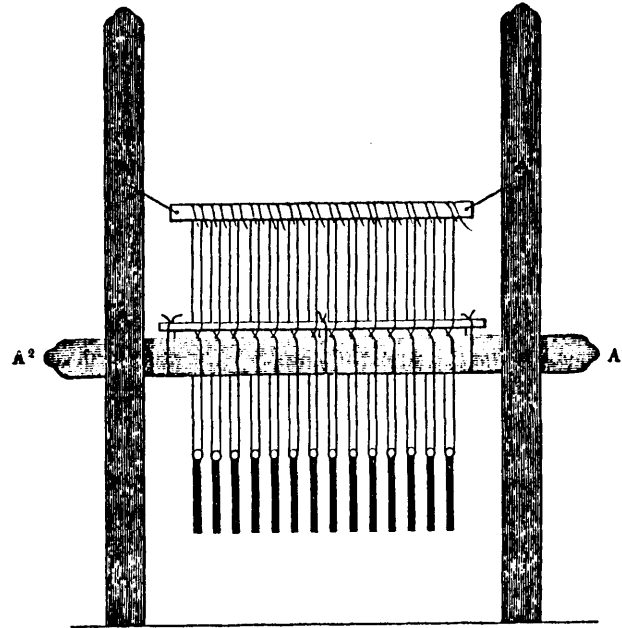


the pulleys, will be diminished in proportion as the number of parts in a given harness are increased. It is also obvious, that as each simple cord is connected, by means of its tail cord, to a corresponding mail in each part, the pattern which is produced will be merely the same group of figures, repeated as often as there are parts in the harness or mounting.

#### MOUNTING THE LOOM.

When a harness is to be *constructed*, as it is termed, a frame, such as is represented in Fig. 67.

Fig. 67.



must be procured; and the two upright sides, AA are fastened to the inside of the loom, one on each side, and in the very same position between the cloth and the warp rolls, which the harness is afterwards to occupy. The cross bar of wood or slab stock A² A², slides up and down in grooves cut in these side pieces, and may be fixed with small bolts at any given height, to suit the position of the mails after the harness is tied. In the upper edge of the slab stock, which is somewhat rounded, is a groove into which the under ends of the mails are inserted during the process of mounting the harness.

This frame being thus adjusted, the operator proceeds to hang the leads, or connect them to their respective mails. This is effected by taking one end of the harness twine, cut of the proper length, through the under hole of the mail, and again through the upper end of the lead; after which both ends of the twine are stretched down below the slabstock, one on each side, where they are knotted, and the knot slipped down to the top of the lead, so as to be clear of the warp when the sheds are opened; the distance between the mail and the lead being about nine inches. A more durable method of hanging the leads, however, is to take both ends of the twine through the hole of the lead, and then turning them backward, one on each side, to knot them together. These twines or hangers are made of flaxen yarn, from three to nine ends laid together, and must be well twisted.

The harness leads are made by cutting a piece of sheet lead into long square slips, and afterwards drawing them through circular holes of different diameters in a steel plate, till reduced to the requisite size; after the manner of drawing other metallic wires. They are afterwards cut off to the proper lengths; and the weight suitable for any harness is estimated by the number of these pieces in a pound. Thus, for the borders of shawls in the cotton manufacture the leads are from fourteen to sixteen inches long, and those for the bosom or body from eight to ten. The weight of leads for a four thread harness will be about fourteen in the pound for the borders, if intended for shawls; and from forty-five to fifty-five for the bosoms, being, however, governed according to the number of parts into which the harness is tied; for the greater the number of parts, the more leads will be attached to each simple cord; and therefore, they must be proportionably lighter, and the contrary. The leads for the borders of a two thread shawl are the same as those of the four thread, provided the borders are not gathered; but for gathered borders, which have double the number of threads attached to each simple cord, they are from twenty to twenty-five in the pound, and of the same length as the fourteen to the pound. The bosom or body leads are from fifty to sixty in the pound, according to the number of parts in a given breadth of the harness and the number of lashes requisite for the pattern; for, it is evident that the more lashes there are on the simple, the greater will be the friction on the simple cords in passing through them; and consequently the leads must be heavier to sink the mails after being raised. Full harnesses, in general, require leads from eighty to a hundred in the pound for the bodies of shawls, but if the parts into which they are

tied be numerous, the leads are sometimes used as light as a hundred and ten.

When the leads are all hung, and the under ends of the mails inserted in the grooves of the slabstock, a piece of strong wire, (flattened by passing it between a reed maker's rollers,) is run through their eyes, by means of which they are all kept at the same uniform height. The wire is then tied firmly to the slabstock with pieces of strong twine, at such distances as are sufficient to prevent the wire from bending, or allowing any portion of the mails to rise higher than the others while tying the neck; all of which process will be apparent by referring to Fig. 67.

When the sleepers are taken through the upper holes of their respective mails they are divided into the parts or portions in which the harness is to be tied. The holes in the harness board are then counted off for each part or pattern, commencing with the hole nearest the right hand selvage; which, *if a right hand harness*, will be in the front, as at Fig. 66; but in the backmost row on the board, *if a left hand harness*. Changing the position of this hole from the front to the back row is effected merely by turning up the other face of the harness board. Then, if the part be composed of any number of fives, as 30, 35, 50, &c. six, seven, ten, &c. of the oblique rows are set off for each part respectively; but if the part is not divisible by five, as for example the number 64; then, there must be thirteen oblique rows appropriated to each part, which will leave one hole empty at the end of each, as was formerly observed. The sleepers are now taken up through the harness board in regular succession.

The board is next fixed very firmly in the centre of the loom, exactly in the same situation in which it is afterwards to remain, and at the height of about  $8\frac{1}{2}$  inches above the mails. The sleepers, which are made of the same twine as the hangers, are in length, from the mails to the knots above the harness board, about  $15\frac{1}{2}$  inches. The position of the harness in the loom will depend in a great measure on the nature of the work in which it is to be employed. Thus, for example, a pressure harness must stand further than a full harness from the breast-beam; which is that wooden bar over which the cloth passes to the receiving roll. The common distance of a pressure harness from the breast-beam is about twenty-two inches; and a full harness eighteen inches; and of a seeding harness, which in general is placed before the ground leaves about twelve inches. The height of the mails in a full harness is about three-fourths of an inch below the level of the breast-beam; in the

split and four thread harness the mails should stand about one inch and a quarter below this level, and to these respective heights the harness board must be accurately adjusted.

The mails being now divided into parts, the sleepers of the first part are laid over the edge of the harness board on one side, and those of the second on the other, and so on alternately, that each part may be kept distinct from the others; then the twine or sleeper attached to each mail, being now double, is knotted to its respective neck twine; which must be cut of a length sufficient to reach from these knots to the ends of the tail cords at the neck. This process is called *beating the harness*. These neck twines are made of three ends of flax yarn, well twisted, and weigh from two and a half to five and a half ounces per hank of four cuts: the coarse twine being employed for those harnesses which are divided into the fewest parts. These neck twines, however, will vary in length according to the width of the harness. For example, for a harness fifty-four inches wide, the neck twines may be five feet six inches long.

In the process of beating the harness the snitch knot used on the treadle cords in tweeling, &c. is mostly employed, to enable the weaver to adjust any of the twines that may have been slacker or tighter tied than the others; and this is effected when the neck twines are single, which is commonly the case for light fabrics, by casting a loop knot on one end and forming it into a snitch, through which the two ends of the sleeper are taken and knotted in the usual way, to prevent them from slipping. In some harnesses, however, which are intended for stouter fabrics, the neck twines are taken double through the hole board; in which case the two ends of the sleeper are tied together, and formed into a snitch, into which the two ends of the neck twine are inserted, and afterwards knotted.

Before the operator can proceed further, the tail must be warped; which is effected by winding the twine round two nails or pins, fixed in the wall of a house at a distance from each other equal to the whole length of the tail, and this is commonly about eighteen feet; though some tails are now made as short as fourteen. This part of the draw loom is made of what is termed by the spinners of this article, *unlaid twine*, a quality which prevents it from untwisting after it is tied to the neck twines of the harness.

When the requisite number of tail cords, *which must always be equal to the number of mails that are to rise independently of each other*, are thus laid together, a lease, as in warping, (see Fig. 3, Section 1st.) is formed at one end, and the loops cut at the other: at the lease end the loops are separated into small parcels, com-

monly five in each, and formed into snitches, by which they are fastened at equal distances round the tail stick so that they may stand nearly equal to the breadth of the tail. This piece of wood or tail stick is fastened to the ceiling of the shop where the tail terminates. The other ends of the tail cords are taken through the pulley box, with the assistance of a small hook, in the following order: supposing the tail cords to be numbered 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10, from the bottom of the back row at A to the top at B, (see Fig. 64,) then the first ten cords will pass over the pulleys from 1 to 10 respectively; the second ten cords over the pulleys 11 to 20; the third ten over 21 to 30: and so on, always commencing each row of pulleys at the lower part of the box A.<sup>2</sup> All these arrangements being made, and a wooden frame called mounters or justers, such as that employed in mounting leaves with couplets, is fixed to the cape of the loom and over the tail at W, to keep the cords equally tight and at the proper angle, the harness is then ready for tying.

In the plan of a harness Fig. 63, it will be observed, that there are ten mails numbered on the edge of the harness board, which is repeated four times, indicating that the harness is tied in four parts of ten mails each, which supposes only one row of holes in the harness board. But as there are five such holes in the board Fig. 66, though, to save room in the representation, there are only sixteen oblique rows, the harness may be calculated upon fifty mails for each part, which, though still on a limited scale, will be sufficient to explain the principles upon which the draw loom is mounted. Either one or more assistants, as the extent of the harness may require, are stationed at the side of the harness board, to take up the twines in the order in which they occur, and hand them to the person who ties the neck. In this example the right hand twine of each part is selected and given to the operator, who ties all these four twines to the tail cord numbered 1, or that which passes over the first pulley in the box, as already mentioned. By the time this is tied the second twine of each part in succession is ready to be handed up, which the operator ties to the second tail cord marked 2, and so on with the others till the fifty be tied; which, in this example, occupy one half of the box. (See Fig. 64.) It must still be remembered, however, that when the first ten tail cords are tied which complete the first row of pulleys, the operator must again commence at the bottom of the box, as at first.

The knot here employed is formed by taking the four neck twines in one hand and the end of the tail cord in the other; then,

laying the former over the latter, he takes the turn of a knot on the upper part of the tail cord, or that immediately above the figures 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10, in the drawing Fig. 63, with the part which he holds in his hand; then another knot round the same with the ends of the neck twines.

The principal care to be taken in tying the neck is, that the twines from the different parts be equally tight, and that the knots be all in the same horizontal line, sufficiently far below the pulleys to prevent their coming in contact when any part of the harness is raised to form the shed or sheds. To assist the operator in this, he places a rule or scale along the inside of the carriage, in the position U O, in a line with one edge of which he ties his knots; and this scale he shifts forward as each row of cords is tied. On the same scale are marked the distances at which the ends of the tail cords should descend vertically, so that the harness may hang perfectly plumb in the loom after it is completed. Before the tying commences, however, a lead is suspended by a piece of twine from the centre of the pulley box E, to which the centre of the harness is accurately adjusted; or, which is more accurate, two leads are suspended, one over the fifth, and the other over the sixth pulley, at the centre of the box, counting from the bottom, and half the distance between these will be the position of the centre of the harness board.

The next process is to warp and apply the simple, which is prepared in every respect in the same manner as the tail, though only about six feet ten inches or seven feet long, less or more, according to the height of the shop; it has also a lease, formed at its lower end, for the convenience of selecting the cords when required: this lease, however, is merely temporary, being retained no longer than while the simple is tying to the tail; from which it can at any time be recovered when it again becomes necessary. The operator now ties each cord of the simple to its corresponding tail cord at W, (see Fig. 63) each of the cords being readily found in succession from its respective place in the lease. In order, however, that the knots of the simple may not be too much crowded on the tail, the simple cords are usually tied in two, or three, or more rows, according to the number of cords which it contains, as represented at W in the Fig.

The simple is made of what is termed *laid* twine, which distinguishes it from that of the tail, and weighs from twenty to twenty-seven hanks in the pound, but in every other respect it is

the same as the tail twine formerly described, consequently one hank will produce twenty simple cords seven feet long.

The lashes III are formed by taking the lash twine around certain portions of the simple cords as explained under the head of reading or lashing the pattern, Fig. 70, and which, as formerly noticed, serve to select the cords of each particular shed. Each turn of the lash twine round any part of the simple is called a tack, and the whole number of tacks requisite for one shed constitute a lash.

Lash twine is now commonly made of cotton yarn, about No. 48, water twisted, and from six to eighteen plies laid together, and moderately twisted; for too much twist causes the twine to curl on the simple and obstruct the draw boy's progress. The twine composed of the greater number of ends is chiefly employed for stout fabrics, or when only few lashes are requisite for the pattern; but the more lashes there are on the simple the finer is the kind of twine which is applied, to occupy less space, as well as to afford the draw boy sufficient room to work.

The length of the lashes, exclusive of the heads, is commonly from eight to twelve inches, according to the breadth of the simple; for were short lashes, for example, to be employed on a broad simple, the simple cords on each side would be drawn into an oblique position by the draw boy's hand, before they could be brought to act along with those in the centre, and consequently form a very irregular shed.

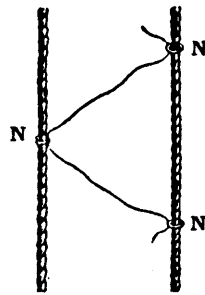
The heads NNN are small pieces of twine, which, as formerly observed, connect the lashes together and the gut cord on which they are made to slide up or down at pleasure; each lash having its respective head. These heads are made of foot twine when only few lashes are necessary, but of snitch twine when they are more numerous. The length of twine requisite for each head is from nine to ten inches; and when the two ends are laid together and knotted, the length in the double state will be from four to four and a half inches. The head is taken through a snitch formed by the loops of the lash, and is prevented from slipping by the knot on the end. On the loop end is formed a noose which runs on the gut cords.

The bridles KK, which are tied to the heads for the purpose of drawing the lashes down or up in regular succession, are made of snitch twine, and are commonly from nine to thirteen inches between the heads; the longer ones being necessary where the draw boy employs what is termed a *dog* or *devil*.

The gut cord *L* which extends from the floor to the ceiling of the shop, or at least to the height of the tail, is generally composed of three, four, five, or more smaller cords, laid together without any twist. Those made of cotton are preferred to those made of flax or hemp, on account of its softness, and having less tendency to cut the heads of the lashes.

For the smaller sized patterns, which require only a few lashes, one gut cord is fully sufficient; but when the lashes become more numerous it is customary to have two, and the heads are attached to them alternately, as represented in Fig. 68.

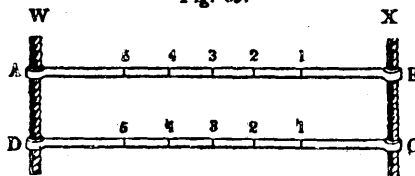
Fig. 68.



Moreover, all covered work requires additional gut cords, one for each cover or colour.

When four or more gut cords would be necessary, however, it is now common to employ only two, and to put on the lashes with cross bridles. These will be easily understood by referring to Fig. 69,

Fig. 69.



in which *W*, and *X* are two gut cords, placed at the distance of eleven or thirteen inches from each other, according to the number of covers or variety of colours in the pattern; the cross bridles extend horizontally from *A* to *E* or from *D* to *O* between the two gut cords, on which they can be shifted up and down by the draw boy at pleasure. They are made of seine twine, two ends laid together, and a knot tied for fixing the head of each colouring lash, at the distance of one inch from each other; those at the end being about two inches from their respective gut cords, as represented in Fig. 68.



by the Figs. of reference, 1, 2, 3, 4 and 5. Thus, if the lash at 1 were for green, at 2 for dark blue, at 3 for red, at 4 for yellow, and at 5 for light blue, then, when the draw boy takes down the cross bridle D O, on which there are lashes for all the five colours, and which he draws in succession, beginning with the lash 1 for the green, 2 for the dark blue, 3 for the red, 4 for the yellow, and 5 for the light blue; he then shifts down this cross bridle, and replaces it with the one marked A E: but on this the lash 4, for the yellow is wanting, so that he has only the lashes 1, 2, 3 and 5 to draw in succession on this bridle, for the green, dark blue, red, and light blue, respectively.

By referring again to Fig. 63 it will be observed, that as the twines incline from the harness board to the neck in very different angles, those towards the selvages, especially if broad harnesses, being much more oblique than those near the centre; it will follow, that when any portion of the simple cords is drawn down to form a shed, all the mails cannot rise to the same elevation; and, therefore, the sheds thus formed will be not only very irregular, but in many cases wholly impervious to the shuttle. To obviate this inconvenience, two wooden rollers are placed in each space between the rows of tail cords at the neck, or at the knots 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10, one on each side of a row, and the ends of these rollers turn on two pieces of wood, one fixed on each side of the carriage at U O. By this means all the harness twines, however oblique, will rise vertically between the rollers, and consequently all the mails will be raised to the same uniform height in opening the sheds.

When the harness and all its appendages are completed, it is disengaged from the frame in which it was built; the frame of wood or justers which was fixed above the tail at W removed; the wire drawn out of the mails; and the slabstock taken out of the hangers. But in order to preserve the progressive order of the mails for drawing in the warp, a shaft or rod must be introduced into the place of the slabstock before it is taken out; by which means the mails will come to the weaver's hand in regular succession as he has occasion for them in entering his warp, without the necessity of having recourse to the harness board. The harness should now retain the very same position which it occupied while fixed in the frame, both with respect to the height of the mails and their distance from the yarn roll and breast-beam.

The process of drawing the warp through a harness does not differ from that formerly explained under tweeling, Figs. 18, 21, 24, 25, 27, 28, 29, 30, 31 and 32 (which see;) always drawing the

first thread on the back leaf, and so on to the front until the leaves of headles have been gone over; beginning again at the back leaf and drawing towards the front, and repeating the operation until the whole warp be entered. This is the case always in shawls, damask, and many other kinds of weaving. After the warp is taken through the harness, however, a new lease must be forced through the eyes or mails, from the rods behind, for the purpose of taking it through the ground leaves.

When the tail of a harness extends across the shop on the weaver's right hand, while on his seat, as in the example Fig. 63, it is termed a *right hand* harness; but, were the situation of the loom to require it to be tied on the opposite side of the shop, it would then be denominated a *left hand* harness; all the tail and simple cords would retain their relative positions and connections, only what is here the top of the pulley box would become the bottom; and the right hand side of the simple in the present case would become the left. This distinction must be particularly attended to in reading the pattern on the simple; which will be further explained under the head of *reading or lashing patterns*.

It may be again observed, that in Fig. 63 the tying of the harness commenced at one side, or at the figure 1 in the harness board in each part, and continued in regular succession till finished. This is the most common form of the harness, though other varieties are occasionally adopted. Had, for example, the mails numbered 1 in the two parts on the right, and those numbered 10 in the two parts on the left, been tied to the first tail cord or that marked 1 at the neck, and the others in regular order from the outsides toward the centre, this would be denominated a *gathered* harness; and would produce this effect, that whatever positions the patterns assumed in the two right hand parts, they would stand reversed on the other two; or, if stripes were to run diagonally from the right side in the former two, they would change their direction in the two latter, and meet in the centre of the web. In harnesses of this kind, however, it will always be found advantageous to terminate the tying with an odd mail in the centre, which prevents the appearance of teething.\*

Again, were the same example (Fig. 63) to be taken for the bosom of a shawl, and that a border of fifty mails were to be added, it is obvious that an additional tail and simple of fifty cords each would be requisite; which would exactly fill the pulley box repre-

---

\* A double point.

erented in Fig. 64 ; and the tie of the harness would be said to be fifty border and fifty body.

In this case the fifty pulleys in the back part of the box at A, B, C, D, would be appropriated to the border, and the remaining fifty to the body.

In tying a harness for shawls of this kind, the operator may commence either with the border or body. If he begin with the border the tail cord which passes over the first pulley, number 1 in Fig. 64, is tied at the first neck twine of each border or those at the extremities of the harness board at A and E (Fig. 66.) The second tail cord is tied to the second neck twine of each border, counting from the two selvages, and so on with the others till the borders be tied ; observing, as formerly directed, that when the first ten cords in the pulley box are tied, to commence the second ten at the bottom of the box, and consequently the border will end at C. After the border is tied, the body begins with the tail cord which passes over the fifty-first pulley or the first in the body part, C, D, E, F, and proceeds in every respect as has been already explained.

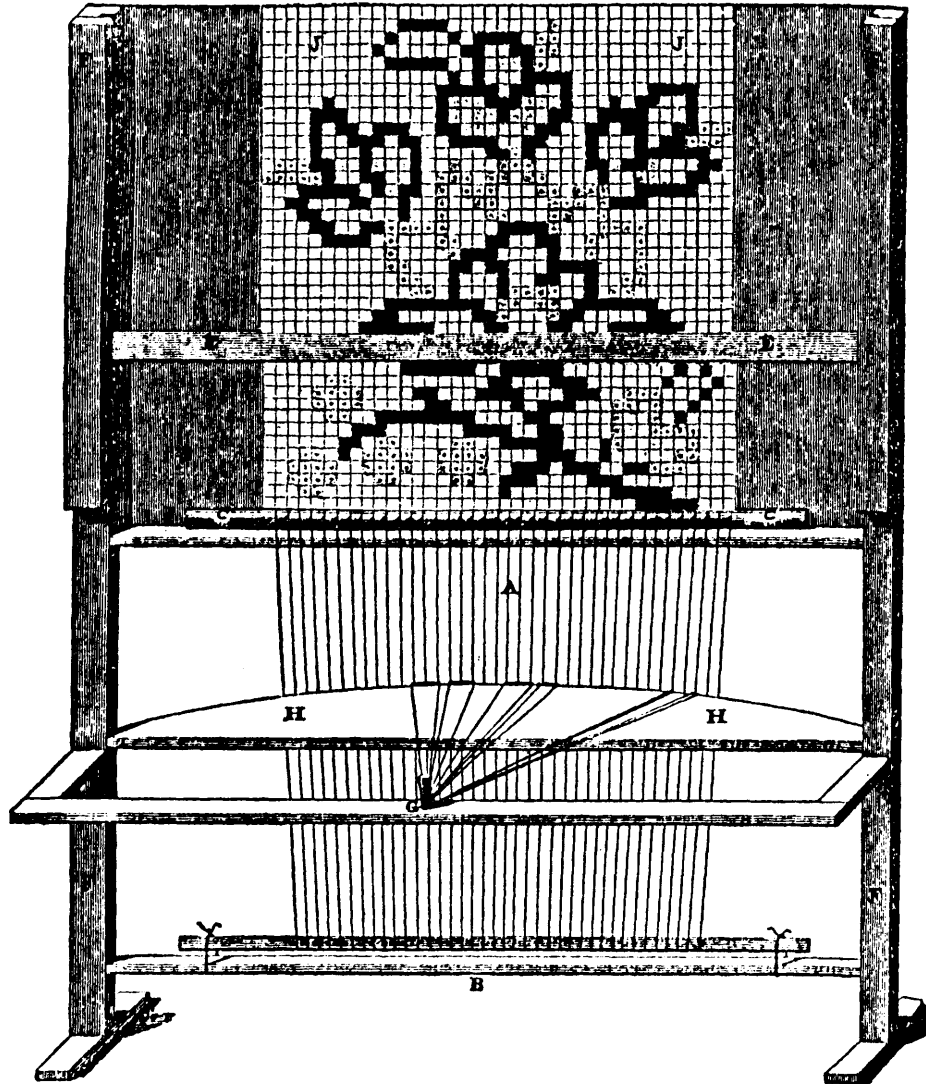
Had the tying commenced with the body, the process would have begun with the tail cord which passes over the first pulley at the corner of the box, or that which was last in the preceding method, and proceeded on in the contrary direction till finished ; and then the border would begin with that tail cord which passes over the first pulley at the left hand in the sixth row, counting from the front ; and in this case the harness twines nearest the selvages would be the last tied. Hence it is evident, that in tying the borders the right hand mail on one side, and the left hand mail on the other, are connected to the first tail cord ; the second of each in succession, to the second tail cord, &c : but, in the body the tying of each part always commences at one side and proceeds regularly to the other, except in the case of a gathered harness, which would have continued inward to the centre, or outward to the selvages, in the same manner as the borders.

#### READING OR LASHING PATTERNS.

This operation, from the complexity of the patterns, and the necessity of accuracy, requires close attention.

The lower end of the simples A is fastened to the cross bar B in the reading or lashing frame, a very correct representation of which is given in Fig. 70,

Fig 70.\*



and each simple cord is afterwards placed in a separate interval of the reed *CC*; which is open at one side so as to resemble a comb.

\* We have been at great pains to make this machine (as well as all the others described in this work) worthy the attention of the manufacturers of this country; and we doubt not that our endeavors to please them in this particular will be properly appreciated. We have not slavishly followed in the

This reed must be made of such a fineness that each cord of the simple A may stand directly opposite to that space of the design paper to which it corresponds in the pattern, with allowance for one empty interval of the reed at the end of each design, but this does not appear in the drawing (Fig. 70.)\* The pattern is now placed above the reed, as shown in the Fig. and over it the straight edge E E is made to slide up and down in grooves cut in the sides of the frame at F F.

These arrangements being made, and the straight edge E E fixed above the space of the design paper that represents the first lash, the operator fastens one end of the lash twine round the pin G, in such a manner that he can disengage it again at pleasure; then, after counting off such spaces at the left of the design as are to be omitted, if any, he takes a turn of the lash twine round the first parcel of simple cords that are to be taken for the lash, bringing the loop of the twine over the pin G; then round the next parcel of cords that are to be taken, and again bringing the loop of the twine over the pin G; and so on, alternately, until the lash be completed; taking care at the same time, never to take above six or seven cords of the simple into one tack or loop of the twine; for, when a greater number of cords come together they must be divided into different tacks, not exceeding either of these numbers in each. After the lash has been applied in this manner, the two ends of the lash twine are knotted together, close to the pin G; which is now taken out, and the loop that it has formed is twisted round and made into a snitch, for the purpose of fastening it to the head. The lash is now pushed down behind the board H H, to make room for another.

In the example given in Fig. 70, the pattern J J would require a simple containing 38 cords, as it consists of that number of small squares in the breadth; and as there are six colours in it, we shall suppose cross bridles to be employed. It is placed in the frame and adjusted to the simple, as already mentioned. The lasher, after fastening one end of his twine to the pin G, counts off 30 cords at

---

track of our predecessors by copying verbatim the matter furnished by men totally incompetent to the task. We have spared neither expense nor labour in endeavouring to make this Work, in all respects, of sterling utility; and we rest our case in the hands of practical weavers and manufacturers.

\* It is customary to have 9 dents in the reed or comb, C C on the same space as one of the designs, 8 by 8. This enables the reader or lasher of the pattern to leave every ninth interval of the reed empty, and thus to distinguish more easily the termination of each design. The same principle is applied whatever be the kind of design paper used.

the left side of the simple, corresponding to the 30 blank spaces or ground on the first line of the pattern at the bottom ; then takes a turn of the twine round the next 5 cords, which are black ; brings the loop over the pin G ; and passes the 3 last cords, which are blank. The two ends of the lash twine are now to be knotted together ; the pin G taken out ; the loop twisted ; (it is unnecessary to twist a lash of one tack, although all larger ones require it) and the lash put upon the first head of the bridle, or that marked 1, (Fig. 69 ; ) which bridle being thus finished, as there is only one colour in the first line, is then put behind the board H H. The second line contains two colours, red and black, and after the straight edge has been shifted to its proper position for this line, the lasher again proceeds with the black by passing 19 cords to the left and taking the twentieth ; he passes the next 8 and takes 5 which are black ; and as the last 5 on the line are blank, they are likewise passed ; and the lash, being completed, he attaches it to the first head of the second bridle, as formerly. The red lash on the same line is now to be formed. He passes three cords, and takes 2 red ones, which follow ; and this finishes the second line of the pattern, as the rest of it is all ground, except the black, which was taken in the previous lash. He fastens the red lash to the second head, or that marked 2 on the second bridle ; which bridle he puts behind the board H H, as he did the first ; and so on till the pattern be finished ; bearing always in mind, as before observed, *that every colour must have a lash exclusively to itself, and they must all be drawn in regular order by the draw boy.*

By looking over the pattern it will be noticed that there are two cords of green on the fourth line from the bottom, in addition to the black and red, so that there must be three lashes on the corresponding bridle. On the fourth line there must be four, as the blue comes in extra upon it ; and on the sixth line five will be required, as it contains two cords of yellow. The pink begins on the seventeenth line, and, as all the colours are upon it, there will be six lashes on the bridle.\* The ruler E E is represented in the drawing as being just above the twelfth line, which only contains black and green, and consequently but two lashes will be necessary for this line.

---

\* In Fig. 69 only five heads are represented on the cross bridles, although there are six colours in the pattern, Fig. 70 ; but, of course, the operator will use as many as he has covers or colours in his pattern.

Although, in these examples, the instructions are given to take the painted parts of the design, yet in some cases it is of advantage to the weaver to take the ground simples or the blanks, and pass the painted parts, especially when they are heavier to draw than the ground ; and in others, it is absolutely necessary, as in shawls for instance, the pattern of the side borders of which is thrown up by the warp, and of the cross borders by the weft ; for in the one the flower is taken, and in the other the ground.

It may be here observed, that the cross bar or board H H in the frame, should be somewhat circular at the back, that when the simple cords are spread round it, the lashes may be all of an equal length from the simples to the pin G ; The board H H should be moveable in the side pieces at I I, so that it may be regulated according to the intended length of the lashes.

The loom is worked by two persons, one of whom pulls the lashes and simples to form the pattern, and the other manages the treadles, shuttles and lay. The ground mounting is exactly the same in every respect as in damask weaving, (which see,) and the number of leaves is, of course, equal to one set of the tweel. For the ordinary quality of damasks five leaves are commonly used,\* as at K K Fig. 65 ; but many of the finest are wrought with eight.

The person who pulls the lashes draws the first bridle down ; and then, by pulling the simples of the first lash, and consequently the tail, raises that part of the harness which is attached to the latter : the weaver then works until a change of the pattern becomes necessary ; the draw-boy slacks those cords of the simple which he last pulled, and pulls the simple cords of the second lash, as before : the weaver proceeds to work until another change is required ; and so on to the end of his pattern.

When the mounting of the draw loom is very extensive, it is found necessary to employ from two to ten, or more, boxes of pulleys, and as many draw-boys ; for, were the whole number of pulleys placed in one box or frame, it would be extended to a very *inconvenient* size. These are placed parallel to each other, and an equal portion of the cordage is conducted over each.

#### SCOTCH COUNTERPOISE HARNESS.

The next weaving machine, in order, which merits our attention is that invented by the late ingenious James Cross of Paisley (Scot-

---

\* In this case these form what is generally called a *bastard tweel*.

land.) This machine is known by the name of "Cross's Counterpoise Harness;" and its object is to supersede the use of draw boys. In the various branches of figured work to which the draw loom is applicable, this object has long been a desideratum; and many attempts have been made, especially in Scotland, towards its accomplishment, but nearly all of them have either proved abortive, or at least have been confined to particular branches of the manufacture. Since the introduction of the Jacquard machine into England by Stephen Wilson, (brother to Samuel Wilson, late Lord Mayor of London,) even Cross's machine seems to have gone out of use; but from its great ingenuity, and evident utility, *in many respects*, we have neither spared trouble nor expense in preparing new drawings, and in remodeling the description of it, from the original account given in the Edinburgh Encyclopædia; and we trust that these will enable the reader to comprehend with ease its various parts, both in detail and in combination.

This machine consists of three distinct parts; one properly called the counterpoise harness, another, an apparatus for preparing the lashes, and the third, a treading machine. Fig. 71, is a front elevation of these three parts connected together as they stand in the loom when it is at rest. The harness F is in all respects like that of the common draw loom, already explained, till it reaches the neck, where the counterpoise apparatus commences. The principal part of this apparatus is contained in the upright frame AA, and the whole is supported by the carriage E E, which rests on the capes of the loom, as in the common draw loom. In the frame A A are four boards *e, u, v, i*, which are perforated with a number of corresponding holes, equal to the tie of the harness or size of the simple. The two boards *e, i*, (the top and bottom ones) are mortised into the cross rails *d, d*, which are let into the upright frame A A; the former called the suspension board (the top board *e*) from its bearing the weight of the harness and leads, and the latter (*i*) the neck, or directing board, as it answers the purpose of rollers, as well as keeps the cords at regular distances. The other two boards *u, v*, are called trap boards, and are mortised into the moveable bars *m, m*, called the arms of the trap boards, have their holes of a sufficient size, about a quarter of an inch in diameter, to allow the knots on the cords *c*, to pass freely through them; and at the side next the simple, there is a saw draught, or cut in the edge of each hole, to admit the cords, but to support the knots as represented in Fig. 72.



Fig. 71.

