

CHAPTER 19

THE INDUSTRIAL AGE

Section 1

“The Second Industrial Revolution”

Objectives

Students will be able to:

- 1) Describe how the Bessemer process changed the steel industry.
- 2) Analyze how the Bessemer process affected industry in the USA.
- 3) Describe the uses of kerosene.
- 4) Analyze the problems that Thomas Edison faced regarding the use of electricity, and how he solved it.

Objectives

Students will be able to:

- 5) List and describe the advances made in communication and transportation.
- 6) Analyze how telephones improved communication.
- Describe how phones & cars changed the lives of people.

Factors Affecting Industrial Growth:

- 1. Greater ability to use natural resources
- 2. A growing population
- 3. Transportation advances
- 4. Rising immigration
- 5. Inventions and innovations

Factors Affecting Industrial Growth (cont.):

- 6. Increasing business investment
- 7. Government policies assisting business, such as protective tariffs

Steel Processing

- **SECOND INDUSTRIAL REVOLUTION:**
Period of rapid growth in U.S.
manufacturing in late 1800s
- By mid-1890s USA became world's
industrial leader
- Greatly aided by development of steel
industry

Steel Industry

- Important advances in technology happened in the steel industry
- Steel is made from iron - made stronger by heat and addition of other metals
- **BESSEMER PROCESS:** (invented by Henry Bessemer in mid-1850s) Made steel quickly & cheaply by blasting hot air through melted iron to remove impurities

Steel Industry (cont.)

- With Bessemer process, what used to take 1-2 days, now only took 10-20 minutes

Bessemer Process

- 2 Men - American William Kelly & Englishman Henry Bessemer - simultaneously developed ideas for improving steel manufacturing by blasting air into it
- Bessemer actually built the converter that made the process possible
- First used in USA, Nov. 1864 @ Wyandotte, MI

Bessemer Process

- USA steel production increased
 - 1870: 77,000 tons
 - 1879: more than 1 million tons

Riding the Rails

- Steel dropped in price - Cost of building RR dropped also
- More track built
- Sleeping cars
- Refrigerated shipping cars
- Cities on RR lines grew (ie Chicago)
- Free tickets to settlers

Riding the Rails

- Farmers & Manufacturers increased shipping on the RR
- RR Industry (and related business) grew & employed more people
- 1886 - standardized track on May 30th, all the same gauge track in North & South

Oil & Electricity

- Oil & Electricity were the power sources that fueled the 2nd Industrial Revolution
- Also brought about other changes

Oil

- Figured out a way to convert crude oil into KEROSENE
 - Cooking
 - Heating
 - Lighting
- Increased the demand for oil

Oil

- Edwin L. Drake (1859)- proved it was possible to pump oil from ground
 - Titusville, PA
- Soon drilling for oil in Ohio, Pennsylvania, West Virginia
- Producing millions of barrels of oil per year
- Companies built refineries

Electricity Spreads

- Great source of light & power
- Inventor THOMAS EDISON looked at uses of electricity

Thomas Edison (aka “Wizard of Menlo Park”)

- Invented:
 - Light bulb
 - Phonograph
 - Moving picture machine
 - Projector
 - Electric power plant

Electricity - Thomas Edison

- Inventor - made items with commercial use
- Research Center in Menlo Park, NJ
 - Called an “invention factory”
- Held more than 1,000 patents
 - 1879 Electric Lightbulb
 - 1882 Power Plant in NY City
 - Edison Electric (now General Electric)

George Westinghouse

- Edison's Power Plant could not send electricity over long distances
- **GEORGE WESTINGHOUSE** - In the late 1880s built a power system that could send electricity across many miles

Electricity

- Westinghouse & Edison competed
- Use of electricity spread to many cities
- Soon powered homes, businesses, factories
- Also used to power streetcars in cities

Patents

- PATENTS: exclusive rights to make or sell inventions (helped protect inventions from being made by other manufacturers)
- US Constitution provided for patents in Article I Section 8
- 1st patent - 1790 - developed a better way to make potash (used in making soap & other items)

Rush of Inventions

- Late 1800s - time of many new inventions (many in communications and transportation)

Inventions - Communication

- 1861 - East & West Coasts were connected by telegraph wires
- 1866 - telegraph cable under the Atlantic Ocean connected US & Great Britain
- 1876 - Alexander Graham Bell patented the telephone

Alexander Graham Bell

- Scottish-born speech teacher
- Inventor that patented the telephone in 1876
 - Called it “talking telegraph”
- Telephone companies organized
 - 55,000 phones in USA by 1880
 - 1.5 million phones in USA by 1900

Alexander Graham Bell

- Western Union refused to buy the rights to the telephone (called it a toy)
- Bell started the Bell Telephone Company
- As potential of phone became apparent, many companies tried to start their own phone services

Alexander Graham Bell

- In 1879 the Bell Telephone Company successfully sued Western Union after it started the American Speaking Telephone Company
- Bell himself faced 587 lawsuits contesting his exclusive patent on the telephone
- AT&T (formerly Bell) pioneered use of telephone cables across the oceans, satellite communications, & a radar system for US Defense Department

Automobiles

- 1876 - a German engineer invented the gasoline-powered engine
- 1893 - Charles & J. Frank Duryea used a gas engine to build the 1st practical motorcar in the USA
- By early 1900s - thousands of cars were being built in the USA

Automobiles

- First cars were expensive (only rich could afford them)
- 1908 - HENRY FORD introduced the Model T
 - Moving assembly line used to manufacture
 - Reduced the cost of making the car
 - Cars more affordable for average citizen

Planes

- WILBUR & ORVILLE WRIGHT - built a lightweight airplane that used a gas-powered engine
- Orville Wright made the 1st piloted flight in a gas-powered plane
 - In Kitty Hawk, NC
 - December 17, 1903

Inventions

- 1844 - Telegraph & Morse Code invented by Samuel Morse

Inventions

- 1852 - Elisha Otis invents elevator safety brake
- 1854 - Henry Bessemer patents his method for making cast steel
- 1864 - George Pullman invented the railroad sleeping car (Pullman car)
- 1866 - Cyrus Field ran Transatlantic Cable for telegraph

Inventions

- 1868 - Christopher Sholes invents typewriter
- 1869 - George Westinghouse invented the air brakes for trains
- 1869 - John Roebling begins work on the Brooklyn Bridge

Inventions

- 1872 - Elijah McCoy receives patent for device that oils machine engines
- 1876 - Alexander Graham Bell invents telephone
- 1879 - Thomas Edison creates durable electric light bulb
- 1882 - Edison builds electric power plant in NY City

Inventions

- 1883 - Jan Matzeliger invents the shoe making machine
- 1887 - Harriet Strong receives a patent for advances in dam & reservoir construction
- 1888 - George Eastman invented the lightweight Kodak camera
- 1880s - Gustavus Swift - RR refrigeration cars

Inventions

- 1893 - J. Frank Duryea & Charles Duryea successfully test their gas-powered auto
- 1893 - George Ferris displays the 1st Ferris wheel @ World's Columbian Exposition in Chicago
- 1903 - Orville Wright makes 1st flight in motorized airplane

Inventions

- Automobiles - Many invented the automobile, some as early as 1860s.
- 1913 - Henry Ford introduced the assembly line in the manufacturing of his cars.