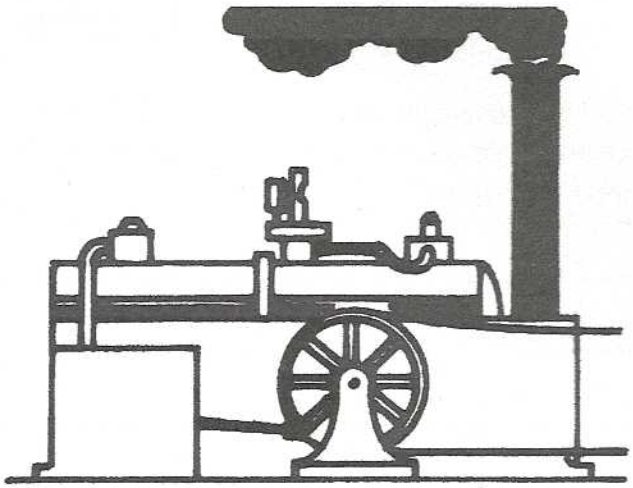
THE FIRST IMPORTANT INVENTIONS



Steam Engine

The cottage industry system had developed over a course of many centuries. Although minor improvements were made to speed up the process of making yarn and cloth, the procedures remained fundamentally the same until the mid-1700s. Then several English inventors produced devices that increased production but also brought about the demise of cottage industry.

The most time-consuming part of producing cloth was the spinning of the cotton into yarn. In 1700 it took approximately ten spinners to produce enough yarn to keep one weaver busy at her loom. In 1733 John Kay invented the "flying shuttle," a device that sped up the production of the weavers. This made the imbalance between spinning and weaving even greater. For years, people searched for ways to speed up the process of spinning yarn. In 1764 James Hargreaves invented a hand-operated device he called the "jenny." It allowed one person to spin eight threads at once; further improvements increased that number to as many as eighty threads. This was a great improvement, but it did not fundamentally change the nature of production. The device was still operated by hand and used in the peasant cottages.

It only took four more years for Hargreaves' invention to be dramatically improved upon. Richard Arkwright used many of the same ideas behind the "jenny" in his invention called the "water frame." As the name indicates, the machine was powered by water. Spinning mills, powered by waterwheels, were set up next to streams. Samuel Crompton further improved upon the water frame in 1787 when he invented a spinning machine called the "mule." It was powered by James Watt's newly perfected steam engine. These inventions were too large and required too much power to be practical in cottage homes. Therefore, cottage industry began to decline. The city of Manchester, England, became the center of textile production when there was a boom in factory construction there at the end of the eighteenth century. In 1782 Manchester had two factories, but by 1802 there were more than fifty, easily making Manchester the largest producer of textiles in the world. After 1820, weaving sheds that used Edmund Cartwright's power loom were often added to the spinning mills, bringing the entire process of fabric manufacturing to one location.

It was James Watt's perfection of the steam engine that provided the power to run the factories. Primitive and inefficient steam-powered engines had been used to pump water from coal mines for several decades, but Watt produced the first steam engine that was powerful and efficient enough to be used to provide power for industry. The invention of the steam engine allowed factories to end their dependence on the waterwheel and, thus, ended the need to be located next to streams or rivers. The steam engine was fueled by coal, making coal an increasingly important resource. It was difficult to transport large amounts of coal, so now it was important that factories be located near a cheap supply of coal.

The idea of textile factories soon spread beyond England to France, Belgium, Germany, and the United States as businessmen saw the advantages of factory production. Cottage industry was soon unable to compete with the factories. The Industrial Revolution had begun.

