



Eli Whitney

THE STORY OF THE COTTON-GIN.

By Edward Craig Bates.

OF the four great staples which provide man with clothing, — cotton, silk, wool, and flax, — cotton, now the cheapest and most indispensable, was last to come into general use. It is not, however, a new article. Thousands of years ago cotton was the national cloth of India, just as linen was of Egypt. The Chinese, who had known the plant from the earliest times, began its manufacture into cloth during the thirteenth century. The earliest explorers found beautiful fabrics of cotton among the natives of Mexico

and South America. In the fourteenth century, — long after linens, woollens, and silks had become articles of commerce, — cottons were introduced into Europe ; but they were necessarily very expensive. The distance from which they were brought, and the clumsy methods of their manufacture, gave almost a monopoly to woollens, silks, and linens, until the great inventions of Hargreaves, Arkwright, and Compton, late in the last century, made cotton the ordinary clothing of the people.

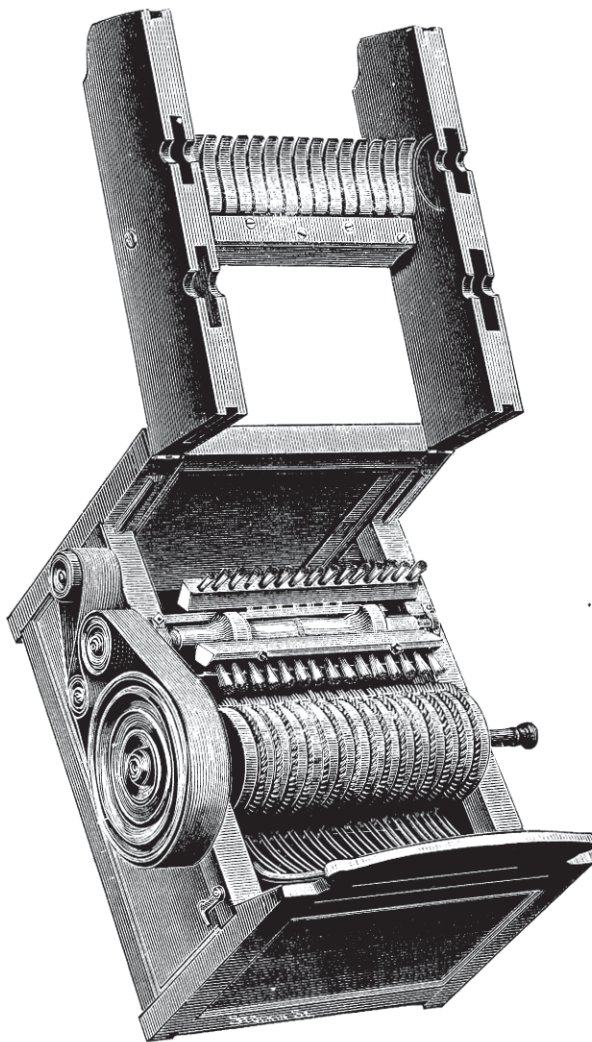
These inventions mark an era in the

industrial development of the world. In the course of twenty years, from 1765 to 1785, the manufacture of cotton goods made greater progress than in thousands of years preceding. The first improvement was Hargreaves' invention of the spinning-jenny in 1767, which enabled an operator to spin one hundred and twenty threads at once,—a task that would formerly have required one hundred and twenty persons. Two years after the spinning-wheel had given way to the jenny in the making of weft (the softer kind of yarn), Arkwright invented that wonderful piece of mechanism, the spinning-frame, for making the firmer yarn used as warp. The genius of Compton, five years later, united the two operations in one machine; and when Watt contributed the steam-engine in 1782, the power of a spinner was increased a thousand-fold. It remained for Dr. Cartwright, a clergyman of Kent, to complete this series of remarkable discoveries by inventing the power-loom. The great English industry of modern times was then begun. In less than twenty years from Arkwright's invention, the prices of cotton goods had fallen ninety per cent. It became possible to bring the raw material from India, four thousand leagues away, turn it into cloth, and undersell the native Indian workman in his own village. The rude methods of other producers, in spite of cheap labor and an abundance of cotton, were powerless in competing with these marvellous inventions.

