



### SPOOL-COTTON THREAD.

THE GREAT TRIUMPH OF THE THREAD-MAKER'S ART. — INCOMPREHENSIBLE FIGURES. — THE DISTAFF — THE OLD SPINNING-WHEEL IN THE TIME OF HENRY VIII. — SCIENCE IN INDIA. — THE REIGN OF THE SPINNING-WHEEL FOR TWO HUNDRED YEARS IN ENGLAND. — THE INVENTION OF JAMES HARGREAVES, 1765. — RICHARD ARKWRIGHT. — SKETCH OF THE GROWTH OF THE COTTON MANUFACTURE IN THE COLONIES AND THE UNITED STATES. — ELI WHITNEY'S INFLUENCE UPON THE BUSINESS. — OF THE DISTINGUISHED SAMUEL SLATER. — THE MANUFACTURE OF COTTON THREAD. — THE WILLIMANTIC LINEN COMPANY, OF WILLIMANTIC, CONN., THE LEADING THREAD-MAKERS OF THE UNITED STATES. — THE FOREIGN THREAD-MAKERS FINALLY SURPASSED. — THE BEST COTTON THREAD IN THE WORLD MADE HERE. — THE POPULAR SIX-CORD THREAD FOR SEWING-MACHINE USE. — THE PROCESS OF MANUFACTURE OUTLINED. — SKETCH OF THE RISE AND PROGRESS OF THE COMPANY. — ITS VAST FACTORIES. — ITS UNRIVALLED PRODUCTIONS. — OF THE LATE MR. LAWSON C. IVES. — MR. AUSTIN DUNHAM. — SCIENTIFIC MECHANICS IN CHARGE OF THE VARIOUS DEPARTMENTS.

PERHAPS the modern triumph of no art is more marked than that of the making of thread now, over those days when the fibres of the material of which it was to be constructed were carded, and placed upon a distaff held under one arm, were drawn out by the thumb and fingers of the operator's free hand, and twisted into yarn of the size desired; while in these times the manufacture of perfect six-cord cotton thread requires that the fibres of a certain quantity of cotton (say thirty-seven ounces, for example, or enough to constitute a "lap") undergo, from the time they are taken from the bale to completion, sundry operations in which they are "doubled" (as the technical phrase is) or inter-combined over twenty billions of times! It is impossible for the mind to comprehend so vast a number, to count which, at the rate of two hundred a minute, would occupy over a hundred and ninety-six years, day and night, without ceasing. Yet in order to produce a perfect six-cord thread no less "doubling" will suffice. A six-cord thread could be made, and is manufactured, with less than 500,000

“doublings;” and the writer knows of but one mill in the United States which expends a larger amount of labor on its thread than indicated by the latter figures. But the skilful mechanic knows that every doubling which the cotton receives in its progress from the pickers to the final spooling adds to its value; and the conscientious manufacturer will withhold nothing of value to his thread from the consumer.

History is silent as to the birth of the distaff, but it was probably one of the earliest inventions of man, and, as an emblem of woman’s domestic slavery, is found pictured upon the very earliest historic monuments. The housewife of to-day, though a slave in many things which still remain to be reformed, owes a debt of gratitude to the genius and enterprise which have emancipated her from the distaff and the spinning-wheel, and which place in her lap for use, at barely a nominal cost, a thread the equal of which in practical value could not have been made by hand by the continuous and united labor of her ancestors in line from a thousand years back.

The progress from the distaff to the mule (German *mühle*, mill) or mule-jenny, with its improvements of to-day, has been slow indeed. The spinning-wheel succeeding the distaff was unknown in England until some time during the reign of that admirer of woman, Henry VIII. (1509–47), when it was imported into that land from India, the country which has supplied so much of wealth to Western Europe, both physical and mental. The spindle, caused to revolve at high speed by the wheel, twisted the material to be spun, in place of the human fingers with the distaff. It is but a generation ago that in New England, and throughout the country, a spinning-wheel was to be found in nearly every house, for the spinning of woollen yarn, and flax, and linen thread, and sometimes cotton thread, although at that time cotton thread was largely manufactured in England and the United States. One reason for the continuance of the household manufacture to that date was the fact that the early machinery of the factories did its work incompletely, leaving the yarn or thread irregular, and it may properly be said that perfectly operating thread machinery has not been achieved till within the last five years.

