

Building Industrial America on the Backs of Labor

The growth of the American economy in the last half of the nineteenth century presented a paradox. The standard of living for many American workers increased. As Carnegie said in *The Gospel of Wealth*, “the poor enjoy what the rich could not before afford. What were the luxuries have become the necessities of life. The laborer has now more comforts than the landlord had a few generations ago.” In many ways, Carnegie was correct. The decline in prices and the cost of living meant that the industrial era offered many Americans relatively better lives in 1900 than they had only decades before. For some Americans, there were also increased opportunities for upward mobility. For the multitudes in the working class, however, conditions in the factories and at home remained deplorable. The difficulties they faced led many workers to question an industrial order in which a handful of wealthy Americans built their fortunes on the backs of workers.

WORKING-CLASS LIFE

Between the end of the Civil War and the turn of the century, the American workforce underwent a transformative shift. In 1865, nearly 60 percent of Americans still lived and worked on farms; by the early 1900s, that number had reversed itself, and only 40 percent still lived in rural areas, with the remainder living and working in urban and early suburban areas. A significant number of these urban and suburban dwellers earned their wages in factories. Advances in farm machinery allowed for greater production with less manual labor, thus leading many Americans to seek job opportunities in the burgeoning factories in the cities. Not surprisingly, there was a concurrent trend of a decrease in American workers being self-employed and an increase of those working for others and being dependent on a factory wage system for their living.

Yet factory wages were, for the most part, very low. In 1900, the average factory wage was approximately twenty cents per hour, for an annual salary of barely six hundred

dollars. According to some historical estimates, that wage left approximately 20 percent of the population in industrialized cities at, or below, the poverty level. An average factory work week was sixty hours, ten hours per day, six days per week, although in steel mills, the workers put in twelve hours per day, seven days a week. Factory owners had little concern for workers' safety. According to one of the few available accurate measures, as late as 1913, nearly 25,000 Americans lost their lives on the job, while another 700,000 workers suffered from injuries that resulted in at least one missed month of work. Another element of hardship for workers was the increasingly dehumanizing nature of their work. Factory workers executed repetitive tasks throughout the long hours of their shifts, seldom interacting with coworkers or supervisors. This solitary and repetitive work style was a difficult adjustment for those used to more collaborative and skill-based work, whether on farms or in crafts shops. Managers embraced Fredrick Taylor's principles of scientific management, also called "stop-watch management," where he used stop-watch studies to divide manufacturing tasks into short, repetitive segments. A mechanical engineer by training, Taylor encouraged factory owners to seek efficiency and profitability over any benefits of personal interaction. Owners adopted this model, effectively making workers cogs in a well-oiled machine.

One result of the new breakdown of work processes was that factory owners were able to hire women and children to perform many of the tasks. From 1870 through 1900, the number of women working outside the home tripled. By the end of this period, five million American women were wage earners, with one-quarter of them working factory jobs. Most were young, under twenty-five, and either immigrants themselves or the daughters of immigrants. Their foray into the working world was not seen as a step towards empowerment or equality, but rather a hardship born of financial necessity. Women's factory work tended to be in clothing or textile factories, where their appearance was less offensive to men who felt that heavy industry was their purview. Other women in the workforce worked in clerical positions as bookkeepers and secretaries, and as salesclerks. Not surprisingly, women were paid less than men, under the pretense that they should be under the care of a man and did not require a living wage.

Factory owners used the same rationale for the exceedingly low wages they paid to children. Children were small enough to fit easily among the machines and could be hired for simple work for a fraction of an adult man's pay. The image below ([Figure](#)) shows children working the night shift in a glass factory. From 1870 through 1900, child labor in factories tripled. Growing concerns among progressive reformers over the safety of women and children in the workplace would eventually result in the development of political lobby groups. Several states passed legislative efforts to ensure a safe workplace, and the lobby groups pressured Congress to pass protective legislation. However, such legislation would not be forthcoming until well into the twentieth century. In the meantime, many working-class immigrants still desired the additional wages that child and women labor produced, regardless of the harsh working conditions.



A PHOTOGRAPHER TOOK THIS IMAGE OF CHILDREN WORKING IN A NEW YORK GLASS FACTORY AT MIDNIGHT. THERE, AS IN COUNTLESS OTHER FACTORIES AROUND THE COUNTRY, CHILDREN WORKED AROUND THE CLOCK IN DIFFICULT AND DANGEROUS CONDITIONS.

WORKER PROTESTS AND VIOLENCE

Workers were well aware of the vast discrepancy between their lives and the wealth of the factory owners. Lacking the assets and legal protection needed to organize, and deeply frustrated, some working communities erupted in spontaneous violence. The coal mines of eastern Pennsylvania and the railroad yards of western Pennsylvania, central to both respective industries and home to large, immigrant, working enclaves, saw the brunt of these outbursts. The combination of violence, along with several other factors, blunted any significant efforts to organize workers until well into the twentieth century.

Business owners viewed organization efforts with great mistrust, capitalizing upon widespread anti-union sentiment among the general public to crush unions through open shops, the use of strikebreakers, yellow-dog contracts (in which the employee agrees to not join a union as a pre-condition of employment), and other means. Workers also faced obstacles to organization associated with race and ethnicity, as questions arose on how to address the increasing number of low-paid African American workers, in addition to the language and cultural barriers introduced by the large wave of southeastern European immigration to the United States. But in large part, the greatest obstacle to effective unionization was the general public's continued belief in a strong work ethic and that an individual work ethic—not organizing into radical collectives—would reap its own rewards. As violence erupted, such events seemed only to confirm widespread popular sentiment that radical, un-American elements were behind all union efforts.

In the 1870s, Irish coal miners in eastern Pennsylvania formed a secret organization known as the Molly Maguires, named for the famous Irish patriot. Through a series of scare tactics that included kidnappings, beatings, and even murder, the Molly Maguires sought to bring attention to the miners' plight, as well as to cause enough damage and concern to the mine owners that the owners would pay attention to their concerns. Owners paid attention, but not in the way that the protesters had hoped. They hired detectives to pose as miners and mingle among the workers to obtain the names of the

Molly Maguires. By 1875, they had acquired the names of twenty-four suspected Maguires, who were subsequently convicted of murder and violence against property. All were convicted and ten were hanged in 1876, at a public “Day of the Rope.” This harsh reprisal quickly crushed the remaining Molly Maguires movement. The only substantial gain the workers had from this episode was the knowledge that, lacking labor organization, sporadic violent protest would be met by escalated violence.

