

From Hand to Machines: Increasing productivity

Context

Problem

How do you produce more cloth for clothing?

→

Solution

Inventor:
Invention:
Purpose:

How do you match the demand for cloth with the greater need for thread?

→

1. Inventor:
Invention:
Purpose:
2. Inventor:
Invention:
Purpose:
3. Inventor:
Invention:
Purpose:

What do you do with the surplus of thread now?

→

Inventor:
Invention:
Purpose:

How do you get more cotton for your factories?

→

How do you increase the cotton production?

→

Inventor:
Invention:
Purpose:

How do you meet the demand for cotton?

→

How do you improve transportation between producers of raw materials and factories?

→

1. Flying Shuttle

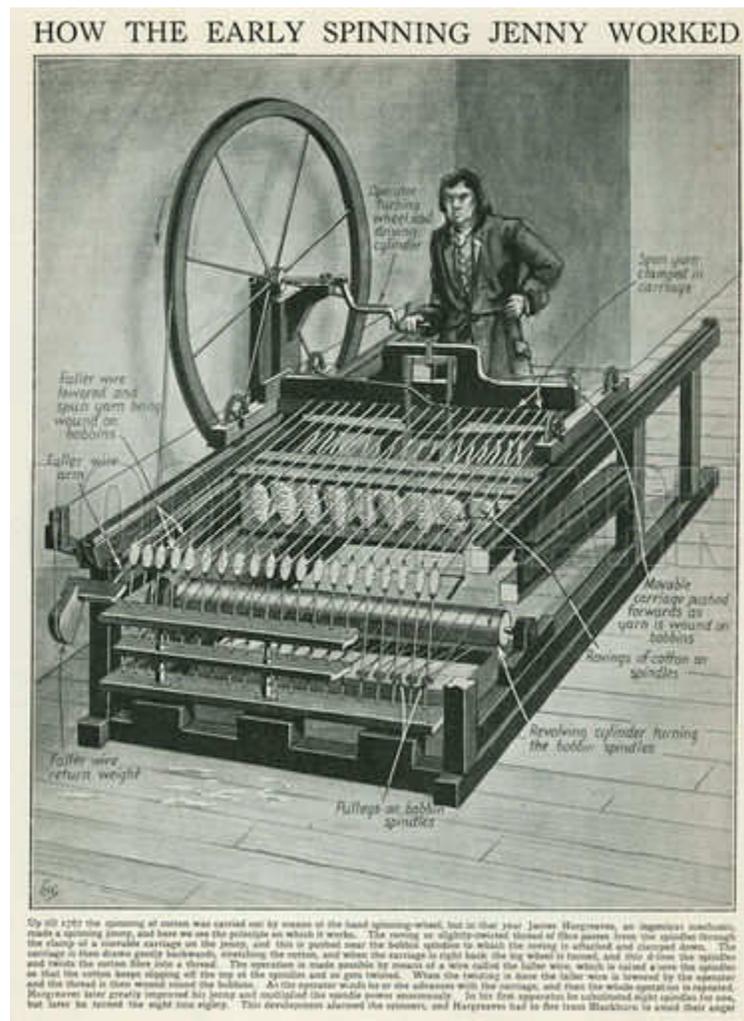


In 1733, John Kay invented the flying shuttle, a key contribution to the Industrial Revolution. The flying shuttle was an improvement to looms that enabled weavers to weave faster. The original shuttle contained a bobbin on to which the weft (weaving term for the crossways yarn) yarn was wound.

It was normally pushed from one side of the warp (weaving term for the series of yarns that extended lengthways in a loom) to the other side by hand. Large looms needed two weavers to throw the shuttle. The flying shuttle was thrown by a lever that could be operated by one weaver. The shuttle was able to do the work of two people even more quickly.

