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Teacher Overview

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SQ 4. How did innovations during the Industrial Revolution change life in Great Britain in the 19th century?



Unit Essential Question(s): Do the benefits of innovation outweigh the costs? For whom? [Link to Unit](#)



Supporting Question(s): How did innovations during the Industrial Revolution change life in Great Britain in the 19th century?

Objective(s):

- **Describe** how innovations during the Industrial Revolution changed life in Great Britain in the 19th century.

Vocabulary

The following words are introduced or reinforced in this lesson. Reference the unit vocabulary tracker for more information. [Click here](#) for the New Visions Global History glossary.

**Word/Phrase
(part of speech)**

Definition

accelerate	to make something go faster
canal	a man-made waterways used to transport people and goods from one place to another that usually connect to a larger body of water like a river, lake, or sea
coal	a black or dark brown rock that burns easily when set on fire
complex	consisting of many different and connected parts
division of labor	the separation of steps in the process of making something into different jobs
domestic system	also known as the putting out system
economic	related to the use a country or region's wealth and resources
factory	a building or set of buildings where products are made by machines
finished goods	products that are ready to be sold to customers
flying shuttle	a device that mechanized weaving in 1733
Great Britain	the main island of the United Kingdom, located off the northwest coast of France and occupied by England, Scotland, and Wales; Great Britain
Industrial Revolution	the period in which the production of goods shifted from hand production methods to complex machines. This period of industrialization resulted in social and economic changes. The Industrial Revolution started in Great Britain around 1750. The process of industrialization spread throughout the world in the following centuries.
industrialization	the process of developing manufacturing on a large scale
innovation	a new method of addressing a problem
invention	something made for the first time
James Watt	(1736 – 1819) was a Scottish inventor and engineer whose improvements to the steam engine provided much of the force behind the Industrial Revolution
locomotive	an engine that moves a train
machine	a piece of equipment with a system of parts that work together to do or make something
manufacturing	the process of making a large number of something
mechanize	to make a processes more mechanical or automatic by introducing machines
merchant	a person who is involved in trade

mining	the act or business of digging up coal, ore, or other minerals in a mine
power loom	a machine that weaved fabric invented by Edmund Cartwright in 1785
putting out system	also known as the domestic system
raw materials	an item (usually a natural resource) used to create manufactured goods
social	having to do with society, people living together in large groups
spinning jenny	(1770) machine invented by James Hargreaves that spun wool into yarn
steam-engine	a machine that heats water, then uses resulting steam to move machinery. Though other invented the steam engine, James Watt's version of it was popular during the Industrial Revolution.
steamboat	a boat that runs on steam power
transportation	the process of being moved from one place to another
turnpike	a highway on which drivers are charged a toll
water frame	a machine that spun wool into yarn invented by Richard Arkwright in 1767

Formative Assessment Possible Responses

These responses represent possible answers to the formative assessment tasks in this lesson. They are not the only correct answers. Create your own list of possible responses before using this resource with students to anticipate student misconceptions and adjust your instruction.


after	before	during	then	but
Category of Life in Great Britain		What changed as a result of innovations during the Industrial Revolution?		
Source of Energy		Before the Industrial Revolution, people and animals were the main source of energy, but during the Industrial Revolution, water and later coal was used to power factories.		
How goods were made and where people worked		Before the Industrial Revolution, goods were created through the domestic system where people made finished goods in their homes and were paid for what they created. During the Industrial Revolution, were made in factories and people came to factories to work.		
How people and goods were transported		Before the Industrial Revolution, people and goods were transported on foot or with the use of horses. Afterwards,		

roads were improved, canals were created to ship goods and move people, and trains were invented.

NYS Social Studies Framework

Key Idea	Conceptual Understandings	Content Specifications
10.3 CAUSES AND EFFECTS OF THE INDUSTRIAL REVOLUTION: Innovations in agriculture, production, and transportation led to the Industrial Revolution, which originated in Western Europe and spread over time to Japan and other regions. This led to major population shifts and transformed economic and social systems. (Standard: 2, 3, 4; Themes: MOV, TCC, GEO, SOC, ECO, TECH)	10.3b Factors including new economic theories and practices, new sources of energy, and technological innovations influenced the development of new communication and transportation systems and new methods of production. These developments had numerous effects.	Students will examine changes and innovations in energy, technology, communication, and transportation that enabled industrialization.

