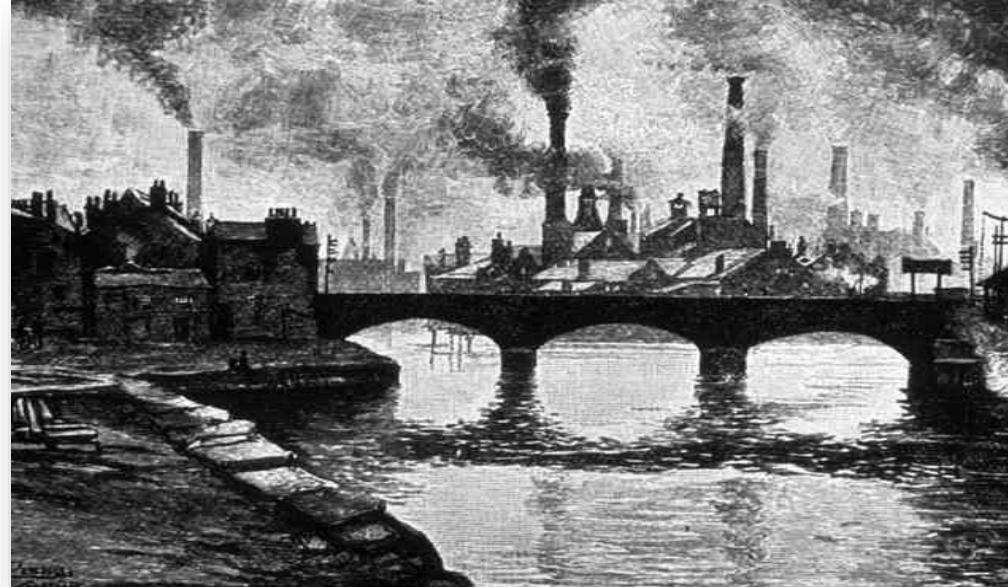


# INDUSTRIAL REVOLUTION

BY: MANMEET KAUR PANESAR

# INDUSTRIAL REVOLUTION

- INDUSTRIAL REVOLUTION WAS THE TIME PERIOD WHICH TOOK PLACE BETWEEN 17<sup>TH</sup> AND 18<sup>TH</sup> CENTURY .
- STARTED IN BRITAIN AND SPREAD THROUGHOUT THE WORLD.
- THE INDUSTRIAL REVOLUTION WAS THE TRANSITION TO NEW MANUFACTURING PROCESSES. THIS TRANSITION INCLUDED GOING FROM HAND PRODUCTION METHODS TO MACHINES, NEW CHEMICAL MANUFACTURING AND IRON PRODUCTION PROCESSES,  
IMPROVED EFFICIENCY OF WATER POWER, THE INCREASING USE OF STEAM POWER AND DEVELOPMENT OF MACHINE TOOLS



# Historical Significance of the Industrial Revolution

- An ancient Greek or Roman would have been just as comfortable in Europe in 1700 because daily life was not much different – agriculture and technology were not much changed in 2000+ years
- The Industrial Revolution changed human life drastically
- More was created in the last 250+ years than in the previous 2500+ years of known human history



# What was the Industrial Revolution?

- The Industrial Revolution was a fundamental change in the way goods were produced, from human labor to machines
- The more efficient means of production and subsequent higher levels of production triggered far-reaching changes to industrialized societies

# The Industrial Revolution

- Machines were invented which replaced human labor
- New energy sources were developed to power the new machinery – water, steam, electricity, oil (gas, kerosene)
  - Some historians place advances in atomic, solar, and wind energy at the later stages of the Industrial Revolution
- Increased use of metals and minerals
  - Aluminum, coal, copper, iron, etc.



# Developments

- Mass production of goods
  - Increased numbers of goods
  - Increased diversity of goods produced
- Development of factory system of production
- Rural-to-urban migration
  - People left farms to work in cities
- Development of capitalism
  - Financial capital for continued industrial growth
- Development and growth of new socio-economic classes
  - Working class, bourgeoisie, and wealthy industrial class
- Commitment to research and development
  - Investments in new technologies
  - Industrial and governmental interest in promoting invention, the sciences, and overall industrial growth

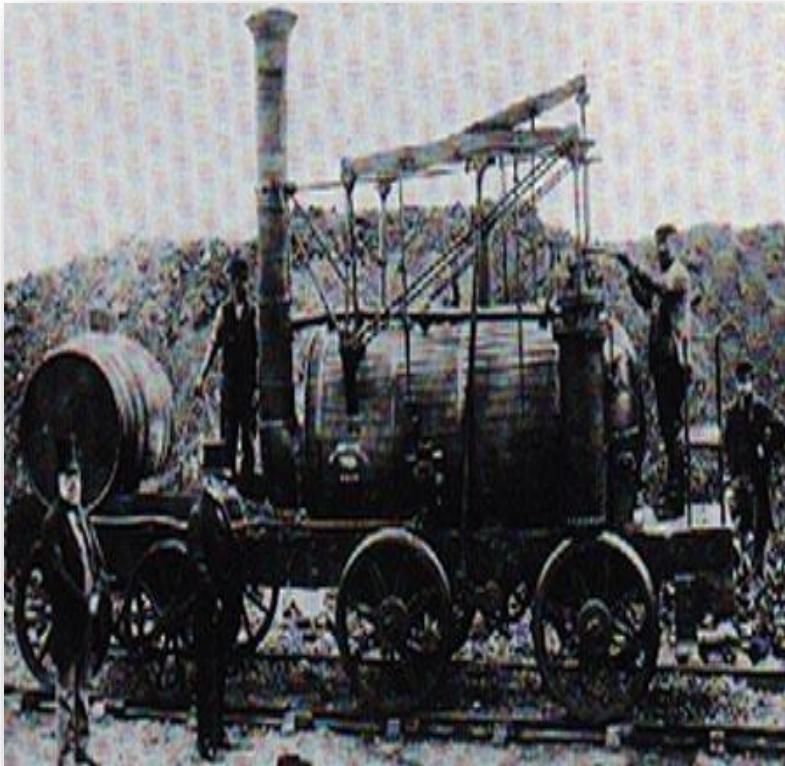
# MAJOR INVENTIONS

**THE STEAM ENGINE :** INVENTED BY JAMES WATT IN 1785, WHOSE PROLIFERATION INTO NEWLY BUILT MACHINE SHOP AND IRON FOUNDRIES ENGINEERED AN APPROPRIATE TYPE OF BUILDING.

