INDUSTRIAL REVOLUTION

The Industrial Revolution is the name given the movement in which machines changed people's way of life as well as their methods of manufacture.

About the time of the American Revolution, the people of England began to use machines to make cloth and steam engines to run the machines. A little later they invented locomotives. Productivity began a spectacular climb. By 1850 most Englishmen were labouring in industrial towns and Great Britain had become the workshop of the world. From Britain the Industrial Revolution spread gradually throughout Europe and to the United States.

Changes That Led to the Revolution

The most important of the changes that brought about the Industrial Revolution were (1) the invention of machines to do the work of hand tools; (2) the use of steam, and later of other kinds of power, in place of the muscles of human beings and of animals; and (3) the adoption of the factory system.

The Industrial Revolution came gradually. It happened in a short span of time, however, when measured against the centuries people had worked entirely by hand. Until John Kay invented the flying shuttle in 1733 and James Hargreaves the spinning jenny 31 years later, the making of yarn and the weaving of cloth had been much the same for thousands of years. By 1800 a host of new and faster processes were in use in both manufacture and transportation.

Expanding Commerce Affects Industry

Commerce and industry have always been closely related. Sometimes one is ahead and sometimes the other, but the one behind is always trying to catch up. Beginning in about 1400, world commerce grew and changed so greatly that writers sometimes use the term "commercial revolution" to describe the economic progress of the next three and a half centuries.

Many factors helped bring about this revolution in trade. The Crusades opened up the riches of the East to Western Europe. America was discovered, and European nations began to acquire rich colonies there and elsewhere. New trade routes were opened. The strong central governments which replaced the feudal system began to protect and help their merchants. Trading firms, such as the British East India Company, were chartered by governments. Larger ships were built, and flourishing cities grew up.

With the expansion of trade, more money was needed. Large-scale commerce could not be carried on by barter, as much of the earlier trade had been. Gold and silver from the New World helped meet this need. Banks and credit systems developed. By the end of the 17th century Europe had a large accumulation of capital. Money had to be available before machinery and steam engines could come into wide use for they were costly to manufacture and install.

By 1750 large quantities of goods were being exchanged among the European nations, and there was a demand for more goods than were being produced. England was the leading commercial nation, and the manufacture of cloth was its leading industry.

Organizing Production

Several systems of making goods had grown up by the time of the Industrial Revolution. In country districts families produced most of the food, clothing, and other articles they used, as they had done for centuries. In the cities merchandise was made in shops much like those of the medieval craftsmen, and manufacturing was strictly regulated by the guilds and by the government. The goods made in these shops, though of high quality, were limited and costly.

The merchants needed cheaper items, as well as larger quantities, for their growing trade. As early as the 15th century they already had begun to go outside the cities, beyond the reach of the hampering regulations, and to establish another system of producing goods.

From Cottage Industry to Factory

Cloth merchants, for instance, would buy raw wool from the sheep owners, have it spun into yarn by farmers' wives, and take it to country weavers to be made into textiles. These country weavers could manufacture the cloth more cheaply than city craftsmen could because they got part of their living from their gardens or small farms.

The merchants would then collect the cloth and give it out again to finishers and dyers. Thus they controlled clothmaking from start to finish. Similar methods of organizing and controlling the process of manufacture came to prevail in other industries, such as the nail, cutlery, and leather goods.

Some writers call this the putting-out system. Others call it the domestic system because the work was done in the home ("domestic" comes from the Latin word for home). Another term is cottage industry, for most of the workers belonged to the class of farm labourers known as cotters and carried on the work in their cottages.

This system of industry had several advantages over older systems. It gave the merchant a large supply of manufactured articles at a low price. It also enabled him to order the particular kinds of items that he needed for his markets. It provided employment for every member of a craft worker's family and gave jobs to skilled workers who had no capital to start businesses for themselves. A few merchants who had enough capital had gone a step further. They brought workers together under one roof and supplied them with spinning wheels and looms or with the implements of other trades. These establishments were factories, though they bear slight resemblance to the factories of today.

Changing Conditions in England

The new production methods increased the amount of goods produced and decreased the cost. The worker at a machine with 100 spindles on it could spin 100 threads of cotton more rapidly than 100 workers could on the old spinning wheels. Southern planters in the United States were able to meet the increased demand for raw cotton because they were using the cotton gin. This machine could do the job of 50 men in cleaning cotton. Similar improvements were being made in other lines of industry. British merchants no longer found it a problem to obtain enough goods to supply their markets. On the contrary, at times the markets were glutted with more goods than could be sold. Then mills were closed and workers were thrown out of employment.