For over two hundred years after the introduction of the spinning-wheel into England it remained the chief means of manufacturing yarn and thread; but about the year 1765 James Hargreaves, of Lancashire, England, invented the spinning-jenny, in which the

single spindle of the old spinning-wheel was supplemented with seven more, making eight spindles, and the framework turns over on its side. The yarn, as it was twisted on the several spindles, passed through a wooden clasp, held in one hand by the operator. Eventually seventy-two more spindles were added to these, and the jenny became a very important mechanical force, and the now formidable Hargreaves was driven from his home by his competing brethren, who, at Nottingham, erected a small factory to spin yarns in by his machines, and was conducting business there, when, in 1768, Richard Arkwright, of Preston, Lancashire, conceived the notion of spinning by rollers, by drawing out the "slivers," or rolls, as they came from the cards, and by a slight tension elongating and strengthening the fibres. Eventually Arkwright found capitalists who looked favorably upon his conception, and a skilled mechanic, in a Mr. Strutt, of Nottingham, to perfect his crude mechanical devices, and finally a machine driven by the power of a horse was achieved, and in 1771 (just a hundred years ago) a mill driven by water power was established at Cromford, Derbyshire. From that time on spinning machinery slowly grew in favor, and in ten years from that time Arkwright was giving employment to some five thousand people in his mills, and had laid the foundation of his afterwards vast fortune.

But in 1779 Samuel Crompton, of Bolton, England, invented a machine which combined the advantages of Hargreaves' jenny and Arkwright's rollers, and was called the "mule-jenny" (mill-engine) or mule. The spindles were attached to a carriage which was run back and forth a short distance on wheels, drawing out and stretching the "roving" (roll or "sliver" of wool, cotton, etc.), while at the same time it was spun or twisted into yarn or thread. Crompton's machines, though as originally constructed carrying but twenty or thirty spindles, were eventually enlarged, and made with twenty-two hundred spindles each, kept in operation by one person — a vast triumph over the old spinning-wheel. At the present time some thirty millions of spindles are running in Great Britain, ten millions in the United States, and seven millions in France, for spinning cotton alone.

The invention in 1793, by Eli Whitney, of the cotton-gin, by which the seed of the cotton is easily separated from the fibre, stimulated the growth of cotton to feed the new spinning-machines. (Before that time the separating of the seed from a pound of the fibre was a day's work for a field hand; and it may be re-

marked here that, probably, Whitney's genius in mechanics resulted in as much evil, by incidentally prolonging the chattel slavery of the black race in this country, as it did good in supplying the world with a cheap fabric for clothing.)