**STEAM ENGINE LEADS TO INVENTION OF STEAMSHIP ,STEAM LOCOMOTIVES.**



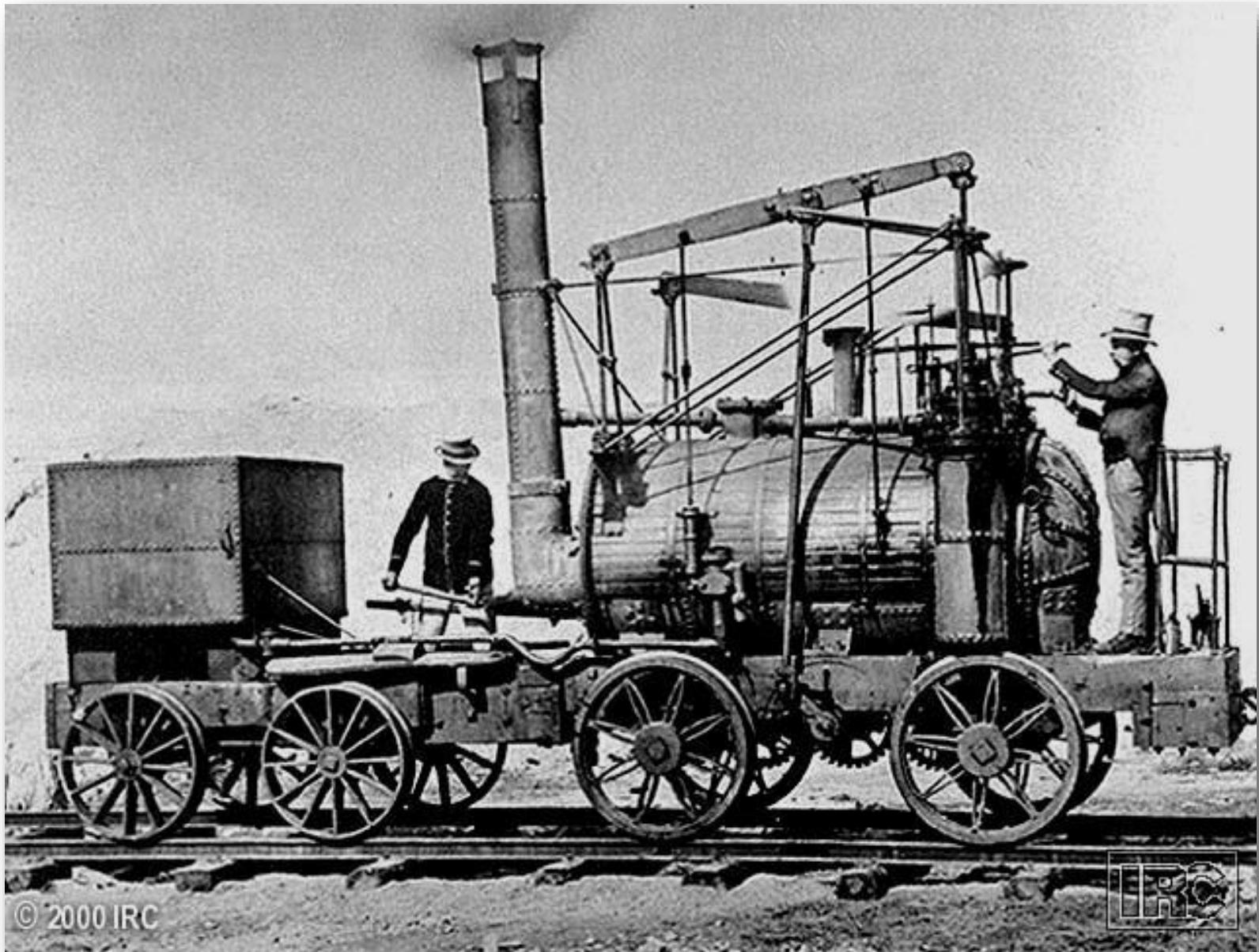
- **RAILWAY**- A MEANINGFUL SYMBOL OF THE NEW AGE WHICH IN TURN HAD CONSEQUENCES FOR ARCHITECTURE - STATIONS, BRIDGES, TUNNELS
- **THE STEAM BOAT** :AN IMPORTANT MEANS OF TRANSPORTATION WHICH IN TURN HAD CONSEQUENCES FOR MASS MIGRATION FROM ACROSS THE GLOBE.