Social Studies Practices

<u>NYS Social Studies Practices</u>	<u>New Visions Student Social Studies Practices</u>
<p>Gathering, Using and Interpreting Evidence (A2, A5)</p> <p>Chronological Reasoning and Causation (B3, B5)</p> <p>Comparison and Contextualization (C3)</p>	 <p>Connect Cause and Effect</p>

NYS Common Core Learning Standards

Reading	Writing	Speaking and Listening
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Craft and Structure:

CCSS.ELA-LITERACY.RH.9-10.4: Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history/social science.

Text Types & Purposes:

CCSS.ELA-LITERACY.WHST.9-10.1: Write arguments focused on *discipline-specific content*.

Comprehension and Collaboration:

CCSS.ELA-LITERACY.SL.9-10.1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9-10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

Associated Classroom Posters

[Student Social Studies Practices Poster](#)

[New Visions Enduring Issues Tips and List](#)

How did innovations during the Industrial Revolution change life in Great Britain in the 19th century ?

Objective:

- Describe how innovations during the Industrial Revolution changed life in Great Britain in the 19th century.

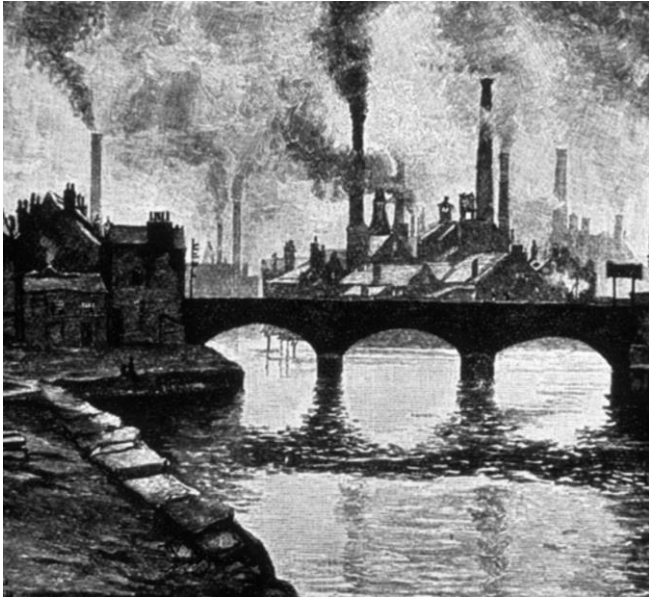
Introduction

→ **Directions:** In the graphic organizer provided below write a definition of the word “innovation,” draw an image that represents it, list three examples of innovations and three examples that do not show innovation (non-examples), then use the word innovation in a sentences.

innovation

Definition	Image	Examples <i>At least three</i>

The Industrial Revolution (1750 -1850)



Factories that came dominate the city skyline in many rapidly expanding cities across.

[Image](#) is courtesy of aria systems

The **Industrial Revolution** was the period in which the production of goods shifted from hand production methods to complex machines. This period of **industrialization** resulted in social and economic changes.

The Industrial Revolution started in **Great Britain** around 1750. The process of industrialization **spread throughout the world** in the following centuries.



Manchester from Kersal Moor by William Wyld

[Image](#) is courtesy of wikimedia commons and is in the public domain

Innovation during the Industrial Revolution

The technological innovations of the Industrial Revolution in Great Britain, and the innovations developed elsewhere when industrialization spread to other countries, changed the course of human history and paved the way for our modern lives. These advances **accelerated** human technological achievement to a pace that people had never experienced before.

→ **Directions:** Examine the innovations on the following pages and respond to the accompanying questions.