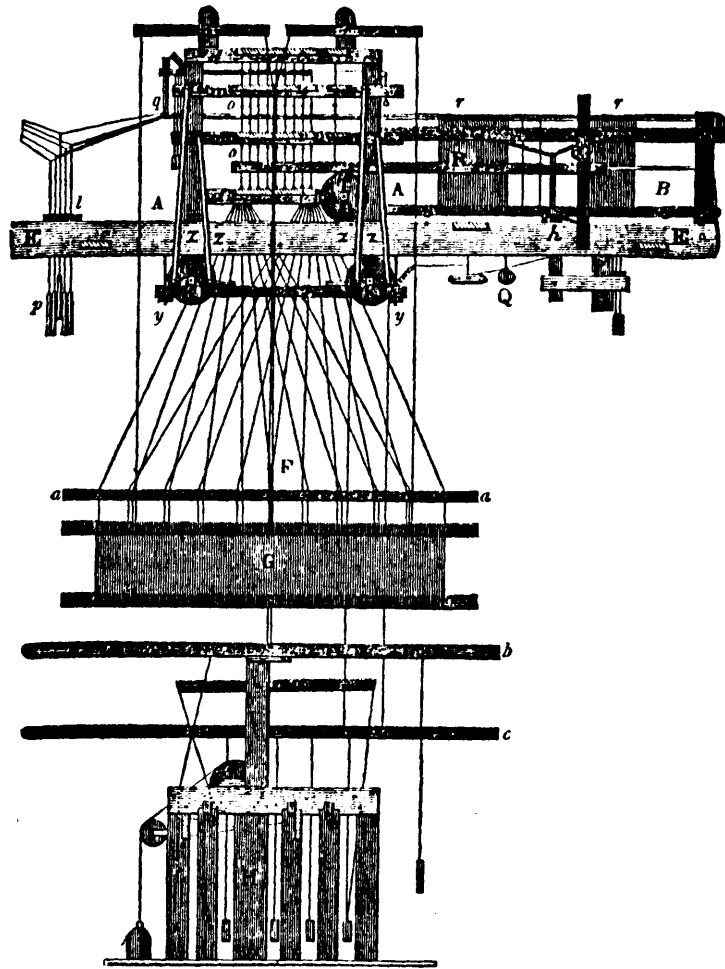
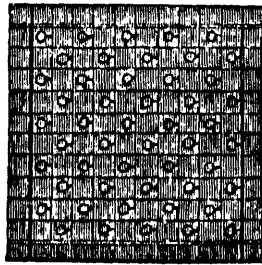


Fig. 72.



They are fastened to the suspension or top board *e*, by means of the holes made for that purpose, and are taken down through both of the trap boards to the neck *i*, where they are tied to the harness. *K K* are two circular pieces of wood, called rotators, which revolve on iron axles, that run through to the opposite side of the frame *E*, where other rotators are similarly fixed. *z, z, z, z*, are small bars or arms of wood, called pushers, and which connect the trap board arms to the rotators on each side of the frame *E*. The rotators *K K* are connected together by means of an arm or rod (one on each side of the carriage) and a small leather belt or strap at each end of it, which takes a turn round each of the rotators. The connecting arm or rod is placed just above the rotators, and works in a guide, which allows it to slide to the right or left, according to the alternate motion of the rotators, so that whatever motion is communicated to any one of these, it is instantaneously transmitted to the other, and thus a uniformity of action is constantly kept up. *L* is a bar of wood, with a corresponding one at the other side of the frame, on which the axles of the rotators revolve, and their height is regulated by the nuts and screws *y, y*.

The process of tying the counterpoise is the same as in the common draw loom; for the workman commences tying at the back row of the holes in the neck board *i*, and the other rows follow in succession; always beginning each row at the same side of the board at which the tying commenced, as from *a*, to *b*, if it commenced at *a*, &c. as in the pulley box of the draw loom (Fig. 64.) In the Fig. 71 there are only two of the knot cords tied to their harness twines *F*, the first and last of each row, to prevent confusion. *a, a*, is the harness board, *G* the headles, and *b*, and *c*, marches.

Now, it is evident, that when the rotators *K K* are turned round to the right, which is effected by means of a cord connected to a treadle, the pushers *z*, will raise the upper trap board *u*, and sink the under trap board *v*; and when the rotators are turned the contrary way, the motion of the trap boards will be reversed. Consequently, were a portion of the knot cords drawn into the saw-draughts of one trap board for one lash, and the knot cords of another lash into the other trap board, *one spotting shed would be rising while the preceding one would be sinking*; and this is the principle of the counterpoise harness.

The next part of the machine is that for drawing the knot cords into the saw cuts, and is chiefly contained in the frame between *A* and *B* (Fig. 71.) In this apparatus, the simple *r, r*, is extended horizontally at the top of the frame *AB*, each simple being tied to

its respective knot cord above the neck : afterwards it is continued, by the addition of other pieces of twine to *g*, where it is supported by a half leaf of headles, and again to the wall or shop window, where the ends are fastened. At *p* are leads, one attached to each cord, to recover the knot cords after the draught, and *l*, a board with holes in it for regulating their distances. *s, s*, are gut cords for keeping the heads of the bridles open for the hooks. *S*<sup>2</sup> is the lash driver cross-piece, and *R* the shaft which communicates the motion from the pulley 'T', which is operated upon by a treadle, and on the axle of which are a number of eccentric pulleys, one for each cover or colour, for gaining power in the preparation of the lashes. The form of these pulleys, or rather tappets will be seen at Fig. 73.

Fig. 73.



Fig. 74.

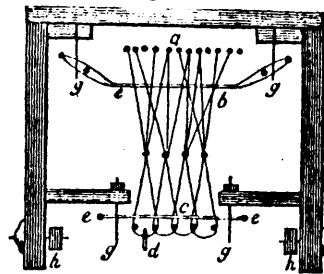


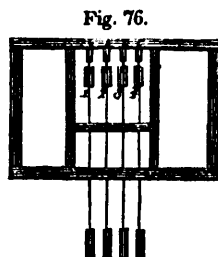
Fig. 74 is a front view of the lash driver ; showing likewise the manner in which the lashes, simple, and cross bridles are connected. The dots at *a*, represent the ends of the simple, *b* the lashes, *c*, the heads of the lashes, and *e*, cross bridles. The position of the hooks *a'* as seen in Fig. 75,

Fig. 75.



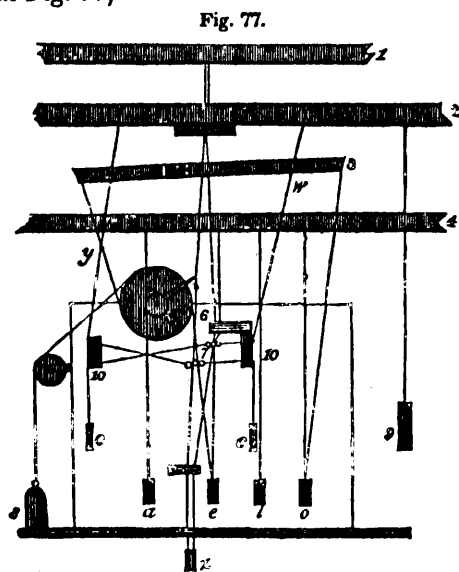
for drawing the lashes is pointed out at *d* (see Fig. 74.) *g, g, g, g*, are iron pins which drive the lashes to their proper place for the draught or opening of the shed. *h, h*, are the small castors on which the lash driver moves. Fig. 75 is a view of one of the tumblers or levers, in which is fastened the hook *a'* for pulling down the lash. The two parts *a'* and *b*, as seen in Fig. 75, are opened by cords connected to the treadles when they are in the position to catch the head of the lash, but shut again by their own gravity, as in the Fig. before the lash is pulled down. There is one of these levers for each cover or colour. *P* (Fig. 71) is the frame in which

these levers are placed, and which will be seen to more advantage at Fig. 76,



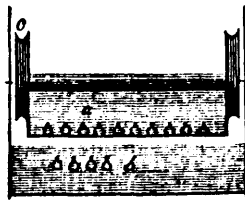
where 1, 2, 3 and 4, are the ends of the levers, and the small pulleys *i*, have cords running over them, to recover the levers after the lash is drawn. *h* (Fig. 71) is the escapement for opening the hooks, and allowing one set of lashes to escape and another to enter. *Q* (Fig. 71) is a roller flattened on one side, to allow the levers to play when the machine is working. This roller has a string connected to the escapement and another to the hook presser. In the hook presser are wires fixed that press on the under part of the hooks. These different parts are put in motion by means of treadles and marches, as in the ordinary way of mounting fancy looms.

The treading machine is next to be explained; the frame of which is seen at H, Fig. 71, but the several parts are more distinctly represented at Fig. 77,



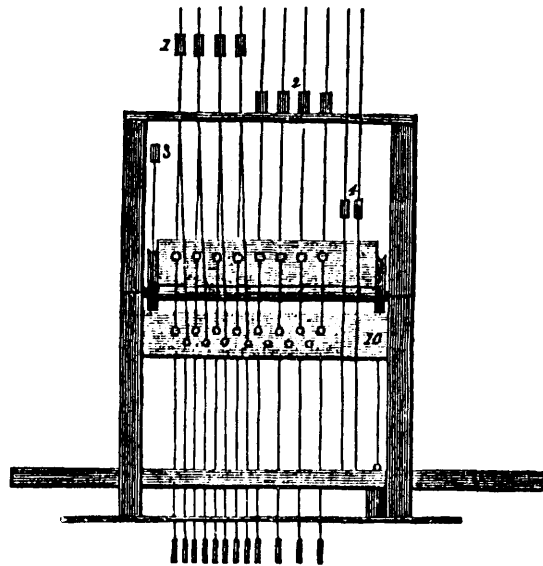
the principal of which are as follow : 1, is a knee shaft ; 2, short marches, one for each leaf of the ground harness or headles ; 3, a couper for turning the trap board 5 ; 4, a long march for working the drawing machine. *a, e, i, o*, are the ends of the treadles : *a* is for opening a flowering or counterpoise shed. 5 is one of the wheels or pulleys of the trap boards, represented at *c*, Fig. 78.

Fig. 78.



6 are the knots (see Fig. 77,) on the raising and sinking cords, and 7 are mails attached to them. 8 is a weight for recovering the machine, and 9 are weights for balancing the mounting, (see Fig. 77,) 10, 10, are boards pierced with holes for conducting the knot cords, one of which is seen at 10, Fig. 79.

Fig. 79.



*c, c*, are weights for balancing the conducting cords ; *w*, a cord for conducting the pressing knot cords ; *y*, for conducting the raising

knot cords, and *x*, weights for keeping the knot cords tight, (see Fig. 77.) *a*, Fig. 78, is a view of the trap board, and *b*, of the pressing board, each with their holes and saw draughts, where the knot cords play. Fig. 79, is a side view of the machine, in which 1, 2, 3 and 4, are the ends of the shafts, marches, and couper, represented in Fig. 77, with the same figures of reference. The tweeling cords are tied to the marches 2, brought down through the board 10, (see Figs. 77 and 79,) and attached to the mails 7, which guide the knot cords into the saw draughts. These cords are arranged according to the plan of the tweel to be woven. As *o* and *e* (see Fig. 78) are the two treadles for the ground, when either of them is pressed down, the pulley 5 is turned round, and opens a shed, and while one foot is tread, the other prepares the knot cords for the next change of pattern to be woven, &c.

#### DESIGN AND COLOURING.

*“Learn hence to paint the parts that meet the view  
In spheroid forms, of light and equal hue:  
While from the light receding or the eye,  
The working outlines take a fainter dye,  
Lost and confused progressively they fade,  
Not fall precipitate from light to shade;  
This nature dictates, and this taste pursues,  
Studios in gradual gloom her lights to lose,  
The various whole with softening tints to fill,  
As if one single head employed her skill.”*

DU FRESNOY.

Mr. Smith, one of the principal silk merchants in London, stated in his evidence before a committee of the House of Commons, that in fancy silks the superiority of the patterns in French fabrics, occasioned the sales to be in the proportion of one half or more over the English; that in fancy ribbands, three-fourths of those sold were of French manufacture, and obtained public favour solely on account of superior design.

James Skene, Esq., of Rubislaw, secretary to the Board of Trustees for the encouragement of manufactures in Scotland, says, “It appears to me that one thing in which the British manufacturer is most deficient is, a knowledge of colours. At present, as far as my acquaintance with manufactures goes, I believe they copy their patterns entirely from France; in doing which, if they introduce any alteration, they often spoil them; and we know quite well that any deviation from the regular established and fixed rules to harmonize

colours, produces the same effect to the eye, as any deviation in music from the harmony of notes : and, in placing our manufactures or fancy goods, along with French fancy articles of the same nature, it has often struck me as a remarkable circumstance, to see how very little those rules, which are exceedingly simple, are attended to in the English copies."

Mr. Crabb, a designer of paper hangings in London, states, that the designs of the French room papers are superior in accuracy of drawing to those of the English : and that the colours are arranged upon some fixed principle by the French artisan : while in Great Britain, the workmen, not being sufficiently instructed, labours more at random until he obtains the effect he wishes, and this may be as often wrong as right.

Charles Toplis, Esq., a vice president of the London Mechanics' Institute, and one of the directors of the Museum of National Manufactures, says, "Many important branches of manufacture call for careful cultivation of the eye, for the purpose of arranging, assorting, and contrasting colours ; which as an affair of taste, calls for some portion of a painter's education." And he adds, "whatever partakes of the nature of ornament, will only be appreciated in a refined eye, as it is characterised by grace and elegance of design ; and by delicacy and precision of execution."

It is no doubt true, that the cultivation of the fine arts will, in course of time, improve the perception and taste of a nation, from the highest to the lowest grades of society ; this is, however, the work of ages : but the present state of our American manufactures demands an *immediate* improvement in this particular.

We believe this want of ornamental designers to arise as much from the nature of the instruction given, as from the want of opportunities afforded for study. It is seldom that the young men who are admitted to our drawing academies, consider their studies as merely intended to improve them in the useful arts to which they may be bred. They almost always imbibe the idea of rising into a higher sphere, and seem to have no other ulterior object in their studies, than to leave their humble calling, at the conclusion of their apprenticeship, and become artists.

We speak from particular facts which have come under our observation.

Many an industrious young man, of ordinary talent, but possessing sufficient to have raised him to the head of ornamental painting, we have known to sacrifice himself to a life of penury and neglect, from this vain idea.

Various reasons may be assigned for the prevalence of this mania among young men who have had opportunities of studying the art of drawing: the flattery of their friends; injudicious patronage; the desire to become, by the quickest and easiest means, a gentleman; and many others, over which no national institution can have any control.

The most prominent cause, however, seems to be, that nothing is reckoned a work of art unless it be a picture. No matter how superior an ornamental design may be, or how much study or knowledge may have been required to produce it, still the production of such, although it may increase the wealth of the individual, cannot raise him one step in the scale of society; he is only a mechanic in the eyes of the public.

On the other hand, no sooner does the youth lay aside his useful implements, and dash off upon canvass something like a landscape, often with no eye to nature, but in servile imitation to some popular painter, than he seems to be by common consent raised to the dignity of *artist*. In short, those branches of the fine arts that are applicable to manufacture and other departments of useful industry, do not obtain in the United States that relative situation to the more intellectual and higher branches, to which they are fairly entitled. The case is different in Italy, for in the Academy of the Fine Arts at Venice there are distinct professors in the following departments of art: Architecture, Painting, Sculpture, Engraving, Perspective, and Ornament, and that in this latter branch the pupils are so numerous that the professor requires an assistant. Their examples are not only the best ornamental models of antiquity, but fruit, flowers and foliage. Every fifteen days they are each required to make an original design, within a given number of hours, precautions being taken to prevent deception; and, according to its merits, advancement and preference are bestowed.

A learned writer states that "the town of Lyons is so conscious of the value of such studies that it contributes 20,000 francs per annum to the government establishment of the school of arts, which takes charge of every youth who shows an aptitude for drawing or imitative design, of any kind applicable to manufactures. Hence, all the eminent painters, sculptors, even botanists and florists of Lyons, become eventually associated with the staple trade, and devote to it their happiest conceptions."

The Chinese seem to surpass all others in directing the studies of their youth distinctly to their ulterior object.

A writer on painting, in "Arnold's Library of the Fine Arts,"



mentions having seen, in the city of Pekin, a drawing book with progressive examples, where the separate character of land and water, rock and foliage, are given in perfect detail; and to these were added implements of various kinds, with figures, separate and in groups, all highly picturesque; and adds, that the objects of all these preparatory studies of the pupil was to enable him to paint a *fan*, which was the last example given.

We feel quite assured that were a similar course followed in our American Academies, a sufficient portion of that genius which at present seems to be all flowing into one channel, would, like a mill race taken from a river, be directed from that which is merely ornamental to that which is essentially useful and beneficial to the country. Art would not suffer from this, on the contrary, where real genius was discovered the facilities for encouraging it would be much greater; and we should have less of that misapplied and often selfish sort of patronage which fosters ordinary talent until it is fictitiously raised to where it cannot stand, and is then by the desertion of such injudicious patrons allowed to fall far below its own natural level.

We have attributed selfishness to some of these pretended patrons of art, for we know that they are often actuated by that feeling.

They cannot bring their minds to encourage those who have really proved themselves to possess the qualities which constitute the real artist; the works of such are too expensive, because their real value is known. Their proteges are the undeveloped, and they procure the early attempts of such for a mere pittance. They calculate that these embryo artists are all to be Rubenses in their day, and that their early productions will, like those of such great men, consequently become highly valuable. In many cases too injudicious patronage is the means of fostering mediocrity, which, assisted by other circumstances, is sustained in a situation injurious to true art. This is well known and much lamented among artists themselves, we mean such as really deserve the name; hence the necessity of national institutions, where merit alone will receive patronage, and be honoured by the approbation of those who are most capable to be its judges.

But, to return to our subject,—notwithstanding the superabundance of mediocre artists, it must be admitted, that there is a want of proper instruction in the art of drawing where it would be of most service; namely, in the populous manufacturing districts; and as this book, being adapted to the improvement of manufactures, may probably find its way into these quarters, we shall add a few hints

for the assistance of such as wish to commence this pleasing and useful study, and who may not have had any previous instructions.

The best kind of study to begin with, for those who intend to direct their attention merely to ornamental designs for manufactures, is that of flowers and foliage. When they are perfect in that branch, they may then soar higher if they please. It is the fault of most students of drawing to begin at the wrong end of their studies, by attempting difficult subjects before they are capable of drawing a single correct line, (it is for a similar reason that we have given in this work so thorough an analysis of plain weaving) and this want of knowledge of the *first elements* generally sticks to them through life; for, in very few instances do those who neglect the attainment of such knowledge at the outset ever descend to the drudgery of doing so afterwards.

#### INSTRUCTIONS IN ORNAMENTAL DRAWING.

A knowledge of drawing is, next to reading and writing, an essential branch of education for the manufacturer and mechanic, and to every one a source of enjoyment. The course of study we are about to point out is within the reach of all, even those in the most humble situations of life. They will find it of easy acquirement, and a source of continued enjoyment, in the improved medium through which it will lead them to view the most ordinary productions of Nature. She shall be their instructor, for all that we can pretend to do is to point out to them a practical mode of receiving her lessons.

In the first place, let your attempts be of the most simple kind, and on as large a scale as you can conveniently adopt. Therefore, begin by procuring a black painted board or slate, of from two to three feet square; and with white chalk practice the drawing of squares, circles and ovals, without any guide to your hand. Make copies of these figures by the ordinary rules, and when you are pretty perfect at these, upon the proper combinations of which depends all linear harmony, you may practice in the same way triangles, hexagons, octagons, and such other figures as arise from the various combinations of the straight line. Next, by your circular and oval lines, you may form crescents, circular and flattened volutes, regular undulations, and other figures which arise out of their various combinations; first making an accurate copy of each figure by

measurement, and continuing to practice until you can form it by the eye with perfect ease. Avoid forming your figures by little bits at a time: do each line, as much as possible, by one sweep of the hand. When you have become expert in this kind of practice we would recommend you at once to draw from nature. You may take for your first subject a pumpkin leaf, the larger the better, and persevere in copying it full size until you can represent it accurately in outline with its principal fibres. You may then vary your practice, by adopting other simple subjects of a similar kind, until you find you can do them all with ease.

Before endeavouring to draw more than one leaf at a time you must know a little of perspective. The most simple mode by which you will obtain such knowledge of this art as will be useful for your present purpose, is to hang a circular object, such as a hoop, between you and the window; set it moving gently round; recede a little from it, and you will find that as one side of it retires and the other comes forward, the circle which it describes becomes more and more elliptical until it disappears altogether, and leaves nothing but a dark line, as if a stick, instead of a hoop, were hanging before you. Fix it in various positions, and draw from it, and observe that the least movement changes its form. A knowledge of this simple fact is all that you require of perspective in the mean time. You may now hang up your pumpkin leaf, and you will observe the same change in its figure as it turns round. Make an outline of its shape while its front is half turned from you; then bring it from between you and the light and place it where the light will fall upon it with its face half turned from you, as when it hung between you and the window. Take your outline and within it draw the principal fibres as you see them. To do this properly will require a great deal of practice, but it will pave the way to your being able to draw the most complex groups of flowers and foliage that can be placed before you. You may now hang before you a small branch of any tree with a few leaves upon it, the larger the leaves are the better, and endeavour to make outlines of them, varying their shape according to their perspective, as already described; be particular on this point, for a great deal depends upon it. We once knew an intelligent Irishman so unaware of the simple fact of a circular object altering its shape by being seen obliquely, that he returned his portrait to have all the buttons made quite round; for although they appeared so at a little distance, he found by actual measurement that they were not like those upon his coat.

To gain anything like a tolerable accuracy in this, the first stage

of your lessons, may occupy from four to six months; that is, suppose you only practice at leisure hours.

You may now lay aside your chalk and slate, and provide yourself with a few sheets of common cartridge paper, and some pieces of charcoal; that made from lime tree is the best. Stretch a whole sheet of your cartridge paper upon your board, and make it fast by a wafer or a little paste at each corner. Place before you a cabbage, or any such large vegetable, and it will be more picturesque if the leaves are hanging loose. Copy these carefully in outline, using your charcoal gently, that any inaccuracy may be easily brushed off. We need not here remind you of what suggested the richest of pure architectural ornaments, the Corinthian Capital, a basket with a weed growing round it.

Your next practice should be light and shade. Bruise a bit of your charcoal to powder, take a piece of any kind of cloth upon the point of your finger, dip it into the powder and rub it upon such parts of your outlined sketch as you observe in the original do not receive the direct light of the window, and where it appears lightest touch your copy with your chalk, leaving the clean cartridge paper intermedially as a middle tint. Persevere in this sort of practice for some months.

For the coarse paper upon which you have hitherto practiced you may now substitute what is called drawing cartridge, which, instead of being merely fixed at the corners, must be pasted all over the edge: provide yourself with a black lead pencil, a swan quill hair pencil, and Indian ink. Commence, as formerly, by sketching your subject lightly with charcoal, as it is more easily erased, and when you have got your outlines quite correct, go over it with your black lead pencil. Rub down plenty of the Indian ink, for much of the freedom of your work will depend upon the wholesale way in which your shades are washed in. Continue this practice for six months before attempting smaller subjects than those we have described. You will now find little difficulty in copying the best examples of either ancient or modern ornament that can be laid before you: but flowers are your best practice. We cannot lead you further: you must go to a drawing master to attain a knowledge of using oil or water colours. But should your patterns be adapted for damasks only, you will have no use for this, unless for your amusement.

We are aware that this course of study would be useless to many, were the present style of patterns in their particular branches of manufacture to continue in fashion; for many of these designs are

a jumble of forms of the most nondescript nature. Improvement, however, is loudly called for.

To those who have gained a facility for copying the beautiful forms that prevail in the vegetable kingdom, and who have had such instructions in the use of water colours as may enable them to copy individual flowers with ease, we would recommend the acquiring of a thorough knowledge of harmonious colouring, (which see.)

The modes in which taste is cultivated at Lyons deserve particular attention, study, and imitation. Among the weavers of that city, (as well as among those of the other great cities of France) much attention is devoted to anything in any way connected with the beautiful either in figure or colour. Weavers may be seen in their holiday leisure gathering flowers and grouping them in the most engaging combinations. They are continually suggesting new designs to their employers, and are thus the fruitful source of elegant patterns. Hence, the French flower patterns are remarkably free from incongruities, being copied from nature with scientific precision.

All these facilities for the improvement of our fancy manufactures, which are now springing into existence in every quarter of this vast country, are within the reach of the most humble. The pursuit of such a course of study as we have endeavoured to point out, would not only augment their sources of innocent pleasure, but lead them to other instructive pursuits. The youth in searching for the most graceful and picturesque plants in nature's most profuse and wildest productions, would be naturally led to commence the study of botany; for, he would then have some interest in the enquiry. And, it may easily be imagined with what avidity the more advanced would add to their knowledge of that pleasing science, or the gratification they would derive from the study and practice of horticulture.

It is scarcely necessary for us to point out the advantages to be derived from the cultivation of flowers, by those engaged in designing ornamental patterns. The productions of a well managed flower garden to such would be, in our opinion, of more real utility as objects of study than the contents of the Louvre. In those productions of nature they will find most exquisite beauty and elegance of form.

In saying that the study of such subjects is of more utility to the ornamental designer than that of those great works of art which have been the admiration of ages, we do not mean to undervalue the benefit that any one, and especially the artist, may derive from studying works of this description. We are aware that the eye has

its principle of correspondence with what is beautiful and elegant, and that it acquires, like the ear, an habitual delicacy, and answers with the same provisions to the finest impressions. Being, therefore, versed in the works of the best masters it soon learns to distinguish true impressions from false, and grace from affectation.

#### HARMONIOUS COLOURING.

Harmonious arrangements of colours are such combinations as by certain principles of our nature produce an effect on the eye similar to that which is produced by harmonious music on the ear; and a remarkable conformity exists between the science of colour and that of sound in their fundamental principles, as well as in their effects.

It is well known to all who have studied music, that there are three fundamental notes, viz. C, E, and G, which compose the common chord or harmonic triad; and that they are the foundation of all harmony. So there are, also, three fundamental colours, the lowest number capable of uniting in variety, harmony or system.

By the combination of any two of these primary colours a secondary colour of a distinct kind is produced; and as only one absolutely distinct denomination of colour can arise from a combination of the three primaries, the full number of really distinct colours is seven, corresponding to the seven notes in the complete scale of the musician. Each of these colours is capable of forming an *archus* or key for an arrangement to which all the other colours introduced must refer subordinately. This reference and subordination to one particular colour, as is the case in regard to the key note in musical composition, gives a character to the whole.

This characteristic of an arrangement of colour is generally called its tone; but, this tone is more applicable to individual lines, as it is in music to voices and instruments alone. The colourist, like the musician, notwithstanding the extreme simplicity of the fundamental principles upon which his art is founded, has ample scope for the production of originality and beauty, in the various combinations and arrangements of his materials.

The three homogenous colours, yellow, red, and blue, have been proved by Field in the most satisfactory manner to be in numerical proportional power as follows: yellow three, red five, and blue eight.

When these three colours are reflected from any opaque body in these proportions, white is produced. They are then in an active state, but each neutralized by the relative effect that the others have

upon it. When they are absorbed in the same proportions they are in a passive state, and black is the result. When transmitted through any transparent body the effect is the same, but in the first case they are material or inherent, and in the second impalpable or transient.

From the combination of the primary colours the secondary arise, and are orange, which is composed of yellow and red in the proportion of three and five; purple, which is composed of red and blue in the proportion of five and eight; and green, composed of yellow and blue in the proportion of three and eight. These are called the accidental or contrasting colours to the primaries with which they produce harmony in opposition, in the same manner in which it is effected in music by accompaniment, the orange with the blue, the purple with the yellow, and the green with the red. They are therefore concords in the musical relation of fourths, neutralizing each other at sixteen. From the combination of these secondaries arise the tertiaries, which are also three in number, as follows: olive, from the mixture of the purple and green; citron from the mixture of orange and purple; and russet from the mixture of green and orange. These three colours, however, like the compounds produced by their admixture, may be reckoned under the general denomination of neutral hues, as they are all formed by a mixture of the same ingredients, the three primaries, which always less or more neutralize each other in triunity; the most neutral of them all being grey, the mean between black and white, as any of the secondaries are between two primaries, it may appropriately be termed the seventh colour. These tertiaries, however, stand in the same relation to the secondaries that the secondaries do to the primaries, olive to orange, citron to purple, and russet to green; and their proportion will be found to be in the same accordance, and neutralizing each other integrally as 32.

Out of the tertiaries arise a series of other colours, such as brown, marone, slate, &c. in an incalculable gradation, until they arrive in a perfect neutrality in black. To all of these the same rules of contrast are equally applicable.

Besides this relation of contrast in opposition, colours have a relation in series, which is their melody. This melody or harmony of succession is found in all the natural phenomena of colour. Each colour on the prismatic spectrum and in the rainbow is melodized by the two compounds which it forms with the other two primaries. For instance, the yellow is melodized by the orange on the one side and the green on the other, the blue by the green and

purple, and the red by the purple and orange. Field, in his excellent essay on the "Analogy and Harmony of Colours," has shown these coincidences by a diagram, in which he has accommodated the chromatic scale of the colourist to the diatonic scale of the musician; showing that the concords and discords are also singularly coincident.

An eminent writer on the fine arts observes, that colouring, like sound in music or poetry, should be an echo to the sense; and according to the general sentiment the subject should inspire, it will be gay, lively, sombre or solemn.

By keeping these observations in view, the pattern drawer will have an extensive field for the display of his judgment and taste, in the selection and arrangement of the harmonizing and contrasting colours, especially if he examines attentively, the order in which nature commonly disposes them. Thus, for example, in the centre of a red rose he will find a yellow tint blended with the orange hue of the stamens, while the petals or leaves of the flower are red. These tints, agreeably to the principles of which we have been treating, are harmonizing colours; while the calyx or cup, which comes in contact with the petals, as well as the other parts of the shrub are green, the natural contrasting colour of red. Examples of the contrasting colours on flowers will be found in some species of the violet, the wall flower, and many other productions of the flower garden.

In the finest specimens of Persian and Turkish carpets, the deep tones of indigo and brown predominate, while the bright hues and tints only appear in detail, and heighten the effect of the pattern.

For the majority of the foregoing observations on design and colouring, we are indebted to Mr. Hay's work on colour\* the best and cheapest practical work on the subject, and one which to the professional man and to the student is indispensable.

#### DESIGN PAPER.

Patterns require to be painted on design paper before they can be lashed. It is commonly printed from an engraved copper or steel plate upon stout white paper: it consists of straight lines running at right angles; the spaces between which lines represent the threads of warp and weft.

---

\* The Laws of Harmonious Colouring. By D. R. Hay: W. S. Orr. 1838.



The varieties of design paper in common use are, 8 by 8, 8 by 9, 8 by 10, 8 by 11, 8 by 12, 8 by 13, 8 by 14, 8 by 16, and 10 by 10. A specimen of 8 by 8 is shown in Fig. 70, and it will be observed, as the name implies, that it has eight white spaces both ways in the design. In using these varieties for draw loom patterns, 8 is commonly considered the simples or mails in a design, and the variable numbers 9, 10, 11, &c., the lashes, to adapt the pattern either to the quantity of weft on the ground or the number of picks on each lash. In some cases, however, the variable figures represent the simple cords and 8 the lashes; which adds considerably to the number of varieties above specified. See page 507.

#### DESIGNING PATTERNS.

This is perhaps the most important as well as the most delicate process connected with figured weaving; for it is on a judicious selection and extensive variety of patterns, combined with economy in the disposal of colours, that the greatest chances of success depend. The manufacturer, therefore, though no designer himself, should possess a knowledge of drawing, or at least of sketching, so as to be able to communicate his ideas to the pattern drawer, and to make a tasteful selection from the productions of others.

The qualifications of a pattern drawer who would excel in his profession are by no means of a superficial nature. A facility in sketching or delineating any object that may present itself, whether natural, artificial, or imaginary, combined with a thorough knowledge of the principles of weaving, at least with those branches with which he is more immediately connected, are indispensable requisites. The pattern drawer, like the poet and the painter, ought to possess a strong and lively imagination, to be deeply impressed with the beauties of nature, and to be able to draw from thence the principal effect of his designs. A chaste taste also is as necessary in the pattern drawer as in the manufacturer; and this will be greatly improved by a little knowledge of geometry, particularly symmetry and proportion; for nothing can be more offensive to a person of genuine taste than a pattern crowded with an incongruous assemblage of distorted objects, as for instance, dwarfs, knockneed night owls, straight-legged curlews, crook-necked cormorants &c.

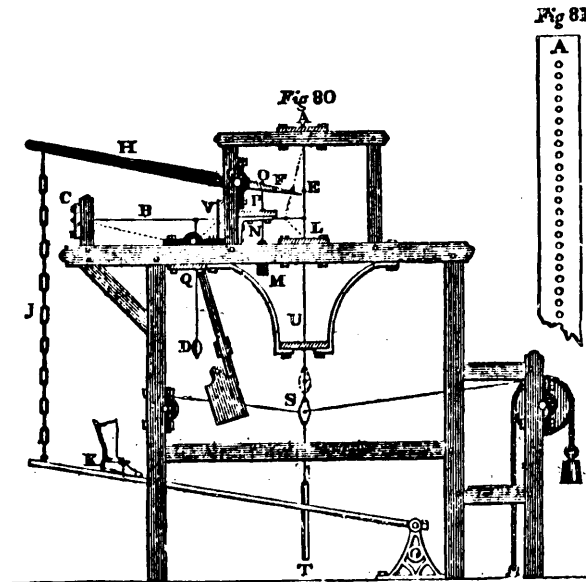
Pattern drawers have frequent occasion to copy extensive patterns from the cloth, such as coloured shawls, vestings and furniture stuffs. This is easily effected by laying a sheet of transparent paper over the pattern to be copied, so that every object and colour

may be distinctly traced through it with a black lead pencil. The pattern may afterwards be transferred to a sheet of clean drawing paper, by means of tracing paper, and a steel point, and coloured in the same manner as the original.