# DEVELOPMENT IN TRANSPORTATION SYSTEM

- ROADS, RAILWAYS AND CANALS WERE BUILT.
- CANALS - CANALS BEGAN TO BE BUILT IN THE LATE EIGHTEENTH CENTURY TO LINK MAJOR MANUFACTURING CENTRES
- RAIL ROAD - THE CONSTRUCTION OF MAJOR RAILWAYS CONNECTING THE LARGER CITIES AND TOWNS





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# Transportation Revolution

Robert Fulton  
(American)

- Steamboat (1807)
- Sped water transportation

Thomas Telford and  
John McAdam  
(British)

- Macadamized roads (1810-1830)
- Improved roads

George Stephenson  
(English)

- Locomotive (1825)
- Fast land transport of people and goods

Gottlieb Daimler  
(German)

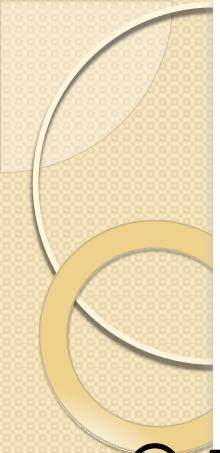
- Gasoline engine (1885)
- Led to the invention of the automobile

Rudolf Diesel  
(German)

- Diesel engine (1892)
- Cheaper fuel

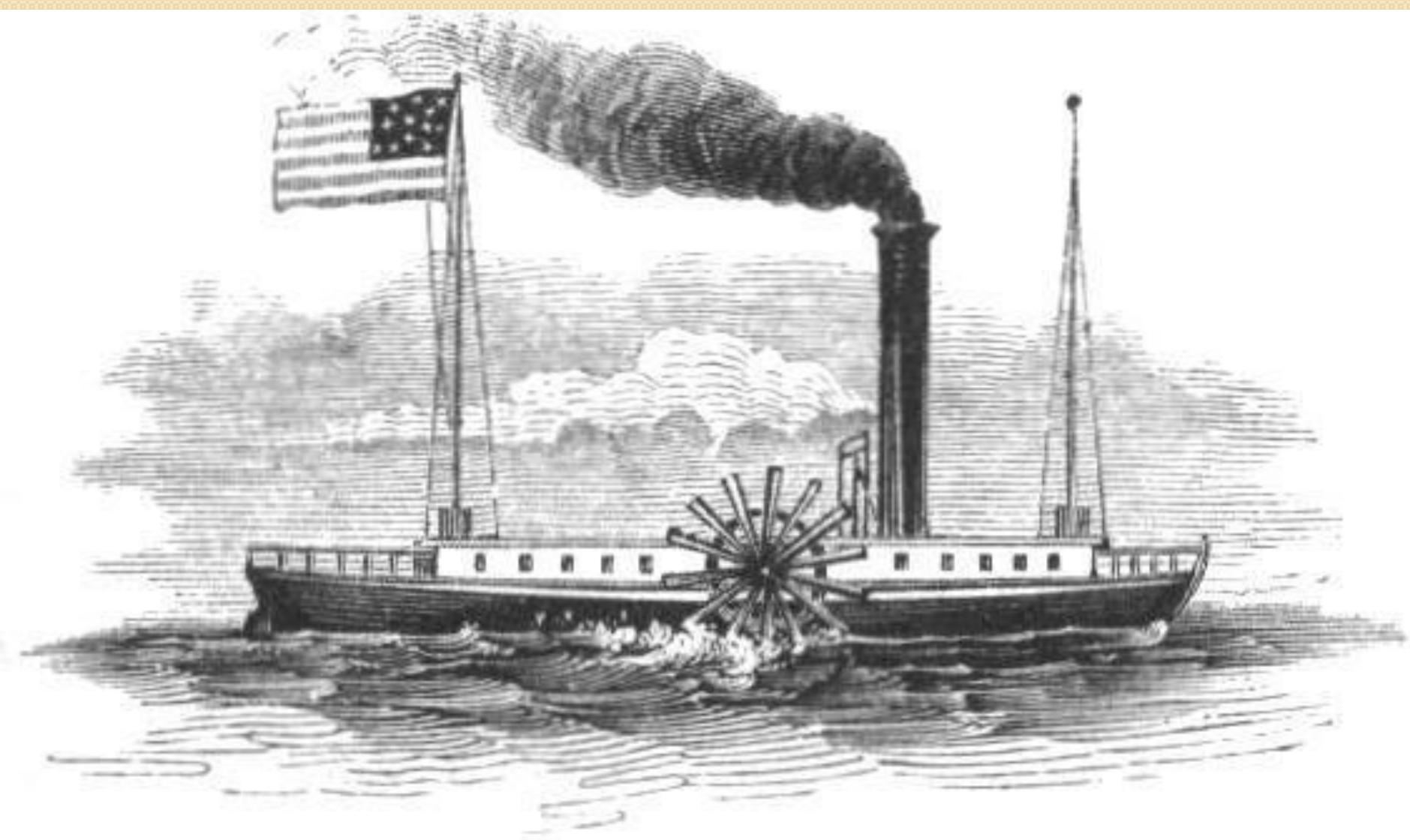
Orville and Wilbur Wright (American)

- Airplane (1903)
- Air transport



# Steamboats

- Robert Fulton invented the steamboat in 1807
- The *Clermont* operated the first regular steamboat route, running between Albany and New York City
- 1819 – the *Savannah* used a steam engine as auxiliary power for the first time when it sailed across the Atlantic Ocean
- 1836 – John Ericsson invented a screw propeller to replace paddle wheels
- 1838 – the *Great Western* first ship to sail across the Atlantic on steam power alone, completing the trip in 15 days







# Railroads

- 1830 – Stephenson’s “Rocket” train traveled the 40 miles between Liverpool and Manchester in 1 ½ hours
- 1830-1870 – railroad tracks went from 49 miles to over 15,000 miles
- Steel rails replaced iron rails
- 1869 – Westinghouse’s air brake made train travel safer
- Greater train traveling comfort – heavier train cars, improved road beds, and sleeping cars

