16.5 The Creation of the Steam Loom

After the mechanization of spinning, the bottleneck in production occurred in weaving. The following excerpt from an 1823 history of the cotton manufacture describes the process by which the mechanized production of weaving “caught up” with spinning and some of the consequences of that development.


The same powerful agent which so materially forwarded and advanced the progress of the Cotton Manufacture in the concluding part of the last century, has lately been further used as a substitute for manual labour, and the Steam Engine is now applied to the working of the Loom as well as to the preparatory processes.

In 1785, the Rev. E. Cartwright invented a Loom to be worked by water or steam. The following account of this invention is taken from the Supplement to the Encyclopedia Britannica:—“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 brought on a conversation on the subject, in which the Manchester gentlemen unanimously agreed that the thing was impracticable; and in defence of their opinion, they adduced arguments which I certainly was incompetent to answer or even to comprehend, being totally ignorant of the subject, having never at that time seen a person weave. I controverted, however, the impracticability of the thing, by remarking that there had lately been exhibited in London, an automation figure, which played at chess. Now you will not assert, gentlemen, said I, that it is more difficult to construct a machine that shall weave, then one that shall make all the variety of moves which are required in that complicated game.

Some little time afterwards, a particular circumstance recalling this conversation to my mind, it struck me, that, as in plain weaving, according to the conception I then had of the business, there could only be three movements, which were to follow each other in succession, there would be little difficulty in producing and repeating them. Full of these ideas, I immediately employed a carpenter and smith to carry them into effect. As soon as the machine was finished, I got a weaver to put in the warp, which was of such materials as sail cloth is usually made of. To my great delight, a piece of cloth, such as it was, was the produce.

As I had never before turned my thoughts to any thing mechanical, either in theory or practice, nor had ever seen a loom at work, or knew any thing of its construction, you will readily suppose that my first Loom must have been a most rude piece of machinery.

The warp was placed perpendicularly, the reed fell with a force of at least half an hundred weight, and the springs which threw the shuttle were strong enough to have thrown a Congreve rocket. In short, it required the strength of two powerful men to work the machine at a slow rate, and only for a short time. Conceiving in my great simplicity, that I had accomplished all that was required, I then secured what I thought a most valuable property, by a patent, 4th April, 1785. This being done, I then condescended to see how other people wove; and you will guess my astonishment, when I compared their easy modes of operation with mine. Availing myself, however, of what I then saw, I made a Loom in its general principles, nearly as they are now made. But it was not till the year 1787, that I completed my invention, when I took out my last weaving patent, August 1st, of that year.”

Mr. Cartwright erected a weaving mill at Doncaster, which he filled with Looms. This concern was unsuccessful, and at last was abandoned, and some years afterwards, upon an application from a number of manufacturers at Manchester, Parliament granted Mr. Cartwright a sum of money as a remuneration for his ingenuity and trouble.

About 1790, Mr. Grimshaw, of Manchester, under a licence from Mr. Cartwright, erected a weaving factory turned by a Steam Engine. The great loss of time experienced in dressing the warp, which was done in small portions as it unrolled from the beam, and other difficulties arising from the quality of the yarn then spun, were in this instance formidable obstacles to success; the factory, however, was burnt down before it could be fully ascertained whether the experiment would succeed or not, and for many years no further attempts were made in Lancashire to weave by steam.

Mr. Austin, of Glasgow, invented a similar Loom, in 1789, which he still further improved in 1798, and a building to contain two hundred of these Looms was erected by Mr. Monteith, of Pollockshaws, in 1800.
In the year 1803, Mr. Thomas Johnson, of Bradbury, in Cheshire, invented the Dressing Frame. Before this invention the warp was dressed in the Loom in small portions as it unrolled from the beam, the Loom ceasing to work during the operation. Mr. Johnson's machine dresses the whole warp at once; when dressed the warp is placed in the Loom which now works without intermission. A factory for Steam Looms was built in Manchester, in 1806. Soon afterwards two others were erected at Stockport, and about 1809, a fourth was completed in Westhoughton. In these renewed attempts to weave by steam, considerable improvements were made in the structure of the Looms, in the mode of warping, and in preparing the weft for the shuttle. With these improvements, aided by others in the art of spinning, which enabled the spinners to make yarn much superior to that made in 1790, and assisted by Johnson's machine, which is peculiarly adapted for the dressing of warps for Steam Looms, the experiment succeeded. Before the invention of the Dressing Frame, one Weaver was required to each Steam Loom, at present a boy or girl, fourteen or fifteen years of age, can manage two Steam Looms, and with their help can weave three and a half times as much cloth as the best hand Weaver. The best hand Weavers seldom produce a piece of uniform evenness; indeed, it is next to impossible for them to do so, because a weaker or stronger blow with the lathe immediately alters the thickness of the cloth, and after an interruption of some hours, the most experienced weaver finds it difficult to recommence with a blow of precisely the same force as the one with which he left off. In Steam Looms, the lathe gives a steady, certain blow, and when once regulated by the engineer, moves with the greatest precision from the beginning to the end of the piece. Cloth made by these Looms, when seen by those manufacturers who employ hand Weavers, at once excites admiration and a consciousness that their own workmen cannot equal it. The increasing number of Steam Looms is a certain proof of their superiority over the Hand Looms. In 1818, there were in Manchester, Stockport, Middleton, Hyde, Stayley Bridge, and their vicinities, fourteen factories, containing about two thousand Looms. In 1821, there were in the same neighbourhoods thirty-two factories, containing five thousand seven hundred and thirty-two Looms. Since 1821, their number has still farther increased, and there are at present not less than ten thousand Steam Looms at work in Great Britain.