(1)

Name _____ Date _____

CHALLENGES

1. What was the most time-consuming part of textile production?

2. James Hargreaves' "jenny" was one of the first inventions we discussed. How did it improve the spinning process?

3. Richard Arkwright and Samuel Crompton also invented spinning machines. What were the machines called?

4. What English city became the center of textile production?

5. What two sources of power were used to run a textile factory's machines?

6. Where were primitive forms of the steam engine used before James Watt perfected it?

7. What fuel was used to run the steam engines?

8. Name three of the countries that followed England's use of factories.

9. How did Watt's steam engine change the way factory locations were selected?

2

THE TEXTILE INDUSTRY

With the growth of the factory system, England experienced a huge increase in textile production. In the past, production had taken place in the cottages of the country. By the late 1700s new factories were being built in northern England that employed thousands of workers. The small factory towns grew into cities almost overnight.

Workers lived in overcrowded, poorly planned neighborhoods.

England's new factory cities were dominated by the economic activity surrounding the textile mills. The new cities were poorly planned due to their rapid growth and soon became heavily polluted. They lacked sewers, paved streets, and safe water supplies. Workers lived in poorly constructed shacks in the crowded slums that grew up next to the factories. Of the new cities, Manchester was the largest and most important. Its population grew from 25,000 in 1770 to 450,000 in 1850. For a century, the city of Manchester was the leading producer of textile products.

The cities' populations were clearly divided into two new social groups: the mill owners and the workers. The mill owners were hard-working, aggressive men who were able to turn small investments into fortunes. They were often ruthless in their pursuit of profits. Unfortunately, most of them cared little about their workers, who lived in poverty. The mill owners became the wealthiest and most powerful people in the new industrial cities. The workers, however, made up the majority of the population. They often owned almost nothing other than the value of their labor. They lived in the worst sections of the city and constantly struggled to make enough money to survive. They often worked 14 or 16 hours a day in the textile mills for very low wages. Conditions in the mills were unhealthy. The air was filled with dust from the cotton, and the temperature was extremely hot in the summer and very cold in the winter. Accidents often occurred when exhausted workers fell asleep at their machines.

International trade was very important to the success of the factory system. The production of clothing and other cotton items increased dramatically with the use of the new machines. The English people bought much of the clothing that was produced, but didn't need all of it. Manufacturers needed new markets for their cotton goods. For many years, England had traded its products with other nations, and with the growth of the factory system, England's trade increased substantially. A large portion of England's textile production went to China, India, Africa, and other parts of the world that had not begun to industrialize.

England also needed to broaden its trade to insure sources of cotton. English farmers could not grow cotton because of the cold climate, so it had to be imported from other countries. At first most of the cotton came from the West Indian Islands, a colony of England. After 1800 more and more cotton came from the slave plantations of the southern United States. By 1840 England obtained three-fourths of its cotton from the United States.

Industrial cities grew in other European countries soon after they appeared in England. France, Belgium, and Germany soon saw their cities develop many of the same characteristics that Manchester had. However, none of these cities ever approached the level of production or degree of poverty for which Manchester was famous.

3

Name_____ Date_____

CHALLENGES

1. Why were the new factory cities poorly planned?

2. What were some characteristics of the new cities?

3. What two new social groups populated the growing cities?

4. What were some characteristics of the mill owners?

5. Describe working conditions in the factory.

6. Why was international trade important to the factory cities?

7. Name one of the places mentioned where England sold large portions of its textile production.

8. From where did England import three-fourths of its cotton by 1840?

9. What English city became the center of textile industry?

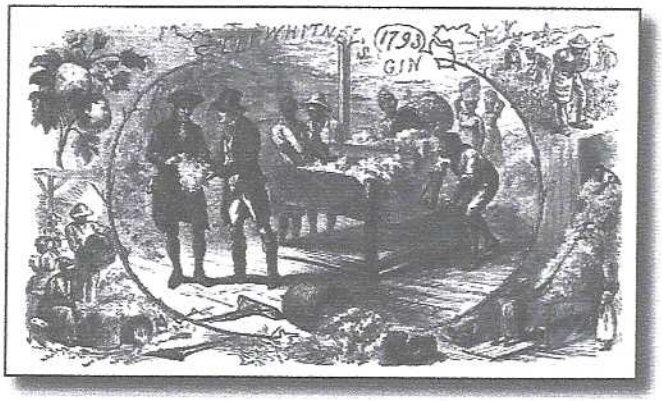
10. Why did England have to import its raw cotton from other nations?

