CONTENTS

CHAPTER

1 Industrial Revolution

Introduction

The broad change generated by man in the industrial and technological fields within a period of about six decades by producing goods with the help of machines instead of manual labour is termed as "the industrial revolution."

1.1 Beginning and Development of the Industrial Revolution

The industrial revolution began towards the latter part of the 18th century in Britain. It was limited to Britain for about another half century. Yet, by the 19th century, the influence of the industrial revolution spread to the other countries in Europe and the rest of the world.

Trade was the major reason for the emergence of the industrial revolution in Europe. When the situation of Europe in the 18th century is analyzed, it can be seen that France, Portugal and Spain other than Britain engaged themselves in colonization and extensive trade. Therefore, it is important to inquire into the reasons why such a revolution began in Britain.

❖ Reasons for the Emergence of the Industrial Revolution in Britain

Financial and commercial affairs started developing in Europe since the 16th century and by the 18th century, Britain had surpassed some of the other leading European countries such as Holland, France, Portugal and Spain. As a result a wealthy class who could invest money on industries was created in that country. At the same time, there was a rapid growth in the population of Britain which resulted in a high demand for goods and in turn producing goods to meet the increasing demand became a challenge. This led to a development in the industrial sector. Further, there was an expansion of the knowledge of science as a result of the Renaissance that took place in Europe in 14th and 15th centuries. This knowledge was used in producing

new machinery. Minerals such as iron and steel that were necessary in producing machinery too were found in Britain. Not only that Britain easily found things like coal which played a major role in producing energy.

Though there was a heavy population in contemporary kingdoms such as France, the development of trade in those countries was limited in comparison to Britain. But, Britain had obstructed the commercial relationships of its colonies with other countries in the world by imposing several commercial laws. Thus, Britain was able to maintain a high demand for their productions in its own colonies because they had no other choice than importing those productions from Britain. Some of those products with high demand in Britain were suitable for the production using machines. One example is the high demand placed upon British cotton clothes by India. Though there was an increasing demand for British cotton clothes, they did not have the ability to increase the production within a short period with the existing production methods. Because of the high demand that existed for the British productions, there arose a need in increasing the production in a short period. It is as a solution to this challenge that there was a rapid development in the industrial field.

There were several changes in the agriculture field too in contemporary Britain. There, the rich landowners combined small pieces of land that belonged to poor farmers and made large farms. This is termed as the "encroaching movement." As a result of this, the farmers who lost their land migrated to cities in search of jobs. The extra labour that was generated as a result was able to be used for the industrial development.

Unlike in other countries, in Britain talented individuals had the opportunity to earn money irrespective of their social status. This free social environment in the attitudes supported the spread of novel ideas and it was conducive for the development of the industrial sector. Further, together with the development of the economy, the emergence of new banks and financial organizations that provided capital for the industries and businesses was seen.

The political stability that was prevailing in Britain too helped the industrial revolution. The parliament provided the freedom, tax relief and support to engage in business activities for the economic development.

Compared with the other countries in Europe, Britain had the most conducive environment for the industrial revolution. A number of features such as being a small island, ability to build a web of markets throughout the country, ability to

charge high prices for productions and London city being a centre that distributed raw materials, capital and products; helped Britain to surpass other countries in the industrial production field.

1.2. Rise of the Industrial Revolution

The industrial revolution in Britain was based on three industries as given below.

- Textile industry
- Iron and steel industry
- Coal industry

The development that occurred in these fields resulted in the gradual progress in other fields such as transport, communication and agriculture.

Textile Industry

Textile producers in Britain faced a challenge of increasing their textile products to meet the high demand that came from their own colonies. Weaving clothes became a little faster with the invention of the flying shuttle by John K. in 1733. But the slowness in preparing threads needed in weaving clothes still remained a problem. According to the situation that was there at that time, threads produced by six thread makers per day were enough only for one weaver to work for one day. Therefore, there was some idea of increasing the pace of spinning. As a result of that enthusiasm, a person called James Hargreaves produced a machine called 'Jenny' in 1764 for cotton weaving. This machine was a manually operated one. Later in 1769, Richard Arkwright produced a more efficient, water powered spinning wheel. It was named as 'water turbine'. Arkwright's creation was an important production when compared to the other machines used for the same purpose in the past. But it was difficult to be used in houses because it was very big in size. On the other hand, because a fast tide of water was needed to run the machine, it could be used only in such places where there was a continuous supply of water.