# INVENTION OF BUILDING MATERIALS

- . CAST IRON, AN ESSENTIALLY BRITTLE MATERIAL, IS APPROXIMATELY FOUR TIMES AS RESISTANT TO COMPRESSION AS STONE.
- WROUGHT IRON, WHICH IS FORTY TIMES AS RESISTANT TO TENSION AND BENDING AS STONE, IS ONLY FOUR TIMES HEAVIER. IT CAN BE FORM AND MOLDED INTO ANY SHAPE.
- GLASS CAN BE MANUFACTURED IN LARGER SIZES AND VOLUMES.
- SOLID STRUCTURES COULD BE REPLACED BY SKELETON STRUCTURES, MAKING IT POSSIBLE TO ERECT BUILDINGS OF ALMOST UNRESTRICTED HEIGHT.
- BUILDINGS COULD BE CONSTRUCTED INTO ANY SHAPE AND IN SHORT TIME.

# CRYSTAL PALACE



# EIFFEL TOWER



# THE IRON RAILROAD STATION

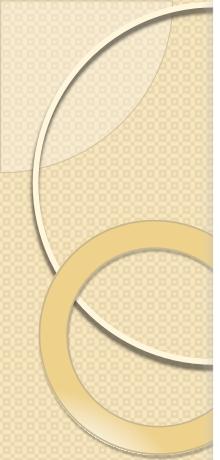


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# Why Was it Started?

- Industrial Revolution as, “a widespread replacement of manual labor by machines that began in Britain in the 18th century.”
- People did not want to do their work manually for the rest of their lives.
- Somewhere around 75% of the British made their money from farming. In the winter when they couldn't farm they worked with the wool from their sheep to make cloth. This was called the cottage industry. This was one thing that caused the Industrial Revolution.

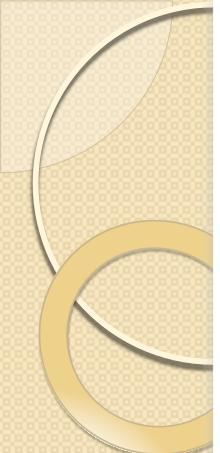


# Why did the Industrial Revolution first start in England by the 1780s?

The factors are :

**Geographic factors** - As an island separated from, and yet close to, the European continent, England enjoyed a geographical situation that was favorable in several ways.

**Political factors** - Government was ready to provide conditions in which trade, industry, banking and farming for profit could flourish. The best single condition it provided was laissez-faire - no government interference with private businesses.



## Economic factors -

Internally, the purchasing power of the people was generally greater than that of other peoples.

Externally, the rapidly increasing trade stimulated the production of cheap manufactured goods in England.

## Technological factors - Before and during the Industrial Revolution, several technological processes converged:

tool improvement, use of coal as fuel, greatly increased use of iron, and use of steam power.

# Population increase

- At the start of the 19th Century about 1/5 of Britain's population lived there, but by 1851 half the population of the country had set up home in London.
- The population of England had more than doubled from 8.3 million in 1801 to 16.8 million in 1851 and, by 1901, had nearly doubled again to 30.5 million.
- Europe's population doubled during the 18th century, from roughly 100 million to almost 200 million, and doubled again during the 19th century, to around 400 million.

# The Industrial Revolution

Agricultural Revolution and Industry

# From the Cottage to the Factory

## **Cottage Industry/ Domestic System**

MERCHANTS OR SMALL BUSINESSMEN HIRED WORKERS TO PRODUCE GOODS FOR THE FAMILY OR FOR THE VILLAGE. (SMALL BUSINESSES- FARMS- NOT IN A FACTORY)

## **Factory System**

AN ORGANIZED METHOD OF PRODUCTION THAT BROUGHT WORKERS AND MACHINES TOGETHER UNDER THE CONTROL OF MANAGERS. (FACTORIES OR LARGE BUSINESSES)

# Agricultural Revolution

After 1750- Farming Science improves

- Crop Rotation (3 field System and “fallow land”)

- Fertilization of used land

- Animal Breeding

By 1850- Machines in farming

- Production/ efficiency grew

- Steel plows

- Reapers

- Horse-drawn rakes

- Eli Whitney’s Cotton Gin and other inventions...

- \*Result: Fewer people needed on farms

# Agricultural Revolution

Farms become Capitalist businesses!

Land becomes commodity for profit

Producing was for “market” - not local family or village  
(increase production)

Enclosure Movement

Land fenced in as private property for large farmers

No open Animal Grazing!

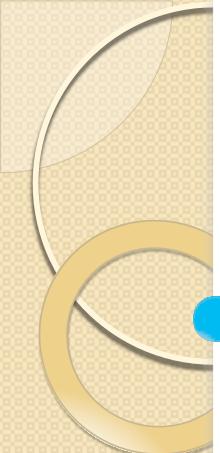
\*\*Result: Small Farmers moved to Cities to find work

Agricultural Revolution leads to  
Industrialization and Urbanization!

# What Was the Effect on Agriculture

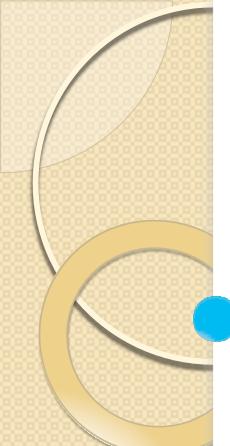


- Farmers that had always done everything by hand were now using machines in their fields.
- With all of the machines not as many farm workers were needed so they had to move to cities to find work.



