

Objectives

As you teach this section, keep students focused on the following objectives to help them answer the Section Focus Question and master core content.

- Analyze why life changed as industry spread.
- Summarize how an agricultural revolution led to the growth of industry.
- Outline the new technologies that helped trigger the Industrial Revolution.

Prepare to Read

Build Background Knowledge **L3**

Write the word *revolution* on the board. Ask students to list revolutions they have studied (including the Scientific Revolution) and the characteristics of revolutions. Tell them they will learn about the characteristics of the Industrial Revolution next.

Set a Purpose **L3**

- **WITNESS HISTORY** Read the selection aloud or play the audio.

 **WITNESS HISTORY Audio CD,**
From Hand Power to Steam Power

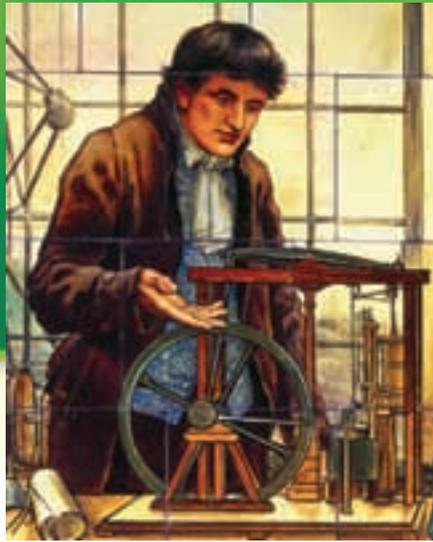
Ask **What effect did Boulton think steam power would have on the world?** (*It would benefit people by relieving them of hard manual labor.*)

Ask students to predict whether steam power would “uplift civilization.”

- **Focus** Point out the Section Focus Question and write it on the board. Tell students to refer to this question as they read. (*Answer appears with Section 1 Assessment answers.*)
- **Preview** Have students preview the Section Objectives and the list of Terms, People, and Places.
- **Reading Skill** Have students use the *Reading Strategy: Understand Effects* worksheet.

 Teaching Resources, Unit 4, p. 7

Matthew Boulton

WITNESS HISTORY  AUDIO

From Hand Power to Steam Power

For centuries, people used their own energy to provide the power for their work. While the idea of using steam power came about in the seventeenth century, it was not until engineer James Watt improved the steam engine that it could be applied to machinery. His financial partner Matthew Boulton, a successful manufacturer, proclaimed:

“I have at my disposal what the whole world demands, something which will uplift civilization more than ever by relieving man of all undignified drudgery. I have *steam power*.”

Focus Question What events helped bring about the Industrial Revolution?

Dawn of the Industrial Age

Objectives

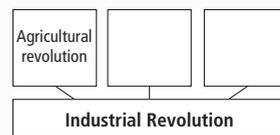
- Analyze why life changed as industry spread.
- Summarize how an agricultural revolution led to the growth of industry.
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Terms, People, and Places

anesthetic
enclosure
James Watt
smelt

Note Taking

Reading Skill: Recognize Multiple Causes
Several key events led to the Industrial Revolution. As you read the section, create a flowchart of these causes. Add categories as needed.



For thousands of years following the rise of civilization, most people lived and worked in small farming villages. However, a chain of events set in motion in the mid-1700s changed that way of life for all time. Today, we call this period of change the Industrial Revolution.

The Industrial Revolution started in Britain. The economic changes that Britain experienced affected people’s lives as much as previous political changes and revolutions had. In contrast with most political revolutions, it was neither sudden nor swift. Instead, it was a long, slow, uneven process in which production shifted from simple hand tools to complex machines. From its beginnings in Britain, the Industrial Revolution has spread to the rest of Europe, North America, and around the globe.

Life Changes as Industry Spreads

In 1750, most people worked the land, using handmade tools. They lived in simple cottages lit by firelight and candles. They made their own clothing and grew their own food. In nearby towns, they might exchange goods at a weekly outdoor market.

Like their ancestors, these people knew little of the world that existed beyond their village. The few who left home traveled only as far as their feet or a horse-drawn cart could take them. Those bold adventurers who dared to cross the seas were at the mercy of the winds and tides.

With the onset of the Industrial Revolution, the rural way of life began to disappear. By the 1850s, many country villages had grown into industrial towns and cities. Those who lived there were able to buy clothing and food that someone else produced.

Vocabulary Builder

Use the information below and the following resources to teach the high-use word from this section.