One thing alone limited the English manufacturer in the production of cotton goods—the lack of a cheap and plentiful supply of raw material. England was at first dependent on Turkey, India, and the East and West Indies. Before 1790, the American producers had contributed little.

Cotton was, however, cultivated in the

American colonies for domestic use before the Revolution. As early as 1621, says Bancroft, "the seeds of cotton were planted [in Virginia], as an experiment, and 'their plentiful coming up' was a subject of interest in America and England." That its cultivation was not extensive, however, may be seen from McMaster's statement that a century and a half ago, "cotton was never



Model of the Cotton-Gin.¹

seen growing but in gardens among the rose-bushes and honey-suckle vines." A small amount had been occasionally exported before 1790, but in 1784 eight bags

¹ See note at end of this article.

were seized by the officials at Liverpool, on the ground that so much cotton could never have come from America. So unimportant was the production of cotton regarded as late as 1794, that John Jay, in making a treaty with England, provided, in an article which was rejected by the Senate, for prohibiting its exportation.

But the increasing demands of English manufacturers stimulated its cultivation.

utilize their slaves, land, and natural advantages for the extensive production of cotton. "Without a vastly increased supply of the raw material, and at a much lower price than it had previously brought, the inventions of Hargreaves, Arkwright, Compton, Roberts, and Watt would have been of comparatively little value";¹ and such a supply was impossible without a new process of separating, thoroughly and



Picking Cotton.

The soil and climate of the Southern states were admirably adapted to its growth. The islands along the coast were destined to provide the long-staple, or Sea Island, cotton, the finest in the world. Moreover, the raising of cotton requires much labor, but little skill; and owing to slavery, unskilled labor was plentiful throughout the South. Labor, soil, and climate were all favorable for producing the raw material so urgently demanded by the manufacturers in England. There was only one drawback. In order to prepare cotton for the market, the producer must separate the fibres from the seeds. In the green-seed, or short-staple, cotton, which forms the bulk of the American product, this was a labor of great difficulty. The seeds clung to the fibre with exasperating persistency. It was a day's work for a man to clean a pound of cotton, — a rate so slow as to make its extensive production impossible.

In 1790, therefore, there was great need of another invention, not only to supplement the weaving and spinning machines which had been invented in England, but also to enable the Southern planters to

cheaply, the fibre from the seeds. The cotton-gin, "a machine which has done more for cotton-growers, manufacturers, commerce, and civilization than any other one machine that was ever invented,"² was demanded alike by the manufacturers in England, the cotton-growers in America, and by the industrial welfare of the whole civilized world.

The genius who unlocked the imprisoned resources of the South was Eli Whitney. The home of his early years was far from the scene of his great triumph. In the little town of Westborough, about thirty miles west of Boston, he was born, December 8, 1765. His father was a farmer, but combined with his knowledge of farming considerable mechanical skill. In a little workshop near his house he had collected a variety of tools for making chairs and wheels, and for such odd jobs of repairing as he and his neighbor farmers constantly desired. In the use of tools the son showed early aptitude. "He lost no time," says

¹ De Bow's *Industrial Resources, etc., of the South and West*, Vol. I., p. 207.

² *Ibid.*

his sister, "but as soon as he could handle tools he was always making something in the shop, and seemed not to like working on the farm." At the age of twelve he made a fiddle that excited much admiration, and the ingenuity which he thus showed brought him many delicate jobs of repairing. To the boy's inquiring mind, his father's watch, as the most delicate mechanism within his reach, was of fascinating interest. During the family's absence at church, it is related, having feigned illness as an excuse for remaining at home, he took the watch to pieces, but, unlike other boys who have attempted the same feat, he put the parts together again so nicely that the deed was undiscovered. When his step-mother lamented the breaking of a table-knife belonging to a valuable set, the ingenious boy made one exactly like it excepting the stamp on the blade; "and this he would likewise have executed," says Professor Olmstead in his memoir, "had not the tools required been too expensive for his slender means."