To make transparent paper, a sheet of silk or tissue paper may be brushed over with sweet oil, until it be thoroughly wet, and when it has been allowed to dry it will be fit for use. But, as this paper will sometimes become dim by exposure to the air, the following receipt is recommended :

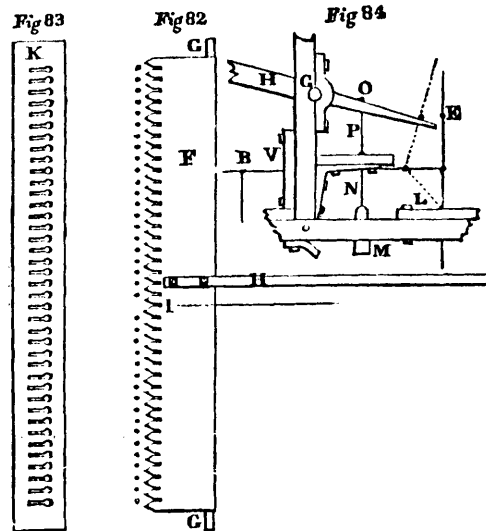
Take one quart of the best rectified spirits of turpentine, and add to it a quarter of an ounce of sugar of lead, finely powdered ; shake it up, and let it stand twenty-four hours ; then pour it off (throwing away the sediment, of course,) and add to it one pound of the best Canada balsam ; set it in a gentle hand heat till it is quite mixed, when it will be fit for brushing over the paper.

#### COMB DRAW LOOM.



After the introduction of Cross's machine among the Paisley manufacturers, Dr. Laughlin Mc. Laughlin, of Ballyshannon, (county Donegal,) Ireland, made some slight alterations upon it, (for they can scarcely be called improvements,) in the mode of lifting the cords of the harness, by substituting a comb or combs, instead of trap boards, which were used in the original. In the

Doctor's modification, the tail is cut short, and the ends of the cords are tied perpendicularly in a board or frame, which is screwed or nailed to the top of the machine, as represented at A in Fig. 80: a plan view of this board is given in Fig. 81. From each of these perpendicular cords, a simple cord B extends horizontally over the weaver's head, (the position of which will be evident enough from the section of his leg seen in the figure,) and is fastened to the board C, (which is precisely like that shown in Fig. 81,) the lashes hanging below, each having a bob D ready to be pulled by the weaver's hand, instead of by a draw boy. A little above the point where the simple cords are connected to the perpendicular or neck cords, there is a knot E on each of the perpendicular cords, all of which knots are in a straight line, and of an equal height; and they do not differ from those marked O O in Cross's machine. Below these knots and above the simple is placed, upon suitable bearings, a flat board F, moving upon pivots at G G, one edge of which is indented so as to resemble the teeth of a *comb* (see Fig. 82) from which useful family utensil, no doubt, it has derived its name. On the side of this board, opposite to the teeth, is nailed a long arm or lever H (see Figs. 80, 82 and 84) which when pulled down raises the indented side or teeth; and consequently the knot cords which have been drawn into them, as is represented at I Fig. 82.



The wire or chain J (see Fig. 80) connects the arm H with the treadle K, which treadle is distinct from those used for working the

ground. Hence, when any shed is to be opened, the weaver pulls down the corresponding lash, thereby drawing the knot cords attached to it, between the teeth of the comb F, as before stated; he then presses down the treadle K with his left foot, keeping it pressed until he has worked over the ground treadles, with his right foot, and given the proper number of picks for that change of the pattern. There is also another guide board, marked L, through which all the perpendicular cords E pass, and it is in all respects like that marked A Fig. 81. The comb F is recovered or counterbalanced to its resting place every time the weaver lifts his foot from off the treadle K, by means of the weight M and cord N, which cord passes into the comb F and is made fast by a knot at O. There is also another knot P on this cord, for preventing the weight M from sinking the comb F too low under the knot E: all this will be seen to greater advantage in the enlarged section Fig. 84. The cords of the lash bobs D have each a knot, which, when the bob is pulled down, is slipped under a saw cut or groove in the board Q, a more perfect view of which is given in Fig. 83. As many of the simple cords B are connected to each of the bob cords as are required to form one lash or change of the pattern, and of course, there must be as many bobs as there are changes in the figure.

We would remark, that in Fig. 80, only one mail S and one lead T are shown, to avoid confusion; but the harness does not differ in construction from that represented in Figs. 63 and 85.

---

## SECTION SIXTH.

### BARREL OR CYLINDER LOOM.

The next improvement in weaving, that merits our attention, is that of the barrel or cylinder loom, the invention of which is claimed by one Thomas Morton, of Kilmarnock, Scotland. This improvement consists in using a barrel or cylinder, on the surface of which, the figure or pattern to be produced in the cloth is arranged in relief, precisely in the same way as tunes are disposed on the barrel of the common organ, or on that of a musical box, by inserting wire

staples or wooden pins, and the barrel being placed upon the top of the loom, these staples actuate other suitable mechanism, and thus the pattern is formed upon the cloth.

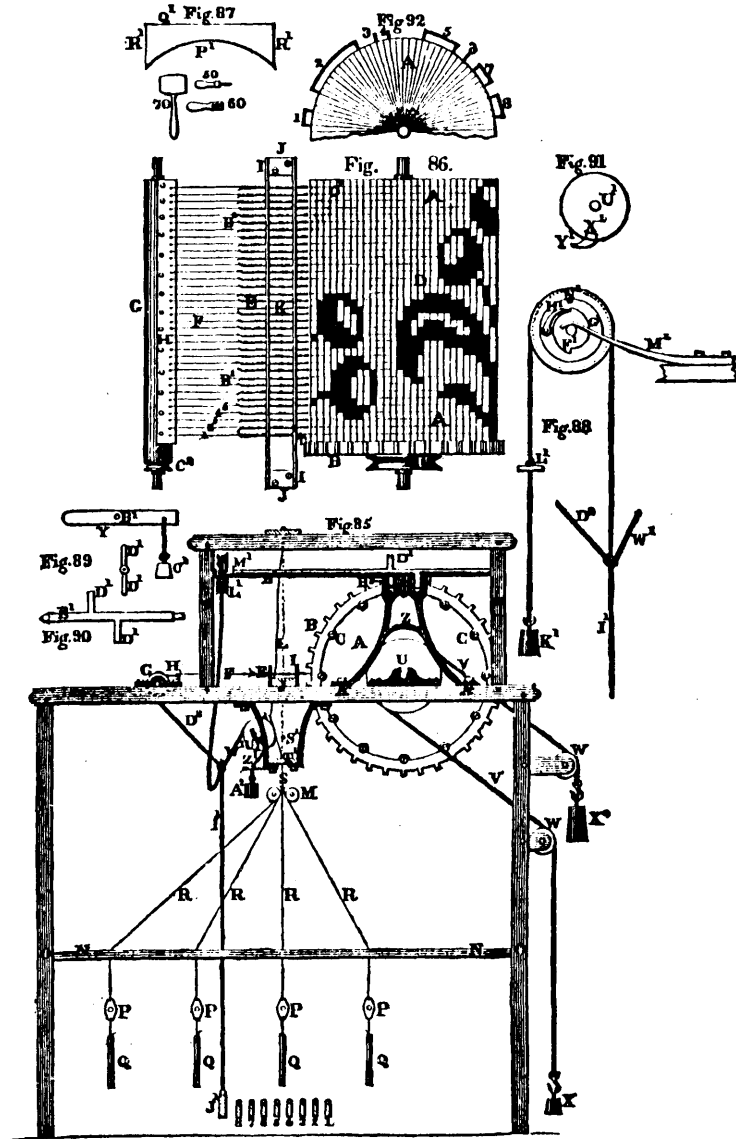


Fig. 85 represents a front view of this loom, as it appears when the shed is formed. A is the barrel ; B a spur wheel fastened to its

end by the screws C C: this wheel, by means of proper catches and other machinery, to be hereinafter described, governs the rotation of the barrel A, so as to give out a line on its surface at each change of the pattern, equal to one line of the design paper, as represented in Fig. 86, which figure shows a plan of the barrel A, with the pattern or sprig D drawn upon its surface; E is the slides; F the connecting cords, and G the slide roller; the latter having a leather strap H nailed to it, in order that the cords F may be fastened thereto, as is shown in Figs. 85 and 86. The slides E work in the slide frame I I, an end view of which frame is given in Fig. 85, and a plan of it in Fig. 86; it is fastened at each side by the bolts or screws J J, which hold it in its proper place. Fig. 92 is an end view, in section, of the barrel A, having a few of the pattern staples driven into it, (by way of example:) these staples are of the various sizes or lengths to suit the number of changes required in the different parts of the pattern, as indicated by the sprig D, Fig. 86. The staple No. 1 (see Fig. 92) contains three lines, and, of course, will cause the warp thread or threads which it governs, to be lifted three times in regular succession; the two lines which follow this staple, being ground, are missed, and ten lines\* are taken for the staple No. 2; two lines are missed, and one is taken for No. 3; one line is missed, and one is taken for No. 4; four lines are missed, and six are taken for No. 5; one line is missed, and one is taken for No. 6; one line is missed, and four are taken for No. 7; one line is missed, and five are taken for No. 8; and the two last lines on the right hand side are missed, being ground or blank.

The neck cords are arranged in a row, (similarly to those of Dr. McLaughlin's machine,) and each passes through a suitable hole in one of the slides E, which holes may be seen at K in the slide frame Fig. 86, and their position is indicated by the dotted line L, Fig. 85. The tail or neck cords are all tied to their respective harness twines immediately above the two wooden rollers M (see Fig. 85:) these rollers keep the selvage warp threads of the same height as those in the centre of the web when the shed is formed. N N is the harness board, which is supported by the framing of the loom at O O; P P P P are mails, and Q Q Q Q their respective lead weights, and both these leads and mails are precisely of the same form as those

---

\* This is the greatest number, or length, ever taken for one staple; because, if more were taken, the staple would be liable to bend in its middle, owing to the slides E driving against it in the working of the loom.

of the draw loom (shown in Fig. 63.) In Fig. 85 there are four harness cords, R R R R, connected to the first tail cord at S, just above the rollers M, which shows that in this example, there are four repeats or parts in the whole tie of the harness. The harness board N N is in every respect like that of the draw loom, Fig. 66, in which figure five holes are shown in the breadth of the board; one row, therefore, or five holes, may be supposed to represent five of the slides E, shown in Fig. 86.

Now, the operator, in proceeding to tie up a harness of this description, takes the first front hole of the board at the commencement of each repeat or part; and if it is to contain four repeats, as in Fig. 85, he connects those four cords to the first or front tail cord, and then proceeds to the second, and so on to the fifth or back hole in his harness board, which will, of course, be connected to the tail cord belonging to the fifth slide. For the sake of illustration, we have numbered these five slides in regular succession, No. 1 being the first in front and corresponding to the front hole in the harness board N N, and so on to slide No. 5, which corresponds to the last or fifth hole at the back of the harness board. When one row is finished, the operator again commences at the front of the harness board, on the right hand side of each of the first rows, tying the four first cords of the second row of each repeat to the tail cord passing through the sixth slide, and so on until the row be completed, always beginning the rows as at first, and proceeding regularly over them until all the harness is tied.

The pattern must be read off from the design paper on to the barrel A, as represented in Fig. 86; but, previous to this process, however, it is necessary to line off the barrel, so as to give its surface the appearance of design paper, and without which preparatory operation, the pattern could not be read on properly: this lining is effected in the following manner:—One of the slides E is sharpened to a point, as represented at T, Fig. 86, which point is kept pressed by the finger of the principal operator against the barrel A, while a second person causes the barrel to revolve, by which means, a mark or line is made round its surface, like those shown in Fig. 86. It may be observed, that none of the slides E are inserted in the frame I I until the barrel A has been chequered as shown in the figure; because, if they were, the pointed slide T, could not be moved along from hole to hole in the frame I I, as the marking or scoring proceeded. Each of the lines thus made round the barrel A must be directly opposite to the centre of a slide, in order that the slides may afterwards strike fairly on the staples.

The operator now proceeds to cross-line his barrel (from right to left) by laying a ruler or straight-edge along the length of it, parallel to its axis; the ends of which ruler rest on each side of the frame of the machine, and perfectly level with the slide frame I I. He affixes to the end of the barrel A a throated pulley U (See Fig 85,) around which is adjusted the rope or cord V V, passing over the pulleys W W, and attached to the weights X and X,\* the latter of these weights being sufficiently heavy to draw round the barrel A one line of the pattern every time one of the catches Y Y (one of which is seen in Fig 89) is elevated from the side of one of the cogs of the spur wheel B. These catches are fixed in the stand or support Z, which is bolted to the frame at A' A' (see Fig. 85;) in this stand the catches are kept in the proper position, by means of a wire pin B' passing through them; a clearer view of one of these catches with its pin B' and recovering weight C' will be had in Fig. 89. The recovering weight C' of each catch merely serves to bring it back to its former position in the spur wheel B after it has been lifted by the arms D' D' of the tumbler E'; this tumbler is distinctly represented in Figs. 85 and 90. On one end of the tumbler shaft is affixed a small pellet F', which works in a gouged-out pulley G' (see Fig. 88,) which pulley is loose on the end of the tumbler shaft, and a small spring catch H' is screwed to it, and this catch works against each of the points of the pellet F' alternately (see Fig. 88.) The operation of these parts is as follows:—

Every time the barrel treadle cord I' (see Figs. 85 and 88) is depressed, the pulley G' having the spring catch H' screwed to it, will cause the pellet F' to turn to the right, and, if the treadle cord I' be of the proper length, the two points of the pellet F' will exchange positions. The cord I', being connected below to the barrel treadle J', as in Fig 85, when the weaver lifts his (left) foot from off this treadle, the weight R' will recover the pulley G' to its former position, as shown in Fig. 88, the spring catch H' slipping over one of the points of the pellet F'. The whole of the apparatus in Fig. 88 is kept in its proper position by means of the knot L'. The spring M' bears against the tumbler shaft in such a manner that at whatsoever point or place the spring catch H' leaves the pellet F' it will there remain; and this prevents any part of the apparatus from interfering with the catches Y Y during the operation of the loom. The knot N' (see Fig. 88) holds the cord in the throat of the pulley G'.

When the operator proceeds to line off or score his barrel lengthwise, as before stated, he lifts the catches Z Z, each alternately.



and draws a line or score for every time a catch is lifted. The weight  $X^*$  causes the barrel A to move half a tooth or interval to each line only, and consequently each of the catches Y Y must only be half the thickness of one interval between the teeth or dents of the spur wheel B; for, if each catch fitted between two of the teeth, although one of the catches were lifted, still the weight  $X^*$  could not move the barrel A, as the other catch would hold it fast: and if both catches were elevated at once, this weight would instantly run down as far as the cord would permit, or until stopt by some other means, such as the floor of the weaving room, and thus spoil the operation, but to avoid this evil, each of the catches Y Y, as before observed, is only half the thickness of the space between the teeth or dents of the wheel B, and they are so arranged, that the one to the left hand side bears against the inside of one tooth and the other to the right bears against the inside of another tooth, thus leaving half a space empty inside of each catch, one tooth being in the centre between them.

Now, suppose the barrel A to be pulled by the weight  $X^*$  towards the right, as in Fig. 85, the tumbler shaft  $L^*$  causing the left hand catch (which was inside the tooth and bearing against it) to be elevated, it is evident that the weight  $X^*$  would directly cause the barrel A to move half a tooth, by bringing the right hand catch against the left hand side of the tooth, instead of the right; and during these movements the first catch would recover its former position, by dropping into a new interval towards the left hand side, the weight  $X^*$  drawing the barrel against the other catch before the first had time to interfere by dropping into the place from which the second was moved: thus the gradual motion is communicated to the barrel A. The operator draws a line or score along the face of the barrel, parallel to its axis, every time he lifts one of the catches Y Y, until the entire circumference of the barrel be lined off.

Particular care should be taken, that the cross lines come directly in a range with the centre of the slides E, so that these may strike correctly on the staples or pins of the barrel in the operation of weaving; for, unless the slides strike correctly on the centres of the lines both ways, the pattern will be imperfect, as the comb will miss the knots of the tail cords (which part of the apparatus will be described hereafter.)

It is necessary to mark upon the barrel A a correct representation of the design or pattern to be woven in the cloth, such as is shown by the sprig D, in Fig 86. The sprig D is given, for the sake of

illustration, with the small squares filled up, as patterns are painted on design paper; but it is evident that the slides E could not strike the centres of those squares, their points being directly opposite to the lines which run round the circumference of the barrel A. The pattern, therefore, instead of being marked in the centres of the squares, like the sprig D, must be marked on the corners of them, or where the lines cross each other at right angles: a specimen of this marking is given at O, Fig. 86, which indicates by the dots the different corners or crossings where the staples are to be inserted. Before the operator drives in the staples, he takes a bradawl, such as that shown at 50, Fig. 87, with which he pierces small holes for the reception of the points of wire of which the staples are formed. The bradawl 50 is held in the left hand, and the mallet 70 in the right; and as soon as a staple has been driven to nearly its proper depth in the barrel, the operator uses the punch 60, which has a saw cut in its face sufficiently wide to admit the staple wire, (which is generally No. 13 or 14;) and, as the depth of this saw cut is exactly the same as the height to which the staples must project from the surface of the barrel, the punch is, therefore, driven until its face touches the barrel; by these means the staples are made to project with the same height all over the barrel. It is also necessary that the staples should stand perfectly straight or plumb, after they are driven into the barrel; otherwise, the slides E would not strike fairly upon their centres, so that the pattern would be incorrect upon the cloth; but, to avoid this evil, a small piece of sheet iron, of about  $\frac{1}{8}$  of an inch thick, is hollowed out at one of its edges, to fit exactly the circumference of the barrel A, as shown at P', Fig. 87, and the opposite edge is left straight, as at Q', the ends being perpendicular to it, as at R' R'. When the stapler has driven a staple into the barrel, as aforesaid, he brings the gauge iron, Fig. 87, against it until one of the ends R' R' comes in contact with it, and if the staple be crooked or inclined to one side, he uses the small hammer or mallet 70 in his right hand, to strike it to its proper position, holding the gauge iron in his left; he then turns the gauge iron, by bringing its edge Q' in contact with the barrel

---

\* Perhaps it is necessary for the reader to bear in mind, that in all our descriptions of machinery and apparatus given in this Work, we make no allowance whatever for that portion of the human family (male or female) who are so unfortunate as to have the most essential (in weaving) members of their bodies misplaced; as, for instance, a left hand for a right, a right foot for a left, &c.

longitudinally, and proceeds to straighten the staple on the other sides also, if necessary.

We shall now consider the mode or method of lifting the harness cords R R R R by their respective tail cords:—Each tail cord, as formerly stated, passes through one of the slides E, and after descending about 8 inches, a knot is made upon it, as at S', Fig. 85; it is then passed through a hole in the guide board T' about 8 inches from this knot, so that the whole distance from the slides E to the board T' is about 16 inches. The knots stand in a row, horizontally, and are  $\frac{3}{4}$  of an inch or thereabout from each other. U' (see Figs. 85 and 91) is a wooden roller of about  $4\frac{1}{2}$  inches in diameter, having suitable iron gudgeons driven into its ends, serving as an axis on which it turns round. On one end of this roller is affixed a throated pulley (like that marked U in Fig. 86,) in which a strong cord W' passing over three fourths of its circumference, is made fast. A small groove X' (see Fig. 91) is cut out of the roller U' lengthwise, of the dove-tail form, and into this groove the back of the comb which lifts the knot cords is inserted. This comb must be made of good smooth hardwood, and the teeth must be formed at such distances apart from each other, that each tail or knot cord shall stand directly opposite the interval between two teeth, without interfering with them. A side view of the form of these teeth is given at Y', Fig. 91, and it may be observed, that they are turned similarly to a parrot's bill, but upwards, (whereas, the bill of that talkative little creature is generally turned downwards,) so that they may more effectually prevent the knot cords from dropping when the weaver is opening the shed. On the reverse side of the throated pulley is another cord Z' with a stop knot, and with a weight A<sup>2</sup>; which weight recovers the comb roller U' to its proper position when the weaver lifts his foot from off the barrel treadle J'. In Fig. 85, the comb roller U' is represented with the shed formed, and the dotted line shows the position of the knots S' when not lifted. The teeth of the comb or roller U' stand generally about  $\frac{3}{4}$  of an inch under the knots S' when the loom is at rest, so that these knots may be thrown into them to form the pattern, as represented on the barrel A. The knot cords against whose slides the staples strike, are lifted, and the remainder, not being thrown into the teeth of the comb, are omitted, and thus they serve to form the ground of the fabric.

We shall now describe the manner in which the slides E are drawn away from the face of the barrel A, so as to allow the weight X\* to turn round the barrel half a tooth or interval to each

change of the pattern :—A small cord F is attached to each slide, as at B<sup>2</sup> B<sup>2</sup> Fig. 86, and the other end of this cord is made fast to a leather strap H; which strap is nailed to the roller G; and this roller has a throated pulley C<sup>2</sup> on one end; a cord D<sup>2</sup> works in the throat of this pulley in a similar way to that of the comb roller U<sup>1</sup> and it is connected to the treadle cord I<sup>1</sup> as shown in Fig 85. Now, it is evident, that if the barrel treadle J<sup>1</sup> be depressed, the roller G will draw the slides E away from the surface of the barrel A; but this must not be done until the comb roller U<sup>1</sup> has taken hold of those knots which were thrown into its teeth by the staples, and has lifted them a little above the other knots, which remain stationary; and, to effect this, the cord D<sup>2</sup> is longer than the cord W<sup>1</sup> which turns the comb roller U<sup>1</sup>, and, therefore, does not begin to draw away the slides E from the barrel A, until the comb has been raised to this position: if the comb roller U<sup>1</sup> remained at rest until the slides E were drawn back, and then came into action, it would lift the whole of the harness, instead of a proper change of the pattern, because all the knot cords would be thrown into the teeth.

The tumbler cord of the pulley G<sup>1</sup>, shown in Fig 88, is connected to the barrel treadle cord I<sup>1</sup> in the same way as those of the comb roller U<sup>1</sup> and slide roller G, and its length is such that it does not begin to operate upon either of the catches Y Y until the slides E have been drawn back from the barrel A; otherwise, although one of these catches were lifted, the weight X\* could not draw the barrel round, in consequence of the staples coming in contact with the points of the slides.

If we suppose, for example, the spur wheel B to contain 400 teeth in its whole circumference, it will give 800 different changes of pattern in the cloth. If the design is what is termed a *point* or *centre* pattern, which consists of two halves exactly alike, then, as soon as one half has been woven up to the last change of the barrel, the weaver shifts the weight X\* from its cord to that marked X, and puts the latter in the place of the former; when he again begins to work, he depresses the barrel treadle once without throwing in any weft, (to prevent a repetition of the last line or change of the pattern;) were this not done, the same line would be worked twice over, which would occasion a defect in the cloth, called a *double point*; he throws in weft for the next line of the barrel, which now turns in an opposite direction from what it formerly did, and continues the operation otherwise as before. Thus, it will be perceived, that a barrel with a spur wheel containing 400 teeth or intervals will

produce a pattern on the cloth of 1600 changes, allowing one pick of weft for each : but, for example, if 8 leaves of headles be used, as in damask weaving, (which see,) and as many treadles, then, the weaver may keep down his barrel treadle J', at each change of the pattern, while he works over (with his right foot) the 8 ground treadles, throwing in a pick of weft to each respectively ; consequently, there would be 8 picks of weft, instead of one, as in the former case, for every change of the pattern on the barrel A ; thus, 12800 threads of weft may be given with 8 leaves of headles for the ground, on a spur wheel of only 400 teeth.

The position of the ground treadles may be seen in Fig. 85, and they are numbered from 1 to 8 ; the front leaves of headles are not shown, but they are in all respects the same as those used in damask weaving (see Gilroy's damask power looms.)

The sides of the slide frame I I are  $4\frac{1}{2}$  inches apart ; the wire of which the slides are made is about No. 8, and the holes in them through which the tail cords pass, must be countersunk both above and below, and well polished, so that they may not cut the tail cords ; the slide roller G, is generally about  $2\frac{3}{4}$  inches in diameter, and should be made of well-seasoned wood.

We trust that from this description of the barrel machine, (which is the only one ever given to the public, of any practical utility, either in this country or in Europe,) our manufacturing friends will be fully enabled to understand its mechanism, and to construct it for themselves.

The apparatus represented in Figs. 88, 89 and 90, is of our own invention ; we refer to the pellet F', the pulley G,' the tumbler shaft E', with its arms D' D', catches Y Y, and the minor parts with which they are connected. This combination we have found from experience to be far superior to the endless screw or worm, used by Mr. Morton, for working the spur wheel B ; because the screw is sometimes liable to give out more than one line of the pattern on the barrel A at once, and at other times it does not give out so much ; in either of which cases, the pattern is injured. We think it superfluous to give any details regarding this screw contrivance of Mr. Morton's as it would only be wasting the reader's, and our own *valuable* time, on a subject of no practical utility to either weaver or manufacturer. E. K. Arphaxad, as appears from his Oration delivered before the Median monarch, King Deioces, seems to have been thoroughly acquainted with the barrel machine, as constructed by Mr. Morton. (See Introduction.)

## JACQUARD MACHINE (FRENCH.)

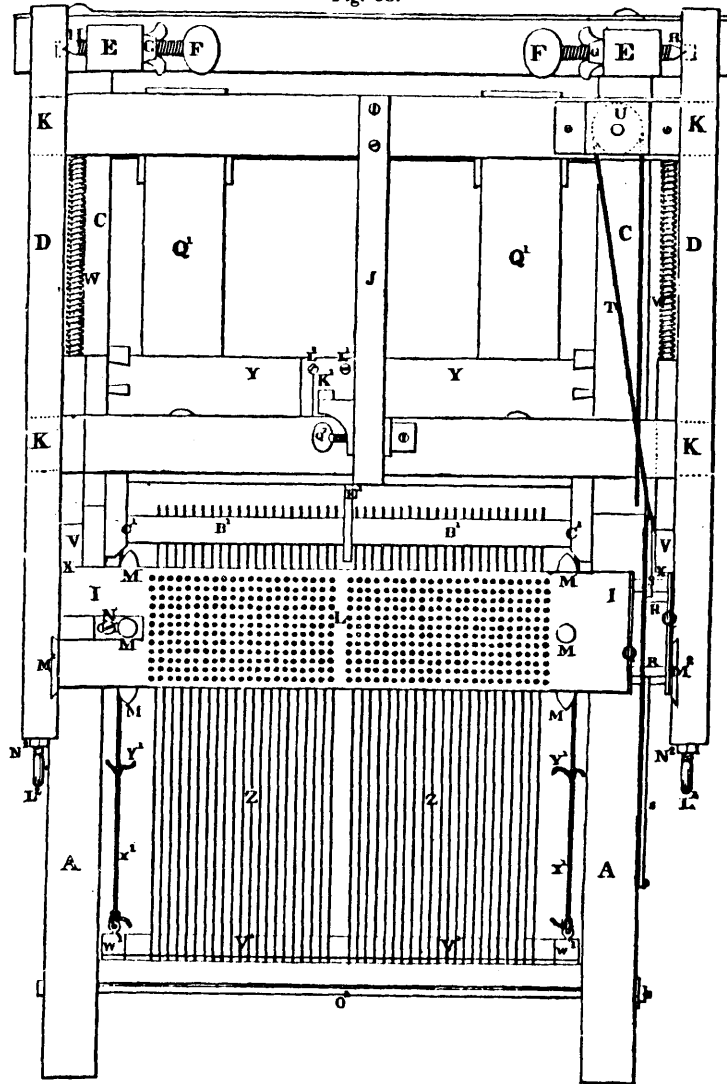
Shortly after the introduction of the barrel machine, from the East, by Mr. Thomas Morton of Kilmarnock, another very ingenious apparatus, invented by M. Jacquard, a native of Lyons, was smuggled from France into England, by Mr. Stephen Wilson, silk manufacturer, (brother to Samuel Wilson, Esq. late Lord Mayor of London;) and its peculiar mechanism, no less than its acknowledged utility, renders it an object well worthy the attention of both weavers and manufacturers.

Like many other great inventions, the progress of this machine was not near so rapid as its merits might have led us to suppose, and this may be traced to two causes; the first of which was, the opposition of interested parties (weavers) who erroneously feared that they would be injured by its introduction among them; the second was, the imperfection of some of the movements of the machine itself, which its ingenious inventor appears to have been unable to obviate. Although M. Jacquard justly deserves the honour of having first constructed a machine with which the pattern was, produced by means of pierced cards or pasteboard strips working against parallel rows of needles, still, the general perfection of such a contrivance, as now in use, must be ascribed to other scientific and practical weavers, both in Europe and America; among whom we would mention the following:—In France, M. Dioudonnat and M. Bosquillon, Paris; in England, Stephen Wilson, Esq. and John Dove (foreman to Messrs. Lee and Edward Wilson, silk manufacturers, 124 Wood Street, Cheapside) London; in Scotland, Claude Wilson, James Morrison, H. and J. Crawford, Paisley, and Thomas Morton, Kilmarnock; in America, Ichabod Hook, Lowell, Mass.

But to proceed to our subject, a loom mounted with this machine has neither tail, simple, nor lashes; and the pattern is cut out on pieces of pasteboard, (or sheet tin,) which are connected together, so as to form an endless chain, as represented in Fig. 37. The harness is constructed very similarly to "Cross's counterpoise harness." Fig. 93, is a front elevation of the Jacquard machine, as it appears when at rest, showing the cylinder, pierced with holes, for carrying round the endless chain of pattern cards; Fig. 94 is an end view, or that part which presents itself to the weaver when seated on his loom; and Fig. 95 is a vertical section, taken transversely through the machine, showing the back board or wire guage for supporting the ends of the needles and keeping them in their proper places: it

also shows the two leather straps and their pulleys for lifting the griff frame.

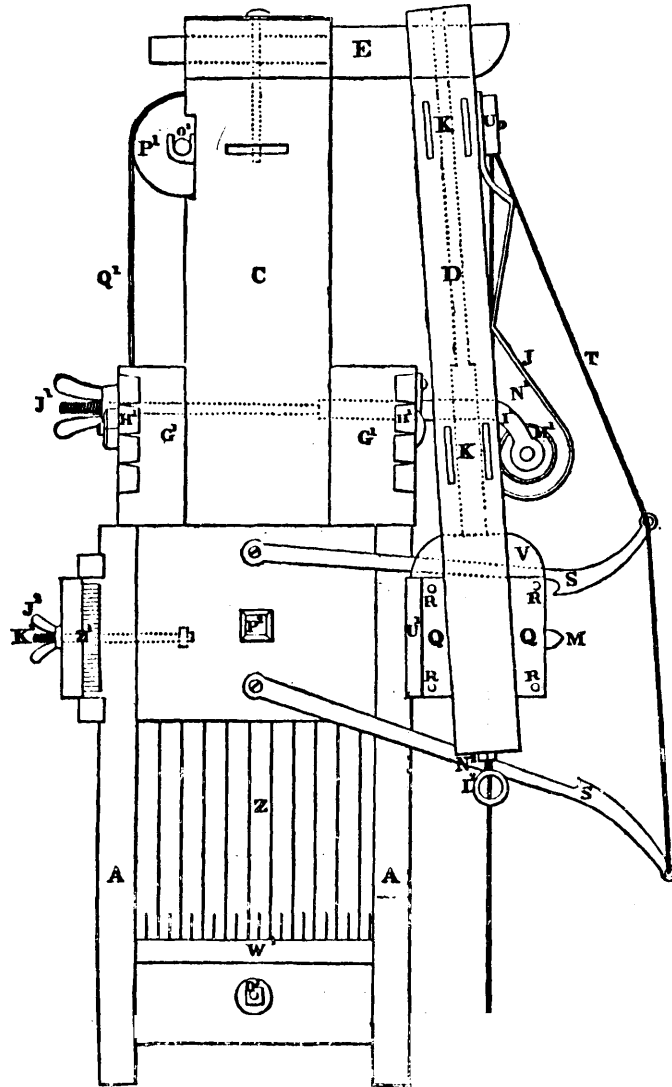
Fig. 93.