 Teaching Resources, Unit 4, p. 45; Teaching Resources, Skills Handbook, p. 3

High-Use Word
statistics, p. 610

Definition and Sample Sentence

pl.n. data that is gathered and tabulated to present information
The **statistics** from this season’s basketball games showed that Jenny had scored more points than any other player.

Industrial-age travelers moved rapidly between countries and continents by train or steamship. Urgent messages flew along telegraph wires. New inventions and scientific “firsts” poured out each year. Between 1830 and 1855, for example, an American dentist first used an **anesthetic**, or drug that prevents pain during surgery; an American inventor patented the first sewing machine; a French physicist measured the speed of light; and a Hungarian doctor introduced antiseptic methods to reduce the risk of women dying in childbirth.

Still more stunning changes occurred in the next century, which created our familiar world of skyscraper cities and carefully tended suburbs. How and why did these great changes occur? Historians point to a series of interrelated causes that helped trigger the industrialization of the West. The “West” referred originally to the industrialized countries in Europe but today includes many more.

✓ Checkpoint Why was the Industrial Revolution a turning point in world history?

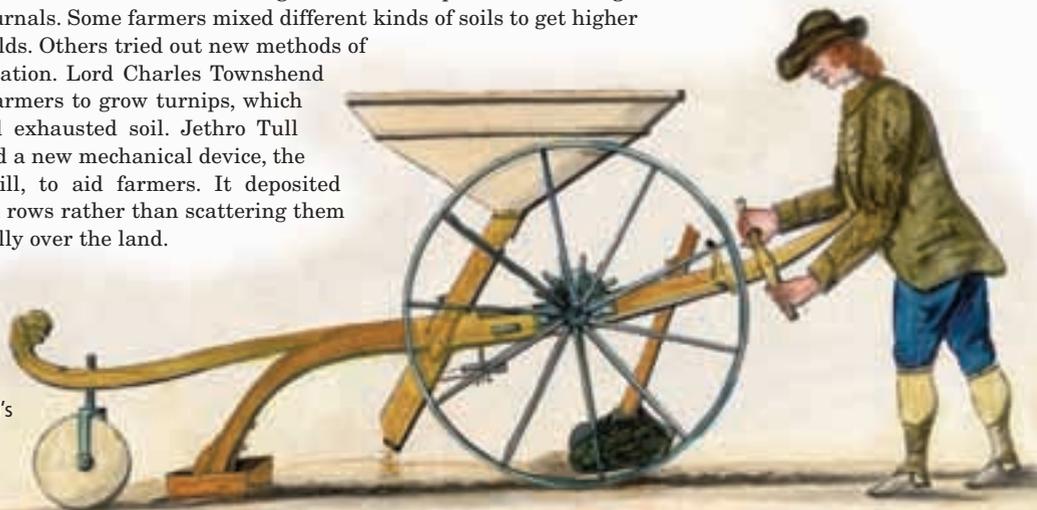
Agriculture Spurs Industry

Oddly enough, the Industrial Revolution was made possible in part by a change in the farming fields of Western Europe. From the first agricultural revolution some 11,000 years ago, when people learned to farm and domesticate animals, until about 300 years ago, farming had remained pretty much the same. Then, a second agricultural revolution took place that greatly improved the quality and quantity of farm products.

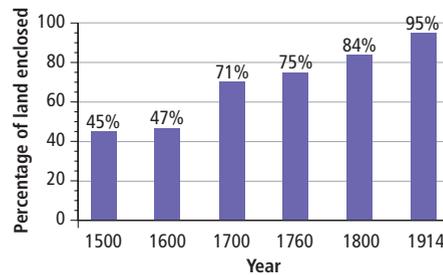
Farming Methods Improve The Dutch led the way in this new agricultural revolution. They built earthen walls known as dikes to reclaim land from the sea. They also combined smaller fields into larger ones to make better use of the land and used fertilizer from livestock to renew the soil.

In the 1700s, British farmers expanded on Dutch agricultural experiments. Educated farmers exchanged news of experiments through farm journals. Some farmers mixed different kinds of soils to get higher crop yields. Others tried out new methods of crop rotation. Lord Charles Townshend urged farmers to grow turnips, which restored exhausted soil. Jethro Tull invented a new mechanical device, the seed drill, to aid farmers. It deposited seeds in rows rather than scattering them wastefully over the land.