Not only did Whitney manifest inventive and mechanical skill at an early age, but his energy and perseverance became likewise apparent. During the Revolutionary War, when the price of nails was high, he engaged in their manufacture. Needing an assistant in his work, he obtained permission from his father to go to the neighboring village. Not finding a man to suit him, he mounted his horse and travelled forty miles before he was successful. When, with the close of war, the nail business was no longer profitable, Whitney turned his hand to a new industry — making hat-pins for women and walking-sticks for men. In these anecdotes of his youth appears the germ of the inventive faculty which afterwards, in a wider field, attained such grand development; and not less clearly appear the industry, energy, and perseverance which afterwards enabled him both to fight for his rights against overwhelming odds and, after the failure of his first great enterprise, to amass a fortune in new pursuits.

It was natural that a young man of Whitney's active mind and ambition should be dissatisfied with the limited education which his native village afforded. At the age of nineteen he decided to prepare for college. In May, 1789, after five years of hard work in earning his living and carrying on his studies,

notwithstanding his step-mother's opposition and the protest of an "intelligent friend" that "it was a pity such a fine mechanical genius as his should be wasted," he succeeded in entering the freshman class at Yale. There he showed great proficiency in mathematics, and his written exercises which have been preserved are evidence of a clear, logical, and vigorous mind. In the repairing of apparatus, and other ways, he had several opportunities for astonishing his instructors and friends with his skill in using tools.

A few months after his graduation, in the autumn of 1792, Whitney was engaged as tutor by a gentleman in Georgia. During the journey from New York to Savannah, he enjoyed the company of Mrs. Greene, the widow of the famous Revolutionary general, and her family. Their friendship proved to be of inestimable value. On arriving in Georgia, he found the position for which he had been engaged already filled. Without resources or employment, he gladly accepted the invitation of Mrs. Greene to remain at her house while he was carrying out his project of studying law. Under her hospitable roof he remained for several months.

The first opportunity for employing his peculiar skill was in making a tambour frame. Mrs. Greene complained that the one she was using was imperfect, and tore the thread of her embroidery. Anxious to please his kind benefactor, Whitney quickly constructed a frame so superior to the one in use as to excite the wonder and delight of the whole family.

This exhibition of skill was still in the mind of Mrs. Greene, when a party of Revolutionary officers who had served under her husband came to pay their respects. Many of them, if not all, were planters. In discussing the state of agriculture and their needs, they lamented the lack of a machine for separating cotton-fibre from the seeds. With the pressing demand in England for raw cotton, this was the only obstacle to their prosperity. By a happy inspiration, Mrs. Greene remarked, "Gentlemen, apply to my young friend, Mr. Whitney, — he can make anything." Whitney, protesting against the praises of his friend, removed what hopeful expectations the most ardent may have had, by calmly replying that he had never seen either cotton or cotton-seed.

Mrs. Greene's object in her friendly introduction was to attract the attention of her influential visitors to the promising young man whom she was befriending. The conversation, however, had an unexpected result. The young law student threw aside his books, and soon set off for Savannah. There he wandered about the wharves, in and around the storehouses, seeking a sample of cotton. After a long search he returned with a small parcel. A workroom in the basement of the house was set apart for his use. He made the tools necessary for his task, drew his own wire, and proceeded to construct a gin ("engine" is the full form) for separating cotton-fibre from the seeds. His purpose was divulged to no one save Mrs. Greene. The winter of 1792-93 was nearly over when his mysterious task was fully and satisfactorily completed. Early in the spring the cotton-gin was set up in a shed, and prominent planters from all over the state were invited to see it work. It was successful from the start. The machine for which there had been such clamoring for many years was at last provided by the ingenuity of a Yankee student.

I have referred to the cotton-gin as "a machine for separating the cotton-fibres from the seeds." A more definite understanding of the operation demands a few words on the nature of cotton and the mechanism of the gin.