We would here remark, that in describing the drawings just alluded to, the same letters of reference indicate similar parts in all of them. A A, Fig. 95, is the frame of the machine, connected by suitable cross bars at B B B; the two upright posts C C, one at

each end of the machine, support the cylinder frame D D, being firmly held in their places by two cross pieces or bars E E, one of which cross pieces is very visible in Fig. 94, and the ends of both

Fig. 94.



are shown in Fig. 93: into these are inserted the pointed screws F F, which are fastened by means of the thumb screws G G; these being brought against the cross pieces E E after the screw points



HH have been inserted into small brass or steel bushes on the sides of the cylinder frame DD; in which bushes these screw points work; while, at the same time, the frame DD vibrates or swings upon them: this frame is adjusted by the screws FF, so that the cylinder II may be brought fairly against the needles, or horizontal wires, that are to play into the holes on its sides or faces. A complete row of these needles, on an enlarged scale, as seen from the side of the machine, numbered at their points from 1 to 8, is represented in Fig. 96. J is a bent piece of iron, seen in front of the machine Fig. 93; and a side view of it is given in Fig. 94: this iron piece is screwed to the middle of the two cross bars which connect the sides of the cylinder frame DD, and these bars are mortised, as shown at KK Fig. 94. The cylinder II is merely a square axis; it is movable upon two iron pivots, driven into its ends, and it occupies the lower part of the frame DD. The four sides or faces of the cylinder are pierced with holes of from  $\frac{1}{8}$ th to  $\frac{1}{4}$ th of an inch in diameter. It is the general custom to have 2 spare rows of needles, in depth, one on each side of the centre, and these are used for working the selvages, independently of those which work the pattern. In a machine, for example, containing 400 needles for the pattern, there are 8 holes in breadth and 52 in length, on each side of the cylinder, as represented in Fig. 96: one row is left blank, as at L, Figs. 93 and 95. A Jacquard containing 600 pattern needles will have 12 holes in the breadth of the cylinder, and 50 in length, besides 2 rows for the selvages, as in the former example. The cylinder II has 8 knobs M, four at each end, and 6 of these may be seen in Fig. 93: those on the right hand end are made of box-wood, and the left hand ones of brass; the latter are riveted into small pieces of iron, which are fastened to the cylinder by the screws N, and one of these screws is shown in Fig. 93. The knobs are so arranged, that the holes O O O O O of the pattern cards, Fig. 97, shall fit them loosely, in order that each card, when brought upon that side of the cylinder which is next to present itself to the needles, may lie perfectly flat or level against it: the screws N serve as regulators or adjusters for this purpose. In the successive application of the cards P P P (see Fig. 97) to each side of the cylinder, the holes O O in each card must always fall directly opposite to those pierced in the other cards throughout the whole series which compose the pattern, so that the knobs M may carry them round in regular succession during the operation of weaving. Near the right hand end of the cylinder, and square with it, there are two square plates of sheet iron Q Q (see Figs. 93 and 94,) each about  $\frac{1}{8}$ th of an inch

thick, with a distance between them of from  $1\frac{1}{4}$ th to  $1\frac{1}{2}$  inches; they are parallel to each other, and are kept in their places by the square part of the gudgeon of the cylinder which passes through their centres. Four small pins or studs R R R R connect these plates at their corners, as shown in Fig. 94, and two of them are represented in Fig. 93. A small roller is placed on each pin, to prevent them from being worn, and to diminish the friction of the catches S S, which turn the cylinder round upon its axis. The catches S S are hung upon suitable centres inside of the frame, and either of them may be brought into action by means of the cord T; which cord passes over a pulley U at the upper part of the machine (see Fig. 93,) and thence descends to a convenient place for the weaver's hand, where a knot is made upon it, to be passed, when required, into a saw cut or notch, like those in the trap boards of Cross's machine, Fig. 72: below the knot, there is a small wooden bob attached to the cord, on which the weaver lays hold when he finds it necessary to bring the under catch S into action, and slips the knot into the saw cut, as before described. When this is done the cylinder I I turns round backward, or in a contrary direction from what it formerly did; and this is often the case in point patterns, in which one half of the figure is exactly the same as the other half: in such a case, the weaver, by working regularly over his cards up to the last one, and then reversing the action of his cylinder, saves half the cards that would be required were he to continue turning the cylinder one way until the pattern was completed.

When the weaver requires to unravel part of the cloth which he has just woven, in consequence of some defect, such as is produced either by the breaking of warp or weft threads, or by using a wrong colour, (which very often happens where forty or fifty are necessary to form the pattern,\*) he brings the under catch S into play against the cylinder head, for the purpose of making the chain of cards move backward, in order to find the particular card by which the pick of weft nearest the reed was thrown in; and, again form-

---

\* Thirty colours (and as many shuttles) were used in the manufacture of her Majesty, Queen Victoria's coronation dress; and 276 were employed in the production of Pope Boniface's night shirt; in the latter of which fancy articles, these colours were so arranged and blended together, as to display correct likenesses of 276 heretics, each suffering under some species of torture different from any of the others; and thus the night shirt of his Holiness contained not only a greater variety of colouring, but also more terrible specimens of *design* than any shirt, perhaps ever manufactured in Europe.

ing the shed by it, he withdraws the pick ; and thus he proceeds until the defective part of the cloth is entirely unraveled.

V V are two pieces of wood, each shaped like a rake (without teeth,) and its stem or shank passes up through the cross bars of the frame D D : the under one of these bars has a square hole in it at each end, to prevent the pieces V V, which are also square where they pass into these holes, from turning round ; those parts of these pieces which pass through the upper cross bar are round, and have spiral springs W W coiled loosely about them ; the upper end of these springs bear against the under side of the top cross bar of the frame D D, so as to press the pieces V V downward against the pins R R R R in the cylinder head, two of these pins coming under them every time the cylinder is brought into contact with the needles, so that the springs W W, by pressing down upon the shoulders of the pieces V V at X X, keep the cylinder I I perfectly on a range with the needles which play into it. It is evident that while the cylinder is being turned round for the purpose of presenting a new card of the pattern to the needles, the springs W W will give way or be compressed, so as to allow the cylinder to turn past its centre ; and when this is accomplished, the cross pieces V V, by means of the springs W W, will immediately recover their former position, and at the same time bring the cylinder I I on a range with the needles ; and all this takes place during the outward motion of the frame D D, one of the catches S then operating upon the cylinder head.

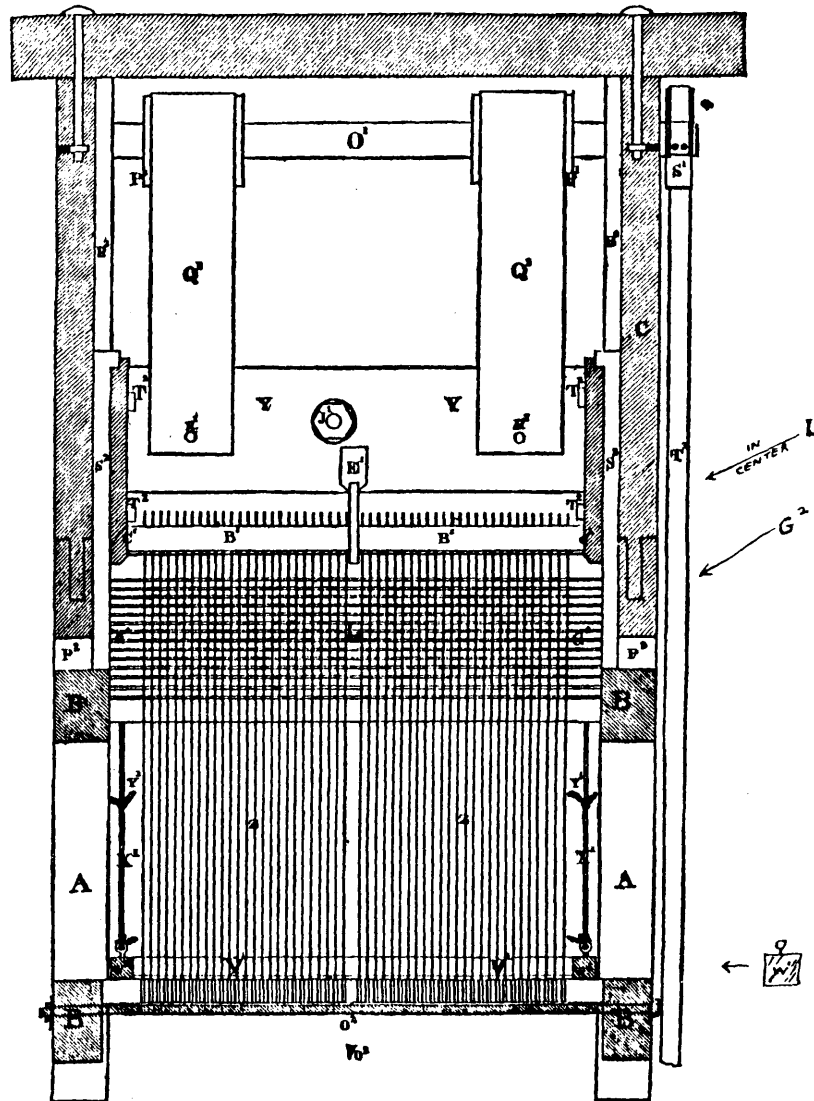
Y Y is the griff frame for elevating the perpendicular wires Z Z, by their hooks at the top : to the lower ends of these wires the harness is connected, as at A' A', Fig. 96. The griff frame contains one straight-edged piece of iron B' for each row of hooks in the machine, and these pieces are inserted into the ends of the frame, as at C' C', Figs. 93 and 95. A side view of one row of hooks is given at D', D', Fig. 96, and their straight-edged lifters B' B' B' in the same Fig. are shown in perspective. The centre piece E' helps to support the lifters, through each of which a suitable mortise is cut to fit tightly into it ; and the end pieces G' G' connect the sides of the frame Y Y by being dove tailed into them, as shown at H' H', Fig. 94. A bent piece of iron I', adjusted at its back end by a nut and screw J', passes through the centre of the back cross bar Y, and its other end, which is square, passes through a square hole in the front cross bar Y ; and to prevent these bars from being worn, a small iron plate K' is fastened upon each by the screws L' L', which may be seen in Fig. 93. The piece of iron I', after hav-

ing passed through the said square holes, is bent to the right hand side, for the purpose of receiving the friction roller  $M'$ , which works in the curvilinear space  $N'$ , of the curved iron  $J$ : a side view of these parts is given in Fig. 94.

The lifting of the griff frame is accomplished by the following means:—There is a shaft  $O' O'$ , running across the frame of the machine, and resting on suitable bearings at each end, on which it turns; and on this shaft there are made fast two wooden pulleys  $P' P'$ , to each of which is attached a leather strap  $Q' Q'$ , and this takes a turn round three fourths of the pulley: the other ends of these straps have holes  $R' R'$  in them, through which two iron spindles pass, and these spindles are kept in their places by means of heads which are made upon them at one end and screw nuts at the other. The proper position of the straps  $Q' Q'$ , is in the centre between the cross pieces  $Y Y$ ; and the pulleys  $P' P'$  should be of sufficient diameter to permit the straps to hang in the centre of the griff frame, so that this frame may be lifted with as little friction as possible in the operation of weaving. On the right hand end of the shaft  $O' O'$ , and outside of the frame, is affixed a pulley  $S'$  with a strong strap or band  $T'$  nailed to it, and taking a turn round three-fourths of its circumference, in an opposite direction to the straps  $Q' Q'$  thence down to a treadle, to which it is connected. When the weaver depresses this treadle, the strap  $T'$ , by means of the pulley  $S'$ , causes the shaft  $O' O'$ , with the pulleys  $P' P'$  and straps  $Q' Q'$ , to lift the griff frame  $Y Y$ , and with it those perpendicular wires whose needles are entered into the holes of the pattern cards and cylinder, according to the figure to be produced in the cloth; and while the griff frame is rising, the friction roller  $M'$ , being affixed to the end of the bent iron  $I'$ , throws out the cylinder frame  $D D$  gradually, by working in the curvilinear space  $N'$ , of the iron  $J$ , and brings one of the catches  $S$  in contact with one of the pins  $R$  on the cylinder head: the griff frame continuing to ascend, by means of the friction roller  $M'$  working against the inclined part of the iron  $J$ , causes the cylinder to turn round another side, bringing with it a new card of the pattern; and, when the weaver lifts his foot from off the cylinder treadle, the griff frame descends, leaving the lifters  $B' B'$  in the position shown in Fig. 96; which Fig., as before stated, represents one complete row of needles, numbered at their points which pass through the front board  $U'$ , against which the cylinder strikes, (see Fig. 94.) It will now be perceived, that by working the strap or band  $T'$  (see Fig. 95) in the manner

just stated, the cylinder I I will be turned round upon its axis, so as to bring a new card against the needles every time the weaver depresses his treadle; and thus the cards of the endless chain are brought into action in regular succession, one after another.

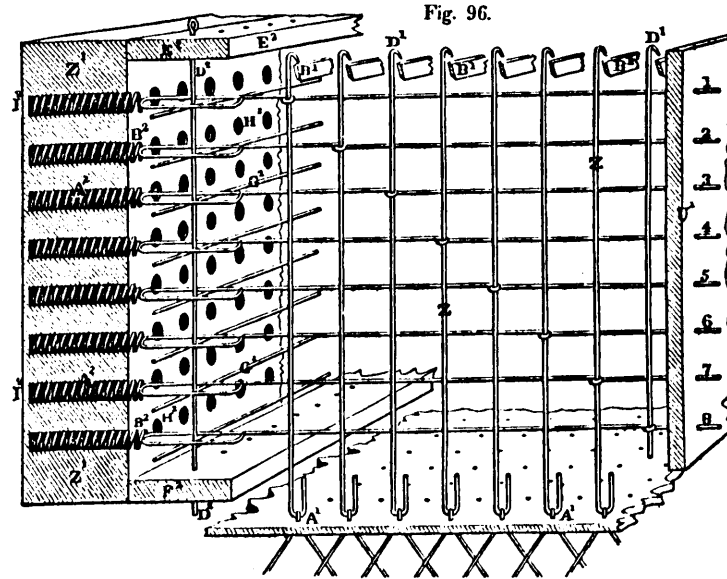
Fig. 95.



The wires Z Z are turned up at their lower ends, as represented in Figs. 94 and 96, and into the loops thus formed small rods or slips of wood V' V' are inserted, from side to side of the machine, one rod passing through each row of needles, and the ends of these rods at one side of the machine, are dove-tailed into a cross piece W' (see Figs. 93 and 95) which prevents them from turning; their ends at the other side are round, and are inserted into another cross piece W', where they are fastened by small nails or brads: the rods fit loosely in the needles. Four small cords X' X' connect the frame W' W', to the under side of the griff frame, as shown in the Figs.; and they are adjusted by the slip knots Y' Y'. The use of the frame W' W' and the rods V' V', is, to prevent the hooks D' from turning round, or from being thrown out of their proper position during the operation of the loom. The loops or turned up part of the wires Z, through which the rods V' V' pass, are usually one inch longer than the intended depth of the shed in the warp: were this precaution not used, these rods would be lifted out of the loops when the griff frame was raised, so that the hooks D' would have nothing to prevent them from turning round; and should any of them get out of their proper place, the rods V' V' could not recover their former position on the descent of the griff frame. In the French machine, from which we made these drawings, while at Lyons, the loops or turned up part of the wires Z were  $4\frac{1}{2}$  inches long, and the shed in the warp was  $3\frac{1}{2}$  inches deep: these proportions work very well.

The perpendicular wires Z Z should be made of No. 12 wire, and the needles of No. 14; both of which must be sufficiently tough to stand the process of bending and also stiff enough not to give way in the operation of weaving. Z' Z' is a wooden box, called the spring box (see Figs. 94 and 96,) which is pierced with as many holes as there are needles in the machine, and into each of these holes, a small brass spiral spring A' A' is inserted (see Fig. 96;) which springs are generally  $1\frac{1}{2}$  inches in length, and nearly  $\frac{1}{4}$ ths of an inch in diameter, and they are made of No. 20 wire (which should be very elastic.) Each of these springs bears against the back end of a needle, as at B' B' Fig. 96 and at C' Fig. 98: the needle represented in Fig. 98, corresponds to that marked No. 1 in Fig. 96.\*

\* It is not perhaps generally known, that M. Jacquard did not employ perpendicular wires like those marked D' D' in Fig. 96, in the first machines which he constructed, but knot cords and trap boards like those shown at Figs. 71 and 72.



Each row of needles, in depth, has a wire pin  $D^2 D^2$  passed through it at the back ends of the needles, and the ends of these pins are inserted into the cross rail  $E^2$  above the needles, and into the cross rail  $F^2$  below them; which pins serve to keep the needles in their proper position, as shown in Fig. 96. The rails  $E^2$  and  $F^2$  are drawn in perspective, and the black dots indicate the position of the perpendicular wires  $D^2 D^2$ , as well as the distance between the rows of needles.  $G^2 G^2$  (see Figs. 95 and 96) are the cross wires which support the needles. The holes  $H^2 H^2$  show the position of the springs  $A^2$  as they stand in the box  $Z^2 Z^2$ : it must be observed, that this view is in perspective. The spring box  $Z^2 Z^2$  is bored to within about about  $\frac{1}{4}$  of an inch from its bottom, as at  $I^2 I^2$  Fig. 96. We may here remark, that we ourself, have superseded the necessity of using the spring box altogether, and also made several other improvements upon the Jacquard machine, particularly in a new method of governing the griff frame, by which a saving of power to the amount of 50 per cent is effected: these improvements, with many others which belong to us, are fully described under the head of "Gilroy's patents" (see Index.) But, to proceed, the needles pass through what is called the needle board  $U^1 U^1$ , against which the cylinder  $I I$  plays: this board is about  $\frac{3}{4}$ ths of an inch thick, and the points of the needles which are actuated by the cards project beyond it about  $\frac{1}{8}$ ths of an inch.

It is now evident, that those needles which are pressed back by the blank or uncut parts of the card (represented in Fig. 97.)

Fig. 97.

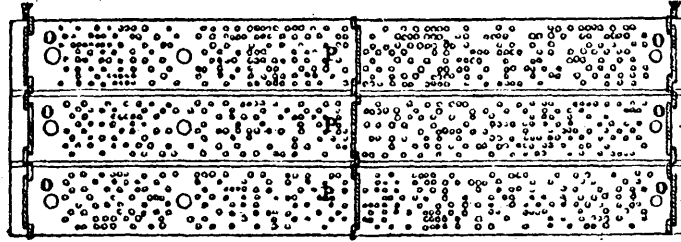


Fig. 98.



when the cylinder is brought against the needle board  $U' U'$ , will throw back the wires  $Z Z$  which pass through them, so that when the weaver elevates the griff frame, the hooks  $D'$  of these wires will be missed by the lifters  $B' B' B'$ , and all the others will be raised, (see Fig. 96.) Each card represents one line of the design paper, and by all the cards being worked over in regular succession one after another the pattern is formed upon the cloth.

It is sometimes of advantage, particularly when the pattern is heavy, to miss the hooks connected with those needles which enter the holes of the cards, and lift the others. To effect this, when the cards have been cut in the usual way, the position of the lifters  $B' B' B'$  must be reversed, so as to incline in an opposite direction, and the hooks  $D'$  must also be reversed or turned round: the weaver may work on otherwise as before, and there will be no difference in his cloth, except that the pattern will appear on the under side of it, instead of on the upper side.

The thumb screws  $J'$  and bolts  $K'$ , at each side of the machine, serve to keep the spring box  $Z' Z'$  in its proper place at the ends of the needles, as seen in Figs. 94 and 96. The screws  $L' L'$  (see Figs. 93 and 94) are used in adjusting the cylinder, so as to answer the points of the needles; they push against the under side of small brass bearings, in which the pivots or gudgeons of the cylinder work: these bearings are let into the wood of the cylinder frame  $D' D'$ , and are kept from dropping out by small pieces of wood  $M' M'$ , which are dove-tailed into the sides of the cylinder frame, as seen in Fig. 93. The screws  $L' L'$ , when the cylinder has been adjusted by them, are secured from turning round by means of the nuts  $N'$



N<sup>2</sup>, which are brought to bear tightly against the under ends of the frame D D (See Figs. 93 and 94.) O<sup>2</sup> is a bar to support the middle of the neck board; P<sup>2</sup> P<sup>2</sup> are pieces of leather to ease the griff frame in its descent (see Fig 94.); R<sup>2</sup> R<sup>2</sup> are brass slides in the sides of the upright pieces C C, into which the square rods S<sup>2</sup> S<sup>2</sup> are screwed to the ends of the griff frame, with the screws T<sup>2</sup> T<sup>2</sup> (See Fig. 95.)

Lastly, we would observe, that in patterns which require one pick of weft only to a point, one card also will be required for each pick: thus, for a pattern of 5000 picks, there must be 5000 cards likewise: but in fabrics where leaves of headles are used to produce the ground, from 2 to 16 picks of weft are usually given to each card or change of the pattern. In shawl weaving, when two colours of weft are employed, two picks of weft are given for each card, one for the ground and the other for the figure; and when a greater number of colours are used, there must be distinct cards for each. In damask weaving, it is customary to use 8 leaves of headles for the ground, the weaver throwing in either 4 or 8 picks of weft for each card regularly; and if only 4 are thrown in for one card, then, the 4 treadles used in working it must not be used in working the succeeding card, but the other 4 treadles must be employed; otherwise, the tweel would be broken. It matters not, whether the weaver changes his cards to every 4 or 8 picks so long as he continues to work his treadles in regular succession. For weaving full satin, 16 leaves of headles and as many treadles are necessary; but the weaver may produce either an 8 or a 16 thread point, by working over the half or the whole of his treadles to each card.

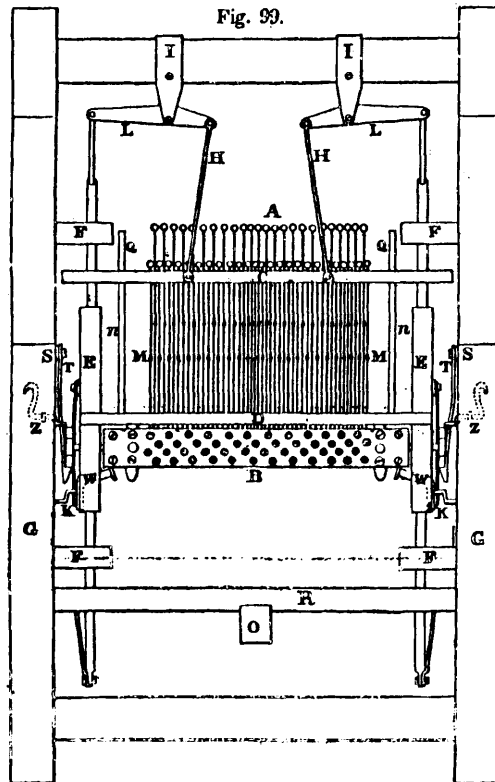
A patent was granted in this country, bearing date February 3d, 1841, to Alexander Calderhead, of the city of Philadelphia, Pa., for placing the cylinder, cards &c., of the Jacquard machine, underneath the warp, and substituting a series of perpendicular wires or needles, arranged in the harness board in parallel rows, each needle representing one of the twines or sleepers of the harness; and these alterations the patentee calls, "an improvement upon the French machine," as described by us, and shown at Figs. 93 to 98. He commences the description of his apparatus in the following strain:

"I, Alexander Calderhead, have *invented* (it will be seen in the sequel that Mr. C. is not the inventor of this contrivance) a new, easy, and cheap method of weaving *all kinds* of figured cloth." This method consists, first, in raising and lowering the threads of the warp with what he calls "independent metallic headles," instead of the weights, mails, twines, &c. composing the counting

of the draw loom ; and, secondly, "in constructing the cylinder and pattern cards or apron, so as to lift directly the said headles or wires, to form the sheed or shire;" or, in constructing a trunk and pattern web, both, to direct what shall be the sheed, by trapping or untrapping the hooks or knot cords to be drawn up, as in Jacquard and draw looms."

Mr. C. uses several terms here which we do not recollect of having seen applied before to anything in the way of weaving ; *trunk* for cylinder, *sheed* or *shire* for shed, *heylds* for headles, *foot board* for treadle, and *apron* or *pattern web* for pattern cards or chain of cards, must be new to most weavers, and, perhaps, these terms form the principal part of the invention.

"I (A. C.) make the heylds or perpendicular wires, for a Scotch imperial three-ply carpet, of No. 13 wire, the length of which heylds is 24 inches. A head A (see Fig. 99)

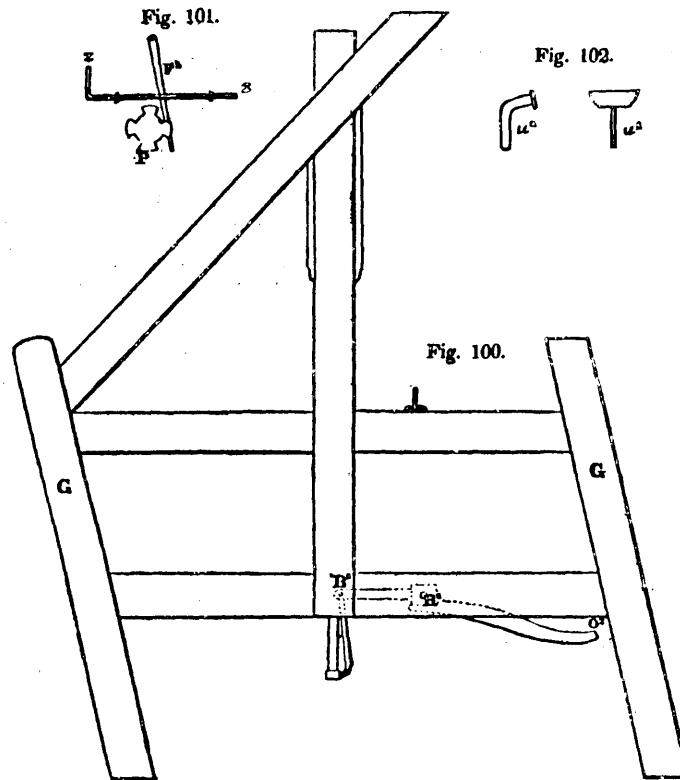


\* For the meaning of the word *shire*, (in weaving,) see Plain Weaving, Section First, of this Work.

is made on each of the said wires; and 14 inches below this head the wire is flattened, as at M M, where an eye is punched or bored in it, and these eyes are substituted for mails. The wires or heylds, work in two boards C and D (Fig. 99;) the board C suspends or hangs them, *by their heads* A; the board D serves as a guide to direct the point of each needle respectively throughout the series or range of the web into the holes of the trunk B, on which the apron or pattern web works. I (A. C.) make the boards C and D one inch thick, (each we suppose,)  $5\frac{1}{2}$  inches broad, and 4 feet in length, or long enough to work on the slides E E, (Fig. 99.) I (A. C.) bore the holes in the said boards C and D large enough to admit wires about 2 numbers coarser than that actually used, say for No. 11; and the holes of the trunk and pattern apron, I make  $\frac{1}{4}$  of an inch in diameter, (we suppose that in making the holes of this size, allowance is given for atmospheric variations.) Each row in breadth of the boards C and D contains twelve holes; and all these rows are slanted (see Fig. 66, draw loom,) so that the back hole of one row shall be nearly square with the front one of another row: this prevents the warp threads from crowding each other. The trunk B, pattern web, and boards must be of the breadth of the web (curious jargon this!); and the trunk B is hollowed out the depth of the sheed. The trunk may be cast, or made of sheet brass, brazed together, and fixed or screwed on blocks or end pieces; and it turns on an axle or centre, which passes through the slides E E: these slides are 60 inches long, 25 above and 35 below from the point where the axle or centre of the trunk B passes through them. The slides E E are kept in their proper positions by the brackets or guides F F, and they are connected by suitable straps to *beams*\* L L; these beams are supported at the top framing of the loom by the hangers I I, and to their ends 4 rods H H are suspended. (Only two of these can be seen in the Figs.) The rods H H are connected to the board C (as shown in Fig 99,) two at the front and two at the back, for the purpose of raising and depressing the board C when required. *n, n,* are metallic rods, which pass through the board C, and are screwed or otherwise secured to the board D: the ends Q Q of these rods guide the board D, and keep it in its proper place. The under extremities of the slides E E are attached to the ends of the lever or cross bar R, (which may also be seen at B<sup>2</sup> Fig. 100:) on the ends or axis of the trunk B is a 4 toothed wheel P (see Fig. 101,) for the purpose of turning the trunk B, which is

---

\* Jacks, not beams.



caught in its descent by the hooks T T (see Fig. 99,) attached to the frame of the loom at S S.

W W are levers, which work in the slides E E, and are pressed by springs K K, in order to bring and keep the trunk square (as is well understood, of course, being so like the apparatus used for a similar purpose in common Jacquards) the levers W W are more clearly shown at  $u^c$ ,  $u^a$ , (Fig. 102.) Z Z (Fig. 99) are two slides, one at each side of the machine, which pass the hooks T T from one side of the toothed wheels P to the other, so as to make the trunk B revolve, either backward or forward (a view of one of these levers Z will be had in Fig. 101.) The operation of the machine is as follows:—

“The foot board or treadle O (see Fig. 99) of the lever or bar R, by being pressed down with the foot, raises up the slides E E, the trunk B, and the guide board D, and lowers the rest board C: this allows the heyls or wires to pass into the trunk B wherever holes are cut or punched out on the pattern card or cards.” (Every alter-

nate wire is represented in Fig. 99, as being raised, and this would cause the warp threads passing through their eyes M M to be raised also; and if these wires were raised and depressed alternately with the others, plain cloth might be produced.) "When the weaver lifts his foot from off the foot board or treadle O, the wheels P P (see Fig. 101,) on the axis of the trunk B, are caught by the hooks T T, and these hooks cause the trunk to turn one-fourth part of a revolution." (One of the hooks T may be seen at F<sup>2</sup> Fig. 101, and the cylinder treadle O is distinctly shown at O<sup>2</sup> Fig. 100: in Fig. 100, R<sup>2</sup> indicates the position of the lever or bar R, and B<sup>2</sup> that of the slides E E, for raising and depressing the cylinder B.)

The enlightened patentee, the said A. C., claims, "the exclusive right to make the above specified machine, to suit *all kinds* of flowered cloth." He also claims, "the *principle* of lifting the *sheed* or *shire* (not county) with metallic *heylds*, directly by the pattern *apron* and *trunk* (not portmanteau) *roll* or *receiver*, or by *lowering the heylds into the same, as described.*"

We have quoted above, Mr. C's own words, in order that our readers may judge correctly of his *pretensions* as a weaver. If he is as ignorant of mechanics as he appears to be of the proper names of the different parts of the common loom, we need not be astonished although he tells us, that a machine, such as that represented in Figs. 99, 100, 101, and 102, "will manufacture all kinds of flowered cloth."

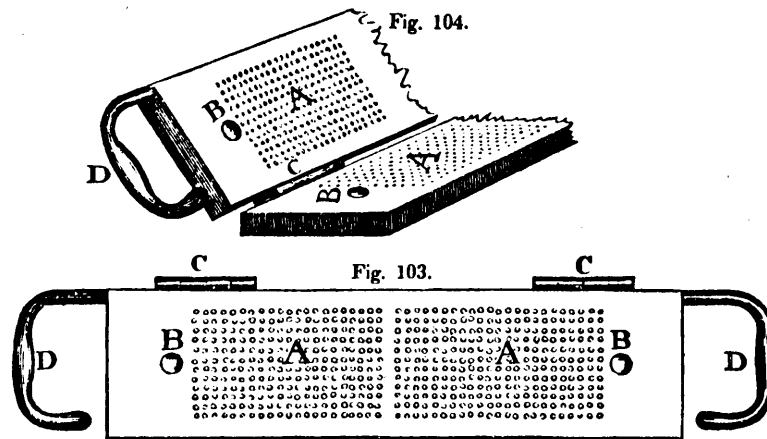
The patentee, Calderhead, speaks of making "a Scotch imperial three-ply carpet" with his machine; but, let us see how he could accomplish this:—In the first place, suppose a carpet 36 inches in breadth, and containing 1800 threads of warp from selvage to selvage; in this case 1800 needles or headles would be required, and the pattern cards and cylinder B would require to be 36 inches each, in length; suppose each of the holes in the cylinder B to be  $\frac{1}{4}$  of an inch in diameter, (as stated by the *intelligent* patentee;) and after making the necessary allowance for the metal left uncut between the holes, perhaps 3 holes might be got on an inch; then, as there are 12 holes in the row across the cylinder B, there would be 36 holes in one inch of the length of it, and likewise 36 needles on one inch across the web; so that in the whole breadth of the web, (36 inches,) there could only be 1296 needles, and, of course, the same number of threads, instead of 1800. But, some kinds of figured goods contain from 400 to 650 threads of warp per inch; and it often happens that a web has as many as 16,000, or 20,000 threads in it, from selvage to selvage, so that on the above principle, 16,000

or 20,000 needles, and the same number of holes in the cylinder would be required in such a case: besides, a web of this kind is very frequently 80 or 120 inches broad, and would require from 16,000 to 20,000 cards to produce the pattern. We question the applicability of the "*heyls, trunk*" and "*apron*" to webs of this description, unless the needles could be made of wire, at least, as fine as No. 60 or 70; and, moreover, cards 80 or 120 inches long might be found somewhat difficult to manage, at least, this is our opinion. Before dismissing this subject we would mention, that one of the most extraordinary specimens of silk weaving, perhaps, ever executed, was exhibited at Mr. Morrison's late conversation given to the members of the Institute of British Architects. It was a portrait of Jacquard, representing that extraordinary man in his workshop surrounded by his implements, and planning the construction of that beautiful machinery, which now, in its increased perfection, returns this testimony to the genius of its inventor. This work, worthily entitled "*Hommage à J. M. Jacquard*," was woven with such truth and delicacy as to resemble a fine line engraving: it was executed by Didier, Petit & Co. There were 1,000 threads in each square inch (French,) in both the warp and the weft; and 24,000 cards were used in the manufacture, each card large enough to receive 1,050 holes.

But, to conclude, we would state, for the information of our readers, that we, ourself, made a machine on the same principle as that claimed by Mr. Calderhead, as far back as Jan. 1833, (for manufacturing common ingrain carpeting;) and a patent for which was granted to Claude Marie Helaire Molinard, of Bury Street, St. Mary Axe, in the city of London, merchant, bearing date 9th April 1833; (see vol. 15, Conjoined Series, of the London Journal of Arts and Sciences, for the year 1840, pages 286 and 287,) so that Mr. C's patent is, in point of fact, null and void. We may also remark, that a friend of ours, in London, William Webb, Esq., of the firm of James Jacquier & Co., No. 1 Wood St., Spitalfields, showed us a machine, in the year 1836, differing in no respect from that constructed by Mr. C., and represented in Figs. 99, 100, 101, and 102; and, no doubt, Mr. Webb would be glad to furnish any number of them to order, to whom we would recommend those of our friends who want such articles to make application forthwith. Perhaps machines of this description might be found of advantage in the manufacture of horse-blankets. (See Arkite Ghiden Ghelen's loom, Fig. A. Introduction.)

The pattern cards P P P Fig. 98 are cut (in small establish-

ments) between two steel plates, like those represented in Figs. 103 and 104.



