

HISTORY OF A COTTON GOWN.—No. II.



[The little wheel, commonly called the Leipzig or Saxony wheel.]

It frequently happens that the principle which pervades an important process, or which is the distinguishing feature in a complex machine, may be better understood by a consideration of the primitive or rude modes of proceeding than by describing at once those of modern date. We think that this remark is applicable on the present occasion. We have brought the materials for our cotton gown to that state where the labours of the

spinner are required. Now in order to form some idea how the *spinning-jennies*, *throstle-frames*, and *mules* perform this operation, we will briefly consider the *domestic* mode of spinning, now almost unknown in this country on account of the cheapness of machine-spun yarn.

The object of spinning is to draw out the *rovings* of cotton (which are soft and easy to be broken), and *twist* them round their centre until all the fibres are so curled as to form a tolerably firm thread—not such as is used for sewing, but such as is employed by the weaver under the name of *yarn*. This is used to be effected by means of a wheel similar to that represented in the cut given in the 'Penny Magazine,' No. 274, commonly called the *big wheel*. The spinster is seated on a stool, and takes one of the bobbins in her lap. Unfastening one end of the roving, she attaches it to the end of a horizontal spindle, which is so connected to a large wheel as to be set in rotation by it. The spinster, holding the cotton in the left hand, draws her hand back to some distance from the spindle; and then, by turning the wheel with her right hand, *twists* the portion of cotton extending from the spindle to her left hand. When this is twisted into a tolerably firm yarn or thread, she winds it on the spindle by reversing the motion of the wheel. The main principle in this operation is this, that by stretching out a portion of the cotton, and causing the spindle, to which one end of it is attached, to revolve, the cotton invariably receives a *twist*, which condenses and hardens the assemblage of fibres. The little wheel, of which we have given a representation above, occupied the fore-finger and thumb of both hands, those of one hand holding the filaments, while the other drew them out into an equable thread. Sometimes two spindles were attached, and the spinster could then form a thread with each hand. The twisting and winding of the thread were also carried on together by means of an ingenious piece of mechanism. This wheel, however, was chiefly used for flax.

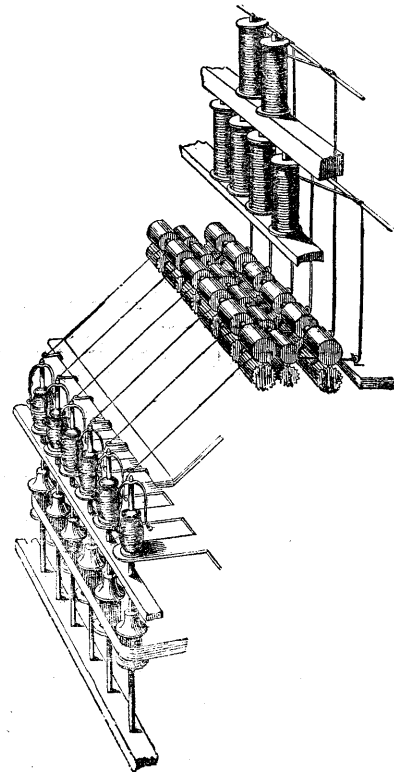
In a way very similar to this was conducted the spinning of almost all the cotton employed in this country until about 1760. It used to be done by the wives and daughters of cottagers by their own fire-sides. The cotton-weavers of that day were accustomed to work at their own houses; and as each weaver could weave as much yarn as three women could spin with their wheels, he was obliged, after having worked up that which his wife and daughters had spun, to apply to the spinsters of the neighbourhood for a further supply. When the demand for cotton goods increased, the supply of spun-yarn was so inadequate, that a weaver was frequently under the necessity of trudging three or four miles in a morning, and visiting many spinners, before he could collect yarn enough to keep his loom at work during the rest of the day; and such was the competition he met with from other weavers similarly employed, that he was often obliged to treat the females with presents in order to quicken them at their work.

This was a critical period in the history of our cotton manufacture; for had not some machine been invented to accelerate the production of spun-yarn, the supply would have been obtained from other countries instead of our own. This was prevented by the labours of James Hargreaves, who invented the *spinning-jenny*. This was a machine formed on the basis of the spinning-wheel, but differing from it in these important particulars, that the wheel which the spinner turned with his right hand set in rotation several dozen spindles instead of a single one; and a frame which he held in his left hand guided and managed several dozen threads instead of one single thread; in fact, the machine was equivalent to multiplying the number of hands, both right and left, possessed by the spinner. Hargreaves met with a return that too often falls to the lot of those who benefit man-

kind: his house was broken open and his machine destroyed by the envious spinners of the neighbourhood.*

The invention once made, however, was not lost to society. A variety of improvements, chiefly by Arkwright and Crompton, were brought to bear in the spinning apparatus. These improvements are all susceptible of being separated into two classes, one in which there is a moveable frame of some kind to stretch out the threads before they receive their twist, and another in which that motion is dispensed with. A cottage spinster, who moves her left hand alternately to and from her spindle, works on the first-named plan: the spinning-jenny of Hargreaves acted on the same plan by the movement of a frame to which the threads were attached: lastly, Crompton invented the *mule-jenny*, in which the threads were stretched by the movement of a little four-wheeled carriage instead of the hand-frame of the spinning-jenny.

On the other hand, a different kind of spinning action was produced by Arkwright's *water-twist frame*, and by a more recent form of machine called the *throstle*. The most essential parts of these machines may be seen from the annexed cut. In the upper part are several



[Throstle-Spinning Apparatus.]

bobbins, containing cotton roving, as brought from the roving-machine. By the rotation of these bobbins the roving is unwound; and after passing over a slender bar, is carried between some pairs of horizontal rollers, which, by a varying velocity, have the effect of drawing or stretching the cotton. The roving from each bobbin then passes down one prong of a curious kind of fork, called a *flier*, and as this flier rotates round a little pin or bobbin, the cotton, which becomes firmly twisted by the rotation of the flier, is wound on the bobbin in the form of *yarn*. The bobbins are made to rotate by a band passing round the spindles beneath them.