1. Innovations in Energy Sources: Human, Animal, Wood and Water Power to Coal

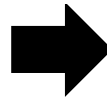
Before the Industrial Revolution

Before the Industrial Revolution, the main sources of energy were **human, animal, wood, and water** power. In addition to using animals to push and pull, they were also used to power machines. A modern version can be seen in the video below. Water power had been used for centuries to power mills, but this limited where someone could put a factory because it needed to be near fast moving water. In the early years of the Industrial Revolution, factories were located near rivers and streams to use the water power to move gears that powered the machines inside. Wood was also used as fuel once steam engines were invented but it took time to replenish after the trees were harvested and it was heavy and bulky to transport.

▶ [Click to watch a modern animal-powered sawmill in Belize.](#)



▶ [Click to watch a restored water-powered sawmill in Ireland.](#)



Industrial Innovation: Coal

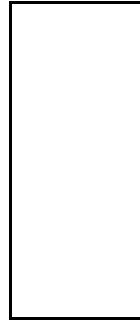


Watch this [BBC Video on the Industrial Revolution \(2:22-5:08\)](#) to learn about the importance and power of coal as source of energy.

Coal is a black or brownish-black sedimentary rock. It is extracted from the Earth by underground mining or by digging large pits until the coal is unearthed. Coal is a common rock in many parts of the world and with improved mining technology in the 18th century, it became easy to get. Because it can be set on fire and it burns at a high temperature for a long period of time, it is an extremely powerful fuel for the generation of heat and electricity. Today, approximately 40 percent of the world's electricity production depends on coal, making it the largest single source of electricity worldwide.



Fireman shovels coal into the engine of a steam-powered train.
[Image](#) is courtesy of wikimedia commons and is public domain



1a. What were the disadvantages to using wood and water power?

1b. Why was the use of coal an improvement on using human, animal, wood or water power for energy?

1c. Predict- What were the possible positive and negatives effects of the use of coal for energy?

2. Innovations in Engines: James Watt's Steam Engine

James Watt

James Watt (January 19, 1736 – August 25, 1819) was a Scottish inventor and engineer whose improvements to the **steam engine** provided much of the force behind the Industrial Revolution. His invention turned heat from burning coal into movement through a series of valves and gears. His invention made it possible to use coal for energy in areas far away from coal fields. The steam engine was used in manufacturing to run machines at great speeds for long periods of time so work could be performed on large scales, almost year-round, with vastly higher efficiency. The steam engine was also used in the **locomotive [train]** and **steamboat**, thus **leading to the revolution in transportation**.



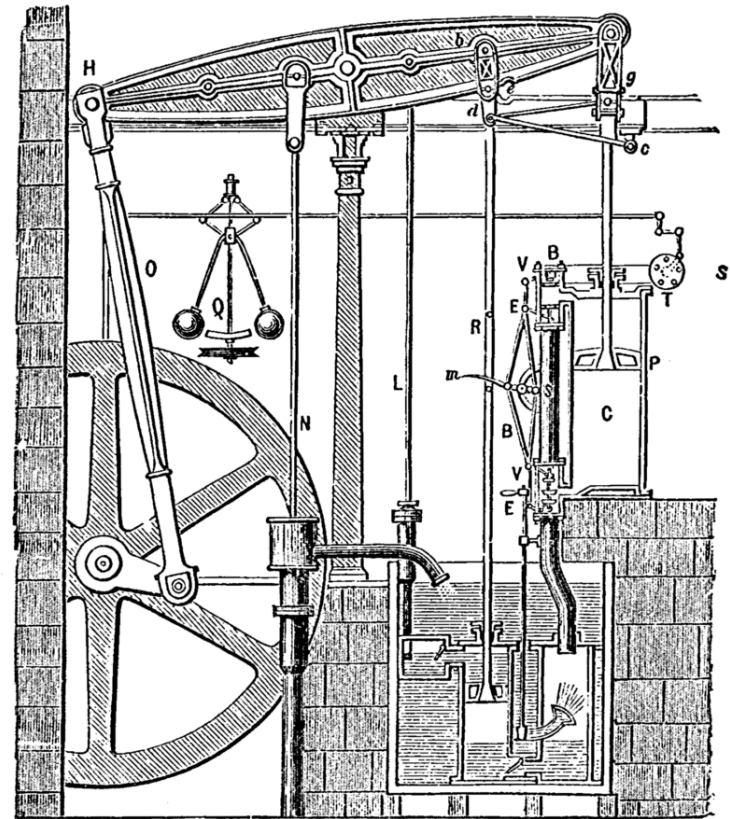
Portrait James Watt, 1792 by Carl Frederik Von Breda

[Image](#) is courtesy of wikimedia commons and is public domain

How do steam engines work?