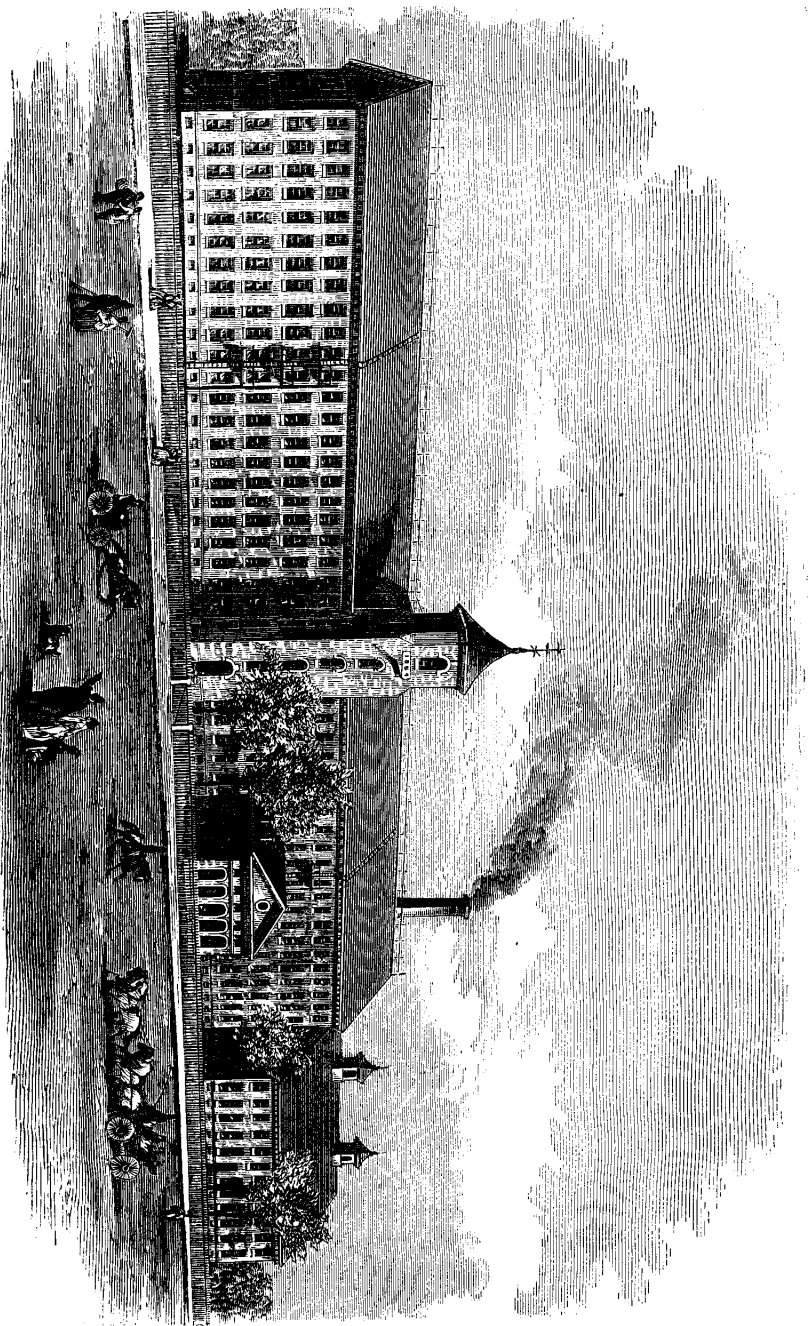
About 1786 two Scotchmen — Alexander and Robert Barr — constructed, at East Bridgewater, Mass., the first machines for carding, roving, and spinning ever made in the United States. The state, by a grant of two hundred pounds in 1789, encouraged the enterprise. In Beverly, Mass., a company for the manufacture of cotton goods commenced operations in 1787, spending some four thousand pounds, and finally receiving a grant from the state of one thousand pounds, by the aid of which they succeeded in establishing themselves. But their machinery was very imperfect. At Providence, R. I., another company was formed in 1788, and went into operation with poor machinery, mostly fashioned after that of the Barrs, and that in use by the Beverly company. At this time it was impossible in this country to obtain plans of the Arkwright machinery, the English government forbidding such plans to pass through the custom-house, and jealously guarding the interests of its own manufacturers.

But in 1789 Samuel Slater, a young man of only twenty-one years of age, but having had seven years' experience in the cotton mills of Derbyshire, arrived in New York with the intention of establishing the manufacture in this country by the processes of Arkwright, of which he thoroughly informed himself, and plans of which a retentive memory of mechanical matters enabled him to bring hither in a manner inscrutable to the custom-house officials. Early in 1790 he went to Providence, R. I., and entered into an arrangement with manufacturers there to construct for them the Arkwright machinery. In a year from that time it was demonstrated that a year more would suffice for the erection of mills and machinery enough to supply the entire country with yarn. With others, Slater erected a small mill at Pawtucket, in 1793, in which seventy spindles were at first operated. The capacity of the mill was soon after much increased. From this beginning other mills were erected in various places in Rhode Island, and eventually in Massachusetts — in 1813 there being built at Waltham, Mass., a mill which is believed to have been the first one in the world which combined all the requisites for making finished cloth from the raw cotton. In 1822 the first cotton mill in Lowell, Mass., was erected.