4

Name: _____ Date: _____

Eli Whitney's Cotton Gin

Eli Whitney learned about the problems of **ginning**, or cleaning, cotton while he was visiting an estate in Georgia. The kind of cotton that grew well in the South was called green seed cotton. The seed of this kind of cotton was almost impossible to separate from the cotton fibers. A slave could only clean one pound of green seed cotton a day.



Plantation owners wanted to find a way to **export**, or send, the cleaned cotton to textile mills in England so that they could make a profit. Inventors had already invented gins to separate the cotton fibers from the seed of the plant. However, those machines were not effective because the seed of the green seed cotton plant clung so tightly to the cotton fibers.

In 1793, Eli Whitney invented a cotton gin that cleaned the cotton much more quickly and much better. As a result, growing cotton soon became profitable. Plantation owners wanted *more* slaves so they could grow even more cotton. Both young and old people who were not strong enough to work at other types of jobs started to work ginning cotton. People paid their debts, and land increased in value. Factories in the North started to use the cotton to make cloth. The shipping industry grew as well.

Cause and Effect

Directions: A **cause** is an event that produces a result. An **effect** is the result produced. Write five effects for the cause listed below.

Cause: Eli Whitney invents the cotton gin.

Effect #1 _____

_____

Effect #2 _____

_____

Effect #3 _____

_____

Effect #4 _____

_____

Effect #5 _____

_____

Name: _____ Date: _____

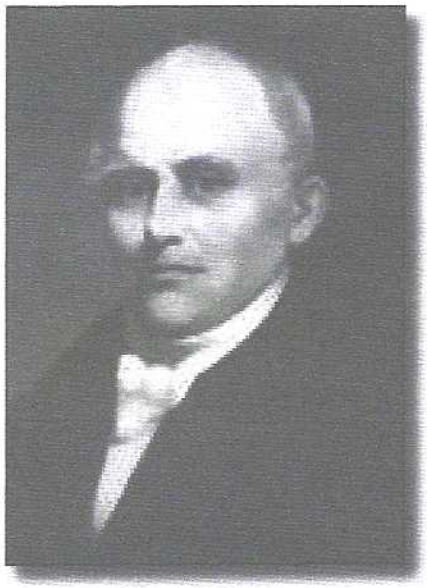
Early American Factories

In 1793, **Samuel Slater** built the first real American **textile** mill in Pawtucket, Rhode Island. In a sense, he began the American Industrial Revolution. Slater put several of the processes that were needed to make textiles into one factory. He used a single waterwheel system to power all the machines.

Almost all of the 30 employees in Samuel Slater's mill were children. He employed children who were seven to 12 years old to work in his mill. The textile machines were easy to operate, so the children did not need any special skills to run them. In those days, children were already working long hours on their family farms, so no one objected to their working in a mill. Soon other factories started, and more than half of the workers in Rhode Island were children.

The children worked alongside adults in terrible conditions. They started working before sunrise and finished after sunset. An overseer supervised them and often used **corporal punishment**.

The mills were always dirty and noisy. In winter, the mills were cold and drafty; in summer, they were hot and humid. Many people developed **respiratory diseases** because of breathing flying lint particles. Although the machines were easy to operate, they were dangerous. If a child was tired or sleepy, he or she could easily lose a finger, an arm, and sometimes, even a scalp!



Samuel Slater

The children lived in housing that Slater built for them. Then he made them buy everything they needed at his company store. Instead of giving them money for their work, he gave them **credits** to use at his store. He tried to control every part their lives. He controlled how long the children worked and how much money they made. He also built churches and schools near his mill. He made sure that the schools taught what he wanted the children to learn.

Back then, only wealthy children had formal schooling. The children who worked in the mills studied basic reading, writing, and arithmetic at Sunday school on their only day off from the mill.

Name: _____ Date: _____

Early American Factories (cont.)

Directions: Complete the following activities.

