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Chapter 1 : Textile manufacture during the Industrial Revolution - Wikipedia

Statistics Of Power And Machinery Employed In Manufactures: Reports On The Water-power Of The United States, Part 2 Hardcover - October 3,

Commercial and service industry manufacturing 9. The same properties that make metal a desirable component in many goodsâ€"strength and durabilityâ€"also make it a difficult material to form. The specialized drills, grinders, molds, presses, and rollers needed to form metal, as well as the accessories used by these machines, are made in this industry. Metalworking machinery manufacturing has a disproportionately large share of the establishments that make up the machinery manufacturing industry because many such shops are small, with over half employing fewer than 20 workers. The agriculture, construction, and mining machinery manufacturing industry segment is made up of much larger establishments that produce both large, sophisticated machines and common household equipment. Examples include leaf blowers and tillers, for personal and commercial use; bulldozers and backhoes, used in construction of roads and buildings; grinders and borers, used for both surface and underground mining; and oil and gas field drilling machinery and derricks, used for extracting these resources. The ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing industry segment makes climate-control machinery for residential and commercial buildings. In addition to heating and cooling equipment, this industry makes air purification equipment, which is increasingly common in new construction, and commercial refrigeration equipment, which is used primarily for food storage. The commercial and service machinery manufacturing industry segment produces the machinery that is used by firms that provide services. For example, firms in this segment produce commercial versions of household appliancesâ€"such as laundry equipment used in laundromats, coffee makers, and microwave ovens used by restaurants, and vacuum cleaners used by cleaning services. Other large components of this industry are manufacturers of automatic vending machines, non-electronic office machinery like typewriters and mail sorters, non-digital cameras, photocopiers, and machinery used to make optical lenses. The industrial machinery manufacturing industry segment makes machinery used to produce finished goods from raw materials. Machinery manufactured in this segment also is used in printing and bookbinding and in making semiconductors and circuit boards. The engine, turbine, and power transmission equipment manufacturing segment includes a variety of machines that transfer one type of work into another. Turbines use the energy from the motion of steam, gas, water, or wind to create mechanical power by turning a drive shaft. Along with gears, speed changers, clutches, drive chains, and pulleysâ€"all also made in this segmentâ€"turbines put assembly lines and other industrial machinery in motion. Attached to a generator, turbines also create electrical power. This industry segment also produces diesel and other internal combustion engines and their components that are used to power portable generators, air compressors, pumps, and other equipment. Aircraft and motor vehicle engines are made by the aerospace product and parts manufacturing and motor vehicle and parts manufacturing industries, respectively, which appear elsewhere. The last segmentâ€"other general purpose machinery manufacturingâ€"produces miscellaneous machines used primarily by manufacturing industries. These include pumps, compressors, welding and soldering equipment, and packaging machinery. This segment also makes a variety of materials handling equipmentâ€"such as industrial trucks and tractors, overhead cranes and hoists, conveyors, and many types of hydraulic equipmentâ€"used in manufacturing and other industries. Other common machinery produced by this segment includes scales and balances, power-driven handtools, and elevators, escalators, and moving walkways. The wide range of products made in the machinery manufacturing industry means that it includes establishments of all sizes. In general, however, the larger and more complicated the machinery is, the larger the manufacturing facility must be to produce it. Thus, large establishments tend to be a characteristic of the agriculture, construction, and mining machinery and the ventilation, heating, air-conditioning, and commercial refrigeration equipment segments, while the metalworking machinery segment has the smallest ones. The size

