



COTTON MANUFACTURES.

INTRODUCTORY HISTORICAL COMMENTS. — COTTON FABRICS IN EGYPT, CHINA, ETC., A THOUSAND YEARS BEFORE CHRIST. — HOW COTTON IS RAISED. — THE COTTON GIN DESCRIBED. — AN UNSOLVED PROBLEM IN THE MANUFACTURE OF COTTON. — AN INTERESTING QUOTATION FROM JOHN WYATT'S LETTERS PATENT, 1738. — ARKWRIGHT AND HARGREAVES. — THE PROPORTION OF COTTON GROWN IN THE UNITED STATES WHICH IS MANUFACTURED HERE. — STANDARD FOR JUDGING COTTON FABRICS.

IN a history of the great industries peculiar to the present generation, no single element of a purely material character is found so important and influential as the white, downy filaments that enclose the seed in a pod of the cotton plant. A generation ago the woollen interest was mighty, the industries of iron, and coal, and brass, and silk were well developed, while that of cotton was in its infancy. When General Burgoyne surrendered, and the folly and obstinacy of George III. robbed the British empire of its richest possessions, the cotton imported into England consisted of a few thousand bales of yellow short staple from East India. During those eventful years, from 1760 to 1780, when the rashness and stubborn pride of England's rulers were doing so much to cripple her power, four poor and humble men — mechanics — with blackened hands and fustian jackets, were developing machines the effect of which has been to restore to England more than she lost at Saratoga and Yorktown. A century ago England aspired to govern half the world by the skill of her generals, the valor of her soldiers, the audacity and genius of her statesmen. Now she dictates prices, and governs with a sway that cannot be broken in the world of commerce; and this is done by her amazing power of gorging every mart of the world with the products of her looms. This she can do because Wyatt, and Arkwright, and Hargreaves, and Crompton, by their wonderful devices, have taught her how one man may do the work that two hundred men did be-

fore, and show a better and more uniform product than the most skilful of the two hundred could have done without their machines. The carding rollers, the drawing frame, the jenny, and the power loom, in their exact adaptation to cotton fabrics, created at once a keen demand for that product; and in the early part of the century, a Yankee inventor gave southern agriculture the one machine that was needed to place cotton among the leading material powers of the world. With Whitney's cotton gin in our southern states, and the great inventions alluded to in England, the equipment was complete. England and the north-eastern states could spin all the cotton the South could grow. Enormous mills went up, rural population flocked to manufacturing centres, cloth merchants opened branch houses in China, in India, in Brazil, in Africa, and Australia. Then our cotton-producing states, conceiving that a control of a staple of such importance was virtually a control of the commercial interests of the most powerful nations on earth, proposed from that vantage-ground to dictate fundamental laws between capital and labor for the whole continent to obey, and thus originated our civil war. Great credit is given to John C. Calhoun, the radical in politics, for sowing the seeds of that strife; but when the remote, but efficient, cause is discovered, we see not a theorizer, but a mechanic — not a Calhoun, but Eli Whitney.

Cotton fabrics are nearly as old in history as fabrics of wool and silk. The Egyptian dead who were embalmed when Joseph was prime minister of Pharaoh were swathed about with fine cotton cambric. The Hindoos and Chinese used it with silk as a national staple for clothing a thousand years before Christ. The East India spinners and weavers became renowned for the fineness and beauty of their lawns many hundred years ago. - With the rudest and most clumsy looking machines, a woman, sitting under a palm tree on the edge of an oblong pit, with threads tied to her toes, could produce a gauze so uniform and delicate that, when wet and laid upon the grass, the eye could barely detect a film spread over the green blades. The latest and utmost skill of English artisans has recently been able to rival, but not to surpass, in delicacy and perfection the fabrics that Indian females could produce with a few bamboo sticks. The peculiarity of modern manufactures is not that better cloths are produced, but that the forces of nature have been so skilfully harnessed that the operations which man once *performed* he now simply *directs*. Iron,

water, steam, all mechanical powers, all chemical agents, are his faithful drudges, and not only yield their amazing forces to his command, but execute works more subtile and delicate than he could accomplish by dexterity alone.

The observation and experiments of many centuries have developed but four materials or sources of the clothing of the race. Two of these are in the animal kingdom, and two are in the vegetable kingdom — silk, wool, linen, and cotton. A walk across one of our southern plantations, and a calculation of the moderate amount of labor by which a large quantity of cotton wool is produced, will show that when the beauty, warmth, and durability of cotton are considered in connection with the ease with which it is grown, this plant is and must continue to stand in the front rank as *the* material for the clothing of mankind.