[How a Steam Engine Works Animation, A Working Glass Model of a Steam Engine, History Channel's Steam Engine History \(4:02-8:07\)](#)



Sketch showing a steam engine designed by Boulton & Watt, England, 1784.
[Image](#) is courtesy of wikimedia commons and is public domain

2a. What uses did Watt's steam engine have during the Industrial Revolution?

2b. How did the steam engine improve manufacturing and transportation?

2b. Predict- What were the possible positive and negatives effects of using the steam engine as a source of energy?

3. Innovations in Manufacturing: Putting Out System to the Factory Model

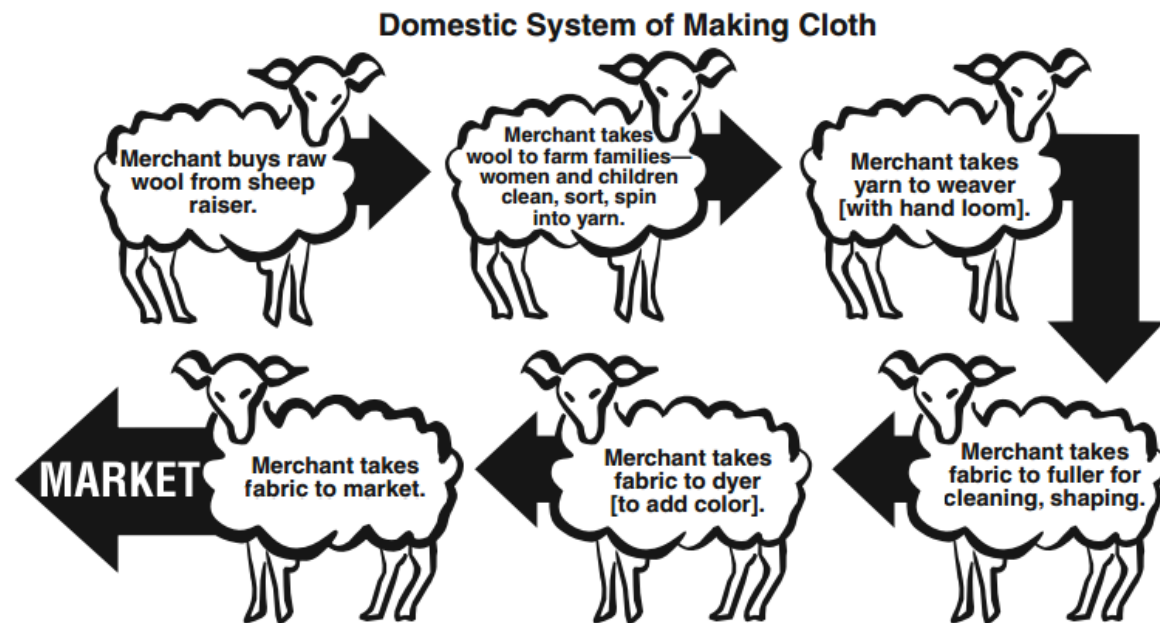
Before the Industrial Revolution: Domestic/Putting Out System

The **Domestic system**, also called the **Putting-out System**, was a production system that was widespread in 17th-century western Europe in which merchant-employers “put out” materials, like cotton, to rural producers who usually worked in their homes producing goods like clothing. Workers returned finished products to the employers and were paid for each finished product they produced. The business owners bought the raw materials like cotton and then sold the finished products, so they only paid workers for their labor. The advantages to the merchant-employer were the lower wage costs and increased efficiency due to a more extensive **division of labor**. Division of labor is the separation of steps in the process of making something into different jobs. For example, the merchants were in charge of getting cotton, and the rural workers were responsible for turning the cotton into yarn.