But we have not space in this article to narrate the progress of cotton manufacture in this country, step by step, to the present time. Of the gigantic proportions of the cotton interest, embracing the cultivation of the cotton plant and the spinning of the fibres of its flowers into threads, and weaving them into cloth, vari-colored by the dyer's art, and now made by him more beautiful in hue than was ever silk touched by the magic hand of the Tyrians, the general reader is fully aware.

The manufacture of cotton thread is now very extensive in the United States, and in the art of making it, is better understood to-day in this country than in Europe, and a good portion of the thread made here is preferable, especially for use in sewing-machines, to the best imported. Yet till within a year or two sundry manufacturers in the United States, deferring to the popular prejudice in favor of the best imported thread, caused their own thread to be stamped like the foreign thread, and put up in thoroughly soldered leaden boxes, as do the foreign manufacturers for export—(in order to protect it against moisture in its imaginary transit over the Atlantic Ocean!)—and this practice is still pursued by one extensive manufactory of thread. But more perfect processes of manufacture having been discovered, have enabled the leading cotton-thread manufacturers of the United States, the Willimantic Linen Company, of Willimantic, Conn., within the last five years, not only to modify, but to almost abolish, the prejudice in favor of the foreign cotton thread by the production of a greatly superior article. These processes being under the exclusive control of this company, have secured for its thread a perfection which can be justly claimed for no other thread made in any part of the world, placing the company quite beyond the sphere of competition with both foreign and domestic manufacturers. This fact may properly be styled one of the greatest triumphs which American inventive genius, skill, and labor in any line of art have achieved over the productions of foreign talent and enterprise, and it gives the Willimantic Linen Company not only the preëminent place among cotton thread makers, but a position in the front rank of American manufacturers.

The making of cotton thread through the various processes, from the pickers on till the yarn is reached, consists in little more than the due selection of the filaments, and their proper combination in a vastly attenuated form; but the processes are delicate, requiring the greatest scientific precision in machinery, and in the



MANUFACTORY OF THE WILLIMANTIC LINEN CO., WILLIMANTIC, CONN.

Willimantic Linen Company's establishment, so much more numerous and extended are these than in any other, that, whereas the yarn is reached in other mills after the filaments have undergone "doubling" or re-combinations less than four hundred thousand times, in the Willimantic Linen Company's works the yarn is not considered complete until its filaments have passed through over seven billions of "doublings" (its six-cord thread being completed only after over twenty billions of "doublings," as referred to in the first paragraph of this article). But all this labor is necessary to the production of the perfect six-cord thread, flexibility, strength, and perfect smoothness being the chief requisites of a good thread.

The mode of making thread may be but little more than intimated, rather than described to the general reader, without diagrams of the intricate machinery used. The cotton, as taken from the bale, somewhat combined with dirt, and not fully free from seeds, is, in the quantity of about thirty-seven ounces at a time, placed in a "picker," so-called, to render it free of seeds and foreign substances. In this machine are sundry "beaters" or cylinders, provided with iron teeth, and running at the rate of twenty-two hundred revolutions a minute, through which the cotton is passed, coming out a clean "lap" of about an inch in thickness and a yard wide. Three of these laps are together passed through another picker, and, combined, are taken to the "breaker cards," whence the whole comes forth in the shape of a long soft rope of an inch in diameter, and called a "sliver drawing," which is taken to a "lap winder," and is made into a lap again. This is taken to another section of cards, called "finishers," where it is further advanced towards perfection into a sliver drawing again. Several of these machines are in line, and their products are run together into "railways," which compress the several "drawings" into one "sliver," which is deposited in a cylindrical "can," the contents of which are taken to a "lap-winder" in which a number of "slivers" are made into what is called a "comber lap." This machine is a very ingenious device. This "comber lap" is then taken to another "lap machine," and, united with other laps, is made into a lap of finer character, which latter is taken to a "combing machine," a beautiful piece of deft mechanism of French invention, where a certain per cent. of the shorter fibres are eliminated from the "lap." The longer fibres being freed from the shorter, the better portion is taken to a

