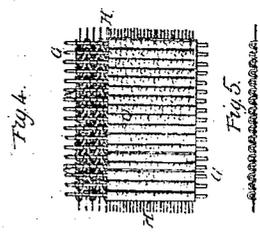
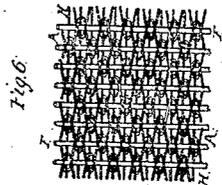
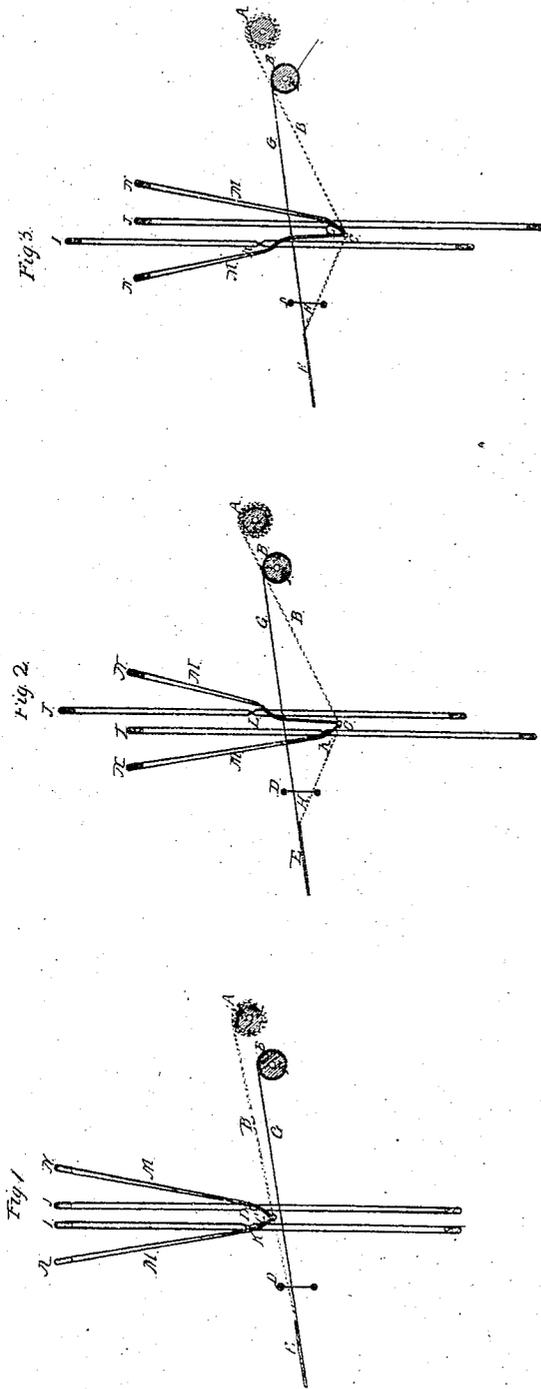


*E. W. Norton.*  
*Making Plain and Figured Fabric.*

*N<sup>o</sup> 10,019.*

*Patented Sept. 13, 1853.*



# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN THE MANUFACTURE OF PLAIN AND FIGURED FABRICS.

Specification forming part of Letters Patent No. **10,019**, dated September 13, 1853.

### *To all whom it may concern:*

Be it known that I, FREDERICK WILLIAM NORTON, of Lasswade, in the county of Edinburgh and Kingdom of Great Britain, have invented certain Improvements in the Manufacture or Production of Plain and Figured Fabrics; and I do hereby declare that the following is a full, clear, and exact description of the principle or character which distinguishes them from all other things before known, and of the usual manner of making, modifying, and using the same, reference being had to the accompanying drawings, which form a part thereof.

My said invention relates to the manufacture or production, under various modifications, of a novel class of plain or figured fabrics applicable for a variety of purposes, but more especially for such uses as what are technically termed "furnitures," or furniture drapery are usually applied to—as, for example, table-covers, curtains, tapestries, carpets, and trimmings. My system or process of weaving or manufacturing fabrics of this class is capable of being worked or carried into effect in the ordinary carpet or other loom, with the modification of attaching a species of cross-heddle to work in conjunction with the ordinary harness or heddle mounting of the loom. This cross-heddle is arranged to work through the ordinary pair of main vertical heddles, and it has a central ring or loop formed in it, through which loop is passed the plain or printed pattern yarn thread intended to form the surface of the fabric. The warp-threads pass from the ordinary yarn-beam through the reed in the usual manner; but, in addition to this yarn-beam, the loom is provided with a secondary beam or roller, carrying upon it a line of foundation-threads of any suitable material and of a fineness proportioned to the effect intended. In some cases cheap and coarse material will answer for this foundation-warp. The threads of this secondary warp are passed along just beneath the line of the surface warp-threads, a thread of each warp being passed together through each dent of the reed, so that when woven the secondary warp-threads serve as a base or foundation to carry the surface warp-threads. During the weaving action the heddles are actuated in such manner that while