Matching

_____ 1.	corporal punishment	a. given in place of money
_____ 2.	respiratory	b. having to do with breathing
_____ 3.	textile	c. cloth
_____ 4.	Samuel Slater	d. began the American Industrial Revolution
_____ 5.	credits	e. infliction of physical pain as a method of changing behavior

Fill in the Blanks

1. _____ _____ built the first real American textile mill.
2. Almost all of the 30 employees in Samuel Slater's mill were _____.
3. The children who worked in the mills studied basic reading, writing, and arithmetic on their only _____ off from the mill.
4. Children started working before _____ and finished after _____.
5. Samuel Slater used a single _____ system to power all the machines.

True or False

Circle "T" for True or "F" for False.

1. T F Slater's textile mill was a safe place for children to work.
2. T F The textile machines were easy to operate.
3. T F Samuel Slater built the first real American textile mill in Pawtucket, New York.
4. T F Many people developed respiratory diseases working in the mill because of breathing in flying lint particles.
5. T F No one objected to children working in Slater's mill.

Constructed Response

The mill was a dangerous place for children to work. Why didn't anyone object to children working there? Give specific details or examples to support your answer.

_____

_____

_____

_____

_____

7

WOMEN IN THE INDUSTRIAL REVOLUTION

The textile industry hired many women workers because they could pay women less than men.

The Industrial Revolution transformed women's lives as well as men's. Scholars have long debated whether the Industrial Revolution helped to emancipate women from domination by men, or merely continued their exploitation in different ways. There is no doubt, however, that the rise of factories caused women's work roles to change dramatically.

Before the Industrial Revolution, most people lived in rural areas and farmed the land. Traditionally women worked alongside their husbands in the fields and also did their household chores. Families worked as units for a common income. Women and children worked under the direction of their husbands or fathers.

The Industrial Revolution changed the way in which families earned their livings. Factory work offered women new job possibilities. The 1851 census showed that women made up about 30 percent of England's work force. Many women still worked on the farm or as maids and cooks, but factory work employed two out of five women. Women in factories earned wages independent of their families,and this gave them a new-found freedom. However, women still found themselves under the direction of men, because mill owners and factory supervisors were almost always men. Prevailing attitudes about women's work remained. Women were believed to be mentally and physically incapable of performing certain kinds of work, and they were usually paid less than men.

Because of these prejudices, women were channeled into certain types of work. Half of the workers in textile mills were women, but there were extremely few women who worked in building construction or the steelmaking industry. The textile industry hired women because large numbers of unskilled laborers were needed to produce the fabric. Mill owners preferred to hire women for some jobs. Women could do the work as well as men, but the mill owners could get by with paying them less money. Also, as child labor became less common at the end of the 1800s, women filled more jobs in the textile mills that had previously been done by children.

Even within the textile industry, women were discriminated against. They typically held only the lowest skilled jobs. Positions of responsibility and authority were usually reserved for men. Because women often stopped working after they married, many men felt that there was no reason to train women for skilled jobs since they were normally short-term employees. Other men were simply prejudiced and believed that women were incapable of performing skilled jobs.

Clearly, the Industrial Revolution offered women new opportunities. Yet, due to prevailing attitudes, many of the opportunities open to men were still not open to women, and they had little opportunity to advance beyond the most menial jobs. However, the idea of women earning their own money became acceptable. Opinions regarding women workers gradually changed. In time, women came to be regarded as equally capable and qualified for important and difficult jobs.