of an establishment also contributes to how some machinery is produced. Large firms involved in manufacturing machinery tend to have a multistage production process, with separate teams of individuals responsible for design and testing, manufacture of parts, and for assembly of the finished product. Nonetheless, there is considerable interaction between the various types of workers; for example, design offices are often located near the factory floor to promote interaction with production workers. Small establishments, in contrast, may have a handful of workers responsible for the entire production process. The machinery manufacturing industry, like all U. Domestic and foreign competition has required the industry to adopt new technologies and techniques to lower costs and raise the productivity of its workforce. For example, using high-technology production techniques, including robots, computers, and programmable equipment results in productivity gains and helps to maximize the use of available equipment and workers. Increasing technology and automation also reduces the number of unskilled workers needed in the production process. Pressures to reduce costs and maximize profits have also caused manufacturers in the industry to adopt new business practices. One example is the practice of contracting out support functions, such as janitorial and security jobs, and increasing numbers of administrative services and warehouse and shipping jobs. Rather than employ workers directly for these jobs, a manufacturer will often contract with another company that specializes in providing these services. These changes have had a profound effect on the machinery manufacturing workforce. By automating many of the production processes and outsourcing many of the administrative and support functions, it has reduced the need for many less skilled workers and increased the skill level required for the remaining workers. These changes are allowing the industry to remain competitive and meet the demand for machinery that other industries rely on. Most workers in machinery manufacturing work 8 hour shifts, 5 days a week. Overtime can be common, however, especially during periods of peak demand. As a result, the average production worker worked Opportunities for part-time work are rare, as only about 3 percent of workers were employed part time in Some plants are capable of operating 24 hours a day, but some shifts are able to operate with a reduced workforce because of the automated nature of the production process. Production workers in the machinery manufacturing industry generally encounter conditions that are much improved from the past. New facilities in particular tend to be clean, well lighted, and temperature controlled. Noise can still be a factor, however, especially in larger production facilities. Most of the labor-intensive work is now automated, but some moderate lifting may still be required. Some workers may also have to work with oil and grease or chemicals that require special handling. Certain types of machinery also require special care in their use. Nevertheless, injuries are rare when proper safety procedures are observed. Employment[To Top] The machinery manufacturing industry provided 1. Employment was relatively evenly distributed among all segments of the industry table 1. There were about 30, establishments in the industry; about 15, employed fewer than 10 workers. However, 40 percent of workers were employed in establishments of workers or more. Percent distribution of employment and establishments in machinery manufacturing by detailed industry sector, Industry segment.

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In , manufacturing accounted for That is the highest multiplier effect of any economic sector. In addition, for every one worker in manufacturing, there are another four employees hired elsewhere. That approach estimates that manufacturing could account for one-third of GDP and employment. Manufacturers Alliance for Productivity and Innovation The vast majority of manufacturing firms in the United States are quite small. In , there were , firms in the manufacturing sector, with all but 3, firms considered to be small i. In fact, three-quarters of these firms have fewer than 20 employees. Census Bureau, Statistics of U. Businesses Almost two-thirds of manufacturers are organized as pass-through entities. Looking just at manufacturing corporations and partnerships in the most recent data, The remainder are C corporations. Note that this does not include sole proprietorships. If they were included, the percentage of pass-through entities rises to Since the end of the Great Recession, manufacturers have hired an additional 1. Bureau of Economic Analysis and Bureau of Labor Statistics Manufacturers have one of the highest percentages of workers who are eligible for health benefits provided by their employer. Indeed, 92 percent of manufacturing employees were eligible for health insurance benefits in , according to the Kaiser Family Foundation. This is significantly higher than the 79 percent average for all firms. Three are only two other sectors â€" government 91 percent and trade, communications and utilities 85 percent that have higher take-up rates. Output per hour for all workers in the manufacturing sector has increased by more than 2. In contrast, productivity is roughly 1. Note that durable goods manufacturers have seen even greater growth, almost tripling its labor productivity over that time frame. To help illustrate the impact to the bottom line of this growth, unit labor costs in the manufacturing sector have fallen 8. Moreover, according to a recent report, 80 percent of manufacturers report a moderate or serious shortage of qualified applicants for skilled and highly-skilled production positions. Deloitte and the Manufacturing Institute Exports support higher-paying jobs for an increasingly educated and diverse workforce. Jobs supported by exports pay, on average, 18 percent more than other jobs. In , for example, U. With that said, a number of economic headwinds have dampened export demand since then, with U. Commerce Department Manufactured goods exports have grown substantially to our largest trading partners since , including to Canada, Mexico and even China. Moreover, free trade agreements are an important tool for opening new markets. Commerce Department Nearly half of all manufactured goods exports went to nations that the U. In , manufacturers in the U. World trade in manufactured goods greatly exceeds that of the U. World Trade Organization Taken alone, manufacturing in the United States would be the ninth-largest economy in the world. Moreover, that figure is likely to continue growing, especially when we consider the number of announced ventures that have yet to come online. Bureau of Economic Analysis U. In , the most recent year with data, manufacturing sectors with the largest employment from foreign multi-nationals included motor vehicles and parts , , chemicals , , machinery , , food , , primary and fabricated metal products , , computer and electronic products , and plastics and rubber products , Given the increases in FDI seen since see 15 , these figures are likely to be higher now. Industrial users consumed Energy Information Administration, Annual Energy Outlook The cost of federal regulations fall disproportionately on manufacturers, particularly those that are smaller. In addition, small manufacturers with less than 50 employees spend 2. Environmental regulations account for 90 percent of the difference in compliance costs between manufacturers and the average firm. Crain and Crain

