe and North America?

By the mid-nineteenth century, Great Britain had become the world's first industrial nation. It had also become the world's richest nation. Great Britain produced one-half of the world's coal and manufactured goods. Its cotton industry alone in 1850 was equal in size to the industries of all other European countries combined.

The Industrial Revolution spread to the rest of Europe at different times and at different speeds. Belgium, France, and the German states were the first to be industrialized in continental Europe, and their governments actively encouraged such development. For example, governments provided funds to build roads, canals, and railroads. By 1850, a network of iron rails spread across Europe.

An Industrial Revolution also occurred in the United States during the first half of the nineteenth century. In 1800 more than 5 million people lived in the United States, and nearly 6 out of every 7 American workers were farmers. No city had more than 100,000 people. In contrast, the U.S. population had grown to more than 30 million people by 1860. Many of these people moved into the cities. Eight cities had populations over 100,000, and only about 50 percent of American workers were farmers.

A large country, the United States needed a good transportation system to move goods across the nation. Thousands of miles of roads and canals were built to link east and west. Robert Fulton built the first paddle-wheel steamboat, the *Clermont*, in 1807. Steamboats made transportation easier on the waterways of the United States.

### Children in Factories

On the conditions of child factory workers:

“Provided a child should be drowsy, the overlooker walks round the room . . . and he touches the child on the shoulder, and says, ‘Come here.’ In the corner of the room there is an iron cistern; it is filled with water . . . he takes this boy, and holding him up by the legs, dips him over head in the cistern, and sends him to work for the remainder of the day. . . .”

—from a British Parliament report, quoted in *The History of the Factory Movement, Vol 1, 1857*

**DBQ** **MAKING INFERENCES**  
Why might the British Parliament have examined the conditions of child factory workers?

**industrial capitalism**  
an economic system based on industrial production or manufacturing

Most important in the development of an American transportation system was the railroad. By 1860, about 30,000 miles (48,270 km) of railroad track covered the continental United States. The railroad soon turned the country into a single massive market for the manufactured goods produced in the Northeast.

Labor for the growing number of factories in the Northeast came chiefly from the farm population. Women and girls made up a large majority of the workers in large textile (cotton and wool) factories.

### **READING PROGRESS CHECK**

**Comparing** How did the effects of industrialization in the United States compare with those in Great Britain?

## Social Impact of Industrialization

**GUIDING QUESTION** *What was the social impact of industrialization in Europe?*

The Industrial Revolution drastically changed society. In the first half of the nineteenth century, cities grew and two new social classes—the industrial middle class and the industrial working class—emerged.

### Population Growth and Urbanization

European population stood at an estimated 140 million in 1750. By 1850, the population had almost doubled to 266 million. The key to this growth was a decline in death rates, wars, and major epidemic diseases, such as smallpox and plague. Because of an increase in the food supply, people were better fed and more resistant to disease.

Famine and poverty were two factors that impacted global migration and urbanization. More than 1 million people died during the Irish potato famine, and poverty led a million more to migrate to the Americas. Industrialization also spurred urbanization, as large numbers of people migrated from the countryside to cities to work in factories.

In 1800 Great Britain had one major city, London, with a population of about 1 million. Six cities had populations between 50,000 and 100,000. By 1850, London’s population had swelled to about 2.5 million. Nine cities had populations over 100,000. Also, more than 50 percent of the population lived in towns and cities.

The rapid growth of cities in the first half of the nineteenth century led to pitiful living conditions for many, leading urban reformers to call on local governments to clean up their cities. Reform would be undertaken in the second half of the nineteenth century.

### New Social Classes

The Middle Ages saw the rise of commercial capitalism, an economic system based on trade. **Industrial capitalism**, an economic system based on industrial production, rose during the Industrial Revolution. This system produced a new middle-class group—the industrial middle class.

In the Middle Ages, the bourgeois, or middle-class person, was the burgher or town dweller. The bourgeois were merchants, officials, artisans, lawyers, or intellectuals. Later, the term *bourgeois* came to include people involved in industry and banking, as well as lawyers, teachers, or doctors. The new industrial middle class that emerged during the Industrial Revolution was made up of the people who built the factories, bought the machines, and developed the markets. They had initiative, vision, ambition, and often greed. One said, “Getting of money. . . is the main business of the life of Man. . . .”