# Use of Iron in Architecture

- The Iron Bridge
- The Iron Rail Road Station
- The Iron Market Place
- The Iron Commercial Buildings
- The Iron Cultural and Religious Buildings
- The Iron Exhibition Buildings



# THE IRON BRIDGES

- Brooklyn Bridge, Brooklyn, New York 1869-1883
- Clifton Suspension Bridge, Bristol, England 1836-1864
  - Tower Bridge London



BROOKLYN BRIDGE, BROOKLYN, NEW YORK, 1869-1883;  
JOHN AUGUSTUS ROEBLING



BROOKLYN

BRIDGE,

BROOKLYN, NEW

YORK, 1869-1883;

JOHN AUGUSTUS

ROEBLING

**Length - 5,989 feet**

**Distance of roadbed**

**above water - 135**

**feet**

**Bridge Style -**

**Suspension Bridge.**

**Tower Structure -**

**Stone masonry**

# Conclusions

- Style=Gothic piers, Structural Expressionist cables and bridge deck
- Date=1869 to 1883
- Location=East River. Park Row, Manhattan to Adams Street, Brooklyn.
- Architect=John Augustus Roebling, completed by son, Washington Augustus Roebling



**TOWER BRIDGE, LONDON, 1886–1894, SIR HORACE JONES**

# Conclusions

- It was opened by Edward 7th when he was Prince of Wales
- 8 years in construction, using 5 major contractors and over 400 labourers.
- completed and opened in the year 1894.
- two piers were sunk into the river bed to support the weight of the bridge.
- A massive 11,000 tons of steel used for the walkways and towers.



# THE IRON RAILROAD STATION

- Central Railroad Station, New Castle on tyne, England,  
1846-55
  - St. Pancreas Station, London



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## CENTRAL RAILROAD STATION, NEWCASTLE UPON TYNE, ENGLAND, 1846-55; JOHN DOBSON

The National Rail station has 12 platforms.



**ST. PANCRAS STATION, LONDON, 1864-68; WILLIAM H. BARLOW,**

**R.M. ORDISH**

**Height (architectural) = 82.30 m.**

**Floors above ground = 6**

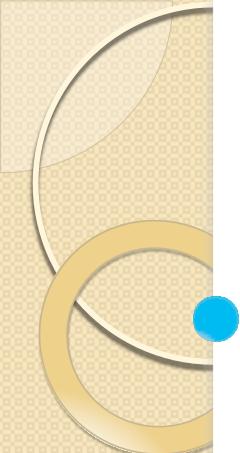


ST. PANCRAS STATION, LONDON, 1864-68; WILLIAM H. BARLOW, R. M. MORDISH



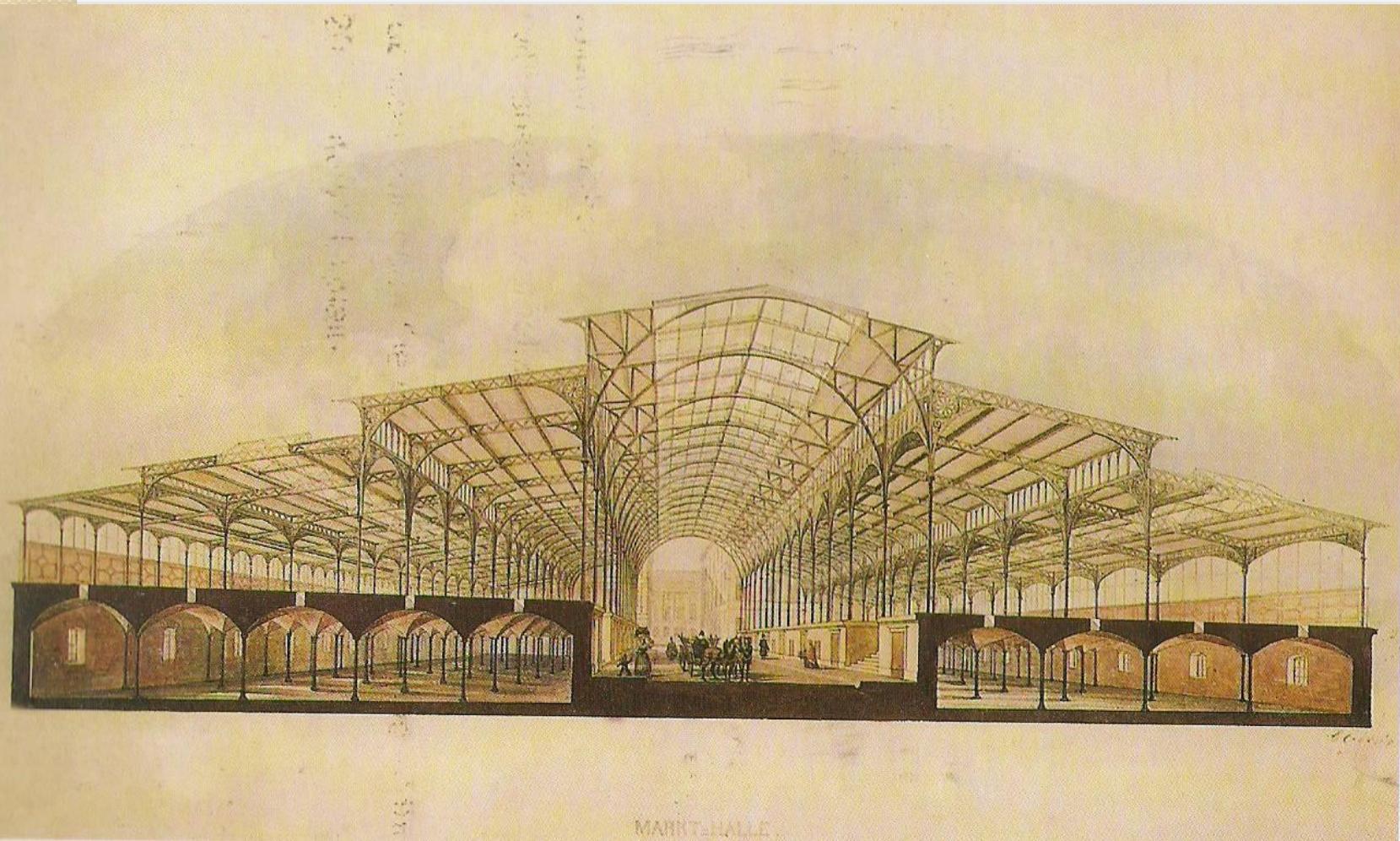
# Conclusions

- It was designed by William Henry Barlow and building work started in 1863
- The station which has a single span roof of 243 feet
- length of 689 ft
- 100 ft above ground
- four Type AF High Friction Clamps fixing is used for roof