Chapter 3 : Military production during World War II - Wikipedia

*Statistics Of Power And Machinery Employed In Manufactures, Volume 2 [William Petit Trowbridge, , United States. Census Office. 10th cens] on calendrierdelascience.com *FREE* shipping on qualifying offers. This work has been selected by scholars as being culturally important, and is part of the knowledge base of civilization as we know it.*

Finishing Industry and Invention[edit] Before the s, textile production was a cottage industry using mainly flax and wool. A typical weaving family would own one hand loom , which would be operated by the man with help of a boy; the wife, girls and other women could make sufficient yarn for that loom. The knowledge of textile production had existed for centuries. India had a textile industry that used cotton , from which it manufactured cotton textiles. When raw cotton was exported to Europe it could be used to make fustian. This was satisfactory for use on hand looms, but neither of these wheels could produce enough thread for the looms after the invention by John Kay in of the flying shuttle , which made the loom twice as productive. Cloth production moved away from the cottage into manufactories. The first moves towards manufactories called mills were made in the spinning sector. The move in the weaving sector was later. By the s, all cotton, wool and worsted was spun in mills; but this yarn went to outworking weavers who continued to work in their own homes. A mill that specialised in weaving fabric was called a weaving shed. Which they eventually achieved via the and Calico Acts. The acts banned the importation and later the sale of finished pure cotton produce, but did not restrict the importation of raw cotton, or sale or production of Fustian. The exemption of raw cotton saw two thousand bales of cotton being imported annually, from Asia and the Americas, and forming the basis of a new indigenous industry, initially producing Fustian for the domestic market, though more importantly triggering the development of a series of mechanised spinning and weaving technologies, to process the material. This mechanised production was concentrated in new cotton mills , which slowly expanded till by the beginning of the s seven thousand bales of cotton were imported annually, and pressure was put on Parliament, by the new mill owners, to remove the prohibition on the production and sale of pure cotton cloth, as they wished to compete with the EIC imports. In order to compete with India, Britain invested in labour-saving technical progress, while implementing protectionist policies such as bans and tariffs to restrict Indian imports. In periods of political uncertainty in North America, during the Revolutionary War and later American Civil War , however, Britain relied more heavily on imports from the colonial Indian British Raj to feed its cotton manufacturing industry. Ports on the west coast of Britain, such as Liverpool , Bristol , and Glasgow , became important in determining the sites of the cotton industry. Lancashire became a centre for the nascent cotton industry because the damp climate was better for spinning the yarn. As the cotton thread was not strong enough to use as warp , wool or linen or fustian had to be used. Lancashire was an existing wool centre. Likewise, Glasgow benefited from the same damp climate. The early advances in weaving had been halted by the lack of thread. The spinning process was slow and the weavers needed more cotton and wool thread than their families could produce. In the s, James Hargreaves improved thread production when he invented the Spinning Jenny. By the end of the decade, Richard Arkwright had developed the water frame. This invention had two important consequences: The Western Pennines of Lancashire became the centre for the cotton industry. Not long after the invention of the water frame, Samuel Crompton combined the principles of the Spinning Jenny and the Water Frame to produce his Spinning Mule. This provided even tougher and finer cotton thread. The textile industry was also to benefit from other developments of the period. As early as , Thomas Savery had made a vacuum steam engine. His design, which was unsafe, was improved by Thomas Newcomen in Watt continued to make improvements on his design, producing a separate condenser engine in and a rotating separate condensing engine in Watt formed a partnership with a businessman called Matthew Boulton , and together they manufactured steam engines which could be used by industry. Prior to the s, most of the fine quality cotton muslin in circulation in Britain had been manufactured in India. Due to advances in technique, British "mull muslin" was able to compete in quality with Indian muslin by the end of the 18th