<http://inventors.about.com/od/famousinventions/fl/Flying-Shuttle-John-Kay.htm>

2. Spinning Jenny



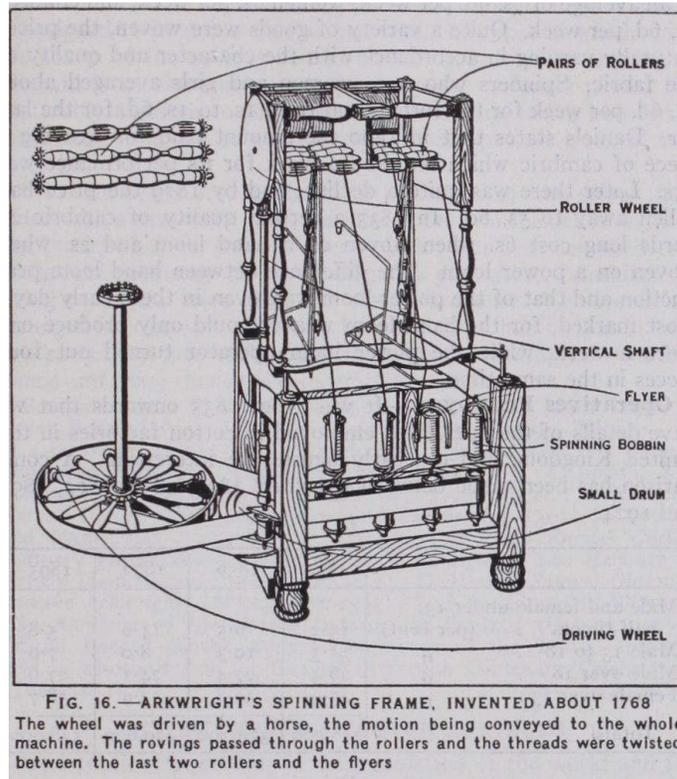
The original spinning jenny used eight spindles instead of the one found on the spinning wheel. A single wheel on the spinning jenny controlled eight spindles, which created a weave using eight threads spun from a corresponding set of rovings. Later models had up to one-hundred and twenty spindles.

James Hargreaves made a number of spinning jennies and started to sell a few of them in the area. However, since each machine was capable of doing the work of eight people, other spinners were angry about the competition. In 1768, a group of spinners broke into Hargreaves' house and destroyed his machines to prevent the machines from taking work away from them.

While James Hargreaves' invention did in fact decrease the need for labor, they also saved money. The only drawback was that his machine produced thread that was too coarse to be used for warp threads (the weaving term for the series of yarns that extended lengthways in a loom) and could only produce weft threads (the weaving term for the crossways yarn).

<http://inventors.about.com/od/famousinventions/fl/Who-Invented-the-Spinning-Jenny.htm>