The holes A A, in these plates, correspond to those of the cylinder shown in Figs. 93 or 99. B B (Figs. 103 and 104) are large holes to fit on the knobs M M in Figs. 93 and 94 ; C C are hinges which connect the plates, and they must be well fitted, so that the plates may present no impediment to the punching of the paste-board or card paper, when it is placed between them ; D D are handles attached to the upper plate, by which the operator raises or lowers it, when he wishes to take out or put in a card ; the large holes B B correspond to those marked O O O Fig. 97.

The method of cutting cards in these plates, from the design paper or pattern, is so well known to all persons having the least knowledge of figured weaving, that we need give no further description of it in this place. We would state, however, that on this plan, an active man can only cut from 100 to 150 cards per day ; whereas, on the great French card-cutting apparatus or machine, (to which the reader is referred,) he can cut from 2500 to 3000, with the assistance of a boy, in the same time.\*

---

\* We would here mention for the benefit of the manufacturers of this country, that a card-cutting machine of this kind, in its most perfect state, may be purchased from our friend, M. Dioudonnet, No. 12 Rue St. Maur, Paris, for 2400 francs ; this includes the copying and stamping machines, the simples and all the other necessary apparatus, as well as the packing or boxing of the whole and its carriage to Havre for shipment. One of these splendid machines would, at least, be sufficient to cut cards for a manufactory containing 200 looms.

## SECTION SEVENTH.

## CARPETING.

The progress of almost any of the arts may be safely taken as an index of civilization. The arts, indeed, are so intimately interwoven, that one of them can scarcely flourish without giving rise to and receiving support from others. This is particularly the case in regard to the manufacture of carpets; which, like the other branches of weaving, has received improvements at every hand, and has lately made important advances. The very fact of the existence of such a manufacture speaks volumes as to the increase of our domestic comforts.

In the superficial texture of the common carpet, nothing appears to distinguish it from an ordinary web; and a first observer is at a loss to imagine by what means its variety of colours can be produced. On examining the figure more narrowly, it appears that the designer has laboured under considerable difficulties: for in many places where purity of colour would have been advantageous, a mixed colour, of the warp and weft, only is to be found, while scarcely any gradual shading of the tints depending on the nature of the figure is to be seen. A still closer examination explains at once the source of these imperfections. The ingrain or double carpet is found to consist of two contiguous webs, intermingled with each other in such a manner as to produce the pattern: each of these webs, if woven singly, would have a striped appearance, being partly coloured in the weft. One set of coloured stripes is thus imposed upon another: and in designing the colours of the pattern, no selection beyond what is afforded by the judicious arrangement of these stripes can be made. The number of full colours is thus very limited; and these can only be obtained where the weft traverses warp of the same colour. To bring up then a part of the figure full red, red warp must be traversed by red weft; these colours can be immediately concealed by sending the threads to the other web, but were they to remain long there, both webs would become monotonous. It is therefore extremely difficult to avoid a strong tendency to striping in the colours, and, except in the principal part of the figure, the colours can hardly be well managed, the secondary embellishments being almost matters of chance.



Yet, in the face of all these difficulties, patterns of great beauty are being continually formed on the carpet loom.

The invention of the *triple carpet*, claimed by Mr. Morton, of Kilmarnock, has almost removed these difficulties.\* This carpet is composed of three webs, which interchange their threads in order to produce the pattern. The primary object in the introduction of the third web, appears to have been the obtaining of greater variety and brilliancy of colouring; but another curious effect has followed, that the two sides of the carpet are necessarily counterparts to each other. To a certain extent the figure of the under must depend on that of the upper side, since threads may be needed from the under web to produce what is wanted in the chief pattern on the upper side, but there still remains the choice of an interchange of threads between the two inferior webs. It is obvious that the tendency to striping must be much less on this than on the common carpet, and that the designer having a far greater choice of colours, may produce effects that could not before have been obtained. After the principal figure has been determined on, the skill of the designer is most severely exercised on the wrong side of the carpet. His choice of materials is indeed as great as with the common carpet, but then he is hampered by the restriction in figure, and can only be entirely at ease opposite a piece of plain texture on the other side. The superior beauty of the triple carpet over the common ingrain or two-ply is at once acknowledged: it possesses almost all the freedom in colouring of the floor-cloth or paper-hanging, while its great thickness and comparative cheapness bring it into competition with the more expensive kinds of carpeting.

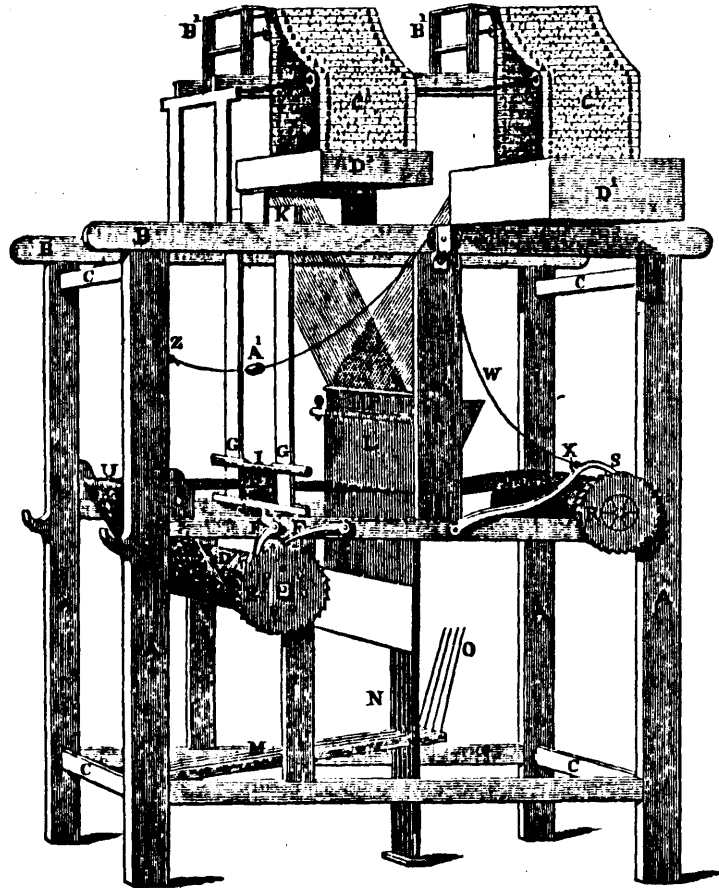
Fig. 105 is a correct representation, in perspective, of an imperial Scotch carpet loom.

The frame of the loom consists of four perpendicular posts A A A A, with capes B B, and cross rails C C C C, to hold them firm at suitable distances apart; these posts are generally 6 feet  $4\frac{1}{2}$  inches in height; D is the cloth roller, which must be made of well-seasoned wood of  $5\frac{1}{2}$  inches in diameter, with an iron gudgeon of  $\frac{3}{4}$ ths of an inch in diameter driven into each end of it, in the usual way; on one of these ends a ratchet wheel E is fastened, which is operated upon by two clicks F F, for the purpose of holding the web in its proper place when wound upon the roller by the weaver,

---

\* Mr. M. is one of those sanguine mortals who believe, that if a man could produce a machine which would generate the power by which it was worked, he would become a creator! Oui!!

Fig 105.



in a similar manner to that formerly described in section 1st under the head of plain weaving; G G is the lay or batten; H the reed; I the upper shell to hold the reed; J the under shell or sill of the lay; K the rocking tree or cross bar, which connects the lay swords G G above, as in Fig. 9, section 1st (which see;) L the harness, with double necking, connected to each of the Jacquard machines; M the treadles; N a rack or guide which serves to keep the treadles in their proper places; O treadle cords or wires which connect the treadles to their respective levers or lifters, in the usual way; P the harness board; Q the warp roller, with its ratchet wheel R, similarly fixed to that of the cloth roller D, and held in its place by the catch or dog S, as in Fig. 7, section 1st (which see;) T the warp yarn as

it proceeds from the warp roller through the harness L, and from thence into the reed H, where it is woven into cloth, then passes over the breast beam U, and on to the cloth roller D; V the cloth; W a strong cord, fastened to the catch or dog S at X, passing over the pulley Y, and attached to the loom frame at Z, on the right hand side of the loom, and convenient to the weaver's hand; on this cord a small wooden bob A' is fixed, which the weaver pulls when he finds it necessary to draw his bore or sink, and he winds the same length of cloth upon the cloth roller that he draws of warp from off the warp roller; B' B' Jacquard machines of the common description, mounted on the top of the loom in the usual way; C' C' the pattern cards, and, D' D' two wooden boxes into which they drop when delivered from the cylinders, as represented more clearly in the description formerly given of the Jacquard machine, and in the drawings Figs. 93, 94, 95, 96, 97, and 98 (which see.)

The introducer of this texture (Mr. Morton) has conferred on us a very great benefit: he has furnished us with a higher embellishment for the interior of our dwellings, and presented to us another evidence of the active benevolence and social disposition of man. And it is agreeable to reflect, that in the nursing of the idea, and the carrying of it into effect, he must have felt a pleasure much more intense than is likely to be experienced by any of the multitudes who will enjoy the fruits of his abilities.

A desire for something in the interior of a dwelling analogous to the soft clothing of the external world, seems to be generally felt; for in all states of society attempts are made to remove the hardness and unseemliness of the floor. Among the poorer nations, these attempts are confined to the mere dormitories, but, as advances are made in wealth, the mat and carpet begin to appear. The softness of the turf and more than its smoothness having been attained, it was natural to imitate also its embellishments: for this purpose several distinct kinds of carpet texture have been contrived. On one of these (the ingrain) we have already reported an immense improvement, and proceed to describe a no less striking improvement on another.

The Brussels carpet is distinguished from the common one by having a raised pile, and by the circumstance that the figures and colours are entirely produced from the warp. The pile is raised by inserting a wire between the body of the warp and the previously raised colouring threads. These threads descend and are fixed by the weft, which is of linen, two picks being given before the insertion of each wire, and these picks are called binders, and after a few

repetitions of the process the wires are withdrawn, taking care that the wires be not drawn out too near the face of the cloth: otherwise the looped warp would become stretched, by recovering the position in which it was before the wires were inserted.

The Wilton carpet differs only in this, that the pile is made somewhat longer, and cut in the manner of velvet.\* Were the coloured warp, however, raised into pile at each stroke, the web would have simply a striped appearance; and if it were raised only at intervals, the figure would be given in relief, but would still be merely striped. In order to produce a properly coloured pattern, several coloured yarns are arranged, so that any one of them may be raised, into pile. Their number is generally five, and these constitute what is called five covers, so that, by their irregular ascent to the surface, the striped appearance is almost broken up.† Still, however, the

---

\* The knife or cutter used in England, for cutting the piles of various kinds of fabrics, is a steel rod about 2 feet long and  $\frac{3}{16}$ ths of an inch thick, having a square handle at one end; the other end is tapered away to a blade as thin as the edge of a razor. To prevent the point of the knife from turning downwards and injuring the cloth, its under side is covered by a guide, which serves to stiffen it, as well as to prevent its under edge from cutting the fabric during the operation of guttering out the pile. The operative grasps the handle in his right hand, and insinuating the projecting point of the guide under the web, pushes the knife smartly forward through the whole breadth of the pile (from selvage to selvage.) This process is repeated upon every line of the pile throughout the web.

An expeditious method of manufacturing common *velvets* has lately been introduced by our respected friend, M. Tannias Falson, of Lyons, its ingenious inventor. There are two principal features of novelty in this method; the first of which is, the weaving of two webs or pieces of velvet at once, the one above the other, the pile of each turning inward, and the webs being connected together by the pile itself. The second feature consists of a vibratory cutter or knife, which passes between the two pieces of velvet and cuts them asunder, as fast as woven, by the mere operation of the loom; the cutter is, of course, set from the face of the cloth at a sufficient distance to prevent its cutting too near the reed.

This excellent mode of manufacturing velvet, might, we think, be introduced with great advantage in this country: the necessary apparatus may be obtained, by applying to the inventor, at Lyons, or to Messrs. James Jacquier & Co., No. 1 Wood Street, Spitalfields, London.

† Called *covers* on account of all the colours being covered or hid, except one, which shows on the face of the cloth. In a pattern, for instance, containing five colours, all these may be visible, but only one will show at any particular point, and the sum of all the parts of the coloured yarns which appear on the face, will be only one fifth of the whole of the coloured yarns employed. Five colours are commonly used in the manufacture of Brussels carpet: if a

web is essentially striped, and though the designer be not nearly so hampered as in the Kidderminster texture, he is yet seriously incommoded in his choice. Let us suppose a board painted in minute coloured stripes. After these have dried, let another coating of coloured stripes be laid on, and so on for five coats, each differing from the preceding: the painter may now form an idea of the difficulties encountered by the carpet designer,—let him set to work, by scraping away the different coats, to produce a pattern. But there is another annoyance; *in order to produce the smallest speck of any particular colour, a thread of that colour must traverse the whole pattern; and that thread may displace some other which would have been advantageously brought in elsewhere.* On account of the very different rates at which the coloured threads are taken up, these cannot be wound upon one beam, but have to be placed each upon a bobbin by itself.

To remedy the inconvenience of this texture (the Brussels carpet) Mr. Richard Whytock, of Edinburgh, contrived a method of partially dying the yarns; but we cannot fully understand the value of the contrivance till we have glanced at another kind of carpet texture.

The Turkey carpet is the simplest in its texture of all carpets, and at the same time is almost unlimited in the choice of colours. Let us suppose ourselves seated at a common loom, and that immediately after having thrown a pick, we commence to tie on every thread of the warp a small bunch of coloured worsted yarns, varying the colour according to our fancy. This completed, let two or three picks be thrown, and well driven up; and then another row of coloured worsteds tied on. It is clear that in this way we could produce any pattern, and that no more of any particular colour is wanted than is sufficient to produce the required effect: nay more, the colours being put on by hand, we would not be compelled to reiterate the pattern at each stated distance. Here we have every advantage that we can wish for, excepting this important one, rapidity of formation.

Whytock's method supplies to all the advantages of the Tur-

---

greater number were employed, the cloth would have a flimsy appearance. Suppose ten colours to be used, instead of five, as already described, then nine of them would always remain below, while only one would be raised, but this one could not fully conceal the others, so that the pattern on the cloth would be indistinct. Could one-half or two-thirds of the coloured threads be brought to show on the face of the cloth, it is clear, that the fabric would have a much more dense and velvety appearance.

key carpet, a rapidity of weaving greater than that of the Brussels fabric. His method may be described thus: If for the five coloured yarns of the Brussels carpet we could substitute one yarn dyed of the requisite colour at different places, we would be able to dispense with all the apparatus for producing the pattern, could make the web with only one body, and work it as a simple velvet. The only difficulty would then be in the dyeing of the warp threads.

In order to dye the threads, one yarn is wound on the surface of a large drum, of which the circumference is equal to the length required for one copy or length of the pattern. This drum is graduated so that the dyeing roller can be passed across the yarn at any required place. The design, extended on the ordinary ruled paper, enables the workman to discover all the places at which a particular colour is to be applied: that done, he changes the colour box, and so proceeds till the whole colouring is completed. The thread, being now dyed, is then taken off the drum, and submitted to the processes (steaming &c.) for fixing and brightening up the colours. The second thread is then dyed, and so on till the whole warp is finished. The next and most difficult part of the operation is, to place all these yarns side by side upon the beam. For this purpose they are wound upon separate bobbins, and small white spots, purposely left in the dyeing, enable the workman to arrange the coloured parts properly opposite each other. They are then carefully rolled upon the beam, and the weaving proceeds rapidly, each thread being brought into the pile upon every successive wire. Whytock uses the grooved wires, and cuts the pile in the manner of the Wilton carpet.

Excepting the necessity for the recurrence of the pattern, this has all the advantages of the Turkey carpet. The coloured spots can be produced at any point, and need not run in rows as in all the other carpets. It need hardly be added, that greatly admired patterns have been produced by this method; and that the manufacture meets with deserved encouragement.

Before concluding this imperfect notice of these two improvements (Morton's and Whytock's) we would draw attention to a subject of great importance to society in general. A strong prejudice, sanctioned by an old proverb,\* exists against those who turn their attention to several branches of the arts. Yet it is a fact, that almost every improver has been jack of a good many trades; nay, an ac-

---

\* "Jack of all trades and master of none."

quaintance with a variety of operations is essential to the invention of new ones; and very often prodigious improvements are effected by the simple transference of a process from one art to another.\* May we be allowed to hint, that the triple carpet is one of those generalizations so often found in scientific researches, and that its inventor appears to have extended his studies far beyond the subject of carpet weaving. Whytock's carpet, again, bears on the face of it the necessity for a knowledge of the arts of dyeing, weaving and scheming; for no one not intimately versed in these could have conceived, or, having conceived, could have carried the idea into effect.

Another idea exists, that the happening upon new discoveries is a matter of chance, and some appear (we judge from their conduct) to imagine that the less they know of a subject the more likely are they to alight on something new; as a bad swordsman trusts to that very circumstance for outwitting his antagonist. Once in a century, indeed, one man among seven hundred and fifty-nine millions may find, by chance, some valuable process; but the great mass of our current inventions are the fruits of assiduous and well-directed exertion; and the mind, even more truly than the body, must earn its bread in the sweat of its brow.

For the benefit of the manufacturers in the United States, who are interested in the carpet trade, we have, at very great trouble and expense, made correct drawings and specifications of Mr. Whytock's very ingenious machinery for colouring carpet yarns, according to the statements just made: and although we have been out of pocket several hundred dollars more than we at first anticipated in this matter, still, we regret it not, believing that our exertions will meet with an adequate reward. We have made all the drawings to a scale.†

This invention consists of a new method or manufacture, which facilitates the production of regular figures or patterns, on different fabrics, particularly velvets, velvet pile, and Brussels, Wilton and Turkey carpets, by colouring the threads or yarns which are to be

---

\* As, for instance, the stealing of other men's inventions, and passing them off for our own. It often occurs that schemers, by such low trickery, succeed in acquiring large fortunes, whereas, the ingenious persons whom they thus swindle not only out of their bread, but also out of the *honour* which they justly deserve, die for want of the common necessaries of life.

† We think it proper to mention, that these drawings were made from one of Mr. Whytock's machines, *while in operation*, at Tournay in Belgium; and we were assisted in making them by Judge Shinimigin of Brussels.

used in weaving such fabrics, with a succession of different colours applied at different portions of the length of each yarn, according to such a peculiarly regulated order of succession of colours, as that after the yarns (so rendered party coloured) have been suitably arranged, in a simple loom, such as is commonly used for weaving plain cloth, without any Jacquard or other figuring machinery thereon, and after the said yarns have been woven, particularly into any of the fabrics aforesaid, by the ordinary manipulations of plain weaving, the cloth shall exhibit the appearance of a pattern or design, in diverse colours, by virtue of the variegated colours which were previously applied on the yarns by this improved method, according to a suitable and peculiarly regulated order of succession of colours, as aforesaid.

And although certain yarns which are intended for weaving patterned fabrics by plain weaving, have been heretofore rendered party-coloured, by tying up part of the hanks or skeins in order to preserve them free of colour when the other parts are coloured, by submitting the whole hanks or skeins to a dyeing process; and also, by a more recent process (practised by Mr. Louis Schwabe of Manchester) such yarns have been rendered party-coloured by printing them whilst they are in skeins or hanks; and the yarns so rendered party-coloured, whether by dyeing or by printing, are afterwards arranged in the loom, so as to give to the fabric which is woven therein, the appearance of certain irregular and ill-defined patterns in single or party-colours, such as clouded, speckled, mottled, marbled and spotted patterns, and interrupted striped patterns; it is to be understood that this improved method or manufacture, of Mr. Whytock's, is founded on the same principle of previously rendering the yarns party-coloured, and afterwards arranging them in the loom so as to produce a fabric with a variegated pattern by plain weaving of the party-coloured arranged yarns. This improved method, by virtue of certain mechanical combinations and arrangements, hereinafter described, for performing the process of rendering the yarns party-coloured, with a suitable succession of colours, (and after the same are suitably arranged in the loom certain precautionary measures, hereinafter described, being used, in order to keep up the said suitable arrangement unchanged during the process of plain weaving,) will facilitate the production of regular figures or patterns, which will correspond with sufficient accuracy to a previous, and intended design, and will be repeated with sufficient accuracy at regular distances along the length of the woven fabric, so as to exhibit the same appearance as is usual in the regularly



figured or patterned fabrics, which are woven in figured looms, but which regularity and accuracy of patterns have not been hitherto obtained by the ordinary mode of dyeing or printing yarns in the hanks or skeins.

We are aware of the fact, that yarns prepared for weaving into figured fabrics, by plain weaving, by printing suitable impressions in diverse colours upon them to form the chain or warp of the intended web, and passed through reeds like those of the loom which is intended to be used for weaving the same, the said impressions being obtained from engraved metal surfaces or from carved blocks, in the manner practised by calico printers, according to which method of printing warps, the pattern which will be afterwards exhibited by the fabric woven out of such printed warps, will be the same in respect to its design as that which is engraved or carved on the surfaces or blocks, by which the impressions were printed on the warp, except in as much as the design may be contracted in length by the gathering up of the warp in the process of weaving.

It is to be understood, that according to Mr. Whytock's improved method, the yarns, when they are arranged in a warp in preparation for weaving, are not printed; nor does he make use of engraved surfaces, or carved blocks, with any figured design or pattern thereon which bears the least resemblance to the figured design or pattern which will be exhibited by the woven fabric; but, with the same mechanical combination and printing implements which he uses for rendering yarns party-coloured, as aforesaid, suitable for the production of one kind of regular figures or patterns on the woven fabric, he can, also, render yarns party-coloured suitably for the production of an unlimited variety of different regular figures or patterns by only varying the regulated order of succession, whereby he applies the different colours to the yarns, with his mechanical combinations and printing implements; and according to which improved method, the warp or chain is formed in preparation for weaving after the yarns are rendered party-coloured, which is also the case in the common plan of dyeing the yarns in the hanks or skeins, tied up, or in printing the yarns in the hanks or skeins; in the old methods, the warp or chain is formed first, and the printing afterwards performed thereon, and the yarns of their printed warps (or so many thereof as are to form the patterned or figured part of the fabric) must retain the same positions in relation to each other when they are in the woven fabrics, that they had during the printing, for the yarns receive their printed impressions whilst they are arranged in the same order side by side as that which they

are to have when arranged in the loom. This distinction being made, we shall now proceed to explain the improved method or manufacture in all its essential details.

In order to render yarns party-coloured by Whytock's improved method, one yarn or thread, or a small number of yarns or threads, must be wound or coiled around the circumference of a large cylinder or drum, which is mounted on a horizontal axis in a frame, *in the manner of a grindstone*, and the circumference of the cylinder being covered with a blanket, such as is used by calico printers to cover over their tables for block printing, with the addition of an oiled cloth cover, to keep the blanket clean, the circumvolutions or coils which the yarn or each of the yarns makes around the said cylinder, being disposed regularly and closely side by side. And if more than one yarn is wound round the cylinder at once, the coils thereof should be continued until they fill up close to the side of the first coil which was made by the next adjoining yarn, so as to cover all the circumference of the cylinder with circumvolutions of the yarn or several yarns around the same. The yarn or yarns being thus disposed in coils around the cylinder, and the ends fastened thereto, they are prepared for receiving the colours, which are applied by means of long narrow sticks or rulers, the edges of which are covered with felt, and are used as printing surfaces, in the manner of calico printing blocks, *but without any carved pattern* on the said edges or printing surfaces; that is to say, the felt edge of one of the said rulers being furnished with its appropriate colour (from a colour seive, such as is used by calico printers for block printing,) is applied horizontally across the breadth of the cylinder, parallel to the axis thereof, so as to cross over the coils of the yarn or yarns which surround the cylinder; and an impression being given across the yarn or yarns by the printing surface or edge of the ruler, in the same manner as would be done by calico printers, it will apply colour to each circumvolution of the yarn or yarns, along so much of the length thereof as is equal to the breadth of the printing surface of the rulers; and as the yarns or each yarn makes several circumvolutions around the cylinder, the colour so applied will colour as many different places along the length of each yarn, and those places will be exactly at equal distances apart along the length of the yarn, viz. at distances apart equal to the circumference of the cylinder. After one impression is thus made on the yarn or yarns, the cylinder is turned round just as much as will move its circumference a space equal to the breadth of the impression left by the ruler, and then, if the pattern requires a change of

colour, another similar ruler, furnished with a suitable colour, is applied across the yarns, so as to make another impression thereon adjoining to the former; or, if the pattern does not require a change of colours, but the repetition of the same colour, the same ruler which was first used, being furnished anew with its own proper colour, is used to make the second impression, instead of a different ruler; after which the cylinder is again turned round as much as the breadth of the impression left by the last ruler, in preparation for laying another impression, either with the same ruler which was last used refurnished with its own proper colour, or else with a different ruler furnished with a different colour, according as the pattern requires a change of colour, or a continuance of the same colour, on the next succeeding portion of the length of each yarn.

When repetitions of the same colour are frequently required, the colouring may be expedited by using a broader ruler, which will print double or treble the space of the ruler before mentioned. In this way the colouring of the yarns proceeds along all parts which require to be coloured by successive impressions of the different colours, with repetition of the same colours, or a change from one colour to another, according as the pattern requires, until a complete series of such impressions has been made, reaching all round the cylinder; and which series, by joining up to the first impressions, will complete the colouring of the whole length of the coils of yarn around the cylinder with their required party colours, succeeding each other in due order of succession, according to the pattern they are intended to produce in the woven fabric. When one yarn, or one small number of yarns, has been thus rendered party coloured, it, or they, must be taken off the cylinder, to be afterwards, when dried, subjected to the action of steam, to fix the colours, and then washed, and when again dried, to be wound on a bobbin, or on bobbins, in preparation for forming it or them into a warp; and as soon as the cylinder is at liberty, another yarn, or another small number of yarns, is coiled upon the cylinder to be in its, or their turn, rendered party coloured, by a similar series of manipulations, and so on until the whole number of yarns which are required for the formation of the warp or chain of the intended fabric, or of the figured or patterned portion thereof, are rendered party coloured; and, in applying the colours to each yarn or small number of yarns which are wound each time round the cylinder, the order of succession of the different colours is varied as the pattern may require, for each yarn or small number of yarns; and when the whole of the yarns requisite for the warp (or for the figured or patterned portion

thereof) are finished and gathered on their separate bobbins, either the said party coloured yarns are drawn off from the bobbins to form the warp in the loom by degrees, as the yarns are required for the weaving, or else the yarns are collected from the said separate bobbins on to the yarn beam of the loom by the usual process called beaming, as a preparation for weaving; and in so collecting the party coloured yarns from off their different bobbins into a warp, whether it be by degrees as the weaving in the loom requires, or in order to beam the warp upon the yarn beam of the loom previous to the weaving, the several party coloured threads must be arranged side by side, each in its proper place across the breadth of the warp, according as each yarn has been previously rendered party-coloured, suitably for the place it is required to occupy in pattern. And, owing to the circumstance of each yarn making several circumvolutions around the cylinder when the colours are applied thereon, as herein before described, the order of the succession of the party-colours on each yarn will be exactly repeated at intervals along the length of each yarn equal to the circumference of the cylinder, and those repetitions of the order of succession in the warp will produce repetitions of the figured pattern in the length of the piece of the fabric when it is woven. Wherefore, the length of the circumference of the cylinder must be adapted to the length over which the pattern is required to extend, before a repetition of the pattern commences, allowing for the contraction of length which results from the gathering up of the warp in the process of weaving, or else the circumference of the cylinder may be twice or thrice the length of the yarn required to produce that length of the fabric over which the pattern is required to extend before a repetition commences. The warp being thus composed of party-coloured yarns, suitably variegated with colours, and arranged in suitable order in the warp, according to the intended pattern, the weaving is to be conducted in the usual manner of what is called plain weaving, and will produce a fabric with a figured pattern in colours, *without any of the troublesome manipulations which are necessary for what is called figure weaving.* The fabrics for which Whylock's improved mode is most particularly adapted, are those wherein the surface of the fabric which exhibits the pattern is composed chiefly by gathering up the warp into loops, by interlaying a wire during the operation of weaving across the warp in the direction of the shoot or weft, and which wire may be either drawn out in order to leave loops for the face of the fabric, as is the case in Bruxelles carpets, or the wire may be cut out, if it is intended to

form a pile for the face of the fabric, and the cut or divided loops will form that pile, as is the case in velvets, velvet piles, and Wilton carpets; and, as to Turkey carpets, which are a different description of fabric from the others above mentioned, being formed by knotting tufts of coloured worsted yarn around the yarns of the warp, Whytock's improved mode facilitates the production of regular figures or patterns thereon, by enabling the operator to render the skein of yarn which each weaver is to use for forming those knotted tufts party-coloured, with the different colours succeeding each other, exactly according to the order of succession of colours in which the weaver must introduce tufts of different colours. According to the ordinary mode of weaving Turkey carpets, the weaver must have in use as many different skeins or clews of different colours as the variegation in his pattern requires, and must select first a skein or clew of one colour, and then another, with discretion to suit his pattern; he will, according to this improved mode, require to use only one skein or clew of yarn, which, being rendered party-coloured in due order of succession of colours, will furnish all the variation of colouring necessary for forming the successive tufts which he will require in his work, and following each other in due order as they will be wanted. And as he works up the skein or clew of party-coloured yarn by putting in tuft after tuft, and cutting off the yarn each time, those successive tufts will change their colour according to the intended order of succession of colours which the pattern requires, without any trouble of selecting colours and changing skeins with *perpetual* reference to the pattern, as heretofore, but only *occasional* reference thereto, and without the same liability to mistake in so selecting, and the waste of coloured yarn which is occasioned by such mistakes; and also, the number of ends remaining from the number of skeins which must be used will be much diminished by rendering the yarns party-coloured, according to this improved mode, and likewise, by this mode of party-colouring the yarns, the joinings of the patches of colour which were applied successively, will indicate the exact place where the yarn is to be cut off as the tufts are introduced, whereby waste of material in cutting off too long may be avoided, as well as imperfections in the face of the work by cutting off too short.—Note, A saving of colouring material may be made in rendering the yarns for Turkey carpets party-coloured, by an improved method, by omitting to apply any colour to those parts of the yarns which are afterwards to be looped or knotted around the yarns of the warp, and which parts will therefore appear only at the back of the fa-

bric, and will consequently require no colour; these omissions can be easily made in their proper places along the party-coloured yarns, by setting out the pattern so that those parts of the yarns will be known when they are wound round the cylinder, and may be passed over without applying any colouring matter thereon. The places which are so left uncoloured in the yarns will be *extremely useful* as indications to the weaver of the places where the tufts are to loop and knot around the yarns of the warp.