Jethro Tull's seed drill



Land Enclosures in England, 1500–1914



Graph Skills According to the graph, between which years was the largest percentage of land enclosed? What was the result of these land enclosures?

SOURCE: *Oxford Atlas of World History*, 1999

- **Note Taking** Have students read this section using the Guided Questioning strategy (TE, p. T20). As they read, have students fill in the flowchart showing the multiple causes of the Industrial Revolution.

 **Reading and Note Taking**
Study Guide, p. 173

Teach

Life Changes/Agriculture **L3**

Instruct

- **Introduce: Vocabulary Builder**
Have students read the Vocabulary Builder term and definition. Ask **What kinds of statistics might reflect the changes that occurred in the Industrial Revolution?** (*statistics on rural and urban population, factory production, product sales*)
- **Teach** Trace the shift from simple hand tools to complex machines. Ask **How did farming methods improve during the second agricultural revolution?** (*Fertilizer and crop rotation led to higher crop yields; larger fields and new devices increased efficiency.*) **How did these changes help lead to the Industrial Revolution?** (*Greater efficiency reduced the need for labor. Farm laborers migrated to cities in search of work.*)

Independent Practice

Ask students to write a brief paragraph that explains how the practice of enclosures helped lead to the Industrial Revolution. They should use details from the text and from the bar graph on this page.

Monitor Progress

As students fill in their flowcharts, circulate to make sure they understand that an agricultural revolution and the population explosion helped lead to the Industrial Revolution. For a completed version of the flowchart, see

 **Note Taking Transparencies**, 140

Answers

- ✓ The Industrial Revolution changed where and how people lived and how they worked and traveled.
- Graph Skills** between 1600 and 1700; farm output and profits rose, but small farmers were forced off the land and eventually migrated to cities to find work.

Differentiated

Instruction Solutions for All Learners

L1 Special Needs **L2** Less Proficient Readers

Help students brainstorm ways that they use machines and machine-made items every moment of their lives, from the time their alarm clocks wake them in the morning until they turn the lights off at night. Then ask them to summarize what aspects of life were changed by the Industrial Revolution.

Use the following resources to help students acquire basic skills:

 **Adapted Reading and Note Taking Study Guide**

- Adapted Note Taking Study Guide, p. 173
- Adapted Section Summary, p. 174

New Technology Becomes Key

L3

Instruct

- **Introduce** Point out that the way we think of technology is a product of the Industrial Revolution. Use the Think-Write-Pair-Share Strategy (TE, p. T22) and Ask **Was technology a cause or a result of the Industrial Revolution? Why?** (*both; answers will vary.*)
 - **Teach** Ask **Which two technologies contributed to the Industrial Revolution?** (*improvements to the steam engine and to iron production*) **How did these two technologies influence each other?** (*Better-quality iron was used to build steam engines; steam engines produced new uses for iron, such as locomotives.*)
 - **Quick Activity** Display **Color Transparency 116: Steam-Powered Inventions**. Ask students to list what kinds of changes each invention led to. Then return to the Witness History quotation from Matthew Boulton, from the beginning of this section. Have students debate whether they agree or disagree with Boulton's statement that steam power will "uplift civilization," using the evidence in the chart.
-  **Color Transparencies, 116**

Independent Practice

Assign student groups to research one of the following inventors and his contribution to the Industrial Revolution: Henry Cort, Robert Fulton, John McAdam, Samuel F. B. Morse, George Stephenson, or John Wilkinson. Have the groups present their findings to the class.

Monitor Progress

- To review the section so far, have students explain the significance of Abraham Darby's experiments with coal. Point out the photo of the bridge completed by Abraham Darby III.
- Check Reading and Note Taking Study Guide entries for student understanding.

Answers

- ✓ Because of an agricultural revolution, people ate better and were healthier, which reduced death rates.

BIOGRAPHY Sample: Watt's improved steam engine might not have been marketed right away, which could have meant a delay in the spread of the Industrial Revolution.

Vocabulary Builder

statistics—(stuh TIS tiks) *pl.n.* data that are gathered and tabulated to present information

Enclosure Increases Output but Causes Migration Meanwhile, rich landowners pushed ahead with **enclosure**, the process of taking over and consolidating land formerly shared by peasant farmers. In the 1500s, landowners had enclosed land to gain more pastures for sheep to increase wool output. By the 1700s, they wanted to create larger fields that could be cultivated more efficiently. The British Parliament facilitated enclosures through legislation.