3. Spinning Frame

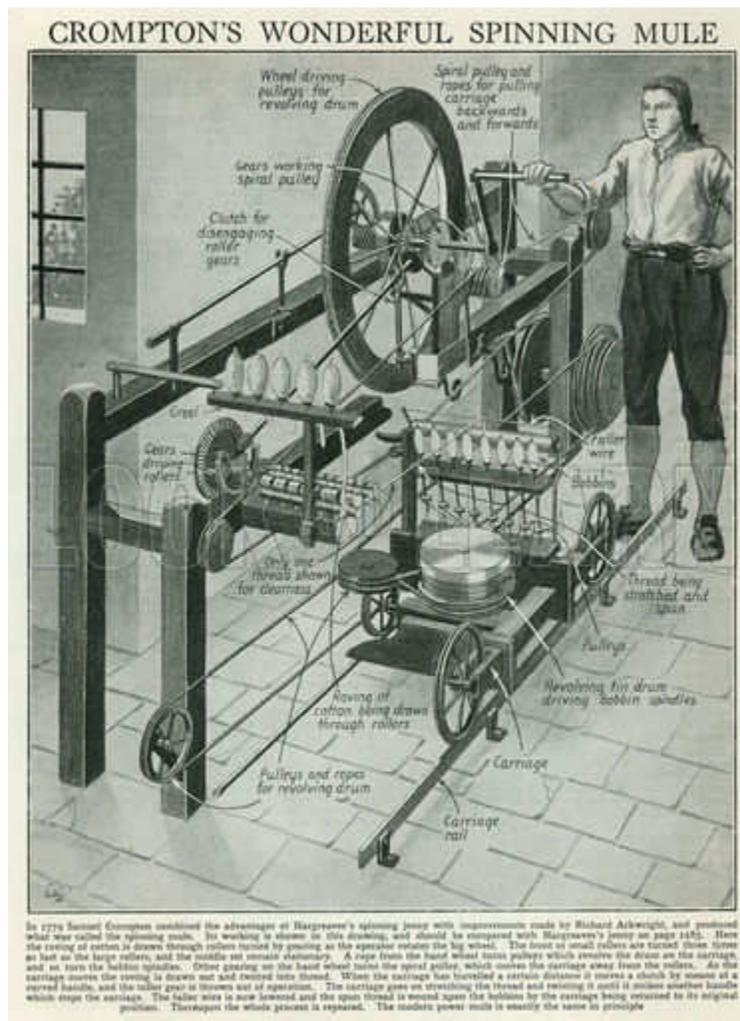


In 1769 Arkwright patented the invention that made him rich, and his country an economic powerhouse: The spinning frame. The spinning frame was a device that could produce stronger threads for yarns. The first models were powered by waterwheels so the device came to be known as the water frame.

It was the first powered, automatic, and continuous textile machine and enabled the move away from small home manufacturing towards factory production, kickstarting the Industrial Revolution.

<http://inventors.about.com/od/famousinventors/fl/Richard-Arkwright-and-the-Water-Frame.htm>