one vertical heddle descends, as in the ordinary arrangement to produce the shed, it draws down the cross-heddle and with it the line of pattern or surface warp-threads in such way that each loop or ring of this cross-heddle is brought down beneath the level of its corresponding foundation warp-thread, and, as I shall in this instance suppose, on the left side of the latter. While the harness or heddle remains in this position a shot of weft is passed across the piece, the weft-thread from the shuttle being conveyed along over the top of the warp-threads and beneath the foundation-threads, so that the weft so passed binds or holds down an angular loop or bend of the warp-thread to the left side of each foundation-thread. Then in the course of weaving the heddles are reversed for the next shed, and the reverse vertical heddle, or the one which remained elevated during the last movement, now descends, and a similar action occurs on the opposite or right side of each of the foundation warp-threads—that is, each cross-heddle ring draws its warp-thread across its corresponding foundation in the opposite direction or to the right, the warp-threads being passed down beneath the foundation-thread, as before, and the next weft-shot then secures this reverse set of angular loops and holds in each case a portion of the surface warp across or over the surface of the corresponding foundation-thread. In this way the weft-shots secure the warp in a species of zig-zag over the foundation-thread without the actual formation of any loop. Then as the reed beats up the weft-threads in the shed it also forces up at the same time the zigzag threads of the surface-warp close together, so as to bring each bend or angle of the warp-threads to a right angle, or nearly so, with the line of foundation-threads. Figures 1, 2, and 3 on my sheet of drawings illustrate this mode of producing my improved fabric.

Fig. 1 is a diagram of the heddles as at rest in their intermediate position when no shed is formed. Fig. 2 is a corresponding view showing the cross-heddle rings drawn to the left side of the foundation warp-threads; and Fig. 3 is a similar view representing the reverse action, the cross-heddle rings being drawn to the right side of the foundation warp-threads.

The same letters of reference indicate the same parts in each of the figures, which are all vertical transverse sections through the reed-heddles and warp-beams.

The surface-warp beam for the pattern is at A, the line B being that of the warp-threads passing individually through the cross-heddle rings C and through the reed D, E being the line of the woven fabric. The foundation-warp beam F is so placed that its line of threads G shall pass just beneath the line of the pattern-warp. These threads do not pass through the heddle-loops, but proceed direct to the reed, each dent of which has a thread from both warps passed through it. The fabric then is simply composed of three several sets of materials or threads—the pattern-warp B, the foundation-warp G, and the cross binding weft, which in Figs. 2 and 3 is marked H, as passing through the two sheds; but it will be obvious to the practical man that these materials and their numbers and proportions may be variously modified to produce particular effects.

The vertical heddles I J are fitted up just as in the common loom arrangements; but no portion of the materials for the threads passes through their loops K L, these loops being merely used to actuate the cross or additional heddle M, and, the vertical heddles being only required to act in one direction, a single knot or stop only is necessary in each. The cross-heddle M is suspended by each extremity from the fixed points N N, so as to form two pendent sides, terminating at the bottom loop or bend in a ring or loop, C. Each side of the cross-heddle is passed through the loop or beneath the knot of its corresponding vertical heddle I J, the ring C being freely suspended between the two heddles, as more clearly delineated in my diagram Fig. 1. This figure represents the arrangement of the harness in its inert state, the line of pattern warp-threads being above the foundation-warp, so that no shed is formed to either side.

In Fig. 2 the heddle I has descended so as to carry the line of cross-heddles, with their rings C, to the left side or behind their respective foundation warp-threads G. This movement correspondingly sinks the pattern warp-threads B, bringing them out of the straight line into an angle beneath the level of the foundation-warp line G, which constantly retains the same level. This forms the shed, and the succeeding throw of the shuttle then carries a weft-thread, H, over the depressed line of pattern warp-threads and beneath the foundation-warp. In the reverse action of the heddles, as in Fig. 3, the elevation of the heddle I slackens the cross-heddle on that side, and the depression of the heddle J draws the pattern-warp over the surface of the foundation by pulling down its side of the cross-heddles and bringing their rings C to the right side or in front of their corresponding foundation-threads. This forms the reverse shed, and a bend of the pattern-warp having been

held down by the last weft-shot on the left side of the foundation, the succeeding shot for this reverse shed being similarly passed between the pattern and foundation warps, now holds down a corresponding bend on the right side of the threads of the latter, the portion of the pattern-warp between these two bends being thus laid over and covering the foundation-warp at that part.