century. The flying shuttle increased the width of cotton cloth and speed of production of a single weaver at a loom. Shuttles In , Lewis Paul one of the community of Huguenot weavers that had been driven out of France in a wave of religious persecution settled in Birmingham and with John Wyatt , of that town, they patented the Roller Spinning machine and the flyer-and-bobbin system, for drawing wool to a more even thickness. Using two sets of rollers that travelled at different speeds yarn could be twisted and spun quickly and efficiently. This was later used in the first cotton spinning mill during the Industrial Revolution. Paul and Wyatt opened a mill in Birmingham which used their new rolling machine powered by donkey ; this was not profitable and was soon closed. This operated until Lewis Paul invented the hand driven carding machine. A coat of wire slips were placed around a card which was then wrapped around a cylinder. Bourn produced a similar patent in the same year. Paul and Wyatt based in Birmingham improved their roller spinning machine and took out a second patent. Richard Arkwright later used this as the model for his water frame. It was opened in July These were both events that enabled cotton mill construction and the move away from home-based production. In , Thorp Mill, the first water-powered cotton mill in the world was constructed at Royton , Lancashire , England. It was used for carding cotton. James Hargreaves is credited as the inventor. This machine increased the thread production capacity of a single worker â€" initially eightfold and subsequently much further. Others [14] credit the original invention to Thomas Highs. Industrial unrest forced Hargreaves to leave Blackburn , but more importantly for him, his unpatented idea was exploited by others. He finally patented it in As a result, there were over 20, spinning jennies in use mainly unlicensed by the time of his death. Richard Arkwright first spinning mill, Cromford Mill , Derbyshire , was built in It contained his invention the water frame. The water frame was developed from the spinning frame that Arkwright had developed with a different John Kay , from Warrington. The original design was again claimed by Thomas Highs: His initial attempts at driving the frame had used horse power, but a mill needed far more power. Using a waterwheel demanded a location with a ready supply of water, hence the mill at Cromford. This mill is preserved as part of the Derwent Valley Mills Arkwright generated jobs and constructed accommodation for his workers which he moved into the area. This led to a sizeable industrial community. Arkwright protected his investment from industrial rivals and potentially disruptive workers. This model worked and he expanded his operations to other parts of the country. Matthew Boulton partnership with Scottish engineer James Watt resulted, in , in the commercial production of the more efficient Watt steam engine which used a separate condensor. Samuel Crompton of Bolton combined elements of the spinning jenny and water frame in , creating the spinning mule. This mule produced a stronger thread than the water frame could. Thus in , there were two viable hand operated spinning system that could be easily adapted to run by power of water. As with Kay and Hargreaves, Crompton was not able to exploit his invention for his own profit, and died a pauper. In a mill was built in Manchester at Shudehill, at the highest point in the city away from the river. Two storage ponds were built, and the water from one passed from one to the other turning the wheel. A steam driven pump returned the water to the higher reservoir. The steam engine was of the atmospheric type. His initial venture to exploit this technology failed, although his advances were recognised by others in the industry. Others such as Robert Grimshaw whose factory was destroyed in as part of the growing reaction against the mechanization of the industry and Austin [18] â€" developed the ideas further. In , William Radcliffe invented the dressing frame which was patented under the name of Thomas Johnson which enabled power looms to operate continuously. For further details of the operation and history of looms, see Power loom. For further details of the operation and history of spinning mules, see Spinning mule. From this point there were no new inventions, but a continuous improvement in technology as the mill-owner strove to reduce cost and improve quality. Developments in the transport infrastructure - the canals and, after , the railways - facilitated the import of raw materials and export of finished cloth. The use of water power to drive mills was supplemented by steam driven water pumps, and then superseded completely by the steam engines. It was initially powered by a water wheel , but installed steam engines in William Fairbairn addressed the problem of line-shafting and was responsible for improving the efficiency of the mill. Note the wrought iron shafting, fixed to the cast