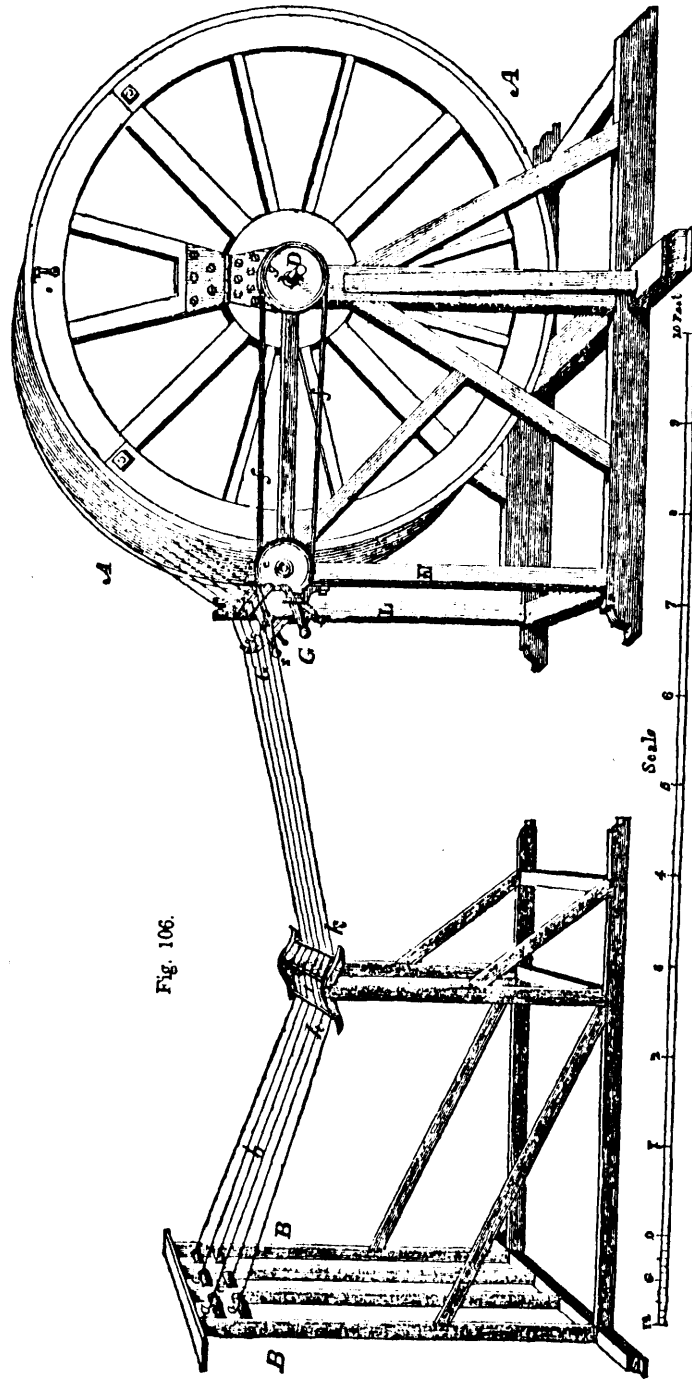
Fig. 106 represents the cylinder A A in perspective, together with the rack B B containing the bobbins *a a*, from which the yarns *b*, are furnished to the cylinder A A as fast as they are wanted, when the latter is turned round in order to wind them around its circumference, as herein before mentioned. Figs. 112 and 113 also represent the cylinder, and the same letters of reference are used to denote the same parts in all the figures. C C E L Fig. 113, and K K L Figs. 114 and 115 is the wooden frame for supporting the axis D of the cylinder A A; E L (see Figs. 113 and 114) are upright standards to support a horizontal shelf or rest F, which is fixed across the width of the cylinder, and serves to place the rulers by which the colour is to be applied to the yarns, in a truly horizontal position, and so that each ruler will be presented to the cylinder A A at the same height thereon; *d d*, (see the Figures 107 and 109) is a guide screw, which is mounted horizontally in bearings notched out in each of the upright standards E L (see Fig. 113;) the screw *d d*, has a pulley *e*, fixed on the extreme end of it, in order to turn it round by means of an endless band or strap *f f* (see Fig. 112,) from another pulley *g*, which is fixed on the extreme end of the axis D of the large cylinder A A; wherefore, the screw *d d*, will be turned round with a motion corresponding to that wherewith the cylinder A A is turned; G G (see Fig. 107) is a conductor for the yarns, which is fitted on the guide screw *d d*, so as to be moved gradually along thereby across the width of the cylinder A A, when the latter is turned round. The rack or frame B B (Fig. 106) contains as many bobbins *a a*, as the number of yarns which it is intended to wind around the cylinder A A, for colouring at one operation.—A yarn *b*, from each of the several bobbins *a a*, is conducted beneath a fixed horizontal rod or wire *h*, then over another such rod or wire *i*, and beneath a third fixed rod or wire *k*; which three rods or wires, by opposing a slight friction to the yarn or yarns when drawn across the rods or wires, will cause the yarn or yarns to be extended with a proper tension when drawn afterwards by the cylinder A A. After passing under the third rod or wire *k*, each of the several

yarns is passed through a distinct eye in a wire guide  $z z$ , (see Figs. 106 and 107) which is fixed upon the top cross rail  $R$  of the conductor  $G G$  (see Figs. 106, 107, and 108) and, finally, each of the yarns is passed through a wire loop  $n$ , which is fixed in the top cross rail  $R$  (see Figs. 107 and 108) and projects so far out therefrom as to reach near to the circumference of the cylinder.  $n$ , (see Figs. 113 and 114) is a fixed rest or guide for the tails of the conductor  $G G$  to bear against, when the screw  $d d$ , is turned round, and as it carries the conductor  $G G$  literally across the width of the cylinder  $A A$  in the manner before stated, and in so moving it will guide each of the yarns, so that the successive coils which that yarn makes around the circumference of the cylinder will fall close to each other side by side; and, if that coiling is continued until the last coil made by one yarn joins up to the first coil made by the neighbouring yarn, then, the whole surface of the cylinder will be covered with the several yarns.—The conductor  $G G$  is made double, and fitted upon the screw  $d d$ , near to each end thereof, the two conductors  $G G$  being united by two wooden rails  $R S$ , and each part which is so fitted on the screw  $d d$ , is formed in two parts  $G p$ , (see Figs. 107, 108, and 109) which are jointed together at  $q$ , in the manner of a pair of pincers, to grasp the screw  $d d$ , by the action of the spring  $r$ , which is interposed between the handles  $G p$ , of the two parts, in order to urge them apart from each other, and cause the other parts  $s s$ , of the pincers to grasp the screw  $d d$  between their jaws, by clasping the two handles  $G p$ , of each of the conductors together in the hands, their spring  $r$ , can be overcome to open the two pincers, and then both the conductors  $G G$  become detached from the threads of the screw  $d d$ , in order to move the whole back from one end of the screw to the other, without the trouble and delay of turning the screw round backwards after one set of yarns has been wound round the cylinder, in order to prepare for winding on another set.\*

Figs. 114 and 115 represent the cylinder as it appears when a part  $H H$  of its circumference is folded inwards towards the axis, in order to admit of taking off the yarn from it after it has been rendered party-coloured. Two portions  $H H$  of the circumference are

---

\* A more simple guide or conductor for coiling the yarns on the cylinder  $A A$ , as represented in Figs. 106, 107 and 108, may be used; and as every manufacturer of cotton goods in the United States is well acquainted with the common traverse or spooling motion, no difficulty can be experienced by them on this head. We are confident that the manufacture of this kind of carpet, (the velvet pile) is destined ere long to receive vast improvements: indeed, we would not be at all surprised to see from 25 to 30 yards of it manufactured





Figs. 107, 108, 109.

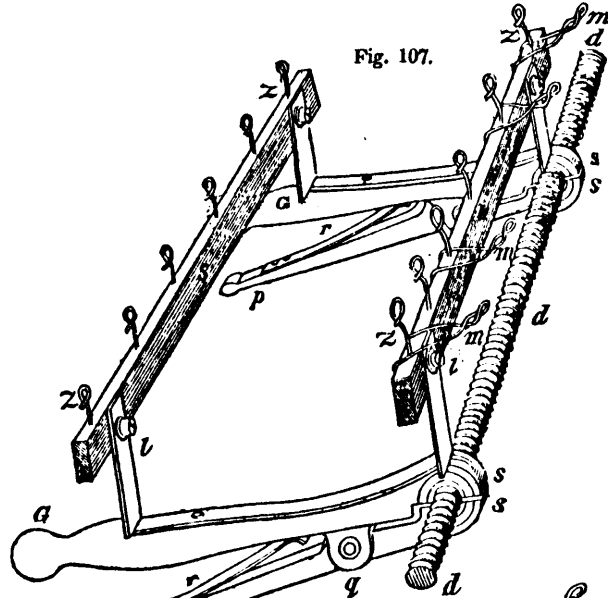


Fig. 107.

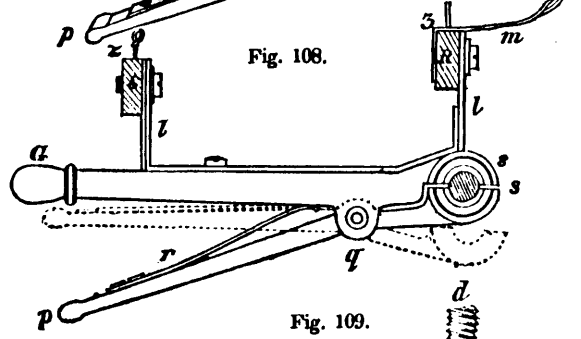


Fig. 108.

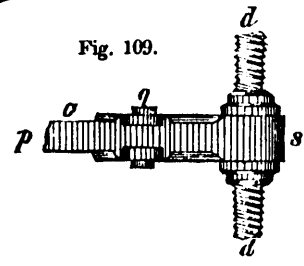


Fig. 109.

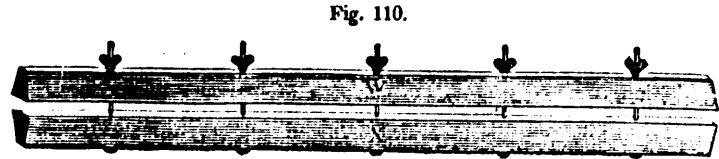
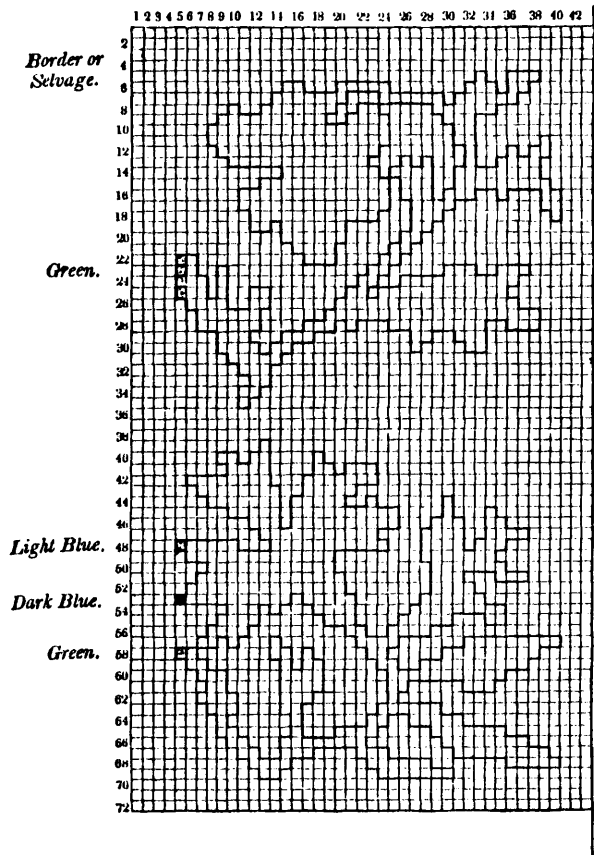


Fig. 110.

Fig 111.



Note.—The above species of painting or of transferring patterns to the design paper is performed with camel hair pencils, and appropriate pigments, which are to be reduced, if necessary, to a semi-transparent state. The pencils should be chosen of a middle size, with a good spring and point, both of which qualities may be discovered by drawing them gently through the mouth, and pressing them on the thumb nail; when, if on being moderately wet, they spring again into their form after being bent, (on the nail,) it is a sure indication of these qualities. The points of the pencils too, should be adapted as nearly as possible to the size of the small spaces or squares on the design paper on which they are to be employed, that the designer may be able to fill any individual space with only one touch of the pencil.

A learner in this department, before he attempts designing of patterns, should endeavour to acquire a dexterity in filling up these little spaces on the design paper, whether they run in straight or curved lines; taking care always to fill them exactly, without allowing the paint to spread beyond their boundaries, or leaving any of them broken or imperfect.

Fig. 112.

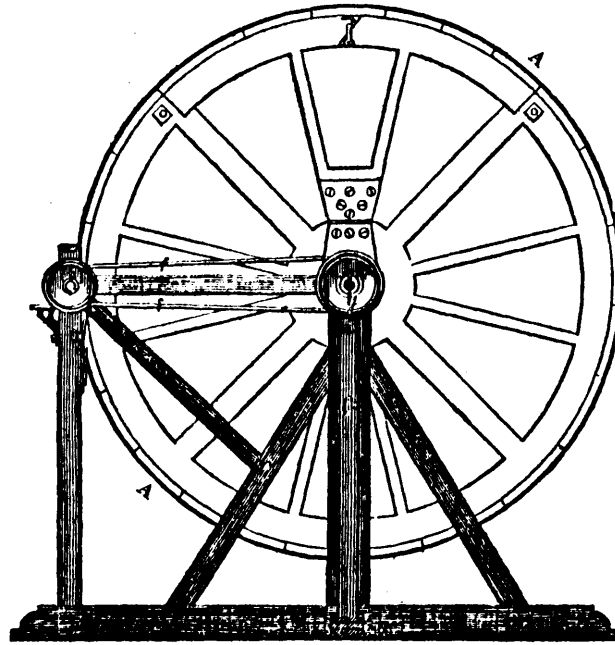


Fig. 113.

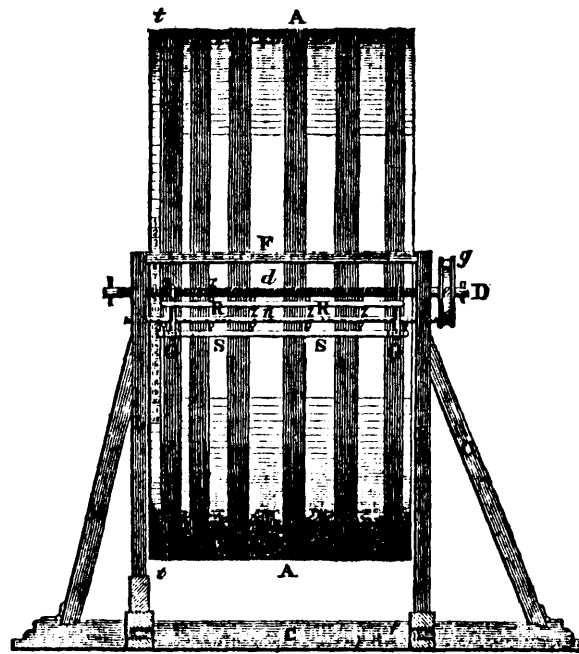


Fig. 115.

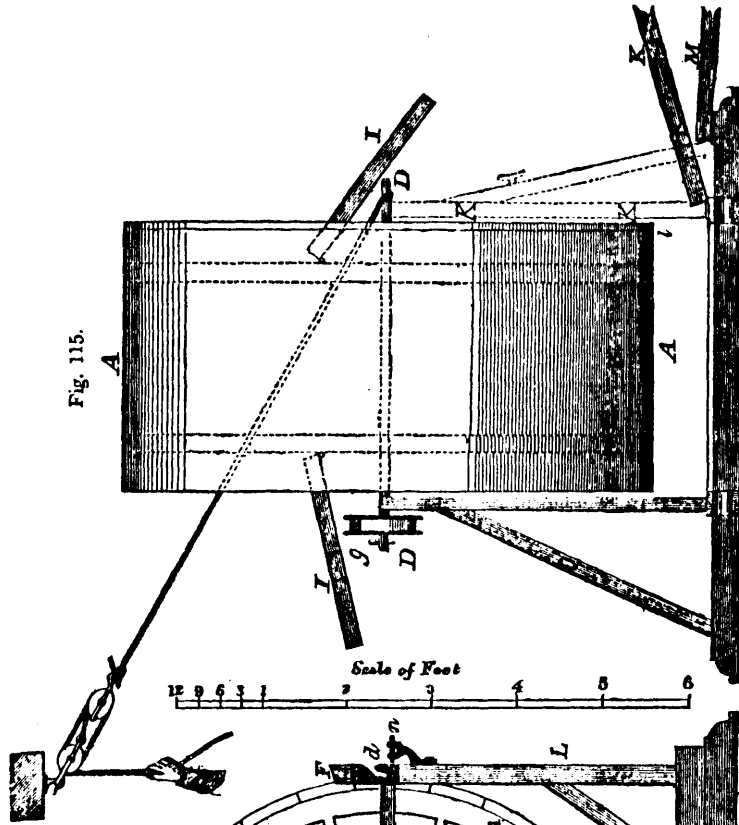
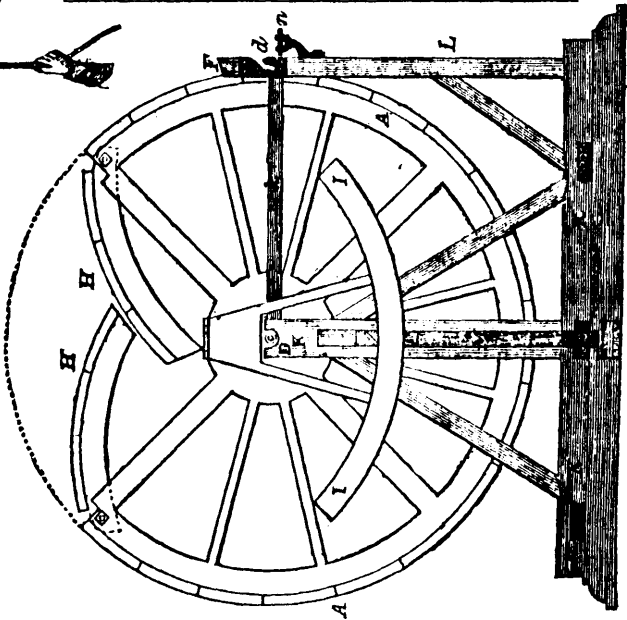


Fig. 114.



*Description of the manner of applying the party-colours on the yarns, and of determining the proper order of succession for the different colours thereon.*

The succession of colours must be determined by means of a design paper, which represents the design or figured pattern intended to be produced by plain weaving of the party-coloured yarns. See a specimen of such a design paper Fig. 111. It is similar to the design paper used by weavers for figured weaving, being ruled with squares, which are numbered across the top and down the length, and it must contain the entire figure of the pattern which it is intended to produce in the fabric, and which pattern is to be repeated thereon at regular intervals along the length of the piece: and, supposing that the ground whereon the pattern, Fig. 111, is to be represented, is to be all of one uniform tint, the whole of the yarns may be dyed with that colour previously to applying the party-colours, the said dye being chosen of such a nature that it will readily give place to the stronger party-colours which are to be applied.\* The size of the cylinder A A must be so chosen that its circumference will be equal to the length of yarn which the warp will take up for weaving, from the commencement to the end of the pattern, where it will join to the preceding, and to the succeeding repetition of the pattern, taking into consideration the contraction of the length of the warp which will result from the gathering up of the yarn in weaving, and which contraction varies very greatly in different kinds of fabrics. Whatever number of squares the length of the design paper occupies, (for instance 72, as in Fig. 111,) the circumference of the cylinder must be divided into a like number, (of 72 equal parts;) or the double or the treble that number, if the cylinder is large in proportion to the pattern; which is easily done by applying a tape painted with suitable divisions upon it around the circumference of the cylinder, as at *t t*, (see Fig. 113) and fastening it with pins to the blanket cover. The design paper should be laid out in large squares, as the printer has to distinguish readily the succession and order of the different colours. It may either represent a figure to fill the breadth of the intended fabric, or one which is to be repeated several times side by side in the breadth, and each square may either represent a single yarn or a number of yarns, according as the texture of the fabric is to be fine or coarse.

---

\* The operator must be careful not to apply light pink, light yellow, sky blue, pea green, or French white on a black or dark *bottom*, as none of these delicate tints would appear to advantage on such a surface.

Repetitions of the same figure in the breadth will admit of several yarns being coloured alike at one operation, and the trouble of afterwards separating these yarns may be avoided by keeping the coils of the different yarns distinct from each other upon the cylinder. The numbers along the top border of the design paper, Fig. 111, (for instance, from 1 to 43 in Fig. 111,) represent the different sets of yarns in the warp which are to be rendered party-coloured together by one operation. Suppose, for instance, that it will take six yarns of the warp, side by side, to fill each of the squares across the breadth of the fabric, that will be 6 times 43 or 258 yarns, side by side, in the whole warp, to produce the pattern Fig. 111. In that case 6 bobbins *a a*, Fig. 106, must be used, and as many yarns must be wound together round the oiled cloth covering of the cylinder *A A*, by attaching their ends thereto with pins, and then turning the cylinder round by a suitable crank. The traversing motion which the screw *d d*, then gives to the conductor *G G*, will lay each of the six yarns in regular coils close side by side on the cylinder, so that the succeeding coils of each yarn will just touch one another. The number of circumvolutions of each yarn which must be thus wound upon the cylinder, will be determined by the number of repetitions of the pattern required to be made in the whole piece of the fabric which is intended to be woven for one warp; and when the required length of yarns is wound on, the successive coils made by each yarn will cover up the space allotted for it on the breadth of the cylinder, so as to join to the space allotted for the next yarn, whereby the whole surface of the cylinder will be covered with coils; which being done, the ends of the yarns are cut off and secured to the oiled cloth covering of the cylinder with pins, and then those yarns are ready to receive the party-colours from the printing rulers or sticks, in the manner herein before described; and it only remains to explain how the proper order of succession of colours is determined by aid of the design paper, Fig. 111, viz. The cylinder is turned round until the division 1 of the tape *t t*, (Fig. 113) around its circumference is brought to an index mark, which is made on any suitable part of the fixed frame for that purpose, and the cylinder is fastened there by means of a stop *x*, Fig. 112, which is jointed to the fixed frame at one end, and the other end formed with a sharp hooked point to stick into the wood of the cylinder. This being done, the printer refers to the design paper, Fig. 111, and finding that the four first sets of yarns at the border of the warp do not require to be party-coloured, he proceeds to the number 5 along the top margin thereof, and finds thereby that the

six yarns which he is going to colour will be the fifth set in the intended warp, reckoning from the border of the warp, then proceeding downwards under that number 5, he finds the first coloured square in the pattern is number 22 down the margin, and also that the said square 22 is painted green, therefore, he knows he is to take a printing ruler furnished with green colour, and laying that ruler upon the shelf F, he presses it towards the cylinder and makes the first impression across the yarns upon the cylinder. He then turns the cylinder round to division 23, and looking to square number 23 down the margin of his design paper, (still under number 5 at top,) he finds that square to be also green, and therefore he knows that he is to make another impression with the same printing stick, after refurnishing it with green colour; after which he turns the cylinder round to division 24, and by reference to his design paper, he finds it again to indicate another impression of green colour, and after that another repetition thereof, at division 25.

These four being done, he finds by referring to his design paper and proceeding downwards (still under number 5 at top) that no more party-colours are required on the fifth set of yarns until the 48th square, which is a light blue colour; therefore, he turns the cylinder round, forward as far as its 48th division, and fastening it there makes an impression with a ruler furnished with a light blue colour, which being done, another reference to his design paper shows him, that he must again turn the cylinder forward to its 53d division, and there apply an impression in dark blue colour; and, lastly, that he must again turn the cylinder forward to its 58th division, and there apply a green impression; after which the said fifth set of yarns, then wound on the cylinder, will be completed and rendered party-coloured at every part of their length where the pattern requires them to be so coloured, unless the cylinder is so large as to require the pattern to be repeated twice or thrice in going round it, in which case he repeats the operation accordingly. And, note, if the yarns have not been previously dyed, as hereinbefore mentioned, with an uniform colour, proper for the intended ground on which the pattern is to be represented, then, (unless the ground is to be white,) the ground colour must be applied to the yarns by making successive impressions thereon with a printing ruler furnished with the said ground colour, making such an impression whenever the cylinder is detained at one of its divisions, whereof the number corresponds to the number of the squares in the pattern paper, (beneath number 5 at top,) which squares are there filled with the said ground colour, viz., the squares numbered

1 to 21, in Fig 111, and then the squares numbered 26 to 47, and 49 to 52, 54 to 57, and 59 to 72. And, note, when the design paper indicates that impressions of the same colour are to be repeated in succession, those repetitions may be expedited by using printing rulers of double or treble the usual breadth of one division on the circumference of the cylinder. The fifth set of yarns (consisting, in this instance, of 6 yarns in number) being now rendered party-coloured, the moveable portions H H of the circumference of the cylinder are folded inwards, in the manner represented in Figs. 114 and 115, and as before described, in order to slacken and set the yarns loose thereon; and then the oiled cloth cover with the yarns upon it is removed from the circumference of the cylinder, which is immediately put together again, and another clean oil cloth is applied thereon, in readiness, for receiving the next set of yarns which are to be rendered party-coloured, according to the order of succession which is indicated by tracing the design paper Fig. 111, from the square numbered 6 at top downwards through all the squares beneath the same. Each set of yarns which is removed from the cylinder along with the oil cloth covering thereof, as before mentioned, is kept extended over two sticks until the colours become dry, and then the yarns are made up into a large hank or bundle, and submitted to steam by the usual process of steam printing, in order to fix the colours, and the yarns are then washed in water, to remove the gum or paste with which the colours were mixed up, and after being dried, the yarns are wound off upon bobbins in readiness for forming them into a warp for the loom. In forming which warp, each set of party-coloured yarns must take their proper place in the breadth of the warp for which they were originally intended when they were coloured with the succession of colours which is indicated by the design paper. In forming the warp by drawing off the yarns from the said bobbins, it may either be beamed on the yarn roller of the loom, or the yarns may proceed at once from their bobbins to the loom, to be drawn off therefrom, as fast as the operation of weaving requires.

Respecting the weaving of figured fabrics out of yarns which have been rendered party coloured, suitably for that purpose, by Whytock's method, hereinbefore described, it is only necessary to remark, that the loom may be such as is commonly used for plain weaving, without any of the apparatus required for figure weaving, and the manipulations may be the same as those for plain weaving of the like fabrics to those on which it is intended to produce figured patterns by using party coloured yarns. And, on this head,



it only remains to explain a precautionary measure which is used during the progress of the weaving, to ensure that all the several yarns of the warp shall preserve their proper relative positions in the direction of their length, without any alteration thereof, during the weaving, from one end of the piece to the other, viz. In applying the colour to each set of yarns, either the first or the last of the impressions, which is made, when the cylinder stands at its division 1, must be of such a decided character, that its place on every yarn can always be distinguished with certainty; or, a narrow black impression may be made across every set of the yarns, when the cylinder stands at its division 1, as a common starting place for all the yarns, and for all the sets of yarns; which decided impression, or narrow black impression, in consequence of the circumvolutions which the yarns make around the cylinder, will be repeated at every place along the length of each yarn, where the repetitions of the pattern are intended to begin and to end. In short, when the party coloured yarns are afterwards formed into a warp, the said marks will indicate the junctions of the successive repetitions of the pattern; and if the yarns are all adjusted so that those marks on each yarn will range in a straight line, square across the breadth of the warp, then a correct pattern will be formed by the party colours of the yarns; and all the precaution that is required during the progress of the weaving, is to keep all the yarns so adjusted in length, that all others of the said marks, at every succeeding repetition of the pattern, shall continue to range in straight lines, and square across. To ensure this condition, a clamp, similar to that represented in Fig. 110 is used, which is composed of two straight rulers *W X*, united by screws *v, v*, which draw the edges of the two rulers *W X* together, and their adjacent edges are covered with cloth. This clamp is applied across the warp, with one of its rulers above the yarns and the other below them, near to the place where the said marks must range in a straight line, square across the warp, and there the clamp is fastened by its screws *v, v*, so as to hold all the yarns fast between the edges of its two rulers *W X*, in order to confine them to their relative positions end ways in respect to each other. As the weaving proceeds, the clamp Fig. 110 advances along with the yarn; and when the length of the pattern has been woven, the weaving must be suspended, whilst the screws *v, v*, of the clamp are loosened, to set it free on the yarns, and it is then taken back along with them, to the next succeeding marks; and, if those marks do not range in a straight line, and square across the warp as they ought to do,

those yarns which are too forward must be pulled back or stretched until the marks are made to range, and then the clamp is to be again screwed fast on the yarns, to confine them in their true relative positions, whilst another length of pattern is woven; after which the clamp is again shifted to the next succeeding set of marks and so on until the weaving of the whole piece is completed. This method of working with the clamp Fig. 110 during the progress of the weaving, is only requisite in case the yarns are drawn off at once from the bobbins to form the warp in the loom as the weaving goes on, without using a yarn beam to the loom: but, if the warp is formed and gathered on a yarn beam by a previous operation to the weaving, then the clamp Fig. 110 must be used in the manner above described during the operation of beaming, but it will not be afterwards required during the weaving of the warp which has been so formed from the yarn beam.

Note. It has been, by way of example, stated that the design, Fig. 111, contains 72 squares in length, and that the circumference of the cylinder is to be divided also into 72 parts; but this supposes a pattern of small extent, and a small cylinder. A large pattern would require a large cylinder, but on a large cylinder a small pattern might be repeated two, three, or more times. The cylinders which the inventor uses in rendering yarns party coloured for a velvet pile carpet, are 6 yards in circumference; but he finds it preferable to divide the circumference into 144 parts, and then 144 successive impressions of the printing rulers will be required to go all round the circumference: in which case a small pattern of 72 squares in length, like that in Fig. 111, would require to be repeated twice over, in applying the party colours to each set of the yarns, after the manner hereinbefore described, before the impressions would reach all round the circumference of the cylinder. Note also, that the operation hereinbefore described, of rendering the yarns party coloured, may be expedited in case the pattern is of such a nature that it will admit of being divided or split down by a central line, along the middle of the breadth of the piece, into halves, and that the pattern on each of those two halves will be precisely similar side by side, except being the reverse one to the other, as the pattern would be to its reflection in a looking glass. In such case twice as many yarns may be applied at once upon the cylinder, as would be applied for a single pattern, in the manner hereinbefore described, the width of the cylinder being suitably proportioned; and after the double set of yarns have been rendered party coloured, one half of them is taken in the operation of warp-

ing and weaving to the left hand of the centre of the breadth of the warp, and the other to the right; and in like manner for patterns which are to repeat three or more times side by side in the breadth of the intended fabric. For instance, if the fabric which is to be woven to exhibit the pattern, Fig. 111, be made double the width hereinbefore supposed, in order to contain two figured patterns, such as Fig. 111, but reversed to each other, and disposed side by side in the breadth of the fabric, then, the warp for such a fabric would contain 86 sets of yarns of 6 each, 516 yarns in the whole warp. In this case a double set containing 12 yarns may be wound on the cylinder at once, in order that all those 12 yarns may be coloured together, and after being so coloured and finished ready for forming into a warp, the 12 yarns are to be separated into 2 sets of 6 yarns each, and one of those sets is used for the right hand half breadth of the piece, and the other set for the left hand breadth thereof. But whether the whole pattern be repeated in reverse or not, any repetition side by side which continues through all the length of the pattern will afford the opportunity of colouring an increased number of threads at once.

The colouring will in all cases be better performed when the coils of yarns around the circumference of the cylinder are laid close side by side, without either crowding each other or leaving intervals between the yarns; therefore, the pulley *e*, on the end of the screw *dd*, (see Fig. 106) should be properly adapted to the size of the large pulley *g*, (see Fig. 112) on the end of the axis *D* of the cylinder *AA*, according to the fineness of the threads of the screw *dd*, in order that the screw may be turned with such a speed in respect to the speed of the cylinder, that the screw will carry the conductor *GG* (see Figs. 107, 108, and 109) across the width of the cylinder, or any portion thereof, at a proper rate of progress to lay the successive convolutions of the yarns properly side by side around the circumference of the cylinder; therefore, when a coarser sort of yarns are to be wound on, a smaller pulley *e*, must be applied on the screw *dd*, to turn it quicker, and give the conductor *GG* a more rapid progression; and, vice versa, when a finer sort of yarns are to be wound on, a larger pulley *e*, must be fixed on the end of the screw to turn it slower.\* The number of yarns to be wound about the cylinder at once varies, for the reasons herein before stated, and also

---

\* The pulleys *e*, and *g*, being on the same range in Fig. 113, would appear to constitute only one pulley; but the reader, on referring to Fig. 112 will easily understand their relative positions.

the number of convolutions of each yarn around the cylinder varies according to the size of the cylinder, and to the length of the yarns to be wound around it: it is necessary to adapt the machinery to those changes, for which purpose the wire eyes *z*, which are stuck into the two wooden rails *RS* of the conductor *GG*, (see Figs. 106, 107 and 108) and the loops *mm*, which guide the yarns, may be very numerous in a row, and the yarns may be conducted through those eyes which suit best.

In order to preserve as much as possible the form and regularity of the several coils made by each yarn and set of yarns, around the cylinder, after they are taken off therefrom, and during the processes of steaming and washing them, as aforesaid, it is proper to pass a small cord of worsted amongst the convolutions, under and over them alternately, tying its ends together. This interlacing of a cord across the several coils may be applied at two different places of each set of coils, before they are taken off from the cylinder, and it will facilitate the winding afterwards upon bobbins, as it will preserve the yarns from entanglement.

In rendering the yarns party-coloured for Turkey carpets, they must be coloured by the same method herein before described, but with the order of succession of colours according to the horizontal rows of squares across the design paper, instead of according to the perpendicular rows of squares thereon; because the figures or patterns on Turkey carpets are not formed as in the other fabrics herein before mentioned, by gathering up the warp threads, but by looping and knotting in detached tufts upon the ground warp. In the ordinary mode of fabricating such carpets, different individuals are generally employed on one piece of carpet, each of them having certain portions allotted to him, and which he is to fill with tufts. In using the party-coloured yarns for these tufts, the portions given to each of the workers must be coloured, so as to correspond to the part of the figure he is to work, or if the yarn has been coloured for a very extensive pattern, each long yarn might be divided into equal portions, and distributed amongst the number of hands to be employed, whereby there would be less risk of mistakes than in the ordinary method: the tuft with which one person would leave off would answer to the commencing colour of the next portion.

Having explained and set forth, by suitable drawings and description, the nature and objects of Mr. Whytock's invention and the manner of carrying the same into effect, we shall now proceed to describe some alterations made upon it by a relation of ours, Mr. Edward Henshall, carpet manufacturer, Huddersfield, England.

The reader will, indeed, perceive, that Whytock's description covers most of the ground claimed by Henshall, but, nevertheless, there are some features of novelty or difference in the latter individual's arrangements worthy of attention ; and from this consideration we have been led to make proper drawings\* of his machinery while in *actual* operation ; in which undertaking we have been at much trouble and expense ; however, we will not grudge all that we have thus sacrificed, if by any means the machinery and processes of Whytock and Henshall shall be so amalgamated as to enable some of our brethren to supersede the present tedious system of manufacturing carpets. If even 25 or 30 yards of Brussels, velvet pile, or the Whytock carpet could be woven in one power loom per day, of 10 working hours, we think the old method might then be considered as on the high road to Texas ; and after its disappearance from all civilized society, the parties who survived the grand catastrophe (particularly if high-tarif-men) would, no doubt, make magnificent fortunes.

Henshall's improvements in manufacturing carpets, and hearth rugs, consist, Firstly.—In the application and use of a peculiar and novel arrangement of apparatus, designed for the purpose of winding the threads of yarns which are to constitute the warp threads of Brussels, Wilton, velvet, or velvet piled, or other similar carpets and hearth-rugs, from separate hanks of yarn, and laying two, three, or more threads, side by side, as if in tapes or bands upon one bobbin, and thus preparing the threads for a two or three-thread warp, before they are placed in the loom for weaving, (same as in Whytock's.)

Secondly.—The invention consists in an improved construction of apparatus, and a novel mode of operation, as well as the peculiar arrangement of the yarns which are to constitute warp threads, whereby, spots, squares, or stripes, may be printed upon a flat surface or table, by means of an ordinary block or type printing apparatus, in different colours, across a collection or number of yarns or threads so arranged, that they may, after being so printed upon the table, be wound again upon a reel into hanks, and taken off the reel, and removed to be steamed, washed, and dried, in order to clear, raise, or fix the colours, as in the ordinary process of printing woollen yarns.