The diagram Fig. 4 is a plan or face view of a portion of the fabric so woven, showing one or two of the pattern or surface warp-threads as they would appear before being beaten up by the reed in a series of zigzags, the portion O being the finished fabric, where the zigzags are beaten up individually into a series of crossings over the foundation-threads at right angles, or nearly so, thereto. Fig. 5 is a transverse section of the fabric on an enlarged scale.

In the description and diagrams which I have hereinbefore given I have referred only to that modification of the process wherein one warp-thread is passed over each separate and individual foundation-thread; but it will be obvious to the practical man that the same principle or general arrangement is also capable of useful application in the passing each surface warp-thread over two or more foundation-threads or over irregular and alternate numbers of the foundation-threads to produce particular effects. I would also remark that this system of weaving may be carried into effect by the agency of various mechanical arrangements of the heddles and other details of the loom, my object in all cases being the formation of a fabric with a full or solid corded surface and whether plain or figured by cross-weaving or crossing the surface-warp back and forward over its foundation, so as to take up the length of the warp-thread without the formation of any loop. The result of such system of weaving is the production of a full even fabric consisting of a series of cords or lines of foundation-threads, covered with the crossed warp-threads and held together transversely by the crossing or interweaving of the weft-shots. This class of fabric presents a novel appearance, being flatter and fuller than the common looped fabrics, while the weft-threads are not or need not be seen on the pattern-surface, and great economy in material arises from the use only of a thin external layer of surface-warp.

The essential principle or distinctive feature of my invention is then the weaving of the surface warp-threads alternately right and left over or across one or more foundation-threads, and first depressing and then binding the surface-warp alternately down on the right and left sides of the said foundation-threads by means of weft-shots thrown in at each crossing and depression of the surface-warp. In this way the surface-warp forms the ground or foundation warp into a series of solidly-covered cords laid in parallel lines across the breadth of the piece and bound in

one mass or layer by the weft-threads, forming a corded fabric.

According to another modification of my system of weaving I cause the surface warp-threads to intersect each other while they cross right and left over their foundation-threads in the manner which I have already described.

Fig. 6 of the annexed diagrams is an enlarged view showing the system of interweaving in plan, the various threads being delineated as woven very open to explain the principle of weaving. A is the surface or pattern, F the foundation-warp, and H the cross binding weft. In weaving this figure the heddle arrangement is of the same general structure as that which I have already hereinbefore described in reference to Figs. 1, 2, and 3 of my illustrative diagrams. This differential system of interweaving, I may observe, may be carried out to any convenient extent so as to cause each surface warp-thread to embrace any required number of neighboring interlineations of the same warp and crossing over any required number of the foundation-threads; and it will be obvious to the practical man that various systems of mountings or arrangements of the loom details may be adopted for producing the same effect, this system, as well as the arrangements which I have hereinbefore described, being applicable as well for plain weaving as for combination with or to work warps printed or dyed and arranged to form devices or patterns, just as is at present practiced in the manufacture of terry-looped tapestry-carpets.

In all modifications, however, the surface warp-threads have no loop; but the elongated portions of the printed threads, when such are used, are taken up and spread over the surface of the fabric by crossing and recrossing them over the foundation, thus spreading the threads across the width of the fabric; and whereas the contraction or taking up in the loom of warp-threads whereon elongated patterns have been printed has hitherto only been accomplished by very tedious pro-

cesses of weaving, and chiefly by inserting wires or needles in the fabric to draw up the warp-threads into raised loops on the surface of the piece, now I am enabled by my hereinbefore-described processes of weaving or modifications thereof to take up the elongated pattern-threads of the surface-warp in a very simple and inexpensive manner, while the woven pattern is produced with better effect and greater accuracy than by the existing machines in use.

Having now described and particularly ascertained the nature of my invention and in what manner the same is or may be used or carried into effect, I may observe, in conclusion, that I do not confine or restrict myself to the precise details or arrangements which I have had occasion to describe or refer to, as many variations may be made therefrom without deviating from the principles or main feature of my invention; but

What I consider to be novel and original, and therefore claim as the invention secured to me by the hereinbefore-in-part-recited Letters Patent, is—

1. The manufacture of woven fabrics by cross-weaving by carrying the cross-warp alternately over a stationary warp and binding the cross-warp on each side of the stationary warp by a shot of filling.

2. Carrying contiguous movable cross-warps over and across each other's path and over one or more stationary warps and binding said cross-warps to the stationary warps by shots of filling.

3. The manufacture of ornamental fabrics by cross-weaving elongated printed warps, as described.

In testimony whereof I, the said FREDERICK WILLIAM NORTON, hereto subscribe my name, in the presence of the witnesses whose names are hereto subscribed, on the 19th day of November, A. D. 1852.

F. W. NORTON.

In presence of—  
JAMES SCOTT,  
JOHN LYON.