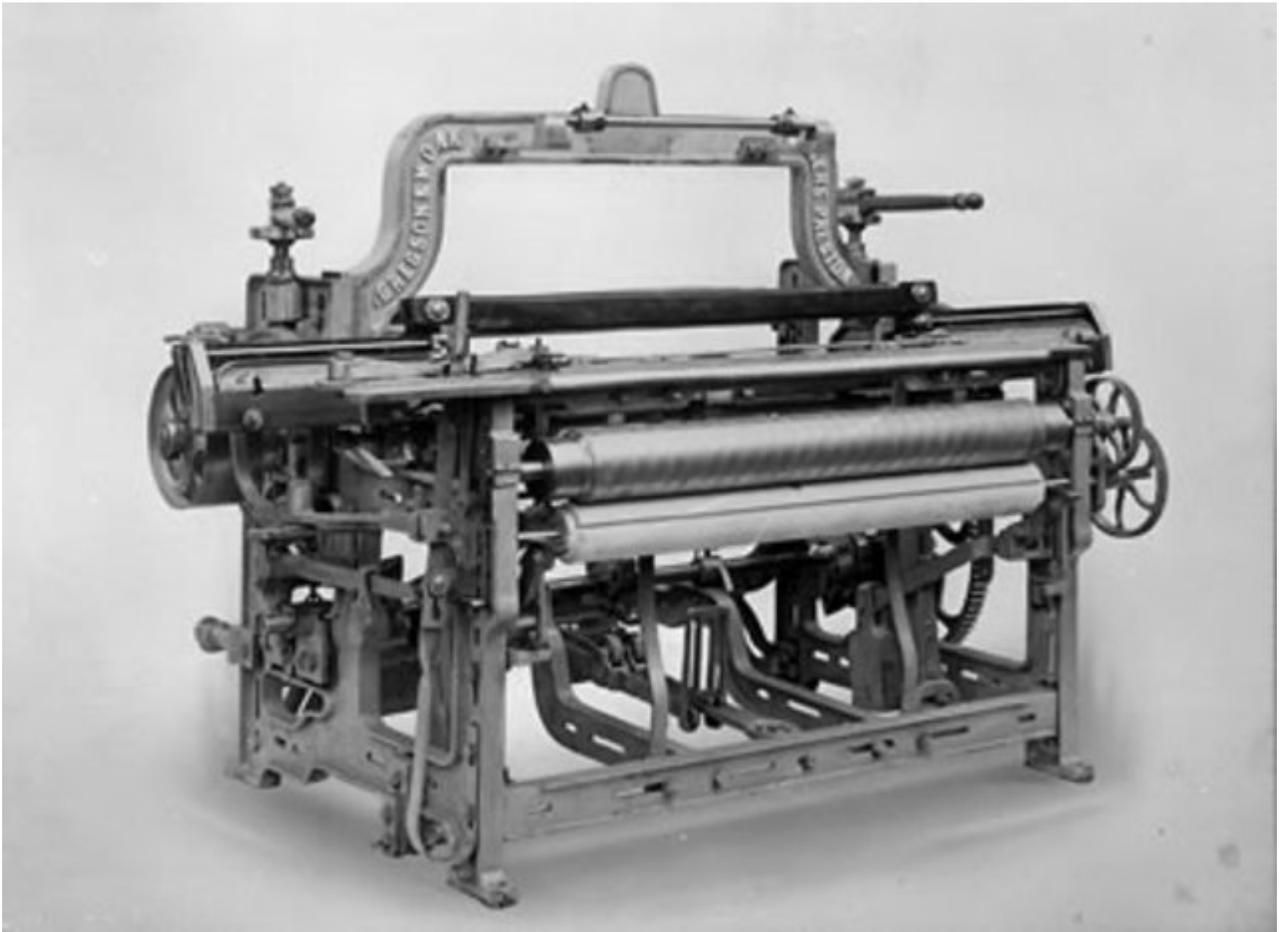
4. Spinning Mule



In 1779, Samuel Crompton invented the spinning mule that combined the moving carriage of the [spinning jenny](#) with the rollers of the [water frame](#). The spinning mule gave the spinner great control over the weaving process, many different types of yarn could be produced.

<http://inventors.about.com/od/cstartinventors/a/Spinning-Mule.htm>

5. Power loom



The first power loom, a mechanized loom powered by a drive shaft, was designed in 1784 by Edmund Cartwright and first built in 1785. It was refined over the next 47 years until a design by Kenworthy and Bullough made the operation completely automatic (the Lancashire Loom).