It must be observed, that each spot, square, or stripe, may be printed or stamped of any breadth of the block, or length of the threads or yarns, according to the pattern required, as the portion

---

\* This we did in August 1840.

of the yarn so printed or stamped is intended to form one or more loops of the fabric, when thrown up by the weaving ; that is to say, if two or more loops, in succession, are required to be of the same colour, to form the pattern of the carpet, the threads or yarns must be printed or coloured at once, over a sufficient space of the length, to form these two or more loops ; this may be done with a block or type of the required breadth or length for two or more loops in the cloth, hereafter more particularly explained. (See Fig. 111 and its explanation.)

The object of this part of the invention, is to operate upon a greater number of threads or yarns, and produce the printed, or stamped, spotted, or striped yarns, direct from the bobbins ; and after printing or colouring, to wind them at once direct from the printing table into separate hanks, all of which is done at one operation. These warps, when subsequently arranged, form the warps of as many carpets, or hearth-rugs, in contra-distinction to printing, stamping, or colouring the yarns collectively, when arranged in the form of a warp, with a pattern or device complete upon the surface of such warp, and ready to be woven in the loom, as hitherto practised under the patented inventions of Messrs. Woodcroft, Schwabe, Whytock, and Whytock and Clink ; the first two persons printing or dyeing the intended pattern or device complete upon the perfect or arranged warp, either before or after beaming ; and the latter, either printing on yarns, wound on a cylinder, or producing the colours by dyeing the said yarns.

When the threads or yarns have been so printed, they are properly arranged, as hereafter described, in order to form the warp threads of the carpets and hearth-rugs ; they are then woven in an ordinary carpet loom. This part of the invention also comprises the arrangement of the threads, and apparatus connected therewith.

Thirdly.—These alterations on Whytock's plans consist of an arrangement of machinery, by means of which, the warp, yarn, or threads, or warp throughout its whole length, can be woven into a slight gauze-work, having weft threads put in at distances of about an inch asunder ; and this is done during the operation of beaming the warp direct from the bobbins.

After the warp-yarn has been thus prepared, patterns or designs may be printed upon its surface, in the ordinary manner of block printing.

In printing the gauze, the pattern-blocks must be elongated when intended for Brussels or similar carpets or hearth-rugs, as before named ; and this is accomplished by providing the block, upon

which the pattern is wrought, about three-fifths longer than the finished pattern will require, when the cloth is completed, as the operation of weaving will weave, or loop up, the extra three-fifths of printed gauze. The gauze, when printed, is removed to be steamed, washed, and dried, in the ordinary manner of woollen printing; after which, it is re-beamed, and woven in an ordinary plain carpet loom, the preparatory weft threads of the gauze, being removed as the cloth is woven.

Fourthly.—The improvements consist in weaving, in a common simple loom, Brussels or sigular carpets, or looped fabrics, as Wilton or velvet piled carpets and hearth-rugs, plain, either in white or grey yarn, or any colour, intended as the ground of the pattern; and afterwards printing upon the said plain goods, any pattern or device, in the ordinary manner of block or machine printing, the colour parts of which may be raised, washed, and dried in the usual way. The carpet is then distended, and the back stiffened with size or other suitable matter, as may be found requisite.

Fig 116

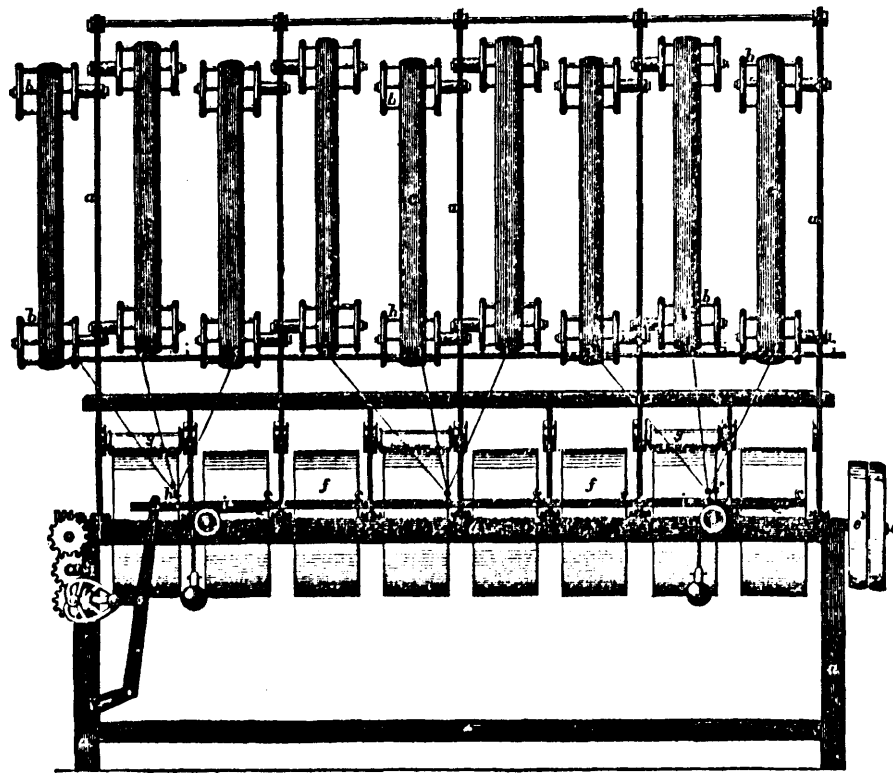


Fig. 117.

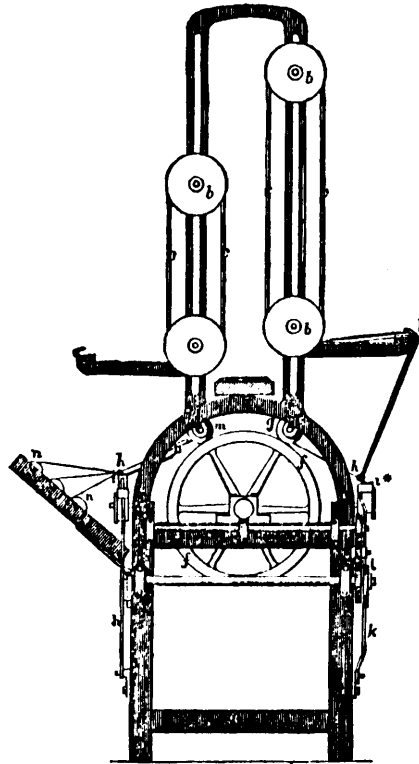


Fig. 116 represents a front elevation of an improved winding apparatus, constituting the first part of the improvements; Fig. 117 is an end view; and Fig. 118 is a plan or horizontal view of the same, as seen from above. These Figs. will be sufficient to illustrate two methods of carrying this part of the invention into effect, viz. doubling from hanks, or skeins, or separate bobbins, as one side of the frame is represented having the hanks or skeins, and the other the bobbins.

The machine consists of a slight frame *a, a, a*, the upper part of which supports the reels *b, b, b*, (see Figs. 116 and 117) containing the hanks of yarn *c, c, c*. The lower part of the framing supports the driving shaft *d, d*, (see Figs. 116 and 118) upon which is keyed the pulley *e*, to which driving power is to be applied. Upon this shaft *d*, a series of wooden drums *f, f, f*, are also mounted, which revolve with it and drive, by friction of contact, the bobbins *g, g*, and *m, m*.

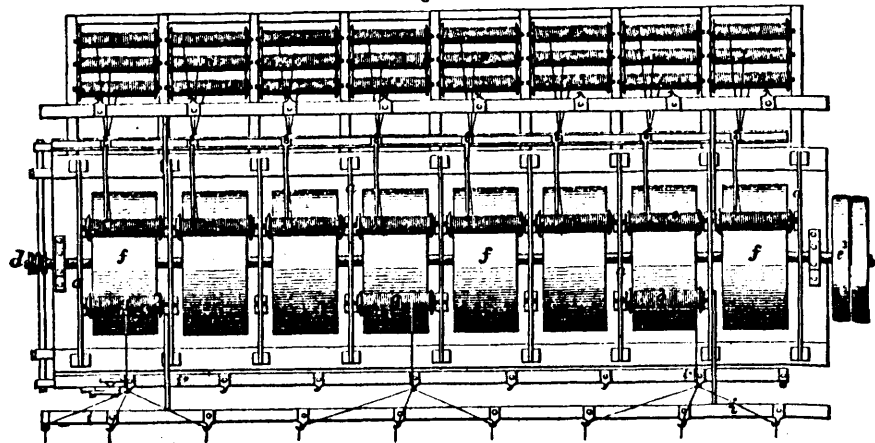


The yarns or threads being taken separately from the hanks *c, c, c*, two, three, or more of them are brought together, and passed through the eyes *h*, in the stationary guide-rail *i, i*; thence through the eyes or hooks *h\*, h\**, on the traversing guide-rail *i\*, i\**, (see Figs. 116 and 117.) These threads are then wound upon one of the bobbins *g*, side by side, so that the two, three, or more, will readily unwind from the bobbins, at the same speed, and thus always preserve an uniformity, in length and tension.

The guide-rails *i\**, are traversed to and fro, in order to lay the yarn evenly upon the surfaces of the bobbins, by means of the lever *k*, being moved by the heart or excentric motion *l*, (see Figs. 116 and 117) geared with the other end of the driving shaft.

It will be observed, by the drawing, that a similar arrangement is represented upon the other side of the machine, except that the three threads are being wound together upon the bobbin *m*, from off bobbins *n, n*, (see Figs. 117 and 118) instead of the reels *b, b*, or hanks *c, c, c*.

Fig. 118



The apparatus necessary to perform the second part of the improvements, namely, the arranging, printing, or stamping, and reeling of the threads or yarns, intended to be woven into carpets or rugs, is shewn in longitudinal elevation at Fig. 119.

Any number of bobbins containing the yarns, are placed at *a', a'*, upon spindles mounted (either vertically or in any other manner) in the boards *b²*, as a creel, the yarns from which are passed between the friction guide rollers *c\*, c\**, and one, two, or more threads (ac-

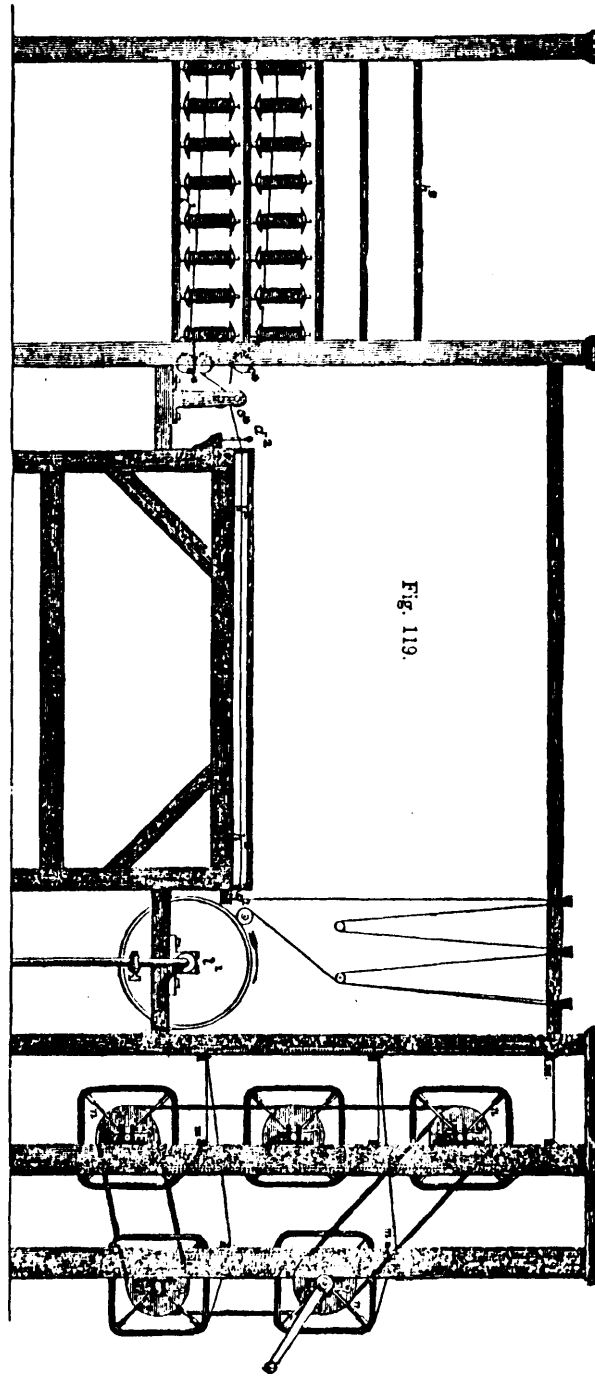


Fig. 119.

ording to the quality of the carpet required) are drawn through each space of the wires in the sley or reed  $e$ ; say ten or twenty of such threads are passed through the reed, side by side, and form a band; a space or blank, of about the same width as the band of yarns, is then left in the reed; and again, a similar number of threads and spaces are left alternately, until the reed is filled. The ends of all the threads are then to be confined in a nipper or clasp  $g'$ , and drawn tightly across the printing or stamping table  $h^2$ . The operation of ordinary block-printing or stamping, is now to be performed, which must be governed by the pattern paper, as in ordinary figure weaving; spots, stripes, or squares, only, are to be printed or stamped, and not any regular fancy pattern or device.

It will be necessary to have an ordinary squared or plaid pattern paper, every square or plaid of which corresponds with each two or three threads of the intended carpet, as in Fig. 111; and after the pattern, to be produced, has been carefully coloured upon the design or ruled paper, by examining the paper, the workman or printer must be governed or directed in printing or colouring the yarn.

Small blocks or types, the breadth of the band of threads, and the length required for one, two, or more loops of the carpet, when woven, must be provided, according as the pattern paper directs, and screwed up into a small hand block, like those used for marking shirts;—thus, if the pattern directs one loop should be printed or stamped black, one type or block must be placed to print or stamp it, and then the number of blanks and printing types which follow, are added, until one hand block of a convenient length, is formed; the whole being screwed together; or a single block may be used, taking one or more colours from a party-coloured sieve, at the same dip, and applying it direct to the yarns.

When the entire bands or lengths of the warp threads have been printed or stamped, as they are passed over the table, they must be each distinguished by a number or letter.\* After the length of threads, lying at one time upon the surface of the table  $h^2, h^2$ , Fig. 119, has been printed or stamped, the nipper or clasp  $g'$ , is to be closed on to the threads which pass over the table  $h^2, h^2$ , in order to remove the length just printed and allow another length of the yarns to be drawn over the printing table.

The printed or stamped threads are hung upon wooden rollers to partially dry (as shown in Fig. 119) and are afterwards completely dried, by passing over the heated cylinder  $l'$ ; thence they

---

\* Instead of the waymarks or hieroglyphics used by Whytock.

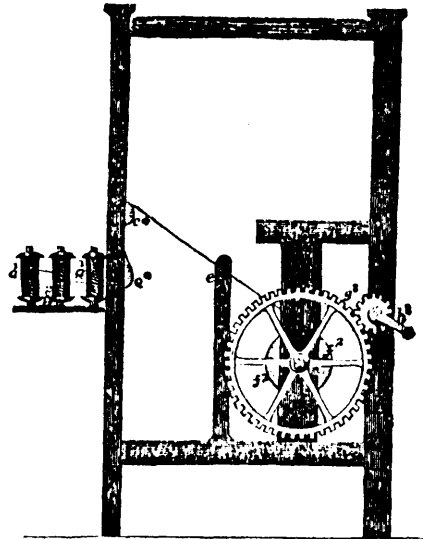
proceed over guide rails *m*, and being there separated by upright wires, are wound into hanks upon the reels *n n*.

The hanks must also be carefully numbered, when taken off the reels, each hank forming only one warp thread, the entire length of the piece,—the same numbers being of course employed, as previously marked in the printing; they may then be steamed, washed and dried, or otherwise treated, as in woollen printing.

When these hanks are required to form the warp threads of carpets or rugs, they are to be wound again upon bobbins, which are numbered the same as the hanks. The bobbins should then be taken in their numbered order, and in sufficient quantities to make a full warp, as we have already explained in the account of Whytock's carpet.

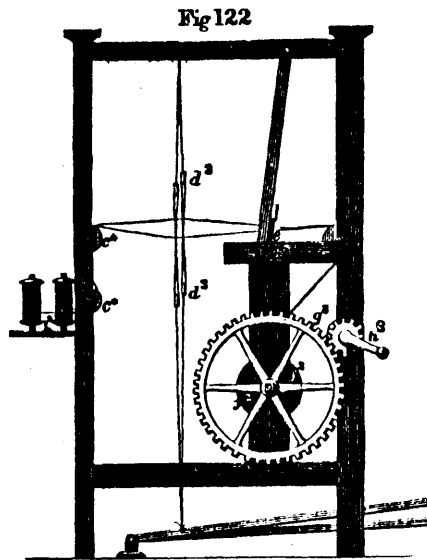
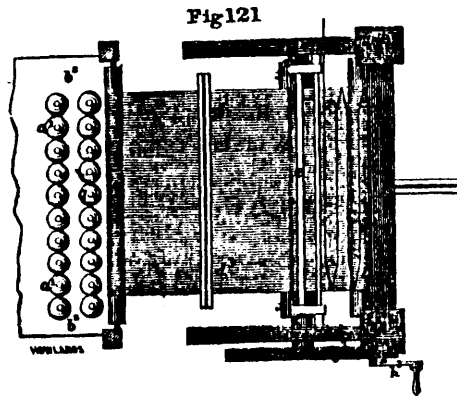
The bobbins *a a*, are now to be placed upon spindles and boards *b b*, as just described, shown in Figs. 116, 117 and 120, beginning with thread No. 1, and passing it through the first space of the sley or reed *e*, and so on for the entire width; then the full warp is to be beamed on the roller *f f* for the loom (see Fig. 121) direct from the bobbins,—which being done, the beam of warp may be removed to a common plain cloth loom (like that shown in Fig. 120) to be woven.

Fig. 120.



Figs. 121 and 122 represent a plan and side view of a slight

temporary loom, in which the third part of these improvements is effected.



A similar creel of bobbins  $a^1 a^1 a^1$  to those before described, are placed upon the boards and spindles  $b^2 b^2$  and contain the warp threads, either single, double, or treble, according to the quality of the intended fabric; but, instead of beaming them at once for the loom, they are passed over guide or friction rollers  $c^2 c^2$  through the headles  $d^2 d^2$  and reed or sley  $e$ , (see Figs. 121 and 122) and at every inch or more of space, a weft thread  $o^2$  is thrown, in order to convert the warp thread or yarns into a preparatory gauze-work,

without weaving any positive or permanent fabric or cloth ; thus a partial weaving is effected with the temporary cross threads  $o^3$ , by means of the headles  $d^3$   $d^3$  and sley  $e$  ; the gauze is then drawn off the beam  $f^2$   $f^2$ , by means of the tooth gearing  $g^3$ , and winch or handle  $h^3$ , and is then ready for printing. (See Figs. 120 and 122.)

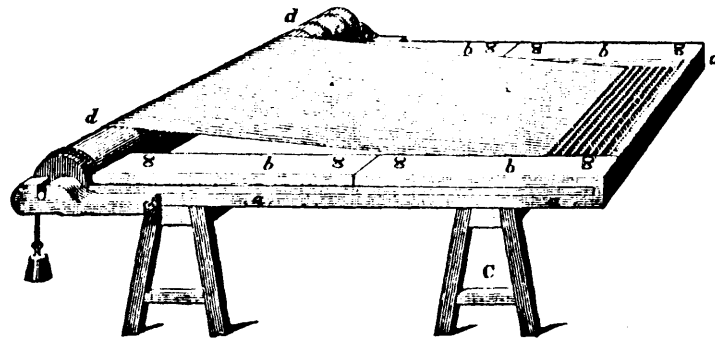
**MANUFACTURE OF CARPETS, RUGS, &c., BY CEMENTING  
A NAP OR PILE ON PLAIN CLOTH.**

A method of manufacturing carpets, hearth-rugs &c., has lately been discovered, which differs so much from those already described, and at the same time possesses so much merit, that we think our Work would be incomplete, without giving an account of it. This method is, indeed, so unlike the ordinary modes of manufacturing carpets, hearth-rugs &c. that it cannot, properly speaking, be considered under the head of any branch of weaving at all ; it will, however, be interesting to both weavers and manufacturers, to have a full explanation of it, as it is likely to supersede many of their present processes.

This remarkable invention attracted considerable notice at the time of its first introduction, in 1838 ; and several machines are now in operation, upon the principle of it, in England and Belgium. We have made the annexed drawings and description from a machine, while at work in the latter country ; and hope that our efforts may prove beneficial to many of our friends.

Fig. 123, represents a perspective view of a machine suitable for carrying out the first part of the invention.  $a$   $a$ , is a quadrangular frame having the guides  $b$ ,  $b$ , affixed by screws or other suitable means, allowing of their being readily removed to take out the work.

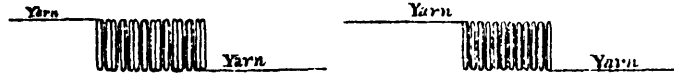
Fig. 123.



The frame *a, a*, is supported by the legs or frame *c, c*. On the under side of each of the guides is a groove or space between the guide and the frame *a*, the object of which will be hereafter fully explained. *d, d*, is a roller or beam (see Figs. 123 and 125) on which is warped a number of yarns or threads of worsted, wool, cotton, silk, or other fibrous materials, or mixtures thereof, in like manner to winding or beaming a warp for a loom, as if the same were to be woven into a fabric, in the ordinary way of weaving with warp and weft, and the warp beam or roller *d, d*, is weighted and has friction cords or bands, as is practised in looms for weaving, and as is shown in the drawing. The ends of the warp threads are made fast to the front rail of the frame *a*, in like manner to fastening a warp to the cloth roller of a loom. The workman then proceeds to work in the following manner; he has a number of strips of thin metal, such as copper, zinc, or other suitable material; the strips being all of the same size; and are to be in width what the depth of the desired nap is to be, and of a length somewhat greater than the width of the fabric to be produced in the machine; the frame *a*, (see Fig. 123) and guides *b, b*, are to have a space between them equal to the width of the intended fabric to be produced. The workman first places one of the strips of metal under the warp, and draws it up to the end, and parallel with the front rail of the frame *a*, the two ends of the strip being placed under the guides *b, b*, by which they are prevented rising up; he then places the next strip edgewise on the upper surface of the warp, and depresses the warp evenly between the first and second strip, and he springs or bends the second strip in such a manner as to allow of the two ends thereof entering into the grooves formed between the guides *b, b*, and the sides of the frame *a*. He then places another strip under the warp, and raises the same up evenly between the second and third strips, and he bends the strip in such a manner as to cause the two ends to enter the grooves formed between the guides and the sides of the frame *a*, and then straightens the strip so as to lay the same parallel with the preceding ones; then he takes a fourth strip and places it on the upper surface of the warp, and depresses the threads thereof evenly between the third and fourth strips, and causes the ends of the fourth strip to enter the grooves formed between the guides *b, b*, and the frame *a*, and with a straight-edge he presses the strips up evenly from time to time, so that they may each be kept upright on their edges and in straight lines parallel to each other, and when the frame *a, a*, is full, the yarns or threads composing the warp will be so arranged between the strips of metal

or other suitable material, as to pass first over, then under, each succeeding strip, as is shown in Fig. 121.

Fig. 121.



The warp thus arranged should have a smooth surface of metal or other suitable material passed over and pressed on the upper side in order to lay and press the yarns or threads down evenly, and also to cause them to spread out in such manner as to produce a touching of the fibres throughout, so that when a suitable cement shall be placed or spread thereon and dried, the whole will become one sheet of fabric when the strips are removed by cutting, as will be hereafter more fully explained. The cementing material used by the inventor is India-rubber (caoutchouc;) but other materials, such as shellac, may be employed instead. One or more coats of India-rubber, or other cement, is to be spread over the surface of the warp, arranged and prepared as above explained, and permitted to dry, and in this condition the frame *a, a*, may be turned over, and then, by a sharp knife or other suitable cutting instrument, the strips may be successively removed by cutting the yarn from side to side of the fabric, in like manner to cutting the warp when weaving velvet, or Wilton carpet; but it is not necessary to have the strips grooved, as is the case with the wires used in making velvet, but they may be grooved, if it is desired to be very correct in the cutting. The fabric thus prepared is then suitable to be applied to woven textures or other surfaces, by cementing it thereto, but it is preferable that the back of the woven fabric should be cemented on to the warp, immediately on the warp or pile having been heated with the cement, and before cutting out the strips of metal (as shown in Figs. 123 and 124) or other suitable material employed, and this may be performed by having first spread a layer of the cement on the warp, and another on to the fabric which is to constitute the back, and then bring the two cemented surfaces together and press them well; and if the surfaces be extensive the pressure may be conveniently performed by means of a smooth iron roller passed over the upper surface, such roller being made hollow, may be heated with an iron heater. In case it be required to make carpets, or rugs, or other fabrics, with patterns, then it will be desirable to print the yarns or threads in the warp, but each pattern in the printing must be so lengthened as to allow of the bending up of the



yarn, and the colours used must well penetrate the warp (see Whytock's and Henshall's methods.) Fig. 125

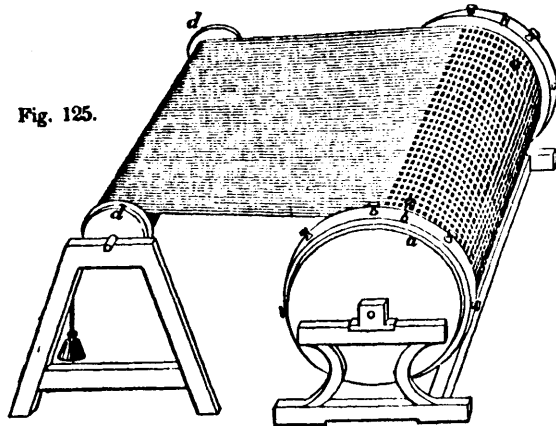
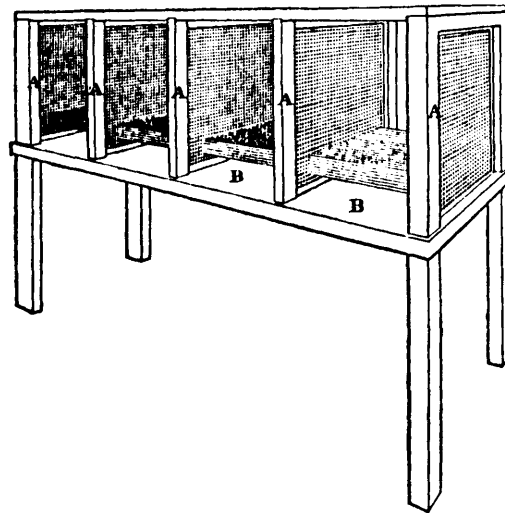


Fig. 127.



shows another arrangement of machinery for performing a like operation of bending lengths of threads or yarns to that above described; the only difference being that the frame *a*, and guides *b*, are formed into a cylinder, and this machine requires that the fabric when produced should be unwound before the cutting out of the

strips: in other respects the description above given, aided by the drawings, will be sufficient, the same letters indicating similar parts in this machine as were used in Fig. 123. And it will be seen that the cylinder *a, a*, has an axis with suitable bearings at each end, in order that it may be turned round by the workman as he proceeds with his work. Another means of performing this operation of bending a number of threads or yarns (in such manner that each portion of thread or yarn when cut shall be cemented at a point or part intermediate of its length, and the two ends thereof rise to the surface and form the warp of the fabric,) may be employed in the following manner; in place of warping the threads or yarns on a roller or beam, as above explained, and then bending the warp over and under a series of thin strips of metal, as in Figs. 123 and 124, the strips may have thread or yarn wound spirally around them, as is shown at Fig. 126, and then a number of such covered strips are to be packed side by side in a frame *a, a*, and the yarns or threads cemented together and to a suitable fabric, and the strips cut there-from as above explained. We have stated that the looped up threads or yarns were to be cemented to a cloth, which would serve as a back, yet under some circumstances it will be preferable not to perform that operation, such as in making a suitable napped fabric for the covering of hats and bonnets, in which case the napped fabric being made, as above explained, in place of cementing it to any fabric, it is to be cemented directly on to the hat or bonnet.

We will now proceed to describe the second part of the invention, which relates to another mode of manufacturing carpets, rugs, and other napped fabrics, which differs from that above described, but is capable of being so worked as to produce very ornamental surfaces and may be made to resemble tapestry and highly finished paintings, *depending on the taste of the person who works the pattern* as will be hereafter explained.

Fig. 127 represents a frame or apparatus suitable for working the pattern when performing the second part of the invention. *A A A A A* are quadrangular frames affixed on the board *B B*. Over each of the end frames *A*, is evenly stretched canvas, such as is used for worsted work, in such manner that the canvas at each end shall be stretched to coincide one with the other as nearly as possible can be done. The person who works the pattern is to proceed as follows:—

By means of a needle he draws the worsted, wool, or other yarn or thread through a hole or mesh in the canvas at one end, and

through a corresponding hole in the canvas in the other frame A, commencing the work at the lower corner hole, and working successively through each hole of the lower rows of the surfaces of canvas; then the next above, (taking care that the thread or yarn between the frames A lie even and smooth, and are drawn equally tight) and the work is to be continued till the yarn has been passed through every hole, when there would be a long quadrangular mass of yarn or thread, which is to be encompassed with a box or case C, (see Fig. 128,) open at both ends; and having so encompassed and secured the mass of yarn or thread, the same may be cut away from the canvas or fabric, and a piston or rammer inserted into the box or case C, which, fitting closely on all sides, will, when desired, force out portions or lengths of the yarn, in order that the same may be cut off after it has been combined by cementing it into a fabric, as will be hereafter more fully described; and the ends of the fibres in the box C, against which the ram is to press, should be cemented to the ram and permitted to dry, before commencing to force out the mass of yarn by the ram.

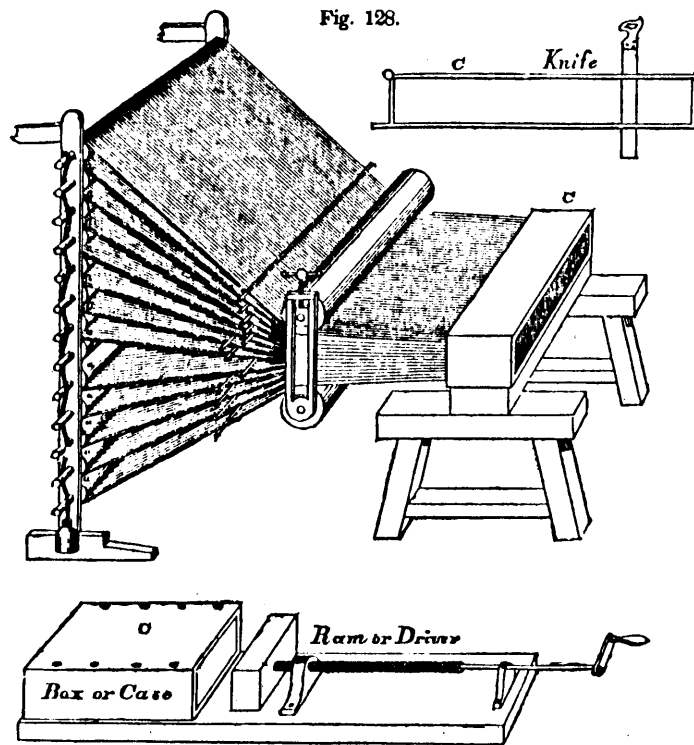
Above we have given our readers an account of the mode of working without reference to the pattern; and we shall now proceed to show how a design or pattern may be worked in the frame, and subsequently transferred and subdivided into a multitude of surfaces, or portions of surfaces. We would first remark, however, that the canvas, or fabric used on the frames A should be fine or coarse, according to the degree of fineness of the yarn or thread used, whether of worsted, wool, cotton, silk, or other fibrous materials or mixtures thereof, and the pattern or design is to be worked or executed with the needle, by counting the meshes, and drawing through colours according to the order of the pattern set before the person performing this part of the work, drawing the thread or yarn through each of the frames, as has been above explained: or it may, in some patterns, be performed by marking the canvas. Thus, supposing that the pattern to be produced was a red jack-ass on a white ground, and that the shape of the ass was marked on the canvas, the person working would continue to draw white yarn or thread through the canvas so long as the lower part of the frame was to receive the ground, then with white and then with red, according as the portions of the row of meshes or holes, of the canvas across from side to side was ground or pattern, and so on till all the holes were worked through and the said quadruped completed. Having performed this operation, he would surround the warp of yarn or thread with the box or case C, as above explained, the boxes or cases C,

being formed in parts capable of being put together readily, by screws or otherwise. We have chosen this simple pattern in order to give a clear description of this part of the mode of working as practised by the ingenious inventor, but from the foregoing description a person will readily be able to perform other patterns, of varied degrees of intricacy, *depending on the taste of the design*, which should be drawn on paper such as is now used in working worsted work on canvas; that is, by having the colours in small equal-sized squares, as is well understood, and consequently forms no part of the present contrivance, and then, by counting the meshes or interstices of the fabric, draw in threads of the colour required, and as may be marked in the design paper. Or in some cases the pattern may be marked on the canvas or fabric, on the frame A A A A A (see Fig. 127.) When the frames are full a case C is applied, just sufficient to embrace the mass of threads or yarns, and retain the same closely together in such manner, that in forcing the mass of threads or yarns through the case in which they are included, they will be prevented getting out of the correct position. Hence each successive portion or slice cut off from the end of the case, will be a repetition of the same pattern, which being combined together will produce a carpet, or rug, or other napped fabric, depending on the nature of the fibrous materials employed, and the mode of getting up the same.