Public opinion was not sympathetic towards labor’s violent methods as displayed by the Molly Maguires. But the public was further shocked by some of the harsh practices employed by government agents to crush the labor movement, as seen the following year in the Great Railroad Strike of 1877. After incurring a significant pay cut earlier that year, railroad workers in West Virginia spontaneously went on strike and blocked the tracks ([Figure](#)). As word spread of the event, railroad workers across the country joined in sympathy, leaving their jobs and committing acts of vandalism to show their



THIS ENGRAVING OF THE “BLOCKADE OF ENGINES AT MARTINSBURG, WEST VIRGINIA” APPEARED ON THE FRONT COVER OF *HARPER’S WEEKLY* ON AUGUST 11, 1877, WHILE THE GREAT RAILROAD STRIKE WAS STILL UNDERWAY.

frustration with the ownership. Local citizens, who in many instances were relatives and friends, were largely sympathetic to the railroad workers' demands.

The most significant violent outbreak of the railroad strike occurred in Pittsburgh, beginning on July 19. The governor ordered militiamen from Philadelphia to the Pittsburgh roundhouse to protect railroad property. The militia opened fire to disperse the angry crowd and killed twenty individuals while wounding another twenty-nine. A riot erupted, resulting in twenty-four hours of looting, violence, fire, and mayhem, and did not die down until the rioters wore out in the hot summer weather. In a subsequent skirmish with strikers while trying to escape the roundhouse, militiamen killed another twenty individuals. Violence erupted in Maryland and Illinois as well, and President Hayes eventually sent federal troops into major cities to restore order. This move, along with the impending return of cooler weather that brought with it the need for food and fuel, resulted in striking workers nationwide returning to the railroad. The strike had lasted for forty-five days, and they had gained nothing but a reputation for violence and aggression that left the public less sympathetic than ever. Dissatisfied laborers began to realize that there would be no substantial improvement in their quality of life until they found a way to better organize themselves.

WORKER ORGANIZATION AND THE STRUGGLES OF UNIONS

Prior to the Civil War, there were limited efforts to create an organized labor movement on any large scale. With the majority of workers in the country working independently in rural settings, the idea of organized labor was not largely understood. But, as economic conditions changed, people became more aware of the inequities facing factory wage workers. By the early 1880s, even farmers began to fully recognize the strength of unity behind a common cause.

Models of Organizing: The Knights of Labor and American Federation of Labor

In 1866, seventy-seven delegates representing a variety of different occupations met in Baltimore to form the National Labor Union (NLU). The NLU had ambitious ideas about

equal rights for African Americans and women, currency reform, and a legally mandated eight-hour workday. The organization was successful in convincing Congress to adopt the eight-hour workday for federal employees, but their reach did not progress much further. The Panic of 1873 and the economic recession that followed as a result of overspeculation on railroads and the subsequent closing of several banks—during which workers actively sought any employment regardless of the conditions or wages—as well as the death of the NLU's founder, led to a decline in their efforts.

A combination of factors contributed to the debilitating Panic of 1873, which triggered what the public referred to at the time as the “Great Depression” of the 1870s. Most notably, the railroad boom that had occurred from 1840 to 1870 was rapidly coming to a close. Overinvestment in the industry had extended many investors' capital resources in the form of railroad bonds. However, when several economic developments in Europe affected the value of silver in America, which in turn led to a de facto gold standard that shrunk the U.S. monetary supply, the amount of cash capital available for railroad investments rapidly declined. Several large business enterprises were left holding their wealth in all but worthless railroad bonds. When Jay Cooke & Company, a leader in the American banking industry, declared bankruptcy on the eve of their plans to finance the construction of a new transcontinental railroad, the panic truly began. A chain reaction of bank failures culminated with the New York Stock Exchange suspending all trading for ten days at the end of September 1873. Within a year, over one hundred railroad enterprises had failed; within two years, nearly twenty thousand businesses had failed. The loss of jobs and wages sent workers throughout the United States seeking solutions and clamoring for scapegoats.

Although the NLU proved to be the wrong effort at the wrong time, in the wake of the Panic of 1873 and the subsequent frustration exhibited in the failed Molly Maguires uprising and the national railroad strike, another, more significant, labor organization emerged. The Knights of Labor (KOL) was more able to attract a sympathetic following than the Molly Maguires and others by widening its base and appealing to more members. Philadelphia tailor Uriah Stephens grew the KOL from a small presence

during the Panic of 1873 to an organization of national importance by 1878. That was the year the KOL held their first general assembly, where they adopted a broad reform platform, including a renewed call for an eight-hour workday, equal pay regardless of gender, the elimination of convict labor, and the creation of greater cooperative enterprises with worker ownership of businesses. Much of the KOL's strength came from its concept of "One Big Union"—the idea that it welcomed all wage workers, regardless of occupation, with the exception of doctors, lawyers, and bankers. It welcomed women, African Americans, Native Americans, and immigrants, of all trades and skill levels. This was a notable break from the earlier tradition of craft unions, which were highly specialized and limited to a particular group. In 1879, a new leader, Terence V. Powderly, joined the organization, and he gained even more followers due to his marketing and promotional efforts. Although largely opposed to strikes as effective tactics, through their sheer size, the Knights claimed victories in several railroad strikes in 1884–1885, including one against notorious "robber baron" Jay Gould, and their popularity consequently rose among workers. By 1886, the KOL had a membership in excess of 700,000.

In one night, however, the KOL's popularity—and indeed the momentum of the labor movement as a whole—plummeted due to an event known as the Haymarket affair, which occurred on May 4, 1886, in Chicago's Haymarket Square ([Figure](#)). There, an anarchist group had gathered in response to a death at an earlier nationwide demonstration for the eight-hour workday. At the earlier demonstration, clashes between police and strikers at the International Harvester Company of Chicago led to the death of a striking worker. The anarchist group decided to hold a protest the following night in Haymarket Square, and, although the protest was quiet, the police arrived armed for conflict. Someone in the crowd threw a bomb at the police, killing one officer and injuring another. The seven anarchists speaking at the protest were arrested and charged with murder. They were sentenced to death, though two were later pardoned and one committed suicide in prison before his execution.