Source: *Encyclopædia Britannica Online*, s. v. "domestic system", accessed November 19, 2015, <http://www.britannica.com/technology/domestic-system>.

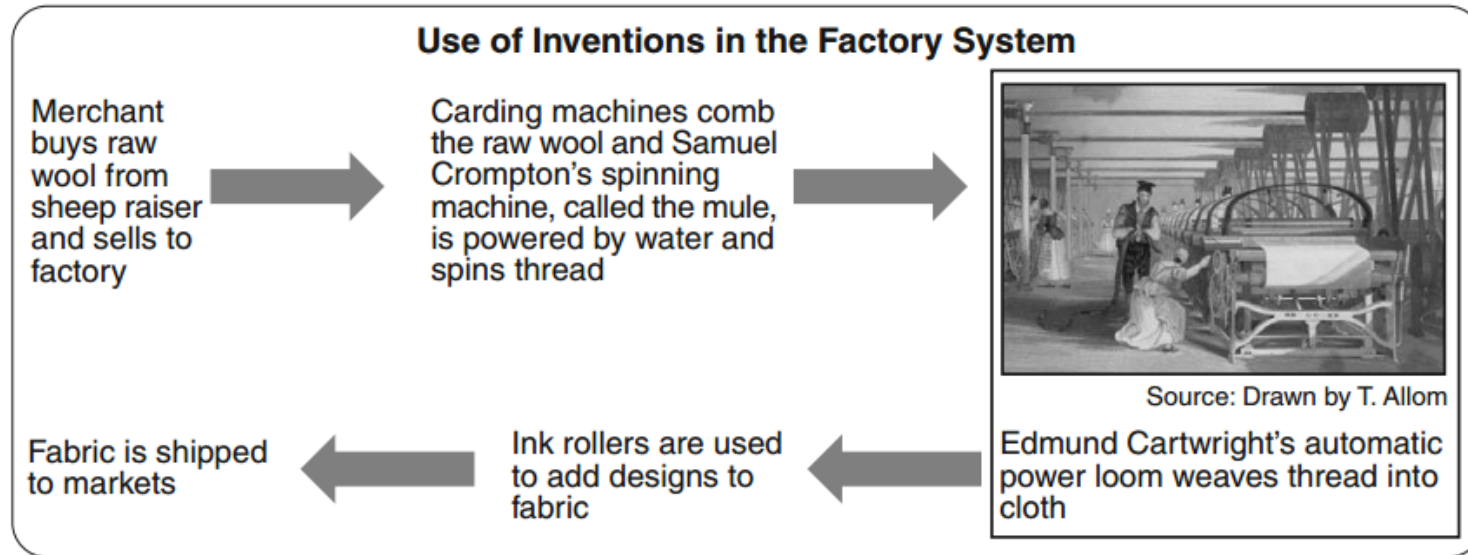


Illustration of two women working at home to make finished goods as part of the **domestic system**.



Source: Farah and Karls, *World History: The Human Experience*, Section Focus Transparencies, Glencoe McGraw-Hill (adapted) from the NYS Global History and Geography Regents Exam, January 2009.

Industrial Innovation: Factory System



Source: NYS Global History and Geography Regents Exam, January 2009.

The **factory system** of manufacturing that began in the early 18th century was based on

- requiring workers to come to one place, a factory, to produce goods
- division of labor (separating the steps of making something into separate jobs)
- keeping the cost of making something as low as possible
- mass production (making a lot of the same good)

The factory system **replaced the domestic system**, in which individual workers used hand tools or simple machinery to make goods in their own homes or in workshops attached to their homes. The use of **waterpower** and then the **steam engine** to **mechanize** processes such as cloth weaving in England in the second half of the 18th century marked the beginning of the factory system. This system was enhanced at the end of the 18th century by the introduction of **interchangeable parts** in the manufacture of muskets [a type of gun] and, subsequently, other types of goods. Prior to this, each part of a musket (or anything else assembled from multiple components) had been individually shaped by a workman to fit with the other parts. In the new system, the musket parts were machined to such precise specifications that a part of any musket could be replaced by the same part from any other musket of the same design. This advance signaled the start of **mass production**, in which **standardized parts** could be assembled by relatively **unskilled workmen** into complete finished products.