The power loom reduced demand for skilled handweavers, initially causing reduced wages and unemployment. Protests followed its introduction. For example, in 1816 two thousand rioting Calton weavers tried to destroy power loom mills, and stoned the workers. A darker side of the power loom's impact was the growth of employment of children in power loom mills.

<http://historymesh.com/object/power-loom/?story=textiles>

6. Cotton Imports to England



CARTE figurative et approximative des quantités de **COTON BRUT** importées en Europe
en 1858 en 1864 et en 1865,

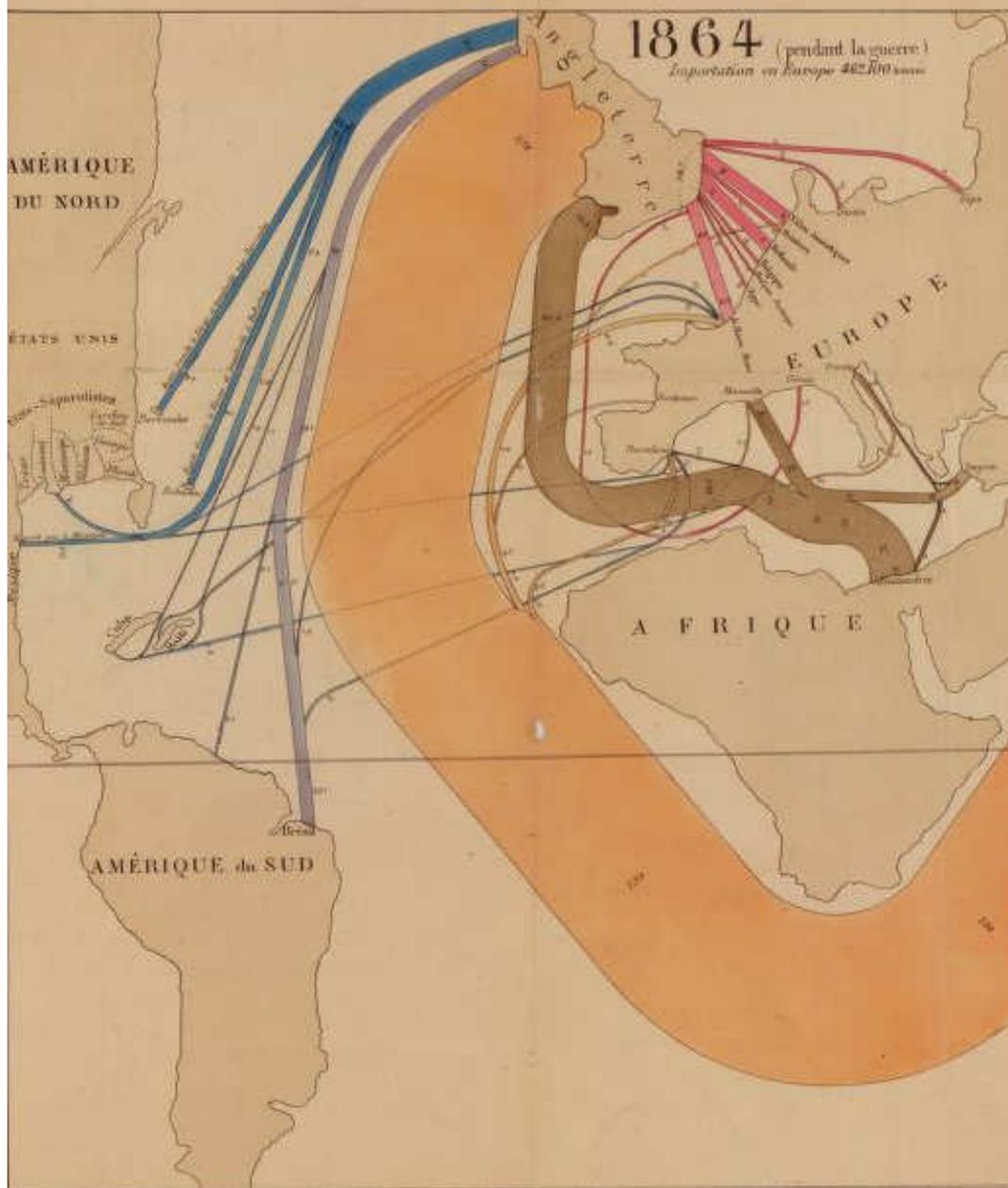
Dressée par M^r MINARD, Inspecteur Général des Ponts et Chaussées en retraite.