# THE IRON MARKET PLACE

- Covered Market , Berlin 1865-1868
  - City Market Hall, Paris
  - Galleria Vittorio Emmanuel II, Milan



**COVERED MARKET, BERLIN, 1865-1868; FRIEDRICH HITZIG**



**GALLERIA VITTORIO  
EMMANUEL II MILAN, 1865-**  
**67, GIUSEPPE MEGONI**



**GALLERIA VITTORIO  
EMMANUEL II MILAN, 1865-67, GIUSEPPE MEGONI**



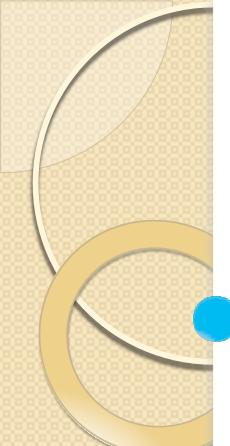
GALLERIA VITTORIO, EMMANUEL II MILAN, 1865-67, GIUSEPPE  
MEGNONI



**GALLERIA VITTORIO EMMANUEL II MILAN, 1865-67, GIUSEPPE MEGNONI**

# Conclusions

- it was originally designed in 1861 and built by Giuseppe Mengoni between 1865 and 1877.
- The street is covered over by an arching glass and cast iron roof, a popular design for nineteenth-century arcades
- The central octagonal space is topped with a glass dome



# THE IRON COMMERCIAL BUILDING

- Mchier Factory, Noisel-sur-marne
- Bradbury Building, Los Angles, California
- Commodities Exchange, Amsterdam



MENIER FACTORY, NOISEL-SUR-MARNE, FRANCE, 1871-1872, JULESSAULNIER



**THE BRADBURY BUILDING, LOS ANGELES, CALIFORNIA,  
1889-93; GEORGE H WYMAN**



**THE BRADBURY BUILDING, LOS ANGELES, CALIFORNIA, 1889–93; GEORGE HWYMAN**

# Conclusions

- The Bradbury Building is an architectural landmark in Los Angeles, California
- Built: 1893
- Architect: George H. Wyman
- Architectural style(s): Italian Renaissance Revival, Romanesque Revival



**THE COMMODITIES EXCHANGE, AMSTERDAM, 1897 TO 1909,  
HENDRIK PETRUS BERLAGE.**



THE COMMODITIES EXCHANGE, AMSTERDAM, 1897 TO 1909, HENDRIK PETRUS BERLAGE.

# Conclusions

- Architect Hendrik Petrus Berlage
- Location Amsterdam, The Netherlands
- Date 1897 to 1909
- Building Type commercial trading room,  
stock exchange
- Construction System brick bearing  
masonry with iron trusses for glazed roof