The press immediately blamed the KOL as well as Powderly for the Haymarket affair, despite the fact that neither the organization nor Powderly had anything to do with the



THE HAYMARKET AFFAIR, AS IT WAS KNOWN, BEGAN AS A RALLY FOR THE EIGHT-HOUR WORKDAY. BUT WHEN POLICE BROKE IT UP, SOMEONE THREW A BOMB INTO THE CROWD, CAUSING MAYHEM. THE ORGANIZERS OF THE RALLY, ALTHOUGH NOT RESPONSIBLE, WERE SENTENCED TO DEATH. THE AFFAIR AND SUBSEQUENT HANGINGS STRUCK A HARSH BLOW AGAINST ORGANIZED LABOR.

demonstration. Combined with the American public's lukewarm reception to organized labor as a whole, the damage was done. The KOL saw its membership decline to barely 100,000 by the end of 1886. Nonetheless, during its brief success, the Knights illustrated the potential for success with their model of "industrial unionism," which welcomed workers from all trades.

The Haymarket Rally

On May 1, 1886, recognized internationally as a day for labor celebration, labor organizations around the country engaged in a national rally for the eight-hour workday. While the number of striking workers varied around the country, estimates are that between 300,000 and 500,000 workers protested in New York, Detroit, Chicago, and beyond. In Chicago, clashes between police and protesters led the police to fire into

the crowd, resulting in fatalities. Afterward, angry at the deaths of the striking workers, organizers quickly organized a “mass meeting,” per the poster below (Figure).

While the meeting was intended to be peaceful, a large police presence made itself known, prompting one of the event organizers to state in his speech, “There seems to prevail the opinion in some quarters that this meeting has been called for the purpose of inaugurating a riot, hence these warlike preparations on the part of so-called ‘law and order.’ However, let me tell you at the beginning that this meeting has not been called for any such purpose. The object of this meeting is to explain the general situation of the eight-hour movement and to throw light upon various incidents in connection with it.” The mayor of Chicago later corroborated accounts of the meeting, noted that it was a peaceful rally, but as it was winding down, the

police marched into the crowd, demanding they disperse. Someone in the crowd threw a bomb, killing one policeman immediately and wounding many others, some of whom died later. Despite the aggressive actions of the police, public opinion was strongly against the striking laborers. The *New York Times*, after the events played out, reported



THIS POSTER INVITED WORKERS TO A MEETING DENOUNCING THE VIOLENCE AT THE LABOR RALLY EARLIER IN THE WEEK. NOTE THAT THE INVITATION IS WRITTEN IN BOTH ENGLISH AND GERMAN, EVIDENCE OF THE LARGE ROLE THAT THE IMMIGRANT POPULATION PLAYED IN THE LABOR MOVEMENT.

on it with the headline “Rioting and Bloodshed in the Streets of Chicago: Police Mowed Down with Dynamite.” Other papers echoed the tone and often exaggerated the chaos, undermining organized labor’s efforts and leading to the ultimate conviction and hanging of the rally organizers. Labor activists considered those hanged after the Haymarket affair to be martyrs for the cause and created an informal memorial at their gravesides in Park Forest, Illinois.

During the effort to establish industrial unionism in the form of the KOL, craft unions had continued to operate. In 1886, twenty different craft unions met to organize a national federation of autonomous craft unions. This group became the American Federation of Labor (AFL), led by Samuel Gompers from its inception until his death in 1924. More so than any of its predecessors, the AFL focused almost all of its efforts on economic gains for its members, seldom straying into political issues other than those that had a direct impact upon working conditions. The AFL also kept a strict policy of not interfering in each union’s individual business. Rather, Gompers often settled disputes between unions, using the AFL to represent all unions of matters of federal legislation that could affect all workers, such as the eight-hour workday.

By 1900, the AFL had 500,000 members; by 1914, its numbers had risen to one million, and by 1920 they claimed four million working members. Still, as a federation of craft unions, it excluded many factory workers and thus, even at its height, represented only 15 percent of the nonfarm workers in the country. As a result, even as the country moved towards an increasingly industrial age, the majority of American workers still lacked support, protection from ownership, and access to upward mobility.

The Decline of Labor: The Homestead and Pullman Strikes

While workers struggled to find the right organizational structure to support a union movement in a society that was highly critical of such worker organization, there came two final violent events at the close of the nineteenth century. These events, the Homestead Steel Strike of 1892 and the Pullman Strike of 1894, all but crushed the labor movement for the next forty years, leaving public opinion of labor strikes lower than ever and workers unprotected.

At the Homestead factory of the Carnegie Steel Company, workers represented by the Amalgamated Association of Iron and Steel Workers enjoyed relatively good relations with management until Henry C. Frick became the factory manager in 1889. When the union contract was up for renewal in 1892, Carnegie—long a champion of living wages for his employees—had left for Scotland and trusted Frick—noted for his strong anti-union stance—to manage the negotiations. When no settlement was reached by June 29, Frick ordered a lockout of the workers and hired three hundred Pinkerton detectives to protect company property. On July 6, as the Pinkertons arrived on barges on the river, union workers along the shore engaged them in a gunfight that resulted in the deaths of three Pinkertons and six workers. One week later, the Pennsylvania militia arrived to escort strike-breakers into the factory to resume production. Although the lockout continued until November, it ended with the union defeated and individual workers asking for their jobs back. A subsequent failed assassination attempt by anarchist Alexander Berkman on Frick further strengthened public animosity towards the union.