iron columns In , using an patent, Richard Roberts manufactured the first loom with a cast-iron frame, the Roberts Loom. It is a semiautomatic power loom. Although it is self-acting, it has to be stopped to recharge empty shuttles. It was the mainstay of the Lancashire cotton industry for a century, when the Northrop Loom invented in with an automatic weft replenishment function gained ascendancy. Number of Looms in UK [20] Year.

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Chapter 4 : Machinery Manufacturing Industry: Career, Outlook and Education Information

Abstract "Sixteenth and seventeenth volumes of the quarto series comprising the final report on the Tenth Census"-- P. calendrierdelascience.comes bibliographical references and calendrierdelascience.com of access: Internet.

Adjusted annually for changing compositions within each alliance. Table notes France to Axis: This trend continued throughout the war and stopped increasing after the war ended. However the high rates of government only was beneficial for a short period of time, a trend that can be seen in most wars. The employment spike was in relation to the tremendous amount of production the United States was making. Examples of high numbers of employment could have been seen in at Gulf Shipbuilding which obtained employees at the beginning of and increased to 11, employees in Alabama Dry dock also was an exemplary business in employment that raised number from 1, workers to 30, in the most productive years of the war. Demographics of employment consisted of eight million women including African Americans and Latinas, adding to the 24 million that searched for defensive jobs outside of the war. While GDP can easily increase Federal expenditures, it also can influence political elections and government decision making. No matter how much percentages of GDP increase or decrease we need higher amounts of GDP in order to pay for more investments, one of those investments being more wars. To pay for these wars, taxes are held at a very high rate. For example, by the end of World War II tax rates went from 1. Along with tax percentages reaching high amounts, spending on non-defense programs were cut in half during the period of World War II. Tax cuts allow one to see GDP in effect for the average American. Although research can support positive relationship between production and jobs with GDP, research can also show the negative relationship with tax increases and GDP. However, during the war, Franklin Roosevelt set ambitious production goals to fulfill. The early s were set to have 60, aircraft increasing to , in In addition, targets for the production of , tanks and 55, aircraft were set during the same time period. The Ford Motor Company in Michigan built one motor car comprising 15, parts on the assembly lines every 63 seconds. American production numbers caused the US employed workforce to increase massively. The government paid for this production using techniques of selling war bonds to financial institutions, rationing household items and creating more tax revenues. Some contribution to the US wartime manufacturing boom can be ascribed to the prior creation of the Alcoa plant in the s. The Alcoa plant prepared thousands of tons of aluminum used for the production of , aeroplanes during the war. The United States quickly adjusted to the levels of production required to equip its military with the millions of war products used during World War II.

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There is a head of 8 feet on the wheel, which gives power for three runs of stone. Water is brought to the wheel through a tunnel excavated in the rock, 80 feet long and 6 by 4 feet in cross-section. A separate tunnel, 1, feet long, conveys water to run two elevators (about 12, and 20, bushels capacity), and a pump for the railroad.

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Chapter 9 : Economic Sectors - Industry, Manufacturing - Federal Statistical Office (Destatis)

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