With English factories calling for supplies, such as American cotton, and sending goods to all parts of the world, better transportation was needed. The roads of England were wretchedly poor and often impassable. Packhorses and wagons crawled along them, carrying small loads. Such slow and inadequate transportation kept the cost of goods high. Here again the need produced the invention. Thomas Telford and John MacAdam each developed a method of road construction better than any that had been known since the ancient Romans built their famous roads.

Building Canals and Railways

Many canals were dug. They connected the main rivers and so furnished a network of waterways for transporting coal and other heavy goods. A canalboat held much more than a wagon. It moved smoothly if slowly over the water, with a single horse hitched to the towline. In some places, where it was impossible to dig canals and where heavy loads of coal had to be hauled, mine owners laid down wooden or iron rails. On these early railroads one horse could haul as much coal as 20 horses could on ordinary roads.

Early in the 19th century came George Stephenson's locomotive and Robert Fulton's steamboat, an American invention. They marked the beginning of modern transportation on land and sea. Railroads called for the production of more goods, for they put factory-made products within reach of many more people at prices they could afford to pay.

The Condition of Labour

As conditions in industry changed, social and political conditions changed with them. Farm labourers and artisans flocked to the manufacturing centers and became industrial workers. Cities grew rapidly, and the percentage of farmers in the total population declined.

The population of England as a whole began to increase rapidly after the middle of the 18th century. Because of progress in medical knowledge and sanitation, fewer people died in infancy or childhood and the average length of life increased.

Far-reaching changes were gradually brought about in the life of the industrial workers. For one thing, machines took a great burden of hard work from the muscles of human beings. Some of the other changes, however, were not so welcome.

The change from domestic industry to the factory system meant a loss of independence to the worker. The home labourer could work whenever he pleased. Although the need for money often drove him to toil long hours, he could vary the monotony of his task by digging or planting his garden patch. When he became a factory employee, he not only had to work long hours, but he had to leave his little farm. He lived near the factory, often in a crowded slum district. He was forced to work continuously at the pace set by the machine. The long hours and the monotonous toil were an especially great hardship for the women and children. The vast majority of the jobs were held by them by 1816.

The change was particularly hard on the weavers and the other skilled workers who sank to the position of factory workers. They had been independent masters, capitalists in a small way, and managers of their own businesses. They had pride in their skill. When they saw themselves being forced into factories to do other men's bidding for the same pay as unskilled workers, it is no wonder that they rioted and broke up looms.

Problems of Capital and Labour

A person had to have a lot of capital to buy machines and open a factory. Those who were successful made huge profits with which to buy more machines, put up larger buildings, and purchase supplies in greater

quantities at enormous savings. Thus capital increased far more rapidly than it ever had before. Much of it was invested in building canals, railroads, and steamships and in developing foreign trade. The men who controlled these enterprises formed a powerful new class in England--the industrial capitalists.

The capitalists had a struggle to obtain a voice in the government. They needed a better system of banking, currency, and credit. They had to find and hold markets for their products. They had many difficulties in organizing their factories to run efficiently. They also had to make a profit on their investments in the face of intense competition.

Laissez-faire was the rule in England. This meant that the government had accepted the doctrine that it should keep hands off business. Factory owners could therefore arrange working conditions in whatever way they pleased. Grave problems arose for the workers--problems of working hours, wages, unemployment, accidents, employment of women and children, and housing conditions.

Children could tend most of the machines as well as older persons could, and they could be hired for less pay. Great numbers of them were worked from 12 to 14 hours a day under terrible conditions. Many were apprenticed to the factory owners and housed in miserable dormitories. Ill-fed and ill-clothed, they were sometimes driven under the lash of the overseer. The high death rate of these child slaves eventually roused Parliament to pass laws limiting the daily toil for apprentices.

Rise of Labour Unions

Workers sought to win improved conditions and wages through labour unions. These unions often started as "friendly societies" that collected dues from workers and extended aid during illness or unemployment. Soon, however, they became organizations for winning improvements by collective bargaining and strikes.

Industrial workers also sought to benefit themselves by political action. They fought such legislation as the English laws of 1799 and 1800 forbidding labour organizations. They campaigned to secure laws which would help them. The struggle by workers to win the right to vote and to extend their political power was one of the major factors in the spread of democracy during the 19th century.

