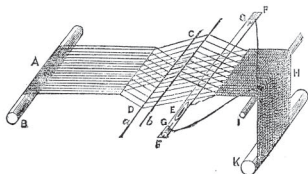


Weaving.

THE warp-threads are now ready for the weaving process, and the roller on which they are wound is placed in the loom. The way in which the warp and weft are woven together is best shown in a figure of the working part of a common hand-loom.

They are finally wound on the roller. B is the roller,

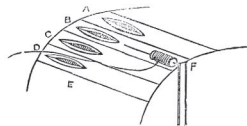


or "beam," on which the warp-threads, A, are rolled side by side. As these threads are rolled off from B on to K at the other end of the loom, they are divided into two sets of alternate threads, C and D, by the heddles, A and B, which, for clearness, are shown only as two sticks. These alternate sets of threads are each in turn raised and lowered by the heddles, while the weft-thread in the shuttle, E, passes backward and forward along the beam, F, being driven by the two hammers, G and H, one at each end, which are connected by a strap, having a handle in the middle. In the diagram the shuttle has just passed from right to left, and is about to return. In passing back to the right the weft-thread will pass over all the warp threads in set D, and under all those in set C. As soon as the shuttle reaches the end, and before it begins to return, the two sets of warp-threads change places. The set C, before raised, is now lowered, and the set D raised. While this is being done the "batten," F, which also carries the shuttle, is moved close to H, so as to carry the last thread of weft close to the one before it. When these two things are done, the weft-thread carried to its exact place, and the two sets of warp-threads changed in their position of up and down, then the shuttle returns from right to left, bringing with it another weft-thread, which now passes over the set of warp-threads, C, and under all those in D. The woven material, H, is rolled over I on to K. This is plain weaving, in which the warp and weft cross each other regularly and alternately. In pattern weaving all the varieties are caused by the difference in the way in which the warp-threads are divided and raised, the rule in all cases being that, every time the shuttle passes the weft-thread to or fro, the warp-threads are divided into two sets, between which the shuttle passes. The different ways in which they can be so divided make the varieties of patterns; while in plain weaving every alternate thread is taken for a set, in pattern weaving it may be every third thread, every fourth, or fifth, or any other number or combination of numbers.

After plain weaving, the simplest variety is shot pattern, in which the warp and weft are of different colors. In shot patterns, the warp being thicker

than the weft, and forming the greater part of the fabric, the color of it forms the prevailing color of the material, that of the weft being only clearly discernible when the light falls directly on it.

In striped fabrics, the warp-threads are of different colors, arranged side by side to form the stripes. In checks the warp and weft are both of different colors, so as to produce strips both along and across the cloth. The difference of color in the warp is easily managed by simply placing different-colored threads, when required, along the warp; but for the weft, not only a different thread, but also a different shuttle, will be required. As many different colors as are wanted in the weft, so many different shuttles will be required,



one for each color. Not only this, but each different shuttle must be brought to the same place when wanted, and removed out of the way when done with. This is contrived by placing the shuttles side by side on the circumference of a cylinder, which moves to and fro, bringing each shuttle to the top as required.

Here there are four shuttles in use—A, B, C, and D. The hammer, F, is now about to move the shuttle, B; but a movement of the cylinder, E, in one direction, would move A before it, and in the other direction would enable it to move C or D. In this way any number of weft-threads, whether of different colors or not, can be used in the same warp. This arrangement of shuttles side by side on the surface of a cylinder, however, belongs to the power-loom now in use, driven by steam, and not to the hand-loom. In the old arrangement for the hand-loom, the different shuttles are placed side by side in a box, which is raised or lowered by a string to the required height for each shuttle.

The hand-loom was soon found unable to weave so much cotton as could be spun by the spinning machinery invented by Hargreaves, Arkwright, and Crompton, and attention was therefore directed to the improvement of the weaving apparatus; and Dr. Cartwright, in 1787, finished his first complete loom, called the power-loom, which, with various modifications, is the great weaving machine of the present day.

In this every thing is done by machinery. The warp-threads are opened, the shuttle thrown between, the weft carried home to its exact place, the warp threads again opened, the shuttle thrown back, etc. The attendant does nothing but mend broken threads, and such like. The machine, of its own accord, stops when the weft-thread breaks, and does not go on until it is mended. This is very important. The weft-thread, being soft and weak, is easily broken; and if, when it is broken, the machine continued working, the warp-threads would continue to be opened in two sets, and the shuttle would fly backward and forward; but no weaving would be the result, and the warp threads would be wound by themselves until the attendant noticed the breakage. But in the power-loom all this is prevented by a small iron hook, which catches in another part of the machinery and stops it. The weft-thread passes over this hook, and by its weight keeps it out of its place; but the instant the weft thread breaks, the hook catches, and the machine stops.

The improvement of the power-loom upon the hand-loom is in quality rather than in principle. Both do the work in very much the same way; but the hand-loom was a large wooden machine, requiring the utmost exertion of strength and skill of a man, while the power-loom is a compact mass of iron wheels and rollers, not larger than a small table, and requiring only supervision of a girl, yet doing the work both faster and better.

On page 201 of the first volume of THE MANUFACTURER AND BUILDER we have described and illustrated the latest improvement in the conveyance of the

shuttle, as shown in the loom of Mr. James Lyall, of New-York. By the use of this peculiar shuttle-carriage, a complete and most convenient control of this important instrument is secured. The reader is recommended to turn back to the article referred to, and consider this valuable invention in the light of the foregoing remarks.

Between the cleaning (described in our February number) and the weaving, to which our last and the present article are devoted, comes the process of carding, which we shall consider in our next.