The resulting system, in which **work was organized to utilize power-driven machinery** and **produce goods on a large scale** had important social consequences: formerly, workers had been independent craftsmen who owned their own tools and designated their own working hours, but in the factory system, the **employer owned the tools and raw materials** and set the hours and other conditions under which the workers labored. The location of work also changed. Whereas many workers had inhabited rural areas under the domestic system, the factory system **concentrated workers in cities and towns**, because the new factories had to be located near waterpower and transportation (alongside waterways, roads, or railways). Moreover, many of the new **unskilled jobs could be performed equally well by women, men, or children**, thus tending to **drive down factory wages**. Factories tended to be poorly lit, cluttered, and unsafe places where workers put in **long hours for low pay**.

UNIT 10.3 | Causes and Effects of the Industrial Revolution | SQ 4. How did innovations during the Industrial Revolution change life in Great Britain in the 19th century?

3a. Describe the Domestic System of manufacturing goods.

3b. Who benefited the most from the Domestic System (merchant or rural worker)? Why?

3c. What are the differences between the Domestic System and the Factory System?

3d. Predict- What were the possible positive and negatives effects of the Factory System?

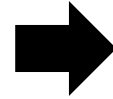
Industrial Innovations in Manufacturing

Before Industrial Revolution

Wool was spun in homes and made into yarn

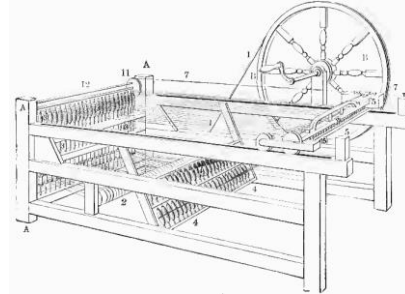


Source: The Costume of Yorkshire, Richard Jackson, Publisher from the NYS Global History and Geography Regents Exam, August 2005.



Early Industrial Revolution

- ▶ [PBS video on water frame](#)
Spinning Jenny, invented in 1764, and the **water frame**, invented in 1769 mechanized the process of spinning wool into yarn and improved the quality and speed of the process.



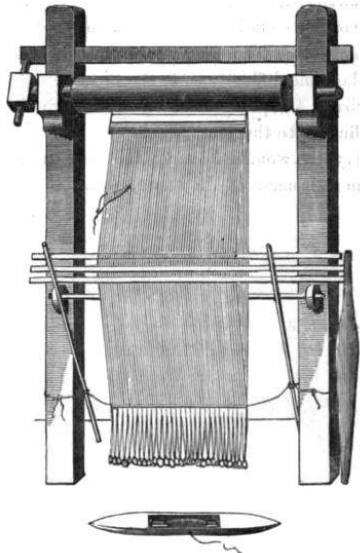
Late Industrial Revolution

The **power loom** spun wool into yarn *and* weaved that yarn into thread

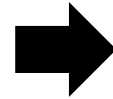


- ▶ Watch an excerpt of the video [“Factories and Machines” from Timelines.tv](#) (start- 1:22) to observe the effects of the **POWER LOOM**.

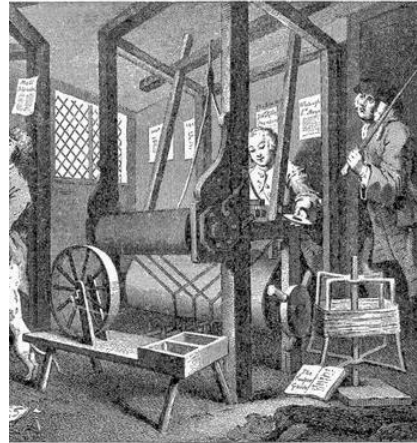
Yarn was turned into fabric by people in their homes using hand looms.