Two years later, in 1894, the Pullman Strike was another disaster for unionized labor. The crisis began in the company town of Pullman, Illinois, where Pullman “sleeper” cars were manufactured for America’s railroads. When the depression of 1893 unfolded in the wake of the failure of several northeastern railroad companies, mostly due to overconstruction and poor financing, company owner George Pullman fired three thousand of the factory’s six thousand employees, cut the remaining workers’ wages by an average of 25 percent, and then continued to charge the same high rents and prices in the company homes and store where workers were required to live and shop. Workers began the strike on May 11, when Eugene V. Debs, the president of the American Railway Union, ordered rail workers throughout the country to stop handling any trains that had Pullman cars on them. In practicality, almost all of the trains fell into this category, and, therefore, the strike created a nationwide train stoppage, right on the heels of the depression of 1893. Seeking justification for sending in federal troops, President Grover Cleveland turned to his attorney general, who came up with a solution: Attach a mail car to every train and then send in troops to ensure the delivery of the mail. The government also ordered the strike to end; when Debs refused, he was

arrested and imprisoned for his interference with the delivery of U.S. mail. The image below ([Figure](#)) shows the standoff between federal troops and the workers. The troops protected the hiring of new workers, thus rendering the strike tactic largely ineffective. The strike ended abruptly on July 13, with no labor gains and much lost in the way of public opinion.



IN THIS PHOTO OF THE PULLMAN STRIKE OF 1894, THE ILLINOIS NATIONAL GUARD AND STRIKING WORKERS FACE OFF IN FRONT OF A RAILROAD BUILDING.

George Estes on the Order of Railroad Telegraphers

The following excerpt is a reflection from George Estes, an organizer and member of the Order of Railroad Telegraphers, a labor organization at the end of the nineteenth century. His perspective on the ways that labor and management related to each other illustrates the difficulties at the heart of their negotiations. He notes that, in this era, the two groups saw each other as enemies and that any gain by one was automatically a loss by the other.

I have always noticed that things usually have to get pretty bad before they get any better. When inequities pile up so high that the burden is more than the underdog can bear, he gets his dander up and things begin to happen. It was that way with the telegraphers' problem. These exploited individuals were determined to get for themselves better working conditions—higher pay, shorter hours, less work which might not properly be classed as telegraphy, and the high and mighty Mr. Fillmore [railroad company president] was not going to stop them. It was a bitter fight. At the outset, Mr. Fillmore let it be known, by his actions and comments, that he held the telegraphers in the utmost contempt.

With the papers crammed each day with news of labor strife—and with two great labor factions at each other's throats, I am reminded of a parallel in my own early and more active career. Shortly before the turn of the century, in 1898 and 1899 to be more specific, I occupied a position with regard to a certain class of skilled labor, comparable to that held by the Lewises and Greens of today. I refer, of course, to the telegraphers and station agents. These hard-working gentlemen—servants of the public—had no regular hours, performed a multiplicity of duties, and, considering the service they rendered, were sorely and inadequately paid. A telegrapher's day included a considerable number of chores that present-day telegraphers probably never did or will do in the course of a day's work. He used to clean and fill lanterns, block lights, etc. Used to do the janitor work around the small town depot, stoke the pot-bellied stove of the waiting-room, sweep the floors, picking up papers and waiting-room litter. . . .

Today, capital and labor seem to understand each other better than they did a generation or so ago. Capital is out to make money. So is labor—and each is willing to grant the other a certain amount of tolerant leeway, just so he doesn't go too far. In the old days there was a breach as wide as the Pacific separating capital and labor. It wasn't money altogether in those days, it was a matter of principle. Capital and labor couldn't see eye to eye on a single point. Every gain that either made was at the expense of the other, and was fought tooth and nail. No difference seemed ever possible of amicable settlement. Strikes were riots. Murder and mayhem was common.

Railroad labor troubles were frequent. The railroads, in the nineties, were the country's largest employers. They were so big, so powerful, so perfectly organized themselves—I mean so in accord among themselves as to what treatment they felt like offering the man who worked for them—that it was extremely difficult for labor to gain a single advantage in the struggle for better conditions.

—George Estes, interview with Andrew Sherbert, 1938

Section Summary

After the Civil War, as more and more people crowded into urban areas and joined the ranks of wage earners, the landscape of American labor changed. For the first time, the majority of workers were employed by others in factories and offices in the cities. Factory workers, in particular, suffered from the inequity of their positions. Owners had no legal restrictions on exploiting employees with long hours in dehumanizing and poorly paid work. Women and children were hired for the lowest possible wages, but even men's wages were barely enough upon which to live.

Poor working conditions, combined with few substantial options for relief, led workers to frustration and sporadic acts of protest and violence, acts that rarely, if ever, gained them any lasting, positive effects. Workers realized that change would require organization, and thus began early labor unions that sought to win rights for all workers through political advocacy and owner engagement. Groups like the National Labor Union and Knights of Labor both opened their membership to any and all wage earners, male or female, black or white, regardless of skill. Their approach was a departure from the craft unions of the very early nineteenth century, which were unique to their individual industries. While these organizations gained members for a time, they both ultimately failed when public reaction to violent labor strikes turned opinion against them. The American Federation of Labor, a loose affiliation of different unions, grew in the wake of these universal organizations, although negative publicity impeded their work as well. In all, the century ended with the vast majority of American laborers unrepresented by any collective or union, leaving them vulnerable to the power wielded by factory ownership.

Growth of Manufacturing

American industry grew phenomenally in the first half of the nineteenth century. A series of tariffs enacted by Congress between 1816 and 1828 protected manufacturing, particularly textile milling, from foreign competition. As manufacturing work sites were gradually relocated from the home and small workshop to the factory, the makeup of the labor force changed. The number of artisans and craftsmen declined, and reliance on semiskilled or unskilled workers, including women, to operate machines increased. Just as in agriculture, advances in technology helped boost manufacturing production and increase efficiency. Indeed, the manufacture of such agricultural inventions as the reaper and steel plow became important sectors of the industrial economy.

Technological innovation. Machines for spinning cotton into thread were developed in Great Britain in the eighteenth century, and how they were built and operated were closely guarded secrets. Although the British prohibited the emigration of anyone with a knowledge of their design, Samuel Slater arrived in the United States from England with the plans in his head. In 1790, he established the first American cotton mill in Rhode Island.