As millions of acres were enclosed, farm output rose. Profits also rose because large fields needed fewer workers. But such progress had a large human cost. Many farm laborers were thrown out of work, and small farmers were forced off their land because they could not compete with large landholders. Villages shrank as cottagers left in search of work. In time, jobless farm workers migrated to towns and cities. There, they formed a growing labor force that would soon tend the machines of the Industrial Revolution.

Population Multiplies The agricultural revolution contributed to a rapid growth of population. Precise population **statistics** for the 1700s are rare, but those that do exist are striking. Britain's population, for example, soared from about 5 million in 1700 to almost 9 million in 1800. The population of Europe as a whole shot up from roughly 120 million to about 180 million during the same period. Such growth had never before been seen.

Why did this population increase occur? First, the agricultural revolution reduced the risk of death from famine because it created a surplus of food. Since people ate better, they were healthier. Also, better hygiene and sanitation, along with improved medical care, further slowed deaths from disease.

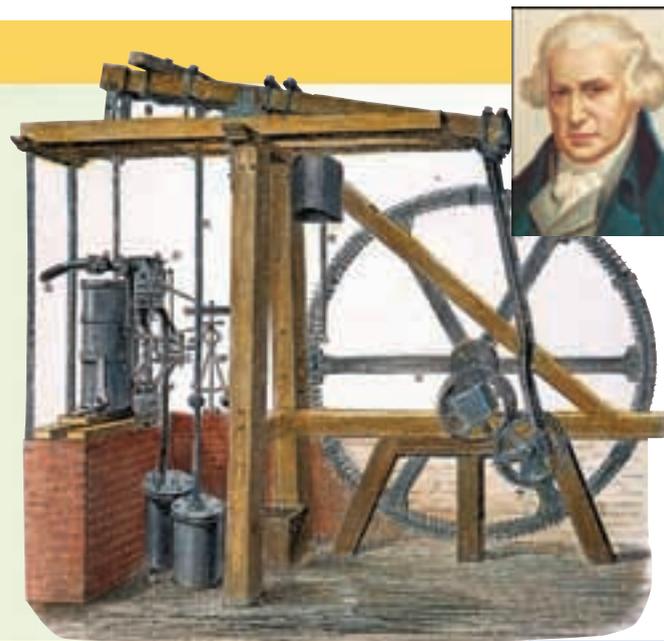
- ✓ **Checkpoint** How did an agricultural revolution contribute to population growth?

BIOGRAPHY

James Watt

How did a clever Scottish engineer become the "Father of the Industrial Revolution"? After repairing a Newcomen steam engine, James Watt (1736–1819) became fascinated with the idea of improving the device. Within a few months, he knew he had a product that would sell. Still, Watt lacked the money needed to produce and market it.

Fortunately, he was able to form a partnership with the shrewd manufacturer Matthew Boulton. They then founded Soho Engineering Works in Birmingham, England, to manufacture steam engines. Watt's version of the steam engine shown here had a separate condensing chamber and was patented in 1769. Eventually, a measure of mechanical and electrical power, the watt, would be named for James Watt. **How might the Industrial Revolution have been different if Watt had not found a business partner?**



Link to Science

Watt, Horsepower, and Watts By preventing the loss of steam, Watt made steam engines more efficient and more powerful. He also attached a flywheel, converting the back-and-forth motion of the pistons into a circular motion to power not only pumps but all sorts of machinery. To market his engines, Watt needed to be able to describe their power. The best source of power at the time was

horses. Watt found that a horse could lift 550 pounds of coal 10 feet (30 m) in 10 seconds, or 33,000 pounds per foot (0.3 m) per minute. He defined this value as one horsepower. Horsepower is still used for engines; trucks and SUVs today average more than 200 horsepower. Watt's name was later given to a measure of power: the watt. Common light bulbs measure 60 to 100 watts. One horsepower is equal to 745.56 watts.