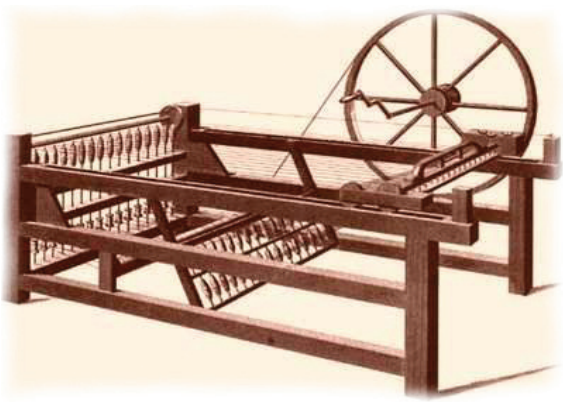

Fig 1.1 – The Jenny machine produced by James Hargreaves for spinning cotton in 1764

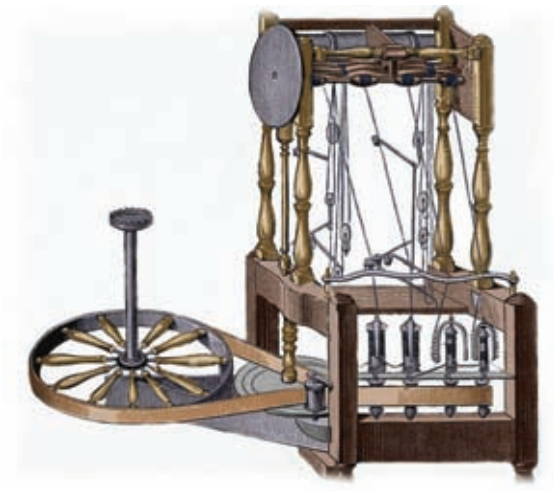

Fig 1.2 – The water powered spinning machine produced by Richard Arkwright

Samuel Crompton who used the functioning principles of Spinning Jenny and the Water Turbine produced a new machine called "Mule" around 1779. This helped to produce finer and stronger threads. Then around 1785, Edmund Cartwright found a way of running the 'Mule' by steam power. Thus, within a period of about 30 years new machines and novel technical methods were invented to make spinning cotton more efficient. Hence, there was a big revolution in the weaving industry during a short period of time.

ACTIVITY 1

1. Make short questions regarding the section on textile industry.
2. Explain the industrial development in textile sector under the following areas.
   - Reasons for industrialization in textile sector
   - New productions of textile sector and their advantages

Iron and Steel Industry

Ore deposits are found in abundance in Britain. British people produced iron and steel even before the industrial revolution to make weapons, agricultural equipment and household tools. They used firewood to smelt ore for this purpose. It was difficult to meet the huge demand for iron and steel needed for the production of machinery that emerged as a result of the industrial revolution using firewood.

Hence, alternative methods had to be looked for. In 1730 the method of smelting ore using coal was found by Abraham Darby. They produced molded iron in this method. In 1784 tempered iron could be produced with the invention of 'Roller' machine by Henri Cort. Henri Bessemer found a new method to produce steel by removing dirt from iron in 1856. The invention of open oven method in 1860, by developing the above mentioned method, enabled the production of high quality

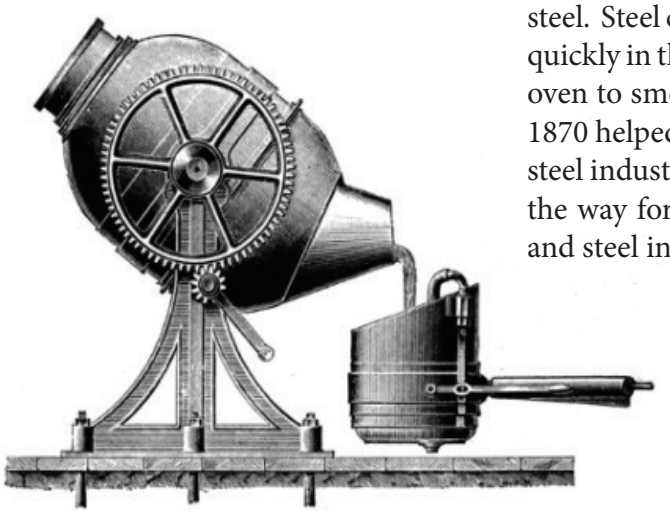

Fig 1.3 Henri Bessemer's oven for producing steel

steel. Steel could be produced cheaply and quickly in this method. Making an electric oven to smelt ore by Wilhelm Siemens in 1870 helped the improvement of iron and steel industry. These mew creations paved the way for a rapid improvement in iron and steel industry.