“Borrowed” technology aside, Americans made their own inventive contributions to industrial development. Eli Whitney, already famous for the cotton gin, developed machine tools capable of producing parts so precisely that they were interchangeable. Interchangeable parts significantly increased industrial efficiency and cut labor costs. Charles Goodyear developed a process known as vulcanization that made natural rubber stronger (1839). The sewing machine was invented by Elias Howe (1846) and improved on a few years later by Isaac Singer.

Perhaps the most significant American invention of the first half of the nineteenth century was Samuel Morse's electric telegraph, which had its first practical application in 1844. Within twenty years, telegraph lines stretched from coast to coast and ushered in a communications revolution. Combined with improvements in printing, the

telegraph was a boon to journalism. The number of daily newspapers in the United States soared from eight in 1790 to nearly four hundred in 1860, and many sold for just a penny.

The factory system. New England's textile industry led the way in developing new forms of manufacturing. The factory system as it evolved in the Northeast had three characteristics—the breakdown of an item's production into phases, the use of machines in all phases of production, and the division of labor. Division of labor meant that a worker performed the task required by one phase of the production, no longer creating the entire product from start to finish. In 1813, the first factory in which spinning and weaving were performed by power machinery all under one roof was established in Waltham, Massachusetts. In Lowell, which was planned and built as a model factory town in 1822, young women made up the majority of the workforce at the mills. The women lived in dormitories or boarding houses provided by the company and worked twelve hours a day, six days a week. Although the women were paid much less than the men, even when doing comparable work, their wages were enough to give them a measure of independence that their mothers and grandmothers never enjoyed. The young women were not a permanent labor force in the mills, however. Most of them worked for only a few years and were gradually replaced by immigrants, mainly Irish men, in the 1840s and 1850s.

Textile manufacturing was the leading American industry before the Civil War and was concentrated in the Northeast because the region's rivers provided both water power and transportation. The cloth produced in New England mills was turned into shirts, pants, and other articles of clothing in smaller factories in New York and Philadelphia. Proximity to raw materials influenced industrial development in other parts of the country. For example, Pittsburgh was a center of the iron industry because it was close to both ore and coal fields, while Cincinnati was an early hub for meatpacking in agricultural Ohio.

The development of the factory system produced tensions. Craftsmen were threatened by manufacturing's increasing reliance on machines and cheap labor, so they began to form trade unions and political parties in the 1830s to protect their interests. Although

initially antagonistic toward unskilled workers, the craftsmen often discovered that they were on common ground over such issues as hours, wages, and working conditions. The first general strike in the United States took place in Philadelphia in 1835, when artisans joined with coal heavers to support the ten-hour workday. A shorter workday was the principal demand of the early trade unions, and most industries accepted it by the 1860s, with the exception of the New England textile mills.

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Industrial Revolution Timeline

Rebecca Beatrice Brooks March 16, 2018 1 Comment
on Industrial Revolution Timeline

The time period of the [industrial revolution](#) was 1750 to 1914. The industrial revolution occurred in two distinct phases: the first industrial revolution, between 1750 and 1850, and the second industrial revolution, between 1850 and 1914.

Furthermore, the industrial revolution originated in Great Britain and spread across the world in three waves:

The first wave occurred in Great Britain, France, Belgium, the German states and the United States during the late 1700s and the early 1800s. The second wave occurred in Spain, Portugal, Austria-Hungary, Italy and the Ottoman Empire in the late 1800s. The third wave occurred in Asia, Africa and Latin America in the early 1900s.

The following is a timeline and list of important dates of the industrial revolution:

1712:

- Thomas Newcomen invents the first productive steam engine.

1719:

- John Lombe opens the first silk throwing factory in Great Britain in Derby.

1733:

- James Kay invents a simple weaving machine called the Flying Shuttle.

1750

- 1st Industrial Revolution begins (goods made by hand to goods made by machine)

1755:

- Professor William Cullen designs a small refrigerator machine at the University of Glasgow.

1764:

- James Hargreaves invents the Spinning Jenny, which allows workers to produce multiple spools of thread at the same time.

1769:

- James Watt patents his revision of the steam engine, which features a separate condenser.

1779:

- Samuel Crompton invents the spinning mule, which combines spinning and weaving into one machine.

1785:

- Edmund Cartwright invents the power loom, which replaces the flying shuttle.
- Henry Cort invents iron refining techniques.

1787:

- Beverly Cotton Manufactory, the first cotton mill in America, opens in Beverly Massachusetts and is powered by horses.

1790:

- On December 20, 1790, Samuel Slater opens his first textile mill in Rhode Island, which is the first American factory to successfully produce cotton yarn using water-powered machines.

1793:

- Eli Whitney invents the cotton gin which greatly increases the production of cotton.

1799:

- Combination Acts makes it illegal in Great Britain for workers to unionize in order to bargain for higher pay or better working conditions.

1801:

- On December 24, 1801, Richard Trevithick test drives the world's first steam-powered locomotive, called the "Puffing Devil" or "Puffer" on the streets of Camborne, England.

1802:

- An American farmer, Thomas Moore, invents the first wooden ice box.
- On March 24, 1802, Richard Trevithick patents his steam-powered locomotive called the "Puffer Devil."

1805:

- American inventor Oliver Evans designs the first refrigeration machine that uses vapor instead of liquid to cool but never builds it.

1807:

- Robert Fulton opens the first public steamboat service in America on the Hudson River in New York.
- Embargo Act of 1807 in the United States cuts off imports from Great Britain, forcing American merchants to increase the amount of goods they manufacture.

1811:

- Luddite Rebellion begins in Great Britain. Luddites attack factories and smash machines in protest against the industry.
- American merchant, Francis Cabot Lowell, tours the textile mills in Great Britain and memorizes the designs of the power loom in order to improve textile manufacturing in the United States.

1812:

- Parliament passes a law making it illegal by penalty of death to destroy industrial machines.

1813:

- On January 16, 1813, fourteen Luddites are hanged at York Castle in England for the murder of manufacturer William Horsfall.
- Francis Cabot Lowell and several partners start the Boston Manufacturing Company in the United States and introduce an improved version of the power loom.

1814:

- The Boston Manufacturing Company builds its first textile mill in Waltham, Massachusetts and introduces the Lowell System, in which every step of the manufacturing process is done under one roof and is performed by adult women instead of children.
- George Stephenson patents a steam engine locomotive that runs on rails.