The cotton which is used for spinning cloth is "the down, or fine cellular hair, attached to the seeds of the plants belonging to the genus *Gossypium*, natural order *Malvaceæ*."¹ This genus has many species, some botanists giving as many as twenty; but the two important species known to commerce are the Indian and the American cottons. The American cottons are of two varieties: "the *Barbadensian*, or black-seeded cottons, bearing pure yellow blossoms, with a reddish purple spot at the base of the petals; and the *Hirsute*, or hairy cotton, more or less covered with a distinct coating of hairs, bearing white or faintly primrose-colored blossoms."² The *Barbadensian*, known as "Sea Island cotton," grows on the islands off the coast of the Carolinas, and surpasses all other varieties in the length, strength, and beauty of its staples. The great bulk of American cotton known as "upland" cotton, is of

¹ *Encyc. Brit.*, "Cotton."

² *Ibid.*

the other variety. Its fibres are shorter than in the Sea Island cotton, and cling most persistently to the green seeds in every lobe.

The low shrub on which the balls of cotton grow is planted in this country during April or May, and matures in August and September. Visitors to Southern states extol the beauty of the long rows of shrubs, with their glossy, dark green leaves, and balls of snowy whiteness.

As soon as the cotton is gathered, the process of ginning begins. The most primitive method was by the *churka*, used by the Chinese and Hindoos. It is a rude machine, consisting chiefly of two wooden rollers fixed in a frame. The rollers revolve in contact, drawing the cotton between them and excluding the seeds. Although the machine has undergone only slight improvement in the course of centuries, it is still used to some extent in India. This method, at best, is slow, clumsy, and imperfect.

In America, the little cotton that was raised before Whitney's gin made extensive production possible was ginned by hand. When the day's work in the fields was over, the slaves were set to work picking out the seeds. An overseer stood by to urge on the indolent and rouse the sleepy. It was a day's work for a man to cleanse a pound of cotton by hand.

The gin invented by Whitney is simple in its construction, and rapid and thorough in its work. The cotton is placed in a large hopper on an iron bed with many interstices. Through these project the teeth of a series of circular "saws." As the saws revolve, their sharp points catch the fibres of cotton and draw them through. The seeds are excluded by their size. The cotton is detached from the saws, and carried from the machine, by an arrangement of brushes. By the use of the gin, a thousand pounds of clean cotton, instead of one pound, are the result of a man's daily work. Another gin, known as Macarthy's roller gin, is used to some extent, especially for Sea Island cotton, but Whitney's is still in most general use. Many slight changes have been made in its construction, but so thoroughly did the young inventor do his work, that no better principle for making gins has yet been discovered.

No sooner had the fact of Eli Whitney's wonderful discovery become known, than

planters from all parts of the state came to see the machine upon which their fortunes depended. Their impatience could not be restrained. The shed which contained the cotton-gin was forcibly entered, and in the morning the machine was gone. The principle of its construction—as yet unpatented—was discovered. New machines, with slight and unimportant variations, were manufactured and set up in various parts of the state. The owners of the original gin (Mr. Whitney had taken as a partner Mr. Phineas Miller, who had married his friend, Mrs. Greene) were involved, after the issue of their patent in the fall of 1793, in almost endless litigation. Their rights, moral and legal, were shamefully disregarded.

In spite of the loss of their only model, and the infringement of their patent, Whitney and Miller still had hopes of securing a share of the wealth which their machine was sure to create. Their plan was to sell no machines, but to gin cotton for the planters on shares, the owners of the gin retaining one pound in every three. This turned out to be an unfortunate plan. Whitney, who went North for the purpose, was unable to supply the needed machines. The scarcity of money, due to the wild speculations in land, crippled his operations. Scarlet fever broke out among his workmen; and, to cap a long series of misfortunes, just as Whitney was recovering from a serious illness, he arrived at New Haven to find his factory and half-finished machines in ashes. This was a serious blow. Not only was the financial loss large, but the impatient planters, who had raised an immense quantity of cotton, the value of which depended on its being ginned, were given extra inducements to make machines for themselves in spite of the patent.