Paris, le 14 Mai 1866.

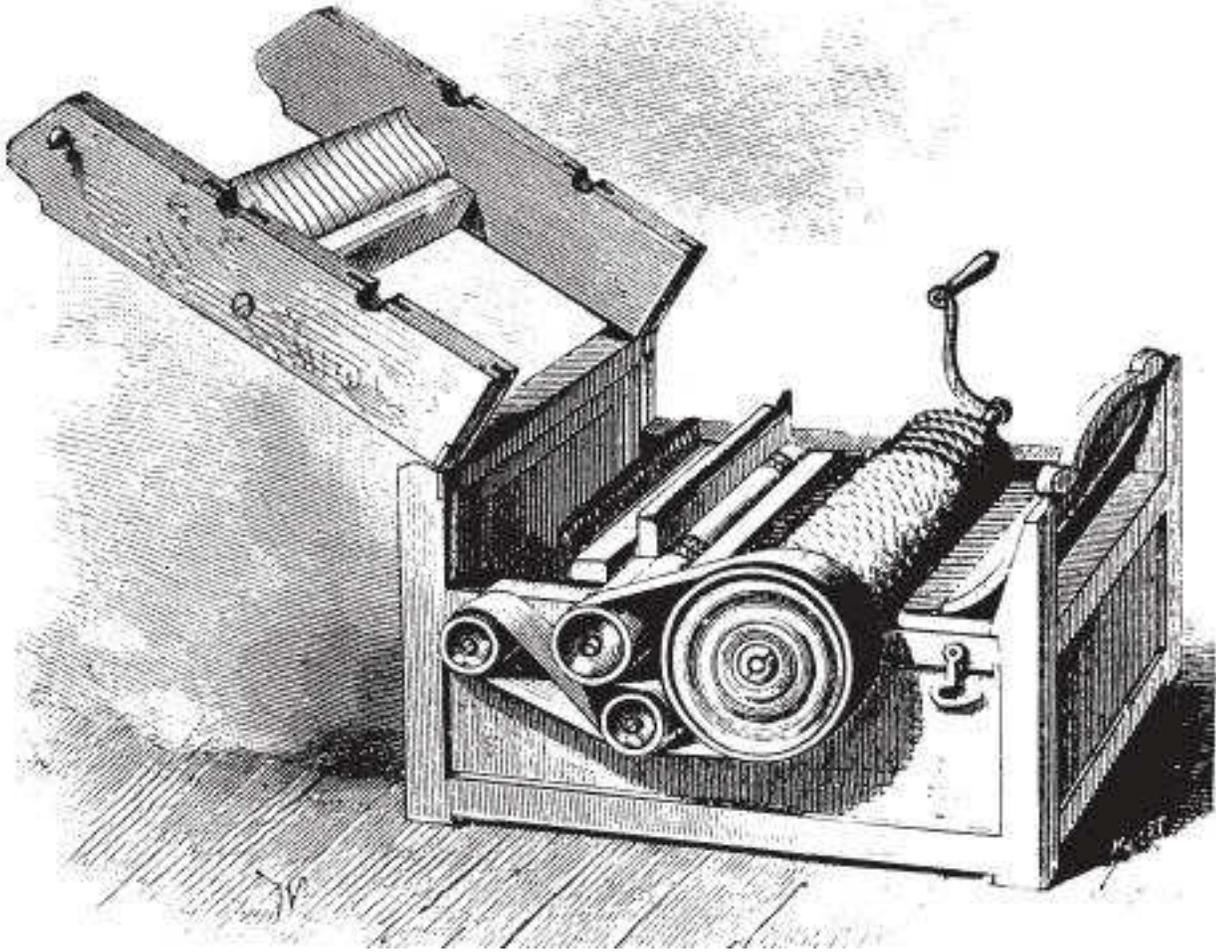
Les tonnages de coton transportés sont représentés par la largeur des lignes colorées à raison d'un millimètre pour cinq mille tonnes, ils sont de plus exprimés par les nombres inscrits au travers des zones et dont l'unité est mille tonnes.