8

Name_____ Date_____

CHALLENGES

1. What types of work did women perform before the Industrial Revolution?

2. How did factory work give women new opportunities?

3. In what industry did most women work?

4. How did laws limiting child labor affect women's job opportunities?

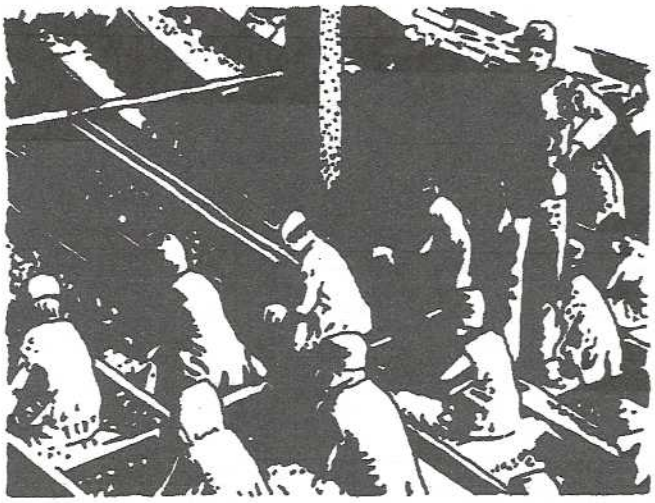
5. Why did factory managers prefer women for some jobs?

6. List two ways that women were discriminated against in the factories.

7. What were the prevailing attitudes during the Industrial Revolution regarding the ability of women to perform skilled work?

8. How did these attitudes change?

CHILD LABOR: ABUSES AND REFORMS



"Breaker boys" worked in coal mines sorting coal for very little pay.

Long before the Industrial Revolution, children were expected to work. Under the direction of their parents, young children worked in the fields, in the house, and in cottage industries. By doing this they added to the family income and acquired the skills necessary to support themselves when they got older. Many children, upon reaching the age of 12 or 13, were apprenticed to craftsmen and learned the skills of a blacksmith, carpenter, bricklayer, or some other trade.

The Industrial Revolution changed this system. As children entered the factories and mines, parental supervision was replaced by the discipline of the foremen, and instead of learning skills through an apprenticeship, children learned only the tedious tasks of operating factory machines.

The demand for unskilled factory workers was high, and child labor met the factories' needs. Children could work for a smaller salary. They were preferred for some jobs in textile mills because their small fingers could better manipulate the cotton threads. In the early days of the factory system, children often worked alongside their parents in the textile mills, because mill owners hired entire families. As the factory evolved, families were routinely broken up, and children worked under the direction of a company overseer. Factory owners often "apprenticed" large numbers of children from orphanages, turning them into virtual slaves who lived only to work at the machines. Impoverished parents were often forced to send their children to work in the factories and mines.

The lives of the child workers were very difficult. Often as young as six years old, they started work as early as five in the morning and worked late into the night. Many of the jobs they performed were dangerous, especially those in coal mines. Their health was poor due to their working conditions and inadequate diet. Foremen often beat them if they worked too slowly. They received no education and learned no skills that gave them hope of employment beyond the factory.

Abolishing the abuses of child labor proved to be difficult. England particularly struggled with the issue. The textile industry used vast numbers of child laborers and was an important part of the English economy. Many political leaders did not believe that it was the job of government to regulate industry. The English Parliament examined child labor in the 1830s and finally passed a number of acts to eliminate the worst abuses over the next decades. The laws limited the working hours and raised the wages of children, as well as prohibited them from performing the most dangerous jobs.

The United States industrialized later than England, but also came to depend on child labor. The 1870 census reported 750,000 workers under the age of 15; that number increased dramatically over the next 30 years. Individual states had passed laws regulating child labor early in the 1800s, but it was clear that national laws were needed. Ministers, doctors, and educators pushed for its abolition. Finally in 1938 the Fair Labor Standards Act prohibited the employment of children under 14 years old and limited the types of jobs that they could perform. This act effectively ended the worst abuses of child labor in the United States.

Name_____ Date_____

CHALLENGES

1. Before the Industrial Revolution, children were often apprenticed to craftsmen. What does an apprentice do?

2. Why did the factory owners hire children?

3. Describe life in the factories or mines for a typical child worker.

4. Why did England find it difficult to abolish child labor?

5. What types of children were usually "apprenticed" by the factory owners?

6. What did English laws regulating child labor try to accomplish?

7. What groups of people led the fight against child labor in the United States?

8. In 1938 America finally passed effective legislation regulating child labor. What was the law called?