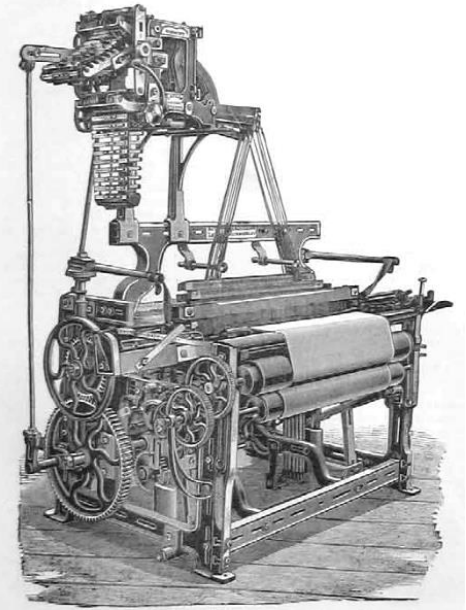
[Image](#) is courtesy of wikimedia commons and is public domain



Workers used more complex frame looms. They used an invention called a **flying shuttle** to pass yarn from one side of the fabric to another with ease.



Hand Loom Weaving by Hogarth
[Image](#) is courtesy of wikimedia commons and is public domain



Sketch of a power loom (1892).
[Image](#) is courtesy of wikimedia commons and is public domain

3e. Identify three innovations in manufacturing that took place during the Industrial Revolution?

3f. Predict- What were the possible positive and negatives effects of the innovations in manufacturing described above?

4. Innovations in Transportation

Industrial Innovation in Transportation: Turnpikes



Turnpike in Romania, 1877 by The Graphic
[Image](#) is courtesy of wikimedia commons and is public domain

As trade increased in the mid-1700s, merchants needed better roads to travel on. To pay for new and improved roads, the Parliament in England started to issue local governments the right to create **turnpikes**, roads that required users to pay tolls. The tolls were used to pay for road repairs and upgrades. A pike was a barrier laid across the road that prevented people from using it until they paid. The operator then turned or lifted the pike to allow them to pass.

Industrial Innovation in Transportation: Canals



The Bridgewater Canal in England 1887 by Hedley Fitton
[Image](#) is courtesy of wikimedia commons and is public domain

Canals are **man-made waterways** used to transport people and goods from one place to another that usually connect to a larger body of water like a river, lake, or sea. As manufacturing increased during the industrial revolution, the need to transport heavy fuel like coal and more finished products made transporting over land less effective. As a result, large canal systems were built all over England and other countries.

Industrial Innovation in Transportation: Locomotives (Trains)

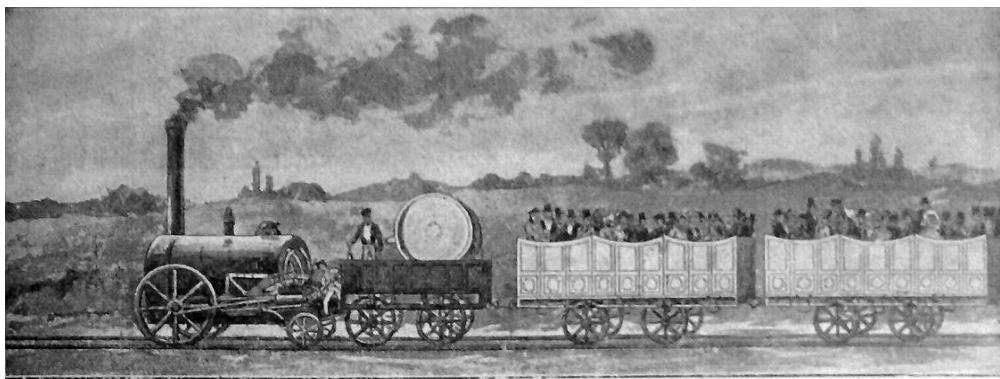


Watch an excerpt from [History Channel's Steam Engine History](#) for a brief history of early trains in Great Britain and [this video of steam engines \(0:00-2:00\)](#) to see what it was like to be near a passing train later in the Industrial Revolution.

In the 1500s, 1600s, and for most of the 1700s, railroad tracks were used to move goods from one place to another over short distances but they were pushed or pulled using human muscle or animal power. **James Watt's steam engine** (1774) breathed new life into the railroad when it was adapted to pull railcars for the first time by English inventor Richard Trevithick's **locomotive** in 1804. Innovators throughout Great Britain, the United States, and Europe improved upon Watts and Trevithick's technology creating faster, more powerful, more efficient, and safer trains.

The speed and power of trains transformed the lives of those who used them to travel and ship goods. Before the locomotive, the fastest way to travel overland was on horseback which averaged around 30 mph, but was uncomfortable, required frequent stops for rest, and could carry very little weight. In contrast, by 1829 George Stephenson's locomotive, *Rocket*, could travel 29 mph and one hundred years later trains were traveling at speeds over 120 mph. Locomotives only required fuel, like coal to keep moving and could pull massive loads.

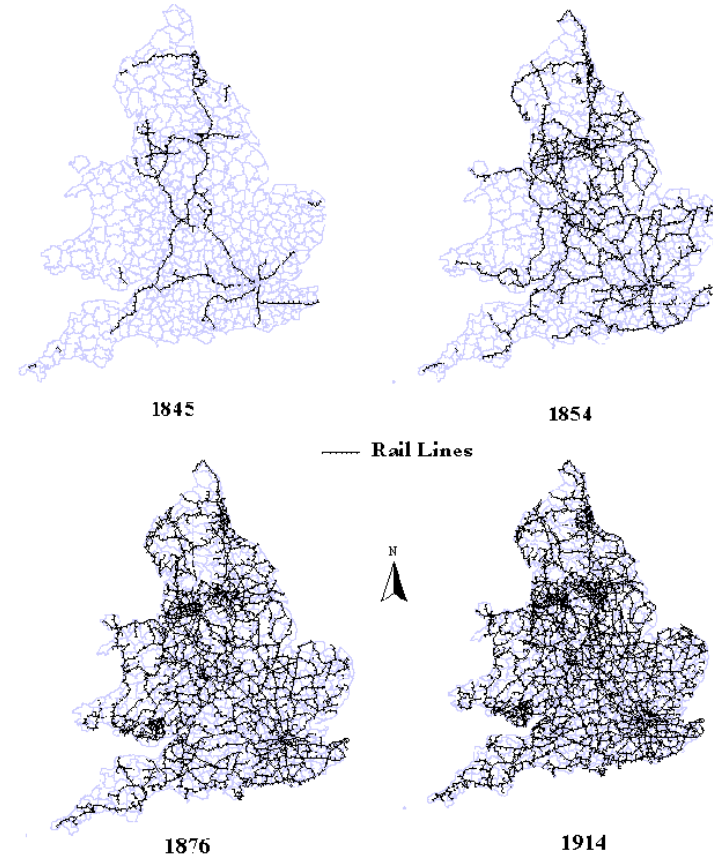
Railroad lines quickly spread throughout Great Britain and all over the world bringing people and goods closer to one another than they had ever been before.



The first passenger carriage in Europe, 1830, George Stephenson's steam locomotive, Liverpool and Manchester Railway

[Image](#) is courtesy of wikimedia commons and is public domain

The Extension of the Railway System in England and Wales, 1845-1914



Source: © Robert Schwartz Mt. Holyoke College.

https://www.mtholyoke.edu/courses/rschwartz/rail/intro_hist_gis.htm, from the NYS Social Studies Toolkit.

4a. Explain how turnpikes and canals improved transportation during the Industrial Revolution?

4b. Predict- What were the possible positive and negatives effects of using turnpikes and canals to transport goods and people?

4c. What earlier innovation of the Industrial Revolution was used to create the first locomotive?

4d. Based the map of the railway system in England and Wales (1845-1914), how did the state of rail lines change during the period represented in the maps?

4e. What were the benefits of using locomotives to transport people and goods over horse power?

4f. Predict- What were the possible positive and negatives effects of using locomotives to transport goods and people?

FA

SQ 4. How did innovations during the Industrial Revolution change life in Great Britain in the 19th century?



Connect Cause
and Effect

Task: Complete the chart below using information you learned in this lesson and your knowledge of Global History and the word bank below.

after	before	during	then	but
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Category of Life in Great Britain	What changed as a result of innovations during the Industrial Revolution?
Source of Energy	
How goods were made and where people worked	
How people and goods were transported	