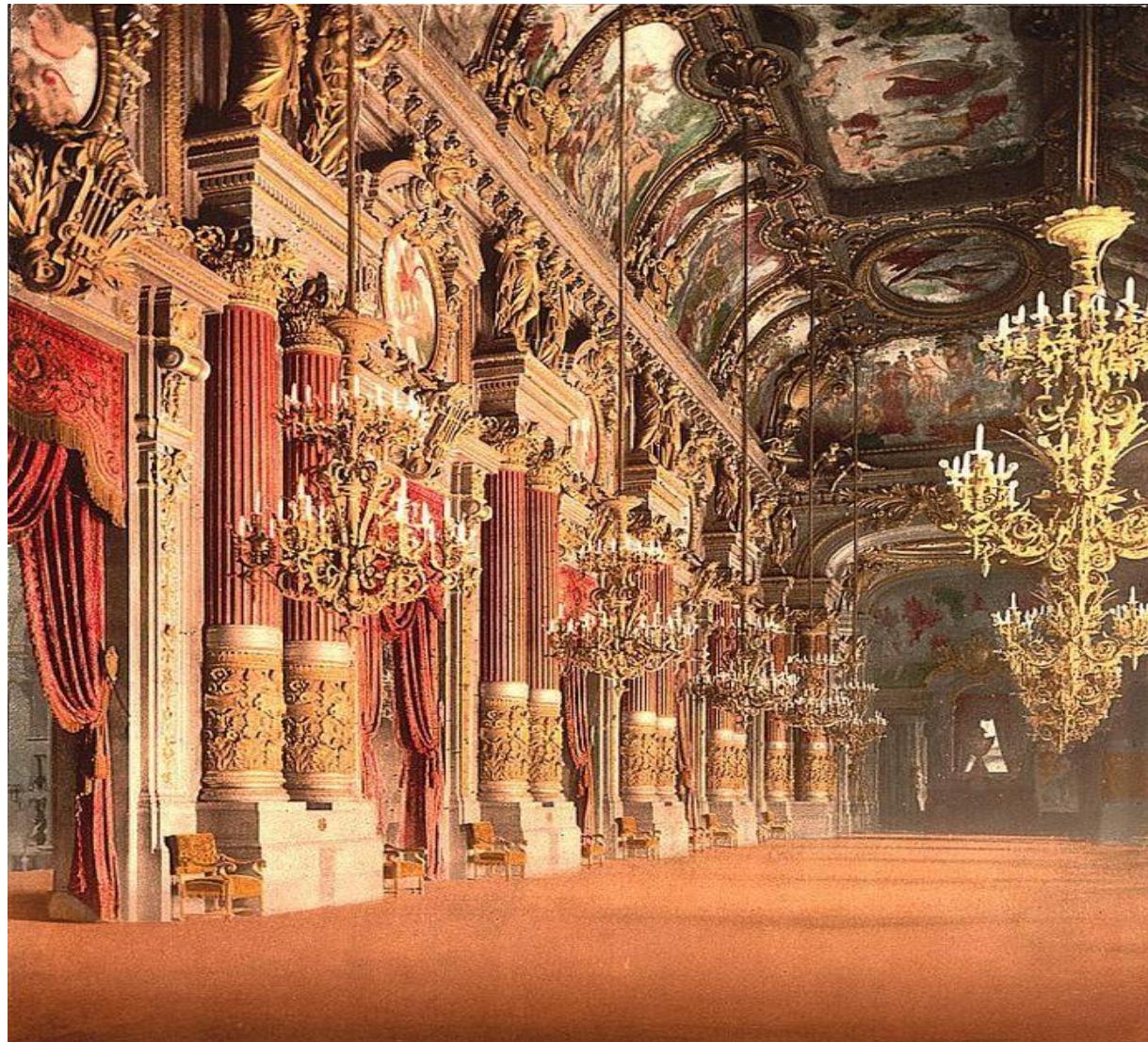
# THE IRON CULTURAL BUILDING

- Paris Opera, Paris, Charles Garnier
- Museum of Natural History, England
- Corn Exchange, Leads Cuthbert Brodick



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**PARIS OPERA, PARIS, 1857-74, CHARLES GARNIER**



PARIS OPERA, PARIS, 1857-74, CHARLES GARNIER

# Conclusions

- Architect Charles Garnier
- Location Paris, France
- Date 1857 to 1874
- Building Type theater, opera house
- Construction System masonry, cut stone
- Style Neo-Baroque



# MUSEUM OF NATURAL HISTORY, ENGLAND, 1860-1880, ALFRED WATERHOUSE

Style = Romanesque



CORN EXCHANGE ,LEADS, 1860-63, CUTHBERT BRODICK

# Conclusions

- Architectural style Victorian
- Location Leeds, West Yorkshire, England
- Completed 1864
- Renovated 1990, 2008
- Architect Cuthbert Broderick
- Grade I Structure