The Industrial Revolution also created an industrial working class that faced wretched working conditions. Work hours ranged from 12 to 16 hours each day, 6 days per week. There was no security of employment, and there was no minimum wage.

Conditions in the coal mines were harsh. Steam-powered engines lifted the coal from the mines to the top, but the men inside the mines dug out the coal. Dangerous conditions, including cave-ins, explosions, and gas fumes, were a way of life. The cramped conditions in the mines and their constant dampness led to workers' deformed bodies and ruined lungs.

The worst conditions were in the cotton mills, which were also dirty, dusty, dangerous, and unhealthy. In Britain, women and children made up two-thirds of the cotton industry's workforce by 1830. However, the number of child laborers declined after the Factory Act of 1833. This act set nine as the minimum age for employment and limited hours for older children. After this, women came to make up 50 percent of the British labor force in textile factories. They were paid half or less than half of what men received. When the work hours of children and women were limited, a new pattern of work emerged. Men now earned most of the family income by working outside the home. Women took over daily care of the family and performed low-paying jobs that could be done at home.

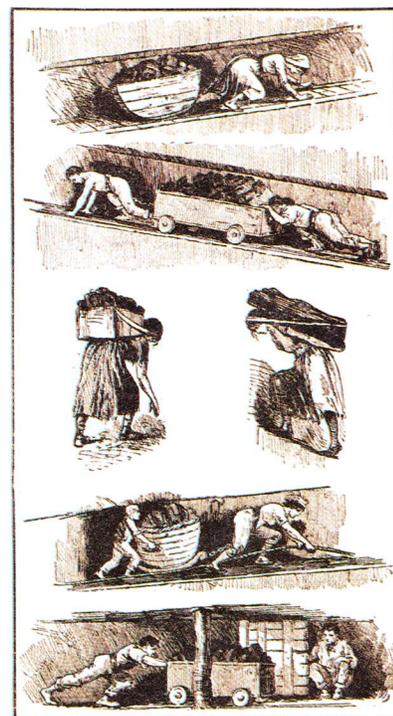
### Early Socialism

In the first half of the nineteenth century, the pitiful conditions created by the Industrial Revolution gave rise to a movement known as **socialism**. In this economic system, society—usually in the form of the government—owns and controls some means of production, such as factories and utilities.

Early socialism was largely the idea of intellectuals. To later socialists, especially the followers of Karl Marx, such ideas were impractical dreams. They contemptuously labeled the earlier reformers utopian socialists, a term that has lasted to this day. Robert Owen, a British cotton manufacturer, was one utopian socialist. He believed that humans would show their natural goodness if they lived in a cooperative environment. Owen transformed the squalid factory town of New Lanark, Scotland, into a flourishing community. He created a similar community at New Harmony, Indiana, in the United States in the 1820s, which failed.

#### READING PROGRESS CHECK

**Drawing Conclusions** Why do you think the working conditions during the Industrial Revolution led some to argue for socialism?



▲ Children and women working in an English coal mine

**socialism** a system in which society, usually in the form of the government, owns and controls the means of production

PHOTO: The Stapleton Collection/Bridgeman Art Library

## LESSON 1 REVIEW



### Reviewing Vocabulary

**1. Summarizing** Write a paragraph describing the importance of urbanization to the growth of industrial capitalism in Great Britain.

### Using Your Notes

**2. Organizing** Use your graphic organizer to discuss the major inventors and inventions covered in this lesson.

### Answering the Guiding Questions

**3. Evaluating** What was the significance of the Agricultural Revolution in Great Britain?

**4. Identifying** Why did the Industrial Revolution start in Great Britain?

**5. Making Connections** What factors fed the spread of industrialization in Europe and North America?

**6. Drawing Conclusions** What was the social impact of industrialization in Europe?

### Writing Activity

**7. INFORMATIVE/EXPLANATORY** Using the information you collected in your graphic organizer, write a paragraph describing the impact the various inventions had on the Industrial Revolution.