Cotton is planted in rows about four feet apart, and the stalks are cut away from the first stand, or sprouting, till they are about two feet apart in the row. Thus planted, the boughs of the plants by the month of July touch each other across the middles, and the entire field is covered, so that, in good land, not a spot of earth can be seen except as the thick branches and leaves are pushed aside. Early in the month of August, the pods which contain the seed and the enveloping wool begin to burst. Then picking commences. The first pods to open are those first formed on the larger and earlier stalks. As the season advances, other pods growing on the middle and top branches of the plant expand, and the snowy wool, pushing out from the crisp segments of the pod, gives a white and beautiful appearance to the whole field. So profuse is this crop of vegetable wool that a prosperous plantation in the month of October, when the greatest number of bolls are open, looks as though a shower of snow-flakes had fallen, and the white mantle had not been blown or melted from the surface of the vegetation. One man can easily plough, plant, and cultivate ten acres of cotton. A good yield is a bale or bag of four hundred pounds for each acre. The labor of one man and one mule produces, then, in a good season, and on good soil, four thousand pounds of material for cloth. On an average, as cloth is made, each of those pounds will be converted into four yards of cloth. Thus, one man laboring in the cotton field can give society the raw staple for sixteen thousand yards of cloth. It would task the activity and care of the same man to take charge of one hundred sheep that might yield a clip of four hundred pounds of wool,

to provide supplies for wintering them, and to shear the fleeces. In this view of the case, the raw material for cotton spinning can be produced with about one tenth the ease that the same quantity of wool is given to the manufacturer.

In an important sense of the word the manufacture of cotton begins at the plantation and the gin-house. After the lint, or wool, has passed through one stage of the process, it is packed closely in square bales, hooped with iron, and sent many hundred or thousand miles to the pickers, rollers, throstles, and jennies that convert it into yarn, and the looms that make cloth of it. A cotton gin is, in its essential parts, a series of circular saws, with fine hooked teeth on one cylinder, which revolves rapidly against a mass of the seed cotton as it comes from the field. Cotton wool is a species of hair or down that grows out of the seed and envelops or wraps it. The seed is somewhat smaller than the common field pea, and when the down, or lint, is pulled away from it, shows a black and rather oily husk. The weight of the seed is about thrice that of the enveloping wool. Thus twelve hundred pounds, as it comes from the field, will be separated by the gin into three hundred pounds of lint and nine hundred of seed. Back of the saw cylinder is a revolving brush which removes the lint from the teeth, and a blast of air from a fan blows the lint away from the brush, and throws it back in a snowy shower into the lint room. It is one of the unsolved problems of political economy in this country how to unite the manufacturing with the cotton growing interest, so as to bring the carding mill, the roving frame, and the jenny to run by the same power that drives the gin. The loss of time, and power, and material by thus interrupting the process, packing the lint, compressing and hooping it, removing it to the factory, where there are other machines for picking it light and whipping out the dust, is very great. When a mass of cotton wool is made fleecy and wholly freed of dust, it is ready for the carding rollers. These draw the staple out into fine parallel threads, or filaments, and wind them around a large cylinder. A device not unlike a fine steel comb removes them from the cylinder, and by a slow, gentle motion these fine fibres are drawn together into a long, white roll or cloud-like rope, that parts at a slight pull. The great inventions which have given cotton manufacture such impetus take up the staple at this point. This soft rope, or tube of fibres, held so loosely together, must be very gently drawn out and compacted. Perhaps the mode of doing

this cannot be better stated than in the letters patent granted to the invention of John Wyatt in 1738. It is copied from the close rolls of George II., the twelfth year of his reign, and the quaint spelling of that age is retained: "One end of the mass, rope, thread, or sliver is put betwixt a pair of rowlers, cillinders, or cones, or some such movements, which, being twirled around by their motion, draw in the raw mass of wool or cotton to be spun in proportion to the velocity given to such cillinders. As the prepared mass passes regularly betwixt these rowlers, cillinders, or cones, a succession of other cillinders, moving proportionably faster than the first, draw the sliver or thread into any degree of fineness which may be required. Sometimes these successive rowlers have another rotation besides that which diminishes the thread, and they give it a small degree of twist betwixt each pair by means of the thread itself passing through the axis and centre of that rotation."