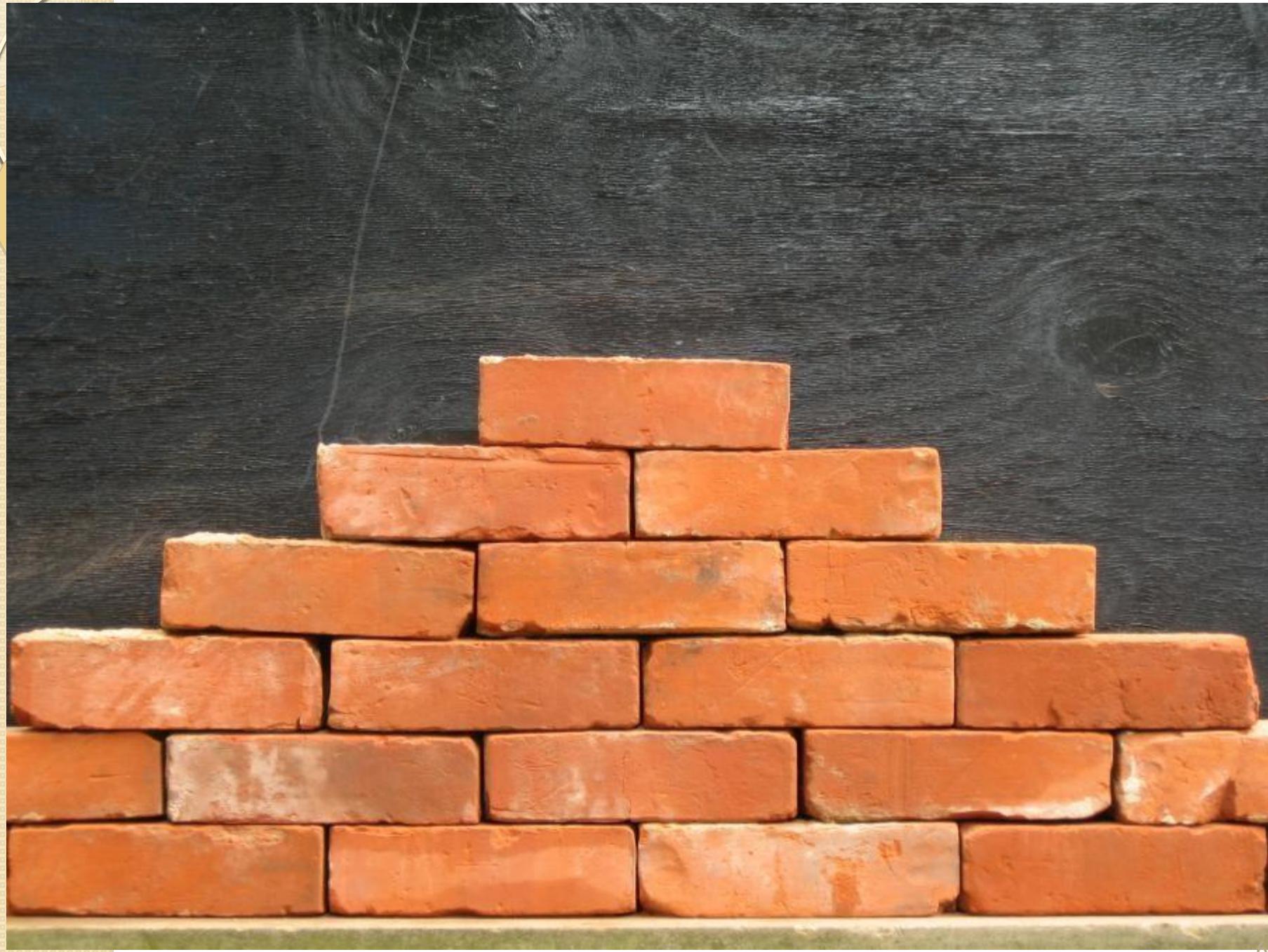


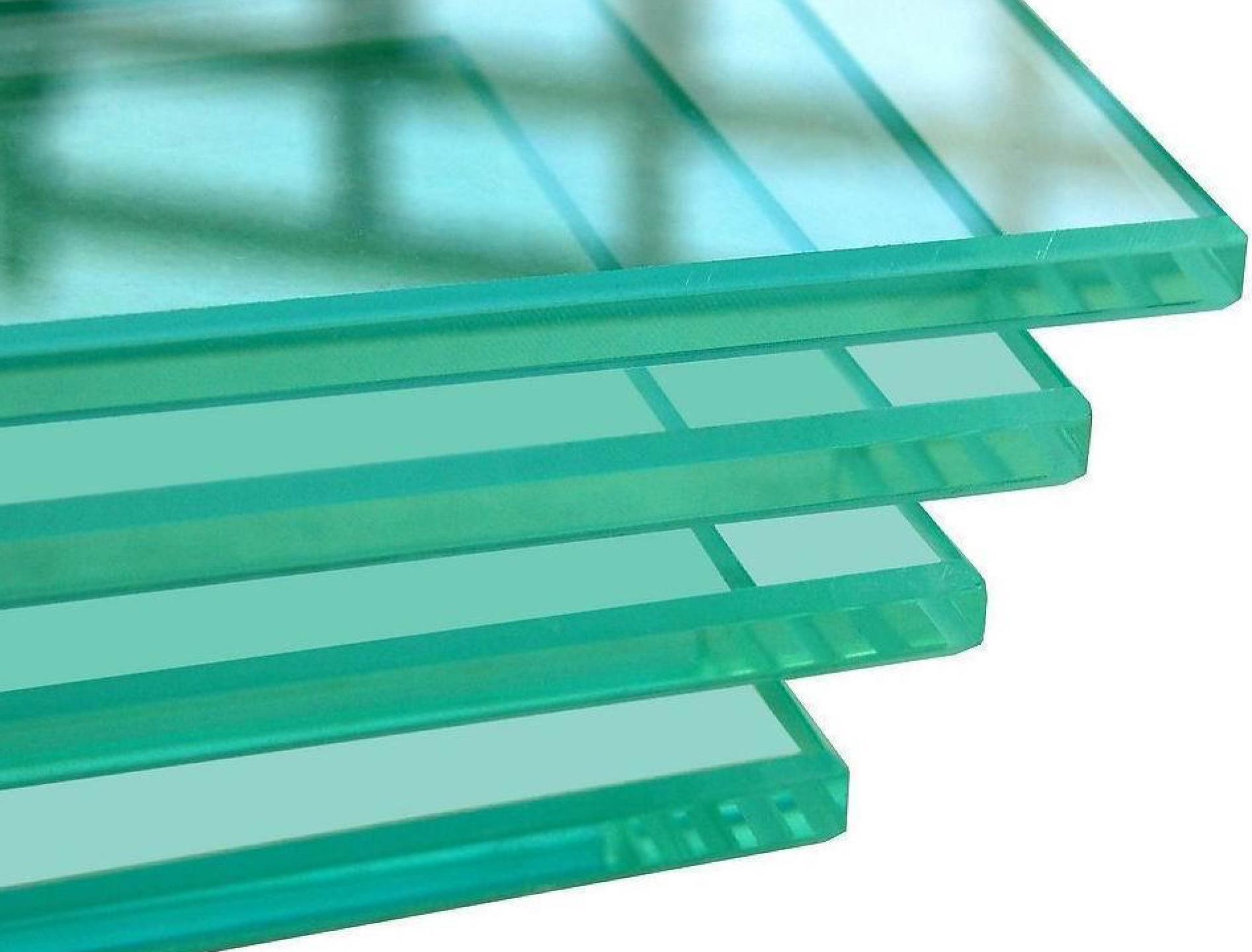
# **IMPACT OF INDUSTRIAL REVOLUTION**

- Countless discoveries were made in many fields of work.
- Textile plants were affected greatly with the use of coal.
- Travel was made easier with the use of trains, canals and the fixing of many roads throughout countries.
- As canals were constructed, the need for a quicker ship became more and more obvious.
- When the steam boat came along trade, travel and many other daily jobs were done much quicker.
- Steam powered trains also had a major breakthrough, which increased the need for more railway systems along the countryside.







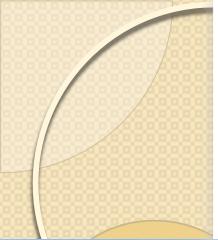






□ WHAT WOULD BE  
TODAY'S WORLD IF  
INDUSTRIAL REVOLUTION  
WOULD NOT HAVE TAKEN  
PLACE ???







# Thank you