The owners of the cotton-gin were not disheartened by their misfortunes. They raised money at ruinous rates of interest, and proceeded with their enterprise. But no sooner had their prospects brightened a little than a new calamity came upon them. The report became current that their gin injured the fibre of the cotton, and decreased its value. The rumor, which seems to have been founded solely on prejudice, came at a critical period in the affairs of the struggling concern, and for a time—until it was shown to be

without adequate foundation—completely crippled their business. Their gins stood still, in the midst of a cotton-growing country, for lack of cotton to keep them busy.

It is apparent, I think, that the misfortunes of Whitney and Miller would have been only temporary, had it not been for the general infringement of their patent. Their rights were entirely disregarded throughout the cotton-growing district. The first case which they could bring to trial, in 1797, was decided against them. Such was the importance of the machine, the extent of the infringement, and the wealth and influence of the guilty parties, that no jury could be found to return a verdict on the merits of the case. No one now denies that justice was on the side of the patentees; but, nevertheless, sixty cases were tried before a verdict was secured against those who had infringed the patent. This decision was in 1808. The patent had only one year more to run; and justice, coming at so late a date, brought little recompense to the inventor. "The want of a disposition in mankind to do justice," was the philosophic reason for all his trouble, given by Whitney in a letter to Robert Fulton; "and I have always believed," he adds, "that I should have had no difficulty in causing my right to be respected, if it had been less valuable, and been used only by a small portion of the community." Whitney was, with good reason, disgusted at his treatment, and never afterwards, though he made several ingenious and valuable inventions, did he apply for a patent. The rewards which he received for his invention of the cotton-gin were disheartening misfortunes, the loss of a lucrative and honorable profession, costly and troublesome law-suits, health shattered by worry and travel, a paltry grant from South Carolina,—and imperishable fame as one of the foremost figures in the history of industrial development.

It would be impossible to enumerate the results of a great mechanical invention. Its influence extends to all ranks of society and to every region of the world. Like the telegraph, the steamboat, and other great inventions, the cotton-gin has had a striking influence upon modern civilization. It changed the occupations and modes of life of great multitudes in both America

and England; it demanded, and brought about, new inventions to supplement its work; it transformed the sluggish life of the South into a life of activity, power, and wealth; and, perhaps more important than all, it caused a change in the political development of the United States, which reached its climax in a great civil war.

Its effect upon the production of cotton was immediate and striking. I have already said that cotton was an unimportant factor in colonial productions. In 1786, attention was called to the possibility of raising cotton for the English market, and more vigorous efforts were made. In 1791, the South produced 2,000,000 pounds, of which 189,316 pounds were exported. The following year, however, the exportation was only 50,000 pounds. So difficult, in fact, was the process of ginning, that tobacco, indigo, and rice bade fair to be the permanent products of the Southern states. In the winter of 1792-93 came the invention of the cotton-gin. Encouraged by the hope of its success, the planters, during the following season (1793), raised 5,000,000 pounds of cotton, and sent 487,600 pounds to England. During the following year, the use of the cotton-gin became more general in Georgia and South Carolina. It is not surprising, therefore, to find a product of 8,000,000 pounds in 1794, and an exportation of over 1,600,000 pounds. Year after year the area of the cotton-producing country, the number of planters and their slaves, and the amount and value of the crop, showed rapid growth. In 1800, the product was 35,000,000 pounds; in 1810, 85,000,000; in 1820, 160,000,000; in 1830, 350,000,000; in 1840, 880,000,000; and—to omit the intervening decades—in 1880, the crop was 3,200,000,000 pounds. The debt which the nation and the world owe to Eli Whitney is proclaimed by the eloquence of statistics. They indicate that Robert Fulton was not wrong when he said that “Arkwright, Watt, and Whitney were the three men who did most for mankind of any of their contemporaries.” Nor was Lord Macaulay too extravagant in saying, “What Peter the Great did to make Russia dominant, Eli Whitney’s invention of the cotton-gin has more than equalled in its relation to the power and progress of the United States.”