There are other methods by which masses of yarns or fibres may be obtained within cases or boxes C, and worked therefrom according to the invention. We will now explain two other modes, slightly differing from each other, and from the one above explained; but by both the object of this part of the invention may be obtained, whereby a mass of yarns, or threads, or such like combination of fibres may be produced in masses, in suitable cases or boxes, and allow of a succession of cuts or slices being successively taken therefrom, in order to produce successive surfaces, or portions of surfaces, which being cemented before cutting, will form the nap of fabrics.

Fig. 128 represents a perspective view of an apparatus or machine wherein a number of warp rollers *a, a, a*, each having wound thereon threads or yarns of any suitable fibre, according to the fabric desired to be produced, the warp rollers being equally weighted.

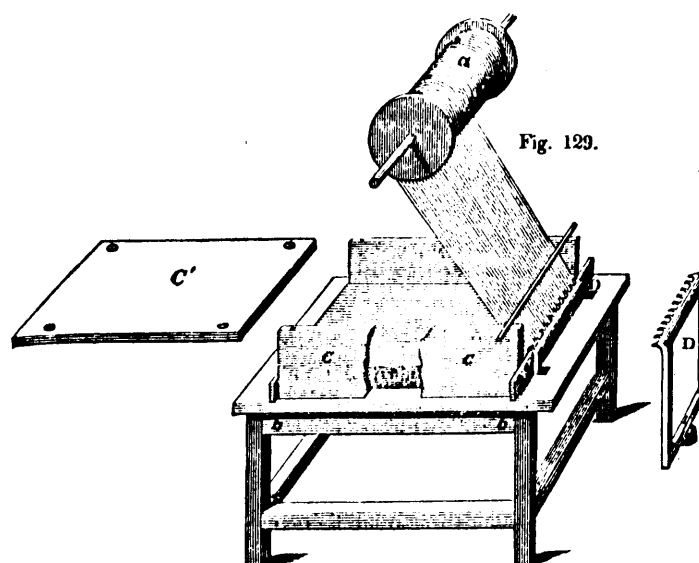
Each layer or warp of yarns is made fast to a rod, which keeps the layers of thread separate (as shown in the Fig.,) and correctly placed, one warp above the other; and having so obtained a mass of threads or yarns, the same is to be enclosed in a suitable case or box C, as above described. Such boxes or cases C, may be of any



convenient length, say twelve inches, *which is a convenient length*, and they may be successively cut from the body of warps, taking care that before cutting off one box or case, or more, securely encompass the body of yarns or threads, in order to hold them securely, the cut or slice being made between the cases or boxes by a sharp thin knife, or such suitable razor-like instrument. Each of these boxes or cases C, will then be worked off by having suitable pistons placed, and forced through them, as above explained, or in cases where the length of nap will allow of it, the cases or boxes C, may be made of parts, each only as deep as the intended nap. Then, in order to cut off each successive layer or slice, India-rubber or other suitable cement should be evenly spread over the external ends of the body of warps. In order to cement all the ends together, a slice, and case or box C, may be cut off, starting with several such narrow cases, and applying one around the yarn as one is cut off, in order to retain the nap secure, the cases C being hinged or otherwise.

Fig. 129 shows another mode of obtaining a body of threads or

yarns into a box or case, in order to allow of a succession of slices or surfaces being cut off to form napped fabrics. It consists in what may be called a folding machine, whereby a warp of yarns or threads, either all of one colour, or of intermixed colours, *according to the will of the party*, and depending on the description of napped fabrics it is desired to produce.



*a*, is a warp roller, on to which the threads or yarns are beamed. *b, b*, is a table; and *c, c*, part of a box or case in which it is desired to pack a quantity of threads or yarns, and *C'*, is the top or cover of the case. The warp is made fast to a rod, which is at one end of the case *C C*; and is then drawn evenly to the opposite end of a case, and a rod or other suitable instrument is laid across the top of the warp; the warp is then taken evenly back to the other end of the case *C C*, and another rod laid on, and the warp again brought to the other end of the case and another rod laid on till the warp is folded, and the case is full, the rods being of such a length as to protrude beyond the end of the case *C C*, and in order to pack the whole closely, the rods are kept pressed down by the weighted instruments *D*, at each end of the box or case *C C*, and when a number of layers of the warp have been folded, the lower rods may be successively removed, in order to allow the layers to go more closely together, and by this means a body of threads will be packed in a case or box, from which may be cut a succession of slices, each slice forming the napped surface, or part of the napped surface of a fabric. We

have thus far spoken of the frames or cases into which the threads or yarns are packed as being rectangular, but we would remark, that they may be of other forms, depending on circumstances. By which arrangement, where an extensive surface is desired to be napped, the cases or boxes may be made into such forms as will, when combined together, produce the shapes required, and place the patterns, or parts of the pattern, in the proper place, which arrangement will allow of the patterns or ornamental designs (which require the most time in packing) being worked into separate boxes or cases, and the threads or yarns which are to form the ground may be in separate boxes or cases C.

Whatever be the course pursued in obtaining bodies of yarns or threads in boxes or cases, as above explained, the fibres at the end of which may protude, should be carefully shaved or cut off evenly, and India rubber, or other suitable cement, is to be laid on to the surface of fibres and permitted to dry sufficiently before the ram or piston is caused to force a quantity equal to the length of the desired nap from the case C. When sufficiently dry, and on examination the cement appears to be complete over the whole surface, the piston or ram is to force out of the case or box C, a length equal to the length of the nap; when that quantity is to be cut off with a sharp knife, or other suitable instrument, and the ends of the yarn which is in the case or box, are to be again coated with cement, and so on till the whole is cut up into slices, which may be afterwards applied, by cement, to canvas or other fabrics, or to other surfaces, or in place of cutting when the fibres have been only combined with cement, they may be further combined by cementing on canvass or other fabrics before cutting; and for hats and such like fabrics, where it is desired to have a laid nap, then this may be accomplished by having the end of the boxes or cases from which the cut is made, on a bevel, and the face of the ram also of a bevel. Hence each slice or surface will be protruded and cut on a bevel or angular direction, and when cemented together will produce a laid nap surface or fabric.

Having now given to the reader a practical description of this novel method of manufacturing carpets, rugs, and other similar fabrics, we would, before dismissing the subject, further remark, that we see nothing to prevent the application of steam or water power, instead of manual labour, in performing all the operations required. By this means, 60 strips of metal, to raise the nap or pile, might easily be inserted per minute; at the distance of about 2 yards from the scene of action, where the inserting process was going on,





direction, it is ready for the weaver. The warp of the shawl is likewise a Turkey gauze, the same as that which is the foundation of the weft, so that when a sufficient quantity of chenille has been produced from a warp, it is customary to make shawls of the remainder. (see Chenille paper, page 511.)

In weaving these shawls, one pick of the chenille is thrown in, and then three of the common weft, whether silk, cotton, or worsted, and the fibres of the chenille, projecting in all directions, give the fabric the appearance of a fine glossy shag, showing the pattern, when figured, alike on both sides.

When the shawls are to be of one uniform colour, only one kind of weft is necessary; but when they are to be figured, different colours are employed, and these are woven in spaces adapted to the different parts of the design; the pattern is painted on design paper, as for an imitation harness; each space of the design, or that which corresponds to a ground lash with its different colours, is again painted on a separate slip of design paper, but two spaces are here coloured, to make them better seen by the weaver, leaving a blank space on each side: these slips are all numbered, to prevent confusion.

Supposing a web of trimmings were to be woven, with eight repeats in the breadth of a yard, for the first pick of chenille, we take the slip of paper No. 1; by reading it, as for a sample, there are 2 spaces yellow, 1 white, 4 red, 2 yellow, 1 black, 2 white, &c., the weaver works a space of each of these colours on the warp, agreeably to its respective size on the slip of design paper, which, when finished, must be exactly the breadth of the trimming. For a guide to the weaver, the slip of paper passes through the reed, and is fastened at each end to a piece of tape, by a bit of rosin, the one behind the mounting hanging over the warp roller and kept tight by a small weight, and the other is fastened at the face of the cloth. The weaver then has only to change his shuttles, by shifting the boxes of the lay at the end of each coloured space, as pointed out by the design. The slip marked No. 2 is next put in the reed for the second pick, and the colours woven in the same manner, but in reverse order to the first, as the one is thrown in from the right hand and the other from the left, and so on till the weft for the whole pattern is finished.

The weft is cut in lengths of eight yards, being the quantity usually wound on one bobbin or quill, and this will make eight picks in a yard-wide web; and the bobbins are taken in succession, agreeably to the numbers of the slip of design paper. The more tightly

the chenille is twisted, the thicker and closer the pile becomes. This species of fabric is likewise well adapted to the rug and carpet manufacture.

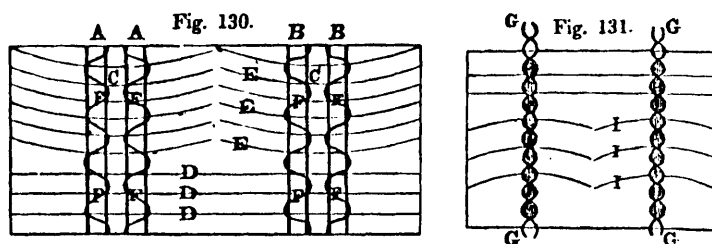
It appears to us, that no person who is unacquainted with weaving can have any idea of the variety and ingenuity of its processes; and even some individuals who consider themselves masters of the art, know, comparatively, very little about it. Notwithstanding the apparent perfection of the methods employed in producing some of the fancy textures which we have already described, yet, we have to record improvements of immense importance upon several of them.

The manufacture which we have just been considering (chenille) has recently been adapted to carpets, rugs, &c., with great success, by Messrs. Templeton and Quigley, of Paisley, who obtained a patent, in England, dated 25th July, 1839, for improvements, which we shall now proceed to explain.

The invention consists in weaving fabrics of silk, cotton, woollen, linen, or other fibrous materials, which are to be cut into strips, and used as weft, somewhat in the manner of chenille weft, (but with this difference, that the two edges of the strip shall incline more towards each other,) and then weaving such strips on a ground, so that all the fur or cut edges of the strips may be brought to one side of the fabric, while the other side is plain; and is also applicable to the manufacture of carpets, rugs, shawls, mats, covers of stools, chairs, or tables, tapestry, or any cloth or fabric requiring to be raised, so as to have the appearance of velvet, fur, or plush.

A texture or fabric of silk, cotton, woollen, linen, or of a mixture of two or more of these materials, is first woven; having the warp threads spaced or set in the reed at certain equal distances from each other, in the following manner:—One, two, or more dents of the reed are filled with the warp threads, and then a space of the reed, (*equal to double the length of the fur required,*) is left empty; then one, two, or more dents of the reed are again filled with warp threads, and another space is left empty, as above described (see Fig. 130;) and this is repeated until the required number of strips is completed. The warp being thus spaced and arranged in the loom, the weft is thrown in, so as to form either a plain or coloured surface, and the warp acts on the weft in the manner of gauze or cross-weaving (see Figs. 49, 50 and 53:) that is, the warp threads, instead of being left parallel, as in common weaving, are crossed over each other by each tread on the treadles; and the weft, when thrown in, intersects the warp, and its edges acquire a tendency to

come together, in consequence of the cross-weaving which the warp has received. On this web being cut into strips, through the vacant spaces already described, the weft, or lateral fibres of both sides of each strip, are all thrown up on one side, and brought close together. The process is somewhat similar to that followed in making chenille weft, but with this difference, that the fur or pile, (that is, the lateral fibres of both sides of each strip,) when cut, are all brought upon one side, and into close contact, instead of projecting from all sides of the warp or body thread, as in the case of chenille weft.



At Figs. 130 and 131, are represented two modes of cross-weaving, exhibiting the crossings of the warp, and intersections of the weft. In Fig. 130, are two dents-full of warp A A of Turkey gauze, (B B is a repetition of the same,) of three threads in the dent; those two dents-full being separated by one empty dent C C, or otherwise. Three picks of weft or fur D D D are uncut, and six picks E E E cut in the centre. The Fig. exhibits the effect which the crossings F F of the warp threads have upon the fur, in causing both sides of the weft, when cut, to incline towards each other, leaving the warp threads to serve as a back-bone or back-band to the lateral threads or fibres. Fig. 131 exhibits two crossing threads G G, turning round a cord or dead thread H H, which is accomplished with "bead lams" (see gauze weaving, Fig. 49.) This Fig. also exhibits, in some degree, (by the turned up ends of the cut weft threads I I,) the appearance of the fur when woven, and the effect the crossings produce after it has been cut.

The pattern intended to be produced on cloth, manufactured partly with the prepared weft, is copied on design paper, formed with as many horizontal lines as there are to be picks of the prepared weft in the cloth; after these lines of the design paper are cut asunder into strips, and numbered, the weaver enters them through the reed of the loom, (beginning with number one,) and

*commences to weave the colours of west, in the exact order in which the colours are painted on these pieces of paper.*

The ground-warp of the cloth is prepared with an extra warp, which may be termed the catcher-warp; a shed is formed by both warps, to receive the ground-west, but a shed of the catcher-warp only for the prepared west; there being fewer threads of the catcher-warp than the ground-warp, less resistance is offered to bringing the fur of the west to the surface. In some cases, a portion of the ground warp is used for fixing the fur-west upon the surface. The weaver having thrown in a pick of the fur-west, sets it in its proper place with his hand, or otherwise, and then, with a brush, comb, or other instrument, raises all the fibres of the fur from the catcher-warp, or that part of the ground-warp which is to fix it on the fabric, and drives it firmly up with the reed. He now throws in as many ground or binder picks as are deemed necessary to form the ground of the cloth, and then repeats the operation of weaving in the fur, and so on, alternately, until the required length of cloth is produced.

## TAPESTRY.

“ This bright art,  
Did zealous Europe learn of Pagan hands,  
While she assay'd with rage of holy war  
To desolate their fields: but old the skill:  
Long were the Phrygians' pict'ring looms renown'd;  
Tyre also, wealthy seat of art, excell'd,  
And elder Sidon, in th' historic web.”—*Dyer*.

As we have, in the introductory part of this Work, (to which the reader is referred,) given ample evidence of the skill of the ancients in the manufacture of tapestry, in all its varieties, it only remains to give some account of its progress after its introduction into Europe.

The first manufactories for weaving tapestry which acquired reputation in Europe, were those of Flanders, and they appear to have been long established in that country, principally at Arras, before they were introduced either into England or France: the precise period when tapestry was first manufactured by the Belgians is uncertain. Guiccardini, in his history of the Netherlands, published at Antwerp in 1582, ascribes to them the *invention* of tapestries, without mentioning any particular date. Whether the Belgians did or did not derive their knowledge from the East, to them is certainly due the honour of having restored this curious art, which

gives a life to wools and silks, scarcely, if at all, inferior to the paintings of the best masters. The weaving of tapestry was first introduced into England in the time of Henry VIII, by William Sheldon, but it was not until the reign of James I, that it acquired any particular reputation. This monarch greatly patronized the art, and gave the sum of two thousand six hundred and seventy-six pounds sterling towards the advancement of a manufactory, which was established by Sir Francis Crane, at Mortlake in Surrey. The patterns first used for making these fabrics in England, were obtained from pieces which had already been worked by foreign artists.\* There is an extract in Rymer's "Fœdra," an acknowledgement from Charles I, that he owed Sir Francis Crane the sum of six thousand pounds Sterling for tapestries, and that he grants him the annual sum of two thousand pounds, for ten years, to enable him to support his establishment.

To France, however, we are indebted for the great perfection to which this costly art has been brought in Europe. Henry IV, first established a tapestry manufactory in Paris, about the year 1606, which was conducted by several clever artists, whom he had invited from Flanders: but this, like many similar institutions founded by that monarch, was greatly neglected at his death, and would probably have been entirely so, had not Colbert the minister of Louis XIV, with a view of providing the costly and magnificent furniture for Versailles and the Tuilleries, again remodeled it upon a more secure foundation, and from that period the royal manufactory of the "Hotel des Gobelins" dates its origin.

As early as the fourteenth century, dyers of wool were settled in the Faubourg St. Marcel (Quartier St. Marcel) at Paris, on the banks of the Bievre, the waters of which stream were considered as favourable to the process of dyeing. One of these named Jean Gobelin amassed considerable wealth, which his descendants increased, and at length renouncing the business of dyers, filled various offices of state.

The Gobelin family were succeeded by Messrs. Canaye, who however did not confine their attention to the dyeing of wool, but under the patronage of Henry IV, commenced the working of tapestry, which until that period had been confined to the low countries. To these succeeded, in 1655, a Dutchman, named Glueq, and one Jean Lianson, a workman, and a great proficient in the

---

\* The designs were furnished by Thomas Cleyn, (a Fleming,) who was retained by Sir Francis for that purpose.

art. Louis XIV, at the suggestion of his minister, Colbert, afterwards purchased the buildings and gardens, which were still the property of the Gobelin family, from which circumstance the tapestry made there, has ever since been known as "Gobelins tapestry." Skilful artists, weavers and dyers, were brought from Flanders, and attached to the establishment; and in 1667 the celebrated painter, Le Brun, was appointed chief director of the Gobelin manufactory, to which he communicated that beauty and grandeur, his admirable talents were so well calculated to produce. He here painted the famous series of the battles of Alexander, which were afterwards worked in tapestry, and still remain the finest productions of the Gobelins. The four seasons, the four elements, and the history of the principal acts of Louis XIV, from his marriage to the conquest of Franche Comte were also from the design of this master.

At the period of the French Revolution this manufacture, which had until then been prosecuted with various decrees of success, greatly declined, but under the government of Napoleon, it was again revived, and has since been successfully carried on, although not to the same extent as formerly. About the year 1801, seventy-six persons were employed at the Gobelins, chiefly in the preparation of tapestry, for the palace of St. Cloud; and it was estimated that 150,000 francs were expended yearly on these productions. The pieces executed are generally historical subjects, and it occasionally requires the labour of from two to six years to finish a single piece of tapestry. The cost of some of these pieces is enormous, but the price of the different articles is regulated less by the size than by the beauty and difficulty of the work.\*

The productions of this manufactory, which is entirely supported by the government, are chiefly destined for royal palaces, or for presents made by the king; but some few pieces, not designed as such, are allowed to be sold.

Connected with the establishment of the Gobelins, is one for the dyeing of wool, under the direction of able chemists, where an infinite number of shades, mostly unknown in trade, are dyed for the tapestry. Wool is now exclusively used, as the colours are more permanent. There is also a drawing school, in which the principles of the art are taught, and an annual course of lectures is delivered upon chemistry as applicable to dyeing.

The Gobelins tapestry was formerly made in lengths or pieces, the width of which varied from four to eight feet; and when one

---

\* Some pieces are valued at from 50,000 to 125,000 francs.

of larger dimensions was required, several of these were sewn or fine-drawn together with such care that no seams were discernable. At the present day, however, they are manufactured of much greater widths, so that they seldom require to be joined even in the largest pieces.

Two methods were formerly practised in the manufacture of tapestry, known as those of the "*basse lisse*" and the "*haute lisse*;" in the first or low warp, which is now abandoned, the warp threads were arranged horizontally in a frame, as in looms for common weaving, the painting intended to be copied being placed beneath the warp, and the process was very remarkable, from the fact of the tapestry being worked on the wrong side, so that the artist could not see the face of the design he was weaving, until the whole piece was finished and taken out of the frame. In the top headles or high warp, which is still used, the frame is fixed perpendicularly before the artist, he also works, as it were, blindfolded, seeing nothing of the effect he produces, and being obliged to go to the other side of the loom whenever he wishes to examine the piece he is executing. The following brief description of the mode at present practised at the Gobelins, may perhaps convey some idea of the manufacture to those who have not visited this most interesting establishment.

The frame or loom in which the tapestry is worked is of the most simple construction, consisting merely of two upright posts with suitable cross-bars at top and bottom; between these posts two rollers or beams are placed, with ratchet heads and clicks or dogs to hold them, similar to the ratchet R and dog S in Fig. 105. To these rollers or beams, are connected the longitudinal threads or warp, composed of twisted wool, wound principally upon the upper roller which may, therefore, be denominated the warp beam, the other, of course, being the cloth beam.\* The longitudinal threads are separated from one another by suitable contrivances, made and provided for that purpose, which the reader will easily under-

---

\* It is a very remarkable coincidence, that the tapestry frame should in all respects bear so close a resemblance to Ghelen's machine or loom, represented at Fig. A, page 13 (see Introduction); and it goes far to strengthen the opinion we had previously formed of the superiority of talent possessed by the ancients over the moderns; by this assertion, however, we are not to be understood as insinuating that either the French or Belgians copied Mr. Ghelen's frame, as we are credibly informed that they had never heard of it, but only struck upon the same idea, by chance, after much reflection upon the subject.

stand. The division of the threads is effected in order to admit the cross threads, or tufts of yarn, which are to form the picture.

As a sort of guide for the artist, to introduce the cross threads in their proper places, he traces an outline of his subject on the threads of his warp in front, which are sufficiently open to enable him to see the painting behind it.

For working the tapestry, three instruments are required, a broach, a comb, and an iron needle; the first is formed of hard wood, about  $7\frac{1}{2}$  inches in length, and  $\frac{3}{8}$  of an inch thick, ending in a point, with a small handle, round which the wool is wound, and serving the same purpose as the weaver's shuttle. The comb is also of wood, eight or nine inches long, and an inch thick at the back, whence it gradually decreases to the extremity of the teeth, which are more or less divided, according to the greater or less degree of fineness of the intended work: it is used to press close the wool, when any line or colour does not set well. The artist places himself behind the frame, with his back towards the picture he is about to copy; he first turns and looks at his design, then taking a broach of the proper colour, he inserts it among the threads of the warp, which he brings across each other with his fingers, in precisely the same way that weavers read their patterns on the simple or simples of the draw loom (see Fig. 70 and its explanation;) this he repeats every time it is necessary to change his colour. Having placed the wool, he beats or presses it down with his comb; and when he has thus wrought several rows he passes to the other side, to see their effect, and to properly adjust them with his needle, should there be occasion.\*

An entire new species of tissue and tapestry has been invented or discovered by M. E. Pavy, and secured by patent, which promises to become an article of great commercial value. In particular, we would refer to some coverings of chairs and tapestry which have been especially ordered by her Majesty Queen Victoria, for the palace. It bears so close a resemblance to silk of the best kind, that it is difficult without a minute examination to discover the difference. The material of which it is composed is the fibre of the banana, aloe, and other trees and plants which are plentifully

---

\* Should the workman have a lively sense of the charms of nature, with what feelings of exquisite delight must he gaze upon the form of a beautiful female, springing up in the most glowing colours amid the threads, spread like a cobweb, before his enraptured eyes, and all that too through his own instrumentality! Tapestry weavers generally die of a broken heart!



found in the West India islands; and by very accurate experiments made by order of the French Government, they have been found on an average to exceed the strength of hemp by one-fourth. The experiments were made at Toulon, upon cordage which had been six months exposed. We understand that the French Minister of Marine has introduced ropes and cables made of this material into the Royal Navy; and as it is so much superior to hemp, we see no reason why it might not be advantageously employed in the cordage of the military and commercial navy of this country. It might also be used with profit in the manufacture of pile carpets and hearth-rugs, as well as in many other important branches of the arts.

#### CASHMERE SHAWLS.

“These are the gifts of Art, and Art thrives most  
Where commerce has enriched the busy coast;  
He catches all improvements in his flight,  
Spreads foreign wonders in his country's sight,  
Imports what others have invented well,  
And stirs his own to match them or excel.  
’Tis thus reciprocating, each with each,  
Alternately the nations learn and teach.”

*Cowper.*

Cashmere is a very rich and fertile province, surrounded with mountains, in the northern part of Hindostan; its chief city is of the same name, and contains about 205,000 inhabitants: this country is famous for its shawls.

Before, however, proceeding to describe the method of manufacturing those beautiful fabrics, we will in the first place, give a minute account of the origin and properties of the Cashmere Angora Goats, or rather of the new race, with a statement of Mr. E. Riley's views in purchasing them, as laid by him before the Society of arts, London.

“Many years since a resident in New South Wales (says Mr. R.) and having in 1825 and 1828 transported to that territory two flocks of the finest sheep procurable throughout Germany, my father had also long contemplated introducing there the celebrated Cashmere goat, anticipating that the fulfilment of his views would, in proving advantageous to himself, become also of ultimate benefit to the colony; in which expectation, he has been encouraged from the results that have attended the importation of the Saxon breed of sheep into their favoured climates, the wools of New South Wales,

and in proportion to their improvement, those also of Van Dieman's Land being now eagerly purchased by the most intelligent manufacturers in preference to those of equal prices imported from any part of Europe.

"With this object in view, he subsequently, during an agricultural tour on the Continent, directed my attention to the Cashmere flocks of Mons. Ternaux, and in October 1828, I met this distinguished man at his seat at St. Onen. (Mons. Ternaux is a great shawl manufacturer and is also a Peer of France,) where he preserved the elite of his herds; the animals were a mixture of various sizes and colours, from a perfect white to brown, with scarcely any stamped features as if belonging to one race exclusively; they were covered with long coarse hair, under which so small a quantity of short soft down was concealed, that the average produce of the whole collection did not exceed three ounces each; therefore, under these unfavourable circumstances, my father deferred for a time his intention of sending any of them to Australia.

"I was then advised, by the Viscomte Perrault de Jotemps, to see the stock of M. Polonceau at Versailles, he having, by a happily selected cross, succeeded in increasing the quantity and value of the qualities of the Cashmere goat beyond the most sanguine anticipations; this gentleman is "*ingenieur en chef*" (chief engineer) to the French government, and in consequence of his enlightened taste for agricultural pursuits, was also honoured with the directorship of the "*ferme modele*" (model farm) at Grignon. He became among the first to purchase a chosen selection of the original importation of the cashmere goat from M. Ternaux, and sometime after seeing, at one of the estates of the Duchesse de Beri, an Angora buck with an extraordinary silkiness of hair, having more the character of long coarse but very soft down, *he solicited permission to try the effects of a union with this fine animal and his own pure Cashmeres.* The improvement even in the first drop was so rapid that it induced him to persevere, and when I first saw his small herd they were in the third generation from the males produced solely by the first cross; the unwillingness however of M. Polonceau to part with any number of them at this period (the only alienation he has made from the favourite products of his solicitude being two males and two females to the King of Wirtemberg, for the sum of 3400 francs,) caused my father again to postpone his intentions until my return from the Australasian Colonies, judging that M. Polonceau would then probably be enabled to dispose of a sufficient number, and that the con-

stancy and properties of the race would by that time be more decidedly determined.

“On my arrival in England at the close of 1831, he again recurred to his favourite project of introducing these animals into our colonies, for which purpose I went to France with the intention of purchasing a small flock of M. Polonceau, should I find all his expectations of the Cashmere Angora breed verified, which having perfectly ascertained, I at length succeeded in persuading M. Polonceau to cede to me ten females in kid, and three males, and I fortunately was able to convey the whole in health to London, with the intention of proceeding as speedily as possible with them to Port Jackson, looking sanguinely forward not only to their rapid increase but also to *crossing the common goats* of the country with this valuable breed, in full expectation that they may, exclusive of their own pure down, become thus the means of forming a desirable addition to the already much prized importations from New South Wales and Van Dieman’s Land. I am led to the conclusion that the latter result may be accomplished, as M. Polonceau, who has tried the experiment with the native goat of France, has obtained animals of the second cross very little inferior to the breed that has rendered his name so distinguished. He has also crossed the common goat with the pure Cashmere, but only obtained so tardy an amelioration, that it required eight or ten generations to produce a down simply equal to their inferior quantity and quality when compared to the produce of the Cashmere Angora.”

From the opinion generally entertained of their value, and by several eminent manufacturers, of the peculiar qualities of their improved down, with the interest they express in their intended introduction into the British Colonies, W. Riley revisited France, and again induced M. Polonceau to admit of a similar selection from his herd with also two bucks and two does of the pure Angora race from the Duchesse de Beri.

#### ORIGIN AND PROGRESS OF THE NEW RACE OF CASHMERE OR ANGORA GOATS.

M. Polonceau created the new race of Cashmere Angora goats, in 1822, by crossing the pure Cashmeres imported into France by M. Ternaux and M. Jaubert, (Monsieur Jaubert has been a member of the Chamber des Deputies for several years past,) under the protection and patronage of the French government, in 1829, with the pure breed afterwards introduced into France from Angora.

Since that period he has unremittingly persevered in the improvement so immediately effected, and has proved during the several years which have elapsed, that an entire satisfactory result in the union of the most essential qualities of down, *abundance, length, fineness, lustre, and softness*, was accomplished by the first cross, without any return having ensued to the individual characters of either of the primitive races, and in consequence, he has since constantly propagated the produce of that cross among themselves, careful only of preserving animals entirely white and of employing for propagation those bucks which had the down in the greatest quantity and of the finest quality with the smallest proportion of hair.

In 1826, the "Societe Royale et Centrale d' Agriculture de Paris" acquainted with the interesting result of M. Polonceau's flock, being at that time in the third generation, and considering that the down of this new race was more valuable than that of the East, and that it was the most beautiful of filaceous materials known, as it combines the softness of Cashmere with the lustre of silk, awarded him their large gold medal at their session, 4th April 1826, and nominated him a member of their society in the following year.

In 1827, at the exhibition of the produce of National Industry, the jury appointed to judge the merits of the objects exposed, also awarded him their medal.

At present the animals are in the twelfth generation, their health and vigour, the constancy of their qualities, and abundance of their down without any degeneration, prove that this new race may be regarded as one entirely fixed and established, requiring solely the care that is generally observed with valuable breeds; that is to say, a judicious choice of those employed for their reproduction, and in such a climate as New South Wales it may be reasonably expected that the brilliant qualities of their down may yet be improved as has been so eminently the case with the wool of the merino and Saxon sheep imported there.

M. Polonceau has goats that have yielded as many as thirty ounces of the down, in one season, and he states that the whole of his herd produce from twelve to twenty ounces; thus showing the astonishing advantages this new breed has over the uncrossed Cashmere, which never yield more than four ounces and seldom exceed two ounces each.

This gentleman also states, that, the Cashmere Angora goats, are more robust and more easily nourished than the common goat, and that they are less capricious and more easily managed in a

flock ; and from the experience he has already had, he finds them much more docile than even sheep. They prefer the leaves of trees, as do all other goats, but they thrive either on hay or straw, or green fodder, or in meadows ; they also feed with equal facility on heaths, and on the most abrupt declivities, where the sheep would perish ; they do not fear the cold, and are allowed to remain all the winter in open sheds. For the first year or two of M. P's. experiments he thought it prudent to give them aromatic herbs, from time to time, but during the last six years he has not found it necessary. He knows not of any particular disease to which they are subject, his flock never having had any. M. P. arranges they should kid in March, but occasionally he takes *two falls* from those of sufficient strength during the year.

The down commences to grow in September, and develops itself progressively until the end of March, when it ceases to grow and detaches itself, unless artificially removed.

To collect the down, he waits the period when it begins to detach itself, and then the locks of down which separate from the skin with little force are taken off by hand ; the down is taken from the animals every three or four days ; in general it first begins to fall from the neck and shoulders, and in the following four or five days from the rest of the body ; the collection is completed in the space of eight or ten days. Sometimes the entire down can be taken from the animal at one shearing, and almost in an unbroken fleece, when it begins to loosen. The shearing has the advantage of preserving more perfectly the parallelisms of the individual filaments, which much increase the facility of combing and preparing the down for manufacture.

The mills for spinning Cashmere wool have multiplied very much of late years in France, and the prices of the yarn have fallen from 25 to 30 per cent. notwithstanding their improved fineness and quality. There is a fabric made with a mixture of Cashmere down and spun silk, which is becoming very general : one of the manufacturers, M. Hindenlang, exhibited samples of Cashmere cloth woven with yarn as fine as No. 130 for warp, and No. 228 for weft.

Messrs. Polino, Brothers, of Paris, produced an assortment of Cashmere pieces from 22 to 100 francs per yard, dyed of every fancy shade : their establishment, at Ferti Bernard, employs 700 operatives with an hydraulic wheel of 60 horse power.

The Oriental Cashmere shawls are woven by processes extremely slow, and consequently costly, whence their prices are very high ;

still sold in Paris at from 3500 to 2500 francs each, and even 50,000 francs have been paid for one shawl. It became necessary, therefore, either to rest satisfied with work which should have merely a surface appearance, or contrive economical methods of weaving, to produce the real Cashmere style with much less labour. By the aid of the draw loom, and still better, the Jacquard loom, M. Ternaux first succeeded in weaving Cashmere shawls perfectly similar to the Oriental in external aspect, which became fashionable under the name of French Cashmere. But to produce shawls altogether identical on both sides, with the Eastern, was a more difficult task, which was accomplished only at a later period by M. Bauson of Paris.

In both modes of manufacture, the piece is mounted by drawing the warp through the harness and ground headles, as is commonly practised for warps in the Jacquard loom. The weaving of imitation shawls is executed as usual by as many shuttles as there are colours in the design or pattern, and which are thrown across the warp, in the order established by the design. The greater number of these weft yarns being introduced only at intervals into the web when the composition of the pattern requires it, they remain floating loose at the back of the piece and are cut afterwards without affecting in the least the quality of the texture, but there is a considerable waste of yarn in the weaving, which is worked up into carpets.

The weaving of the imitation of real Cashmere shawls is different from the above. The yarns intended to be for the weft are not only equal in number to the colours of the pattern to be imitated, but besides this, as many little shuttles, (like those used by embroiderers and lace manufacturers. See Figs. 135 and 136,) are filled with these yarns as there are to be colours repeated in the breadth of the piece, which renders their number considerable when the pattern is somