Main Idea: The Industrial Revolution started in England & soon spread elsewhere

Why It Matters Now: The changes that began in Britain paved the way for modern industrial societies
During the 1700’s England’s landscape was primarily small farms. Wealthy landowners bought up the land that the farmers owned, made larger farms & improved farming methods. This was known as the *Agricultural Revolution*.

**Village Farmers**

The wealthy landowners *enclosed* their land with fences & hedges called *Enclosures*. This enabled them to cultivate larger fields.

It had two results:

1: Landowners experimented with new agricultural methods

2: It forced small farmers to become tenant farmers or give up farming & move to the cities.
Jethro Tull

- Felt that the usual way of sowing seeds by scattering them along the ground was wasteful.
- He invented the seed drill in 1701, which allowed farmers to sow seeds in well-spaced rows at specific depths.
- This caused a larger share of the seeds to germinate, which boosted crops.
Crop rotation proved to be one of the best developments of the scientific farmers.

For example: One year a farmer might plant soybeans, the next, corn, the next, back to soybeans.

This was done to aid the soil by replacing nutrients that may be lost during the first planting.

This system improved on the older methods of crop rotation.
Livestock Breeders also improved their methods. In the 1700’s farmers began allowing only their best livestock to breed, which resulted in stronger, bigger, & healthier livestock.
The Agricultural Revolution caused three things to happen:

- Food supplies increased
- Living conditions improved
- England’s population increased

The population increase caused the demand for food & goods to increase.

Farmers who lost their lands to large enclosed farms began working in factories, which led to THE INDUSTRIAL REVOLUTION.
INDUSTRIALIZATION

The process of developing machine production of goods or The growth of industry.

This requires various resources:

• Water power & coal to fuel the machines
• Iron ore to construct machines, tools, & buildings
• Rivers for inland transportation
• Harbors from which its merchant ships set sail.
Several factors helped support industrialization in England:

1. Britain’s *expanding economy* - business people invested in the manufacture of new inventions

2. Britain’s *highly developed banking system* - people were encouraged by the availability of bank loans to invest in new inventions & machinery

3. Britain’s *political stability* - which gave the country a tremendous advantage over its neighbors & Britain’s Parliament passed laws that protected business & helped expansion.

**Note:** Though Britain took part in many wars during the 1700’s, none of these struggles occurred on British soil.
• Britain’s textile industry was the 1\textsuperscript{st} to be transformed by new inventions.
• Britain clothed the world
• Cloth merchants boosted their profits by speeding up the process by which spinners & weavers made cloth.
Two new major inventions in the textile industry were:

The **Flying Shuttle**—invented in **1733** by **John Kay**.

The **Spinning Jenny**—invented by **James Hargreaves** around **1764** named after his daughter.
The Flying Shuttle
Originally Hargreaves produced the machine for family use but when he began to sell the machines, spinners from Lancashire, fearing the possibility of cheaper competition, marched on his house and destroyed his equipment.

It is estimated that by the time James Hargreaves died in 1778, over 20,000 Spinning-Jenny machines were being used in Britain.
Invented the **Water Frame** in 1769 so that people did not have to use the spinning jenny & the flying shuttle by hand.

This machine **used the water power from rapid streams to drive spinning wheels**.
In 1779, Samuel Crompton combined features of the spinning jenny & the water frame to produce the *spinning mule*.

The spinning mule made thread that was stronger, finer & more consistent than earlier spinning machines.
Wealthy textile merchants set up the machines in large buildings called factories. At first they were built near streams so they could take advantage of the water power.
In 1793 an American Inventor – Eli Whitney invented the cotton gin to speed up the chore of removing seeds from the raw cotton.

England’s cotton came from plantations in the American South in the 1790’s
U.S. Cotton production skyrocketed from 1.5 million pounds in 1790 to 85 million pounds in 1810.
Progress in the textile industry spurred other industrial improvements:

- **The Steam Engine** was a result of searching for a cheap, convenient source of power. It was a heat engine that makes use of the thermal energy that exists in steam, converting it to mechanical work. A steam engine needs a boiler to boil water to produce steam under pressure.

- Any heat source can be used, but the most common is a fire fueled by wood, coal, or oil. (However, anything that can be burned can be used as fuel for the fire: paper, trash, used crankcase oil, ground-up corncobs, manure, natural gas, gasoline, high proof alcohol, dry grass, hay, dry weeds, etc).

- The steam expands and pushes against a piston or turbine, whose motion does the work of turning wheels or driving other machinery.
The first steam engine was used in mining, but it was expensive to run because it used large amounts of fuel.

James Watt
A mathematical instrument maker at the University of Glasgow in Scotland figured out a way to make the steam engine work faster & more efficiently while burning less fuel. 1765

Watt along with a businessman (entrepreneur) named Matthew Boulton began building better steam engines. Boulton was the financial backer & Watt was the builder.
The steam engine was also used to propel boats.

An American inventor named Robert Fulton ordered a steam engine from Watt & Boulton & he used it to propel boats.

After its first successful trip in 1807, Fulton’s steamboat- The Clermont transported passengers up & down New York’s Hudson River.

Note: As a result of the steamboat, in England water transportation improved with the creation of a network of canals or human-made waterways, which helped cut the cost of transporting raw materials.
In England roads improved also, thanks to John McAdam, a Scottish engineer working in the early 1800’s. He equipped roadbeds with a layer of large stones for drainage. On top, he placed a carefully smoothed layer of crushed rock, making travel possible over these roads without heavy wagons sinking in mud.

Private investors (entrepreneurs) formed companies that built roads & then operated them for profit called turnpikes because travelers had to stop at tollgates (turnstiles or turnpikes) to pay a toll before traveling farther.
The Railway Age Begins

Locomotives were first pulled by horses, but the steam engine soon changed that.

After 1820, the railroad locomotive drove English industry.
In 1804, an English engineer named Richard Trevithick won a bet of several thousand dollars by hauling ten tons of iron over almost ten miles of track in a steam-driven locomotive.
George Stephenson

• Improved the Trevithick locomotive
• Built some 20 engines for mine operators in Northern England
• In 1821, he began work on the world's first railroad line
• It ran 27 miles from The Yorkshire coal fields to the port of Stockton on the North Sea.
• Railroad opened in 1825
• It used 4 locomotives that Stephenson designed & built
News soon spread throughout Britain about the success of the railroad line. Various investors wanted a railroad line to connect the port of Liverpool with the inland city of Manchester. The track was laid and in 1829 trials were held to choose the best locomotive for use on the new line. Five engines entered the competition, but the best of the five was *The Rocket* designed & built by Stephenson & his son.
The Liverpool-Manchester Railway opened officially in 1830.

The Rocket
Railroads Revolutionize Life in Britain

- They gave manufacturers a cheap way to transport materials & finished products.
- Created hundreds of thousands of jobs for both railroad workers & miners (miners provided coal for the steam engines & iron for the tracks).
- It boosted the agricultural & fishing industries, because it transported their products to distant cities.
- The railroads encouraged people to travel from the country to the cities for jobs & the people from the cities to the country for rest & relaxation in the countryside resorts.
The Extension of the Railway System in England and Wales, 1845-1914

--- Rail Lines

1845

1854

1876

1914