Les Courbes ont été dressées sur les Douanes de France, Belgique, Hollande, Indes, Autrichiennes, Le Dictionnaire du Commerce, le Trade of cotton de M. J. A. Mann, le cotton circular et la publication Sturtevant de Liverpool, le Merchant's Magazine de Newyork, l'Annuaire de Londres, le journalaire Couru d'Alexandrie etc.

Observation: Les importations sont un peu plus fortes que celles de la Carte parce qu'on n'y a pas tenu compte de ce que les Douanes demandent en plus les trois parties supérieures de toute provenance, je n'ai eu à laquelle les rapporter.



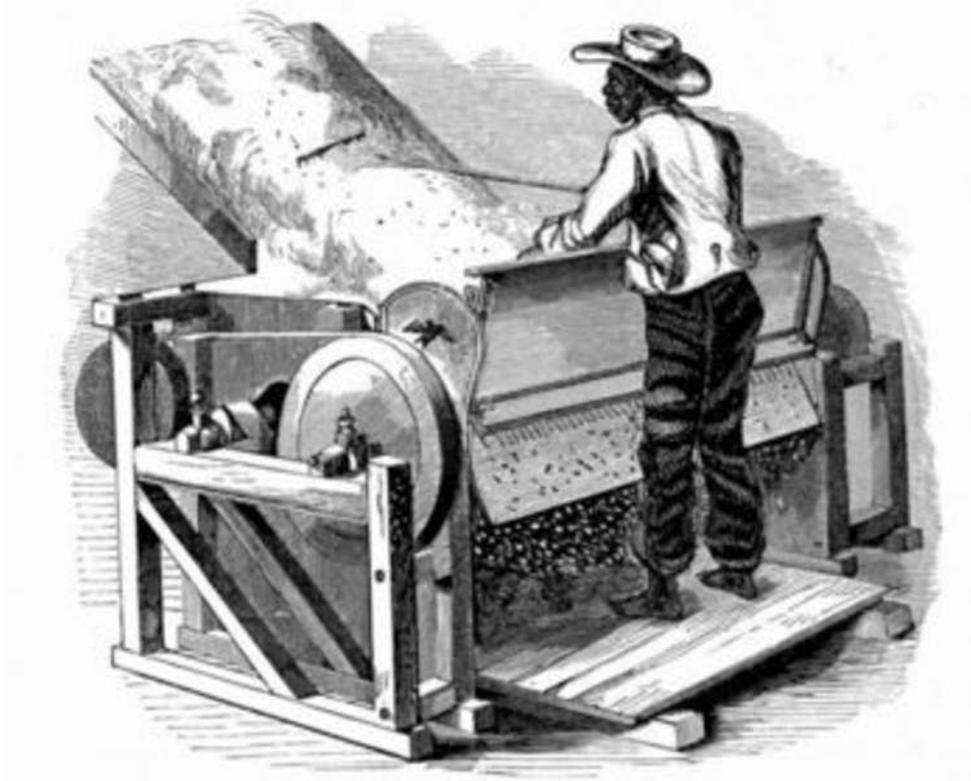
7. Cotton Gin



In 1794, U.S.-born inventor Eli Whitney (1765-1825) patented the cotton gin, a machine that revolutionized the production of cotton by greatly speeding up the process of removing seeds from cotton fiber. By the mid-19th century, cotton had become America's leading export. Despite its success, the gin made little money for Whitney due to patent-infringement issues. Also, his invention offered Southern planters a justification to maintain and expand slavery even as a growing number of Americans supported its abolition.

<http://www.history.com/topics/inventions/cotton-gin-and-eli-whitney>

8. Slavery



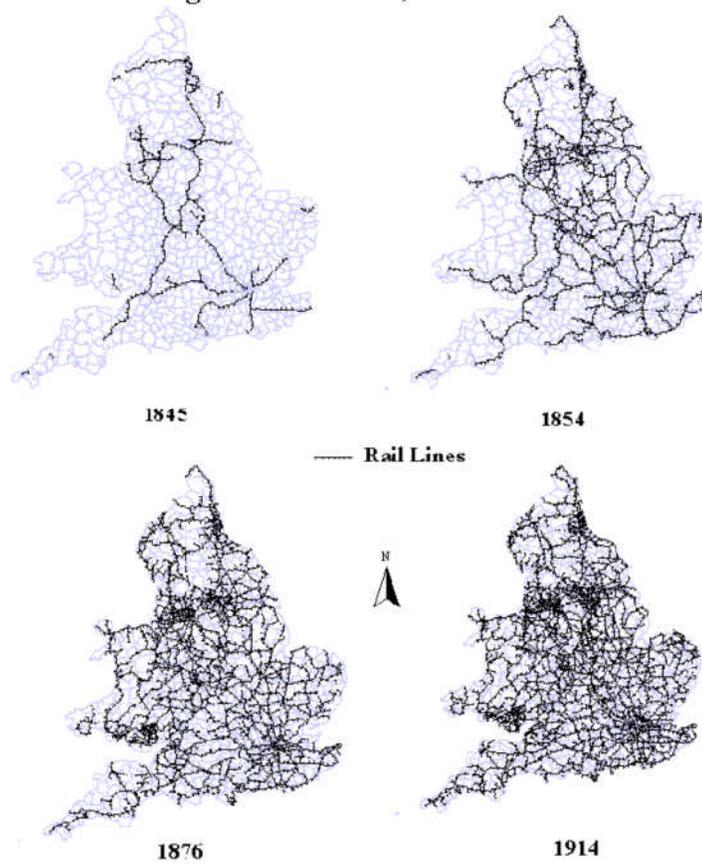
Although there was some hope immediately after the Revolution that the ideals of independence and equality would extend to the black American population, this hope died with the invention of the cotton gin in 1793. With the gin (short for engine), raw cotton could be quickly cleaned; Suddenly cotton became a profitable crop, transforming the southern economy and changing the dynamics of slavery. The first federal census of 1790 counted 697,897 slaves; by 1810, there were 1.2 million slaves, a 70 percent increase.

Slavery spread from the seaboard to some of the new western territories and states as new cotton fields were planted, and by 1830 it thrived in more than half the continent. Within 10 years after the cotton gin was put into use, the value of the total United States crop leaped from \$150,000 to more than \$8 million. This success of this plantation crop made it much more difficult for slaves to purchase their freedom or obtain it through the good will of their masters. Cotton became the foundation for the developing textile industry in New England, spurring the industrial revolution which transformed America in the 19th century.