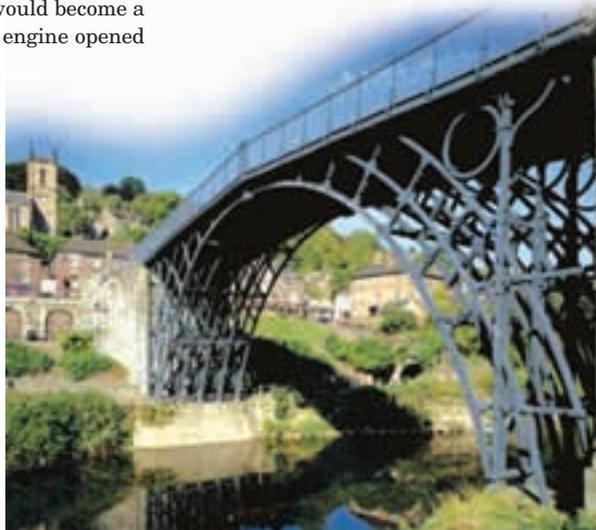
New Technology Becomes Key

Another factor that helped trigger the Industrial Revolution was the development of new technology. Aided by new sources of energy and new materials, these new technologies enabled business owners to change the ways work was done.

An Energy Revolution During the 1700s, people began to harness new sources of energy. One vital power source was coal, used to develop the steam engine. In 1712, British inventor Thomas Newcomen had developed a steam engine powered by coal to pump water out of mines. Scottish engineer **James Watt** looked at Newcomen's invention in 1764 and set out to make improvements on the engine in order to make it more efficient. Watt's engine, after several years of work, would become a key power source of the Industrial Revolution. The steam engine opened the door not only to operating machinery but eventually to powering locomotives and steamships.

The Quality of Iron Improves Coal was also a vital source of fuel in the production of iron, a material needed for the construction of machines and steam engines. The Darby family of Coalbrookdale pioneered new methods of producing iron. In 1709, Abraham Darby used coal instead of charcoal to **smelt** iron, or separate iron from its ore.

Darby's experiments led him to produce less expensive and better-quality iron, which was used to produce parts for the steam engines. Both his son and grandson continued to improve on his methods. In fact, Abraham Darby III built the world's first iron bridge. In the decades that followed, high-quality iron was used more and more widely, especially after the world turned to building railroads.



Abraham Darby III completed the world's first iron bridge in 1779. The bridge still stands today.

Checkpoint What new technologies helped trigger the Industrial Revolution?

1 Assessment

Progress Monitoring Online

For: Self-quiz with vocabulary practice
Web Code: naa-1911

Terms, People, and Places

1. For each term, person, or place listed at the beginning of the section, write a sentence explaining its significance.

Note Taking

2. **Reading Skill: Recognize Multiple Causes** Use your completed flowchart to answer the Focus Question: What events helped bring about the Industrial Revolution?

Comprehension and Critical Thinking

3. **Recognize Cause and Effect** What were the immediate and long-term effects of the agricultural revolution that occurred in the 1700s?
4. **Predict Consequences** How do you think population growth contributed to the Industrial Revolution?
5. **Summarize** Explain how new sources of energy, specifically coal, contributed to the Industrial Revolution.

Writing About History

Quick Write: Give Background To explain a historical process, you should first orient the reader to time and place. Ask yourself when and where the process occurred. Practice by explaining in one or two sentences how an agricultural revolution led to the Industrial Revolution.

Section 1 Assessment

1. Sentences should reflect an understanding of each term, person, or place listed at the beginning of the section.
2. An agricultural revolution, the population explosion, and new technologies helped bring about the Industrial Revolution.
3. Immediate effects included increased crop yields, more efficient farming, and decreased demand for farm laborers.

4. It provided new sources of labor and increased demand for factory goods.
5. Coal was used to produce better iron and to fuel the steam engines that powered machinery such as locomotives and steamships.

Writing About History

Responses should orient the reader in time and place and explain that greater efficiency in farming methods reduced the need for labor, forcing farm laborers to migrate to cities, where they provided labor for factories.

For additional assessment, have students access **Progress Monitoring Online** at **Web Code naa-1911**.

Assess and Reteach

Assess Progress

L3

- Have students complete the Section Assessment.
- Administer the Section Quiz.

All in One Teaching Resources, Unit 4, p. 41

- To further assess student understanding, use **Progress Monitoring Transparencies**, 79

Reteach

If students need more instruction, have them read the section summary.

Reading and Note Taking Study Guide, p. 174

L3

Adapted Reading and Note Taking Study Guide, p. 174

L1

L2

Spanish Reading and Note Taking Study Guide, p. 174

L2

Extend

L4

Have students consider the many changes that are occurring in the world today. Do they think the world is experiencing an agricultural revolution, a population explosion, or a technological revolution? Have them research and write reports expressing their opinions, supported by relevant examples.

Answer

- ✓ Watt's improved steam engine and better-quality iron helped contribute to the Industrial Revolution.