“drawing frame,” where it passes through three processes, out of which it comes as a very smooth and even “sliver,” which is passed on to a machine called a “slubber,” where it is turned into “roving” (a slightly twisted roll), and is run upon bobbins, when it is ready for the “first intermediate fly frames,” so-called, on which it is drawn down more fine; then taken to the “second intermediate” fly-frames, where it undergoes further attenuation, and is then placed in a “jack frame,” where a fine “roving” is made of it for spinning, it being then called “No. 26, hank roving.”

The number of times in which the filaments of cotton up to this point have been “doubled” (or combined, adjusted and re-adjusted as to each other), in their sinuous passage through the multi-fold parts of the various machines to which they have been subjected, is 1,725,235,200! — all necessary for the purpose of rendering the thread which is to be made from it more “level and uniform,” as the technical phrase is. The carding-room of the Willimantic Linen Company, wherein the various processes we have described are conducted, is under the charge of Mr. Andrew Hammond, a man of that order to whom the nation and civilization at large owe more than to any other body — the accomplished and ingenious mechanics.

Much depends upon the state of the atmosphere in the making of cotton thread: sometimes it is too dry. It has been always claimed by the English manufacturers that good thread could not be made in this country on account of the dryness of our climate; but Yankee genius has devised a plan, which is in operation in the Willimantic Linen Company’s mills, by which a moisture is imparted to the air which is preferable to the natural humidity of the English atmosphere, because it is under perfect control.

From the carding-room the “roving” upon bobbins is passed on to the “mule-room,” so called, where the roving of two bobbins is spun into one upon a “cop,” or sort of bobbin. It is now prepared for weaving, or to pass through the final processes into thread. In the establishment in question it is all made into thread. From the spinning-room the yarn on the “cop” is taken to the “twisting-room,” where it is first “steamed” to render it more flexible, and prevent it from “kinking” in the process of spooling; then placed upon a spooling-frame, and the contents of two “cops” run together upon a spool. The spooling-frame, like



most of the machinery in this establishment, is automatic in its action, and if one of the threads chances to break, the spool ceases to revolve. It is then taken to the "first twisting" machines, and run on to bobbins and twisted; thence to another set of "twisters."

After passing the twisting process, the thread is taken to the "doubblers" (machines of peculiar construction, made by the Willimantic Linen Company themselves), where three (already doubled) threads are run together, and then transferred to a final twisting machine, and made into six-cord thread, having now undergone 20,702,822,400 "doublings," and is subjected to further spooling, running upon reels, into skeins of one thousand yards in length, which are now inspected, and the perfect ones passed on to the dyeing or bleaching department. Leaving thence, it is run on to large spools, and taken to the "finishing-room," where the soft finish is applied. The next process is the winding of the thread upon small spools for the market, it being wound upon ingenious automatic machines, the letters patent of which are held and controlled by this company. These machines are so gauged that they necessarily run upon each spool two hundred yards of thread, and stop winding off only when that length is reached, thus assuring purchasers of full measure. The capacity of the machines in this room is fifty thousand dozen spools a week. These are then inspected, and the perfect are passed to the "ticketing machines" (wonderful devices, the patent of which is exclusively controlled by the Willimantic Linen Company), and then stamped or "ticketed" on both ends at the same time, each machine ticketing eighty spools per minute, and the total number of machines being able to ticket twenty-four thousand dozen spools a day. A red ticket is placed upon one end of each spool of six-cord thread, to distinguish it from the three-cord manufactured by this company, and forms a trade-mark for their popular soft-finish thread. After the ticketing and placing in paper boxes, the packing follows, and the thread is then ready for market.