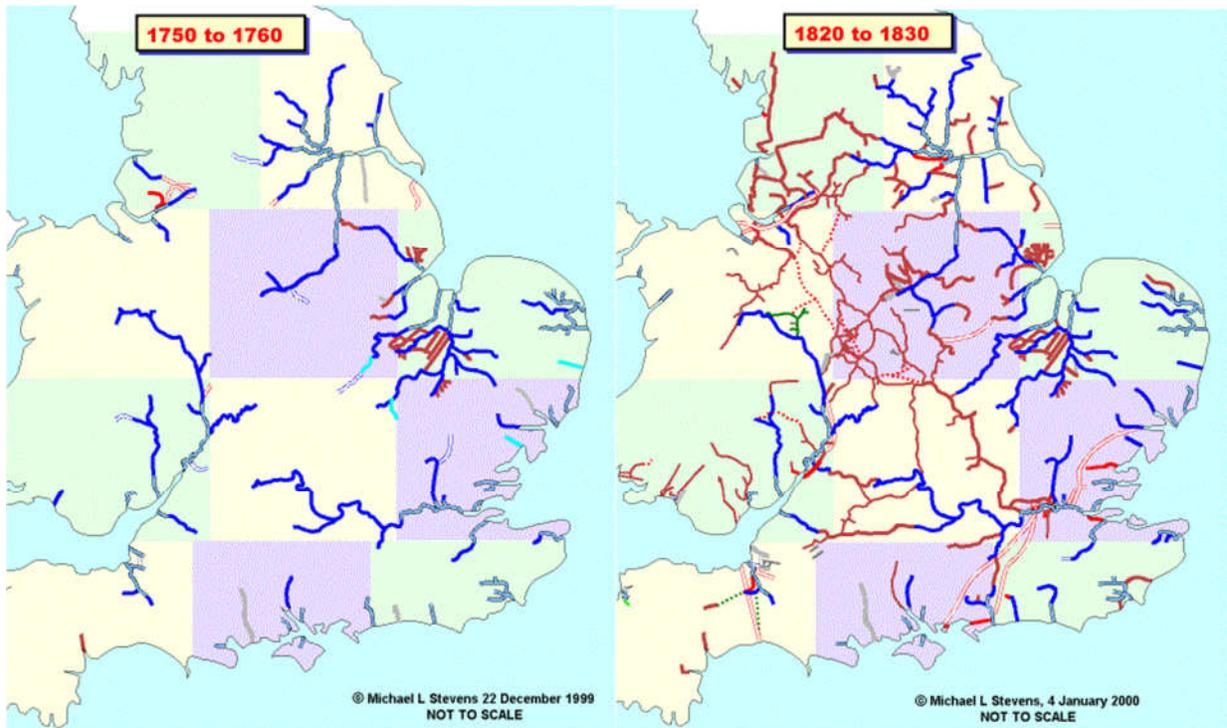
<http://www.pbs.org/wgbh/aia/part3/3narr6.html>

9. Railroads

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



Waterways in England



From Hand to Machines: Increasing productivity

Context: Before industrialization, merchants got around the guild system by contracting with farmers to produce textiles in their home. Merchants would provide the raw materials and then pay for the completed products, which they would sell at markets.

Problem

How do you produce more cloth for clothing?

→

Solution

Inventor: John Kay

Invention: Flying shuttle moves the weft quickly through the warp.

Purpose: This quickened the weaving process doubling the amount of cloth.

How do you match the demand for cloth with the greater need for thread?

→

1. Inventor: James Hargreaves

Invention: Spinning Jenny works eight spindles at a time

Purpose: Increase the amount of thread produce

2. Inventor: Richard Arkwright

Invention Spinning frame improvise the speed and quality of the thread

Purpose: Quality improves and is connected to water power.

3. Inventor: Samuel Crompton

Invention: Spinning mule combines qualities from the spinning jenny and spinning frame to spin up to 400 spindles of thread.

Purpose: quantity and quality improve again

What do you do with the surplus of thread now?

→

Inventor: Edmund Cartwright

Invention: Power loom mechanizes weaving.

Purpose: The power loom can match the quantity of thread being produced.

How do you get more cotton for your factories?

→

Import cotton from other countries.

How do you increase the cotton production?

→

Inventor: Eli Whitney

Invention: Cotton gin helps to remove the seed from cotton

Purpose: It increases the speed of processing cotton

How do you meet the demand for cotton?

→

Expand cotton growing and with it slavery in the American South

How do you improve transportation between producers of raw materials and factories?

→

Increase the railroad systems, as well as, waterways throughout England