1822:

- The Boston Manufacturing Company starts the first large scale factory town in America and names it Lowell after company founder Francis Cabot Lowell, who died in 1817.

1824:

- Trade unions are legalized in Great Britain.

1825:

- George Stephenson commissions a 30-mile railway to be built from Liverpool to Manchester.
- The Erie canal is completed which opens a water route from the Great Lakes to New York City and the Atlantic Ocean.

1828:

- On October 13, 1828, the defunct Beverly Cotton Manufactory burns down.

1829:

- On October 8, 1829, Stephenson's Rocket wins a speed contest, the Rainhill Trials, on the newly built Liverpool-Manchester railroad.

1830:

- On September 15, 1830, the Liverpool and Manchester railway opens to the public.

1831:

- Cyrus McCormick invents the mechanical reaper, a mechanical horse-drawn reaping machine.

1832:

- Sadler Committee investigates child labor in factories in Great Britain and issues a report to Parliament.

1833:

- The 1833 Factory Act in Great Britain provides first regulation of child labor in textile factories.

1834:

- Poor Law creates “poorhouses” for the destitute in Great Britain.

1835:

- On August 14, 1835, Jacob Perkins, now known as the “father of the refrigerator,” builds upon Oliver Evans refrigeration machine idea and patents the first vapor-compression refrigeration cycle.

1837:

- A blacksmith, John Deere, invents the steel plow in Illinois.

1840:

- 1st Industrial Revolution ends

1844:

- Friedrich Engels publishes his observations of the negative effects of industrialization in his book *The Condition of the Working-Class in England*.
- Samuel Morse invents the telegraph, which allows people to communicate quickly over long distances.
- Charles Goodyear patents vulcanized rubber.

1846:

- Elias Howe invents the sewing machine.
- On October 16, 1846, a Boston dentist named William Morton holds the first public demonstration of ether at Massachusetts General Hospital.

1848:

- The British government establishes the General Board of Health to investigate sanitary conditions, setting up local boards to ensure safe water in cities.

1849:

- 10,000 people die in three months in London from a Cholera epidemic caused by contaminated drinking water.

1851:

- John Gorrie patents a mechanical refrigeration system machine.

1853:

- Elisah Otis invents a safety brake for elevators. This paves the way for tall buildings and skyscrapers to be built.

1854:

- James Harrison builds the first commercial ice machine.
- The first steam-powered cotton mill in Asia opens in Bombay, India.

1856:

- The Bessemer Process for making steel is invented by Henry Bessemer which allows for the mass production of inexpensive steel.

1861:

- Emancipation reform in Russia abolishes serfdom throughout the Russian empire, allowing serfs to seek employment.

1863:

- On January 10, 1863, the first subway in the world opens in London, England.

1867:

- Sakichi Toyoda birth (Toyota)

1869:

- On May 10, 1869, the Transcontinental Railroad is completed in the United States.

1870:

- 2nd Industrial Revolution begins (rapid scientific discovery, standardization, mass production, industrialization)
- The Elementary Education Act of 1870, aka Foster's Education Act, in Great Britain makes school attendance mandatory for children between the ages of 5 and 10.
- Large scale industrialization begins in Japan.

1875:

- Public Health Act gives the British government responsibility to ensure public health for housing and sewage
- Alfred P. Sloan is born (General Motors)

1876:

- Alexander Graham Bell patents the telephone.

1877:

- The Great Railroad strike occurs in the United States when railroad companies reduce wages.
- On February 12, 1877, Alexander Graham Bell publicly demonstrates the telephone for the first time at the Lyceum in Salem, Massachusetts by placing a phone call to the Boston Globe in Boston, Massachusetts.

1879:

- On December 31, 1879, Thomas Edison demonstrates the first practical incandescent light bulb by lighting up a street in Menlo Park, New Jersey.

1880:

- Elementary Education Act of 1870 is extended in Great Britain.

1882:

- The world's first coal-fired power station, the Holborn Viaduct power station, went into operation in London, England.

1884:

- The Berlin Conference of 1884 paves the way for widespread colonization of Africa by European countries, such as Britain, France, Belgium, Spain, Portugal and Germany, who are in search of raw materials needed for industrialization and new captive markets to sell their goods to.

1886:

- On December 8, 1886, the American Federation of labor is founded in Columbus, Ohio.

1891:

- Russia begins construction on the Trans-Siberian Railway, which eventually becomes the longest railway line in the world.

1892:

- Sakichi Toyoda starts Toyoda Wooden Loom company

1894:

- Kiichiro Toyoda (Founder of Toyota) born

1897:

- On September 1, 1897, the first subway in the United States opens in Boston, Massachusetts.

1888:

- Alex Osborn (American Executive) born

1901:

- The Factory Act in Great Britain raises the minimum work age to 12 years old.

1903:

- On December 17, 1903, the Wright Brothers make their first successful airplane flight in Kitty Hawk, North Carolina.

1908:

- On October 1, 1908, Ford begins production of the Model T automobile.

1909:

- Alex Osborn earns Bachelor of Philosophy (PhB)

1913:

- Fred Wolf invents the first commercially viable electric refrigerator, which he named "Domelre," short for Domestic Electric Refrigerator.
- Eiji Toyoda is born

1914

- 2nd Industrial Revolution ends

1918:

- In the Hammer v. Dagenhart, the United States Supreme Court rules that Congress has no power under the Commerce Clause to enact child labor laws.

1919:

- The Child Labor Tax law is passed.

1920:

- Armand V. Feigenbaum is born

1921:

- Alex Osborn release his book - A Short Course in Advertising
- Alex Osborn earns a Masters of Philosophy from Hamilton college

1922:

- In Bailey v Drexel Furniture Co, the United States Supreme Court rules the 1919 Child Labor Tax Law unconstitutional.

1923:

- Alfred P. Sloan takes over as Chairman of General Motors

1924:

- Congress proposes the Child Labor Amendment prohibiting child labor but the states never ratified it.

1929:

- Bill Smith is born (Motorola, 6-sigma)

1930:

- Sakichi Toyoda Dies

1933:

- Kiichiro Toyoda starts Toyota Automotive as a department in Toyoda Power Loom Company.