It is a curious circumstance, that, when the Cotton Manufacturer was in its infancy, all the operations, from the dressing of the raw material to its being finally turned out in the state of cloth, were completed under the roof of the weaver's cottage. The course of improved manufacture which followed, was to spin the yarn in factories and to weave it in cottages. At the present time, when the manufacture has attained a mature growth, all the operations, with vastly increased means and more complex contrivances, are gained performed in a single building. The Weaver's cottage with its rude apparatus of peg warping, hand cards, hand wheels, and imperfect looms, was the Steam Loom factory in miniature. Those vast brick edifices in the vicinity of all the great manufacturing towns in the south of Lancashire, towering to the height of seventy or eighty feet, which strike the attention and excite the curiosity of the traveller, now perform labours which formerly employed whole villages. In the Steam Loom factories, the cotton is carded, roved, spun, and woven into cloth, and the same quantum of labour is now performed in one of these structures which formerly occupied the industry of an entire district.

A very good Hand Weaver, a man twenty-five or thirty years of age, will weave two pieces of nine-eighths shirting per week, each twenty-four yards long, and containing one hundred and five shoots of weft in an inch, the reed of the cloth being a forty-four, Bolton count, and the warp and weft forty hanks to the pound. A Steam Loom Weaver, fifteen years of age, will in the same time weave seven similar pieces. A Steam Loom factory containing two hundred Looms, with the assistance of one hundred persons under twenty years of age, and of twenty-five men, will weave seven hundred pieces per week, of the length and quality before described. To manufacture one hundred similar pieces per week by the hand, it would be necessary to employ at least one hundred and twenty-five Looms, because many of the Weavers are females, and have cooking, washing, cleaning and various other duties to perform; others of them are children, and consequently, unable to weave as much as the men. It requires a man of mature age and a very good Weaver to weave two of the pieces in a week, and there is also an allowance to be made for sickness and other incidents. Thus, eight hundred and seventy-five hand Looms would be required to produce the seven hundred pieces per week; and reckoning the weavers, with their children, and the aged and infirm belonging to them, at two and a half to each loom, it may very safely be said, that the work done in a Steam Factory containing two hundred Looms, would, if done by hand Weavers, find employment and support for a population of more than two thousand persons.
The Steam Looms are chiefly employed in Weaving printing cloth and shirtings; but they also weave thicksetts, fancy cords, dimities, cambries and quiltings, together with silks, worsteds, and fine woollen or broad cloth. Invention is progressive, every improvement that is made is the foundation of another, and as the attention of hundreds of skilful mechanics and manufacturers is now turned to the improvement of the Seam Loom, it is probable that its application will become as general, and its efficiency as great, in Weaving, as the Jenny, Water Frame and Mule, are in Spinning, and that it will, in this country at least, entirely supersede the hand Loom.

Questions:
1. What were the costs and benefits of the machines and new divisions of labor? Consider not just the product and the technology, but work location, labor force, consumption, class relations, etc.
2. What hopes and fears were expressed about the future of the new technology?
3. How have these hopes and fears materialized (or not) in the past 200 years? Are the hopes and fears still valid or not?
4. How are workers and manufacturers described and by whom? What conclusions can you draw from these descriptions?
5. How might these descriptions have shaped people’s understanding? How might they have been shaped by ideas of the day (consider, for instance, Enlightenment ideas, see Chapter 18).