Second Industrial Revolution

The machines of the Industrial Revolution in the 18th and early 19th centuries were simple, mechanical devices compared with the industrial technology that followed. Many new products were devised, and important advances were made in the system of mass production. Changes in industry were so great that the period after 1860 has been called the Second Industrial Revolution. New scientific knowledge was applied to industry as scientists and engineers unlocked the secrets of physics and chemistry. Great new industries were founded on this scientific advance: steel, chemicals, and petroleum benefited from new understandings of chemistry; breakthroughs in the study of electricity and magnetism provided the basis for a large electrical industry. These new industries were larger and more productive than any industries existing before. Germany and the United States became the leaders, and by the end of the 19th century they were challenging Great Britain in the world market for industrial goods.

The age of electricity began in 1882 when Thomas A. Edison introduced a system of electric lighting in New York City. Electricity was later applied to driving all kinds of machinery as well as powering locomotives and streetcars. Electric lighting quickly spread across the United States and was soon adopted in Europe. The electrical industry was dominated by large companies that developed new products and then manufactured and marketed them. These companies were based in Germany and the United States but sold their goods all over the world. They were the first multinational companies. Companies like Westinghouse and General Electric helped to electrify cities in Europe, Africa, and South America.

The steel and chemical industries used new technology that greatly increased production. The size of factories increased rapidly, employing more workers and using more machinery. These industries integrated all stages of production under a single corporate structure. They bought out competitors and acquired sources of raw materials and retail outlets. Corporations such as U.S. Steel and Standard Oil controlled all stages of manufacturing the product, from mining and drilling to delivering it to the customer. This gave them great economic power, and the United States government took measures to limit their monopolies in steel and petroleum.

The larger size of business presented great challenges to managers who administered enormous organizations with many branches and subsidiaries. Advances in communications and transportation helped decision makers to maintain control. The electric telegraph was invented by Samuel Morse in 1844 and was used to relay commercial information about prices and markets. It was used in the stock exchanges and on the railway systems. Alexander Graham Bell patented his telephone in 1876,

and networks of telephone lines were built quickly across the United States.

The telephone became a useful tool for managers to keep in contact with the widely dispersed parts of their businesses. New methods of management were devised that stressed central control, planning, and efficient production methods. One of the leading advocates of "scientific management" was Frederick Winslow Taylor.

The Second Industrial Revolution marked great progress in the methods of mass production. More and more industries used interchangeable parts and machine tools. Electric power replaced steam power in factories; it was cheaper, faster, and more flexible. It allowed machine tools to be arranged more efficiently. Human power was replaced by machine power. In 1913 Henry Ford introduced the assembly line in the manufacture of his Model T Ford. Parts were assembled on a moving conveyor belt, and the Model T took shape as it moved from one work station to the next. The assembly line greatly increased the speed of manufacture and soon was used in many industries.

By the outbreak of World War I in 1914, only a small number of industries in the most industrialized nations of the world had adopted advanced production methods and organization. Much of the world had not yet begun a first industrial revolution. Russia, Canada, Italy, and Japan were just beginning to industrialize.

Only Great Britain, the United States, Germany, France, and some parts of the Scandinavian countries had successfully completed an industrial revolution. Most of the world's population still worked in primitive agricultural economies. China, India, and Spain did not begin to industrialize until well into the 20th century.

Questions

1. In what year were most Englishmen labouring in towns?
2. We often believe that the Industrial Revolution happened quickly when in fact it was a gradual process. Why do you think it is often perceived as a rapid change?
3. What were the factors that helped bring about a revolution in trade?
4. By 1750 what was the leading industry for Britain?
5. How did merchants control clothmaking?
6. What impact did new production methods have on trade?
7. How did British trade impact the transport industry?
8. What conditions lead to the development of railways?
9. Why did the population of Britain increase rapidly after the middle of the 18th century?
10. Who held the vast majority of factory jobs by 1816?
11. Who were the Industrial Capitalists?
12. What does the term Laissez-faire mean?
13. What problems did the laissez-fair rule cause for workers?
14. What problems did children face in the Industrial Revolution?
15. What was the importance of labour unions?
16. What is the period after 1860 known as?
17. What new industries were founded as a result of scientific advancements?
18. Where did the system of electric lighting originate?
19. Who were the first multinational companies?
20. What communications tools assisted manager in the running of large businesses?
21. Who invented the assembly line production method and how was is useful?
22. By the outbreak of WW1, which nations were considered the most industrialised?