1938:

- Congress passes the Fair Labor Standards Act, which establishes minimum wage, overtime pay, record keeping, and child labor standards in the private sector and in Federal, State and local governments.

1940:

- Alex Osborn releases his book - Your Creative Power

1946:

- Armand V. Feigenbaum develops and introduces Total Quality Management while at General Electric (GE)

1948:

- Kiichiro Toyota resigns from Toyota Motor Company

1950:

- Eiji Toyoda trains at Ford Motor Company for two months

1952:

- Kiichiro Toyoda dies

1953:

- Alex Osborn releases his book Applied Imagination

1956:

- Alfred P. Sloan retires from General Motors

1957:

- Eiji Toyoda becomes head of Toyoda Motor Company; Ford is producing 8,000 vehicles a day, Toyota 40 vehicles a day.

1964:

- Alex Osborn releases his book - How To Become More Creative

1966:

- Alfred P. Sloan (General Motors) died
- Alex Osborn died

1978:

- China begins to drastically industrialize by building millions of small-scale factories throughout the country, eventually becoming the second largest economy in the world.

1986:

- Bill Smith pitches his “theory of Latent Defect” (which he coined Six Sigma) to the head of Motorola, Bob Gavin. Six Sigma is born.

1993:

- Bill Smith dies (Motorola, creator of 6-sigma)

1994:

- Eiji Toyoda retires from Toyoda Motor Company

2013:

- Eiji Toyoda died (Toyota Motor Company)

2014:

- Armand V. Feigenbaum died

THE INDUSTRIAL REVOLUTION

Remember that to be called a Marker Event in world history, a development should qualify in three ways:

- It must cross national or cultural borders, affecting many civilizations.
- Later changes or developments in history must be at least partially traced to this event or series of events.
- It must have impact in other areas. For example, if it is a technological change, it must impact some other major areas, like government, belief systems, social classes, or the economy.

Like the Neolithic Revolution that occurred 10,000 years before it, the Industrial Revolution qualifies as a Marker Event according to all of the above criteria. It brought about such sweeping changes that it virtually transformed the world, even areas in which industrialization did not occur. The concept seems simple – invent and perfect machinery to help make human labor more efficient - but that's part of its importance. The change was so basic that it could not help but affect all areas of people's lives in every part of the globe.

The Industrial Revolution began in England in the late 18th century, and spread during the 19th century to Belgium, Germany, Northern France, the United States, and Japan. Almost all areas of the world felt the effects of the Industrial Revolution because it divided the world into "have" and "have not" countries, with many of the latter being controlled by the former. England's lead in the Industrial Revolution translated into economic prowess and political power that allowed colonization of other lands, eventually building a worldwide British Empire.

WHY BRITAIN?

The Industrial Revolution helped England greatly increase its output of manufactured goods by substituting hand labor with machine labor. Economic growth in Britain was fueled by a number of factors:

- An Agricultural Revolution - The Industrial Revolution would not have been possible without a series of improvements in agriculture in England. Beginning in the early 1700s, wealthy landowners began to enlarge their farms through enclosure, or fencing or hedging large blocks of land for experiments with new techniques of farming. These scientific farmers improved crop rotation methods, which carefully controlled nutrients in the soil. They bred better livestock, and invented new machines, such as Jethro Tull's seed drill that more effectively planted seeds. The larger the farms and the better the production the fewer farmers were needed. Farmers pushed out of their jobs by enclosure either became tenant farmers or they moved to cities. Better nutrition boosted England's population, creating the first necessary component for the Industrial Revolution: labor.
- A technological revolution - England also was the first to experience a technological revolution, a series of inventions built on the principles of mass production, mechanization, and interchangeable parts. Josiah Wedgwood developed a mold for pottery that replaced the potter's wheel, making mass production of dishes possible. Many experimented with machinery to speed up human labor, and interchangeable parts meant that machines were more practical and easier to repair.
- Natural resources - Britain had large and accessible supplies of coal and iron - two of the most important raw materials used to produce the goods for the early Industrial Revolution. Also available was water power to fuel the new machines, harbors for its merchant ships, and rivers for inland transportation.
- Economic strength - During the previous era, Britain had already built many of the economic practices and structures necessary for economic expansion, as well as a middle class (the bourgeoisie) that had experience with trading and manufacturing goods. Banks were well established, and they provided loans for businessmen to invest in new machinery and expand their operations.
- Political stability - Britain's political development during this period was fairly stable, with no major internal upheavals occurring. Although Britain took part in

many wars during the 1700s, none of them took place on British soil, and its citizens did not seriously question the government's authority. By 1750 Parliament's power far exceeded that of the king, and its members passed laws that protected business and helped expansion.

NEW INVENTIONS

The earliest transformation of the Industrial Revolution was Britain's textile industry. In 1750 Britain already exported wool, linen, and cotton cloth, and the profits of cloth merchants were boosted by speeding up the process by which spinners and weavers made cloth. One invention led to another since none were useful if any part of the process was slower than the others. Some key inventions were:

- The flying shuttle - John Kay's invention carried threads of yarn back and forth when the weaver pulled a handle, greatly increasing the weavers' productivity.
- The spinning jenny - James Hargreaves' invention allowed one spinner to work eight threads at a time, increasing the output of spinners, allowing them to keep up with the weavers. Hargreaves named the machine for his daughter.
- The water frame - Richard Arkwright's invention replaced the hand-driven spinning jenny with one powered by water power, increasing spinning productivity even more.
- The spinning mule - In 1779, Samuel Crompton combined features of the spinning jenny and the water frame to produce the spinning mule. It made thread that was stronger, finer, and more consistent than that made by earlier machines. He followed this invention with the power loom that sped up the weaving process to match the new spinners.

These machines were bulky and expensive, so spinning and weaving could no longer be done at home. Wealthy textile merchants set up the machines in factories, and had the workers come to these places to do their work. At first the factories were set up near rivers and streams for water power, but other inventions later made this unnecessary. Before the late 1700s Britain's demand for cotton was met by India, but they increasingly came to depend on the American south, where plantation production was speeded by Eli Whitney's invention of the cotton gin, a machine that efficiently

separated the cotton fiber from the seed. By 1810 southern plantations used slave labor to produce 85 million pounds of cotton, up from 1.5 million in 1790.