The benefit derived from the cotton-gin,

however, was not unaccompanied with evil. It gave an immense stimulus to the growth of slavery. At the time of the invention, the “cherished institution” was not flourishing. There were 40,000 slaves in the Northern states, and about 600,000 in the Southern; but in the North, the extinction of slavery was already in sight, and in the South it was impossible to supply the slaves with profitable labor. Emancipation societies were tolerated; slavery was regarded as probably of limited duration; and men like Washington, Jefferson, Madison, and Pinckney were outspoken in their disapproval of the system. But the production of cotton, which the cotton-gin made possible, was peculiarly adapted to slave labor. Says Greeley:—

“No other outdoor work afforded such constant and nearly uniform employment for this description of labor. Throughout the greater part of the Southwest, ploughing for the cotton crop may be commenced in January; to be followed directly by planting; this by weeding; and hardly has the cultivation of the earth been completed, when the picking of the more advanced balls may be commenced; and this, with ginning, often employs the whole force of the planters nearly or quite up to the commencement of the Christmas holidays. These being over, the preparation of the fields for ploughing is again commenced; so that there is no season when the hands need stand idle: and though long spring and summer rains, impeding tillage while impelling the growth of weeds and of grass, sometimes induce weeks of necessary hurry and of unusual effort, there is absolutely no day of the year when the experienced planter or competent overseer cannot find full employment for his hands in some detail of the cultivation of cotton.” — *American Conflict*, I. 68.

It is not surprising, then, that with the progress of cotton-growing, the value of slaves rapidly increased, moral sentiments against slavery completely disappeared, and the pernicious system became thoroughly interwoven with the social and industrial life of the Southern people. In view of its effect upon slavery, it is not too much to say, with no discredit to its inventor, that the cotton-gin, in addition to its immeasurable benefits, did more than all other agencies to nourish the cause of the greatest political episode of modern times,—the struggle against slavery, and its culmination in civil war.

NOTE.—The writer is indebted for the illustration of the cotton-gin accompanying this article, as well as for the following interesting letter, to Eli Whitney, Esq., of New Haven, Conn., son of the

inventor of the cotton-gin. The letter is dated New Haven, March 20, 1890:—

“The photograph sent to you of the cotton-gin is from a small model, say 18 x 12, made under my father’s direction about ninety years ago. There are but two of these models now in existence; one at the Smithsonian, and the one in my possession.

“The cotton-gins manufactured to-day have precisely the same mechanical combination as these models. My father’s invention stands almost alone in this respect, that it was perfected when invented. Although this century has been so remarkable for inventions, his has never been improved upon by others. It is almost the only instance of the kind on record concerning the most important and useful inventions. That the Whitney cotton-gin has conferred vast benefits in developing the power and progress of the United States is a matter of well-authenticated history. The inventor made the prosperity of the Southern states agriculturally, financially, and commercially; made England rich, and changed the commerce of the world. He made other valuable inventions, but the litigation and cost of maintaining his cotton-gin patent so disgusted him that he took out no other patent, though he could have received many.

“His invention of methods for making practical and successful his system of making the parts of arms, and any other article, often repeated in manufacture, is of the utmost importance to mankind, and is undoubtedly the foundation of the me-

chanical prosperity of the United States, and the superiority of American manufactures over those of any other country. I refer to his uniformity system — or making the similar parts of an arm or machine so near alike in shape that they can be used in assembling the piece without working. In 1798, when he proposed to make arms with parts interchangeable, the French and English ordnance departments laughed at the idea as an absurdity, saying that each arm would be a model, etc., and would cost \$100; but he soon proved the advantages of his inventions, so that the United States government adopted his system in all the armories under its control. In 1798, there were very few skilled mechanics in the United States, and this uniformity system enabled the manufacturer to employ unskilled mechanics to great advantage. In 1856, the British government, and in 1871 and 1872, the Russian, German, French, and Italian governments adopted the uniformity system of making arms, invented by Eli Whitney in 1797–98. It has been worth many millions to the United States and the world, but he received a very trifling compensation, scarcely worth mentioning, and that indirectly. At the present time guns, clocks, watches, sewing-machines, and almost every article of wood or metal which is often repeated, is made on the plan of his uniformity system, and it would be a loss of many millions every year for the manufacturers of the United States to go back to the old European system of manufactures.”