There are many elaborate pieces of mechanism connected with the spinning apparatus, but it would be im-

See a wood-cut of this machine, in No. 274.

possible to mention them here. Indeed the reason why we have described the difference between *mule-spinning* (that in which a frame travels to and fro) and *throstle-spinning* (that in which a fork-like flier revolves round the spindle) is, because the yarn produced is of different quality in the two cases. Arkwright's machines were of the latter description, and were fitted to spin *warp*, or long threads, and hosiery yarn, of a stout quality; while Hargreave's *jenny* was fitted to produce a soft yarn for *weft*, and for many years all our cottons were made according to those respective qualities. The improvements in both classes of machines have not changed their *relative* character, for Dr. Ure says—"The *mule* makes a definite length of yarn, after which it winds it up while the operation of spinning is suspended; whereas the throstle makes the yarn and winds it up simultaneously. The *mule* is used generally for all numbers above 30's (a technical name for a certain thickness of yarn), *throstles* being now seldom used to spin so high as 40's. The quality of the yarn produced by the two machines is quite different. The throstle yarn, known under the name of *water-twist* (from having been first produced by the machine called a *water-frame*) is smooth and wiry; while the *mule*-yarn is of a soft and downy nature. The former is usually employed for *warps* in heavy goods, such as fustians, cords, or for making sewing-thread; and the latter for *weft* in coarse goods; as also for both warp and weft in finer fabrics."^{*}

The reader may perhaps be surprised that the material for our cotton gown is not further advanced—that it is yet only thread, mere thread. But the truth is, that the processes which precede *weaving* are of infinitely greater importance than weaving itself. The production of good yarn was deemed by our Arkwrights, Hargreaves, and Cromptons, as more deserving of their study than the weaving of that yarn into cloth. Weaving is, however, of great importance, and is only *comparatively* shrouded by the vast efforts made to improve the processes of carding, drawing, spinning, &c.

The yarn which has been prepared in the modes described is devoted to different purposes; some is made into bobbin-net thread, some into lace-thread, some into stocking-thread, and another portion into sewing-cotton or thread, which is sold in balls, réels, and skeins. For the preparation of these various kinds of thread, two, three, or four yarns are laid parallel and twisted together into a firm and compact thread by machines constructed for the purpose. But the larger portion is used by the weaver in the state of yarn, and is by him converted into calico and all the numerous kinds of cotton fabrics. The difference between these fabrics arises principally from the different thickness and quality of the yarn employed, and from the different modes of making the threads interlace among one another.

When cotton has been spun into yarn, and is destined for the market, it is made up into hanks of 840 yards each. But when it is woven in the same manufactory where it has been spun, the yarn is wound off from the small bobbins upon larger ones. Several of these bobbins are then taken to a machine called the *warping-mill*, where, by a beautiful train of operations, from two to four thousand threads are ranged and stretched side by side: these form the *warp* of the intended piece of cloth, and the number of threads varies with the width which the cloth is intended to be. Most cottons in the next operation receive a coating of glue, size, paste, or starch. The object to be attained by this seems to be sometimes to facilitate the weaving, sometimes to impart a certain degree of strength to the cotton, and at others the less creditable one of making them appear more stout and compact than they really are. Formerly the sizing, or *dressing*, was done by hand; but it is now effected in an ingenious machine, in which the yarn dips into a trough

of paste or size—passes between two rollers to have a portion of that covering squeezed from it—then over a hollow chamber heated by steam, by which the paste is dried,—and is finally wound on a large roller called a warp-beam: all these effects are produced while the yarn is travelling from one end to the other of the machine. The warp-beam, with the yarn upon it, is then conveyed to the weaving-loom.

The yarn just alluded to is to form the *warp*, or longitudinal thread, of the cloth. The yarn for the *weft* is fastened up into hanks, and from thence transferred by the weaver to his shuttle. We may here remark, in connection with these hanks, that the *number* attached to any particular quality of yarn represents the number of hanks to the pound, the hank always containing 840 yards. Thus we have No. 40, 60, 80, &c. The last-named quality was deemed a wonder when Crompton's spinning-apparatus first produced it, and he obtained two guineas per pound for it; but such have been the improvements since his day, that even a finer quality, No. 100, can be procured for three shillings per pound; while the power of producing exquisitely fine yarn has advanced to such a degree, that as high a number as 350 has been produced, that is, 350 hanks of 840 yards each, or 294,000 yards, to the pound.

Weaving will be briefly described in the next paper; but we may here remark that it was the impetus given to the cotton manufacture by the improvements in spinning that led to the substitution of power or machine weaving for hand-weaving. The foot and the hand of the weaver were found to move too slowly for the demand of the market. It was said by Dr. Cartwright:—"Happening to be at Matlock in the summer of 1784, I fell in company with some gentlemen of Manchester, when the conversation turned on Arkwright's spinning-machinery. One of the company observed, that as soon as Arkwright's patent expired, so many mills would be erected, and so much cotton spun, that hands never could be found to weave it: to this observation I replied, that Arkwright must then set his wits to work to invent a weaving-mill." This conversation was the exciting cause of the production of a loom for which Dr. Cartwright received 10,000*l.* from parliament, and which was followed by repeated improvements: the result of this has been, that a weaver can produce twenty pieces of cloth in the time formerly necessary to produce two.

* 'Cotton Manufacture of Great Britain,' vol. ii., p. 119.