TRANSPORTATION IMPROVEMENTS

Once the textile industry began its exponential growth, transportation of raw materials to factories and manufactured goods to customers had to be worked out. New inventions in transportation spurred the Industrial Revolution further. A key invention was the steam engine that was perfected by James Watt in the late 1790s. Although steam power had been used before, Watt invented ways to make it practical and efficient to use for both water and land transportation.

Perhaps the most revolutionary use of steam energy was the railroad engine, which drove English industry after 1820. The first long-distance rail line from the coastal city of Liverpool to inland Manchester was an immediate success upon its completion in 1830, and within a few decades, most British cities were connected by rail. Railroads revolutionized life in Britain in several ways:

1. Railroads gave manufacturers a cheap way to transport materials and finished products.
2. The railroad boom created hundreds of thousands of new jobs for both railroad workers and miners.
3. The railroad industry spawned new industries and inventions and increased the productivity of others. For example, agricultural products could be transported farther without spoiling, so farmers benefited from the railroads.
4. Railroads transported people, allowing them to work in cities far away from their homes and travel to resort areas for leisure.

THE SPREAD OF THE INDUSTRIAL REVOLUTION

The Industrial Revolution occurred only in Britain for about 50 years, but it eventually spread to other countries in Europe, the United States, Russia, and Japan. British entrepreneurs and government officials forbade the export of machinery, manufacturing techniques, and skilled workers to other countries but the technologies spread by luring British experts with lucrative offers, and even smuggling secrets into other

countries. By the mid-19th century industrialization had spread to France, Germany, Belgium, and the United States.

The earliest center of industrial production in continental Europe was Belgium, where coal, iron, textile, glass, and armaments production flourished. By 1830 French firms had employed many skilled British workers to help establish the textile industry, and railroad lines began to appear across western Europe. Germany was a little later in developing industry, mainly because no centralized government existed there yet, and a great deal of political unrest made industrialization difficult. However, after the 1840s

German coal and iron production skyrocketed, and by the 1850s an extensive rail network was under construction. After German political unification in 1871, the new empire rivaled England in terms of industrial production.

Industrialization began in the United States by the 1820s, delayed until the country had enough laborers and money to invest in business. Both came from Europe, where overpopulation and political revolutions sent immigrants to the United States to seek their fortunes. The American Civil War (1861-1865) delayed further immigration until the 1870s, but it spurred the need for industrial war products, all the way from soldiers' uniforms to guns to railroads for troop transport. Once the war was over, cross-country railroads were built which allowed more people to claim parts of vast inland America and to reach the west coast.

Table 1		
Percentage Distribution of the World's Manufacturing Production, 1870 and 1913, (percentage of world total)		
Country	1870	1913
USA	23.3	35.8
Germany	13.2	15.7
U.K.	31.8	14.0
France	10.3	6.4
Russia	3.7	5.5
Italy	2.4	2.7
Canada	1.0	2.3
Belgium	2.9	2.1
Sweden	0.4	1.0
Japan	NA	1.2
India	11.0	1.1
All Others	NA	12.2
https://sourcebooks.fordham.edu/mod/indrevtabs1.asp Accessed Jan 3, 2023		

The United States had abundant natural resources such as land, water, coal and iron

ore and after the great wave of immigration from Europe and Asia in the late 19th century it also had the labor.

During the late 1800s, industrialization spread to Russia and Japan, in both cases by government initiatives. In Russia, the government of the Tsar encouraged the construction of railroads to link places within the vast reaches of the empire. The most impressive one was the Trans-Siberian line constructed between 1891 and 1904, linking Moscow to Vladivostok on the Pacific Ocean. The railroads also gave Russians access to the empire's many coal and iron deposits, and by 1900 Russia ranked fourth in the world in steel production. The Japanese government also pushed industrialization, hiring thousands of foreign experts to instruct Japanese workers and managers in the late 1800s. Railroads were constructed, mines were opened, a banking system was organized, and industries were started that produced ships, armaments, silk, cotton, chemicals, and glass. By 1900 Japan was the most industrialized land in Asia, and was set to become a 20th century power.

CHANGES IN PATTERNS OF WORLD TRADE

Industrialization greatly increased the economic, military, and political strength of the societies that embraced it. By and large, the countries that benefited from industrialization were the ones that had the necessary components of land, labor and capital, and often government support. However, even though many other countries tried to industrialize, few had much success. For example, India tried to develop jute and steel industries, but the entrepreneurs failed because they had no government support and little investment capital. An international division of labor resulted: people in industrialized countries produced manufactured products, and people in less industrialized countries produced the raw materials necessary for that production. Industrial England, for example, needed cotton, so turned to India, Egypt, and the American south to produce it for them. In many cases this division of labor led to colonization of the non-industrialized areas. As industrialization increased, more iron and coal were needed, as well as other fibers for the textile industry, and the British Empire grew rapidly in order to meet these demands.

Many countries in Latin America, sub-Saharan Africa, south Asia, and southeast Asia became highly dependent on one cash crop - such as sugar, cotton, and rubber - giving them the nickname of "Banana Republics." Such economies were very vulnerable to any change in the international market. Foreign investors owned and controlled the plantations that produced these crops, and most of the profits went to them. Very little of the profits actually improved the living conditions for people that lived in those areas, and since they had little money to spend, a market economy could not develop.

Despite the inequalities, the division of labor between people in countries that produced raw materials and those that produced manufactured goods increased the total volume of world trade. In turn, this increased volume led to better technology, which reinforced and fed the trade. Sea travel became much more efficient, with journeys that had once taken months or years reduced to days or weeks. By 1914 two great canals shortened sea journeys by thousands of miles. The Suez Canal built by the British and French in the 1850s linked the Mediterranean Sea to the Red Sea, making it no longer necessary to go around the tip of Africa to get from Europe to Asia by sea. The Panama Canal, completed in 1913, did a similar thing in the western hemisphere, cutting a swath through Central America that encouraged trade and transportation between the Atlantic and Pacific Oceans.