Here we have the essential thing in roving and spinning by rollers — a sliver drawn down to the required fineness by a difference in the velocity of two cylinders between which it is carried and the twist to be given it by connecting the thread with the motion at the axis of the cylinder. Thirty years this plan, thus clearly stated, slumbered in the close rolls, and then was taken up by a patient and resolute inventor, Sir Richard Arkwright, who, in the midst of difficulties, and in poverty so great that his friends made up a purse to buy him decent clothes, kept on with wheel, and cog, and cylinder, and bobbin till he gave the world the throstle and water frame substantially as now is used in a thousand cotton mills.

About the same time — that is to say, a little over one hundred years ago — another great invention took up the cotton where the drawer of Arkwright left it, and made yarn of it. This invention was the *jenny*, and Thomas Hargreaves, illiterate and humble, a weaver of Stand Hill, near Blackburn, was the father of it. He is said to have received his original idea from seeing a common one-thread hand wheel overturned upon the floor, when both the wheel and spindle continued to revolve. Why could not a row of spindles be set side by side? Why could not one band drive them all?

Why might not some mechanical device let through just so much roving or soft thread for each spindle, and so one spinster make eight, sixteen, thirty-two, or more threads as easily as she

now makes one? These problems Hargreaves puzzled over for months, and with much casting, and filing, and adjusting, contrived a frame, in one part of which he placed eight rovings in a row, and over against them eight spindles. The rovings, when extended to the spindles, passed between two bars of wood, forming a clasp, which opened and shut somewhat like a parallel ruler. A portion of the roving, or roll, being extended from the spindles to the wooden clasp, this was closed and drawn out on the horizontal frame to a suitable distance from the spindles, thus making the thread fine enough; at the same time, by turning a crank, the eight spindles were made to spin eight lengths of yarn, and by opening the wooden clasp the spun thread could be run back and wound about the spindles. He soon saw that sixteen spindles could be turned by the same wheel by which the eight were driven; and if sixteen, why not thirty-two? why not sixty-four? His discovery it was that gave cotton manufacture its amazing impetus. Before, it had crept along the earth; now, it took on wings, and could speed with a geometric velocity.

One invention, or rather one combination, more was needed, and this was devised by Samuel Crompton. He joined the drawing machine with the jenny, and instead of moving out with the roll, the spindles being fixed, he reversed the process, and took the spindles out on the roving frame, *spinning as he drew out*. It is clear that he could get a much finer thread by this plan, as, by twisting, the thread constantly grew more compact as it was drawn out. This combination he named *the mule*. With it he made yarn never before equalled in England for fineness and uniformity. Other and more skilful artisans made mules. William Kelley, of Lanark Mills, first turned the mule by water power in 1790. Soon after a double mule was made, then the unheard-of exploit of working no less than four hundred spindles on one frame, and of late, in Manchester, Eng., and elsewhere, eight hundred spindles each on a double mule have been used, and in some mills the prodigious number of eleven hundred spindles each, or twenty-two hundred the pair, all managed by one spinner.

About forty years ago one Roberts, an ingenious machine maker, contrived an automatic mule that could roll out several hundred spindles on one frame with a perfectly uniform motion; and at a given time, when the revolutions had made the thread hard enough, it returns, winding the spun thread on the spools, and goes out without aid or touch of hands, thus dismissing the spinner, or

making him merely a looker-on, to mend a broken thread or throw off the band in case of accident.

In order that weaving might keep pace with the rapid production of yarns, several inventors and machinists wrought upon the power loom and on the dressing and sizing apparatus necessary to make the power loom in every respect more rapid and economical than hand weaving. These labors were consummated a little more than forty years ago, when the series of grand inventions culminated in giving England and America the facilities we now have for converting our immense cotton crops of four million bales each into cloth, and performing all this Briarean labor by the gravitation of falling water and the expansion of steam.

Of the cotton grown in this country we manufacture about one fourth or one fifth. That is to say, of a four million bale crop, somewhat over three millions are exported, and from eight hundred thousand to one million bales are converted into cloth, mostly in the north-eastern states. The standard for judging of the weight and durability of a cotton fabric is the number of threads in a square inch. Some cambric shows a network under the glass of 92×96 threads in each square inch. Some standard sheetings show 64×64 . Of the million bales spun by us, full one half is made into such coarse, durable fabrics as the Osnaburgs, Attakapas jeans, and Alabama plaids.

While the Manchester, Eng., mills are much more numerous than any of our manufacturing towns can boast, and are engaged mainly on the finer grades of muslin, which require nicely-adjusted jennies and mules, it is justly a matter of pride with the American spinners that our mill hands are more intelligent, more cleanly, and better paid than the English operatives.