Our female readers, especially, will be interested to know how much of careful labor, patience, etc., is necessary to produce that magical thing called a six-cord cotton thread, and we have endeavored to give them some conception of it. In a certain sense thread unites the world, since it is used in nearly every semi-civilized, as well as civilized, family over the globe; and the six-cord thread of the Willimantic Linen Company, which, by reason of

its great superiority to any other thread, worthily enjoys the patronage of the leading manufacturers of sewing-machines, finds its way wherever the wonderful invention of Howe, and the machines of the Wheeler & Wilson and the Weed Sewing Machine companies, and other great manufacturers, are to be found. On account of its superior strength and smoothness this thread never breaks in a sewing-machine, and always "runs easy." A good share of the thread of the Willimantic Linen Company is used by straw goods, knit goods, clothing and hat manufacturers; but the greater portion of their thread being specially adapted for the use of sempstresses, is consumed in the family circle, by hand, and on machines.

The Willimantic Linen Company (whose name is now a misnomer, the company being organized at first to manufacture linen goods only) was established in 1854, principally by the late Lawson C. Ives and its present treasurer, Mr. Austin Dunham, both of Hartford, Conn., uniting the great energy, perseverance, and general business talent of the former to the equally marked excellent judgment and great financial ability of the latter, who may be said to be without a superior, if not a peer, among New England manufacturers, in his special department. Mr. Ives died in 1867, having amassed a large fortune, and crowned in his lifetime (an example to other men of wealth) his career by sundry valuable charities, among which was the erection at Hartford of a home for indigent widows. The company started with a capital of only \$75,000, which was soon increased to \$125,000, and in 1856 to \$225,000. Its present capital is \$1,000,000.

The factories of this company are noble structures of granite, in which sixty thousand spindles are kept running. Their factory, in which three-cord thread is manufactured, is four stories in height, two hundred feet long by sixty-eight in width, while that appropriated to the manufacture of six-cord thread (and called the "new mill") is five stories in height, four hundred feet long, seventy feet wide, and remarkably well constructed throughout, and furnished with the very best machinery. It is indeed a "monument of architectural beauty." Every provision is herein made for the comfort and security of the operatives. The building is supplied with four of Fales, Jenks & Sons' force pumps for security against fire, each capable of discharging thirteen hundred gallons of water in a minute. The water power of these mills is "800-horse," to which a Corliss steam engine of three hundred horse power is about

to be added. Besides the substantial buildings spoken of above, the company have a dye-house and bleachery immediately attached to the new mill, and which is one hundred and twenty feet in length by seventy in width, with drying rooms of about the same capacity.

This department, under the charge of Mr. James M. Reid, a gentleman of scientific attainments, and probably unequalled anywhere in his profession, is very complete in its arrangements, and is, perhaps, the finest establishment of its kind in the country. The mode of ventilation in the lower rooms, where immense quantities of steam are generated, is new, unique, and very efficient, and the labor-saving appliances and general fitting up of the department are such as to greatly reduce the amount of manual labor usually needed in such operations, and also to promote the comfort of the workmen. Four thousand pounds of thread a day can be turned out when the place is run to its full capacity. Attached to the main building is the boiler house, which contains eight steam boilers, in which steam is generated for use in the dye house and the mill generally. In the upper story and attic of the main building are the store rooms for receiving and storing the product of the several mills, and from these store rooms are drawn the required numbers and quantities to fill immediate orders. All colors and every imaginable shade of color can be produced here to suit customers.

Turning, carpenters', and machine shops, rooms for the manufacture of paper boxes, etc., complete the body and appointments of this company's vast establishment, which is under the immediate care of Mr. A. B. Burleson, the resident agent, of whom, in his business capacity, perhaps the most complimentary thing which could be said is, that he admirably directs the manufacturing business of the leading thread making establishment in the United States.

