Early mechanisation

Iron and coke

- Quality iron essential for machines
  - 1700 low supply
  - Demand
- Problems
  - Energy for furnaces
    - To extract the iron from its ore
  - Right sort of energy
    - To remove impurities
      - Quality
- Wood
  - Principal source of energy
    - Made into charcoal
      - 5 tonnes of charcoal needed to make one tonne of low quality iron
  - Running out by 1700
- Coke
  - **Abraham Darby** of Coalbrookdale
    - **1709**
    - Shropshire
    - Placed his iron works next to **River Severn**
      - Provided water power
      - Near to both coalfields and iron ore sites
      - Outlet to the sea through Bristol port
      - Geographical factors
  - **A by-product of coal**
  - Replaced charcoal
    - for melting iron ore
  - Advantages
    - **Vast supply of coal** available locally
    - Coal allowed many impurities to be eliminated
      - Better quality iron at lower price
        - Essential in developing machinery

Steam power

- Generated power using **coal and water**
  - Lots of coal in Britain
    - Demand
    - Landowners who had coal under their land wanted to extract it for profit
    - Problem
      - Coal mines filled with water and became unuseable
        - Water had to be pumped out
- Steam engine
  - Thomas **Newcomen**
    - **1712**
      - Atmospheric steam engine
  - Pumped large quantities of water out of deep mines at a low cost
  - Later used to **power machines in factories and railway engines**
- Effects
  - Reduced price of coal
  - Doubled, then tripled quantity produced of coal
    - **1700**
      - **2.5 million tonnes**
    - **1750**
      - **5 million tonnes**
    - **1800**
      - **15 million**

Textiles

- Before
  - Raw wool and cotton manually spun into thread and then woven or knitted into cloth or blankets
    - spinning
    - weaving
    - Done in homes
    - Middlemen brought raw materials, take the yarn from spinners to weavers and then collect the finished cloth
- **Edmund Cartwright - power loom**
  - Patented 1685
  - Mechanised weaving
  - Was run on steam or water
- John Kay - flying shuttle
  - Patented 1733
    - Widespread 1760s
  - Mechanised **weaving**
  - Doubled productivity
    - Speed and quality
- James Hargreaves - spinning jenny
  - Invented 1764, patented 1770
  - One worker could **spin multiple threads** simultaneously
  - Initially capable of doing the work of 8 spinners, then **120**
- Arkwright - water frame
  - Invented 1769, patented 1771
  - Workers could produce **128 threads** at the same time
- Samuel Crompton - spinning mule
  - Invented 1779
    - By 1820, more than **4 million**
  - Hybrid between jenny and water frame
  - Fine and strong yarn, large quantities
- **Eli Whitney - cotton gin (US)**
  - Machine that removed unwanted seeds from short-staple raw cotton
- Revolution
  - Both processes (spinning and weaving) mechanised
  - Better quality, lower prices, more demand
    - Cotton went from luxury to everyday material
  - Britain's cotton cloth production
    - 1775
      - 57 000 yards
    - 1783
      - 3.5 million yards

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