ACTIVITY 2

1. Prepare short questions from the section about iron and steel.
2. Explain the industrial development that took place in iron and steel industry under the following areas.
   - Reasons for the industrial development in iron and steel industry
   - New inventions in the above field and their advantages

Coal Industry

There are so many coal mines in Britain. South Wales, Yorkshire, Lancashire are some places where coal mines are situated. Coal was popular as a cheap and efficient fuel for smelting ore, running machines and household chores. Though the demand for coal increased with the industrial development, mining coal was difficult. Several new inventions were made in order to find solutions to the problems such as removing the water that gathered in the mine when it was dug deep, poisonous gases found in the depth, increasing heat and providing light to the depth.

Thomas Newcomen invented a steam engine in 1735 to pump water of the mines and artificially cool the air. Yet, it was inefficient and could not be used in other industries too. Therefore, James Watt developed this to a new steam engine in 1736. It was an efficient engine that could be used in many industries.

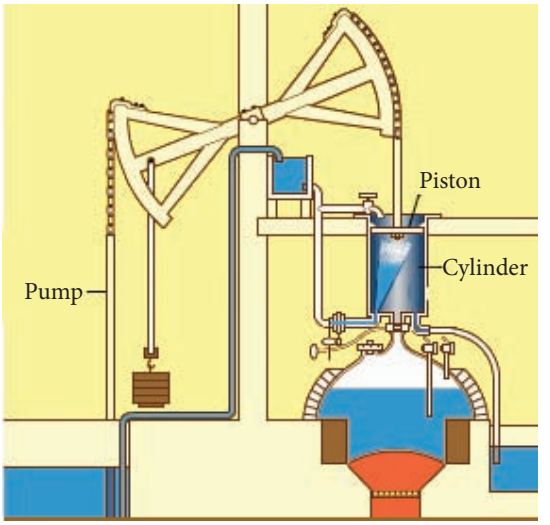

Fig 1.4 - A picture of the steam engine made by Thomas Newcomen

Fig 1.5 – Steam engine produced by James Watt

The problem of providing light to the mines too was solved when Humphry Davy produced the safety lamp in 1812. In 1839, a method was found to take coal out of the mines using iron cables instead of the old method of taking them out by women and children using copper cables.

The development of the coal industry resulted in several by products. Tar obtained by burning coal was used in road construction. Paints that were necessary in dyeing clothes too were made with the help of coal. It was further used to produce medicine, perfumes, oil and fertilizers.

Fig 1.6 – The way coal was taken out of mines by women and children

↓ *ACTIVITY 3*

Explain the development of the coal industry under the following headings.

1.Reasons for the industrial development in the coal industry.

2.Advantages of the new inventions of the coal industry.

Fig 1.7 – Safety lamp produced by Humphry Davy

Expansion of the Industrial Revolution

The industrial revolution that took place in the fields of textile, coal and iron industries in Britain soon spread into the other fields also. When the nature of this expansion is considered, two types of expansions can be identified as expansion of industrial revolution to other fields and expansion of industrial revolution to other countries.

1. **Expansion to other fields**

The new knowledge that emerged in relation to industrial and technological fields as a result of industrial revolution did not limit itself to industries and productions. It spread to the other fields too. Fields like transport, communication and agriculture too had rapid development under the influence of the industrial revolution.

❖ **Expansion of transportation**

Many changes took place in the transport sector because of the influence of the industrial revolution. With the development of the industrial sector, a necessity of developing a road system arose for transporting raw materials to factories and transporting products to markets. Therefore in 1811, John McAdam introduced a new way of making roads. It is called "*the Macadam Method*."

Macadam Method

Macadam method means spreading small pieces of granite on a strong foundation of bigger stones and soil and making roads by pounding and levelling them.

Even the vehicles that carry heavy loads of goods and passengers could be driven fast and easily on these roads. Therefore, hundreds of miles of such roads were built in Britain and Scotland within a short period.

Machines and engines used for transport too developed with the development of roads. The production of the steam engine by George Stephenson in 1814 became a landmark in the industrial revolution. As a result, trains could be used to transport coal and other products. The time spent for transport could be minimized by transporting products from factories to markets and transportation cost was reduced by being able to transport heavy loads of goods at a time. It is believed that George Stephenson who invented the locomotive engine was not able to read and write till he was 17 years old.

Fig 1.8 George Stephenson

Fig 1.9 The steam engine invented by George Stephenson

The development that took place in land transport as a result of the industrial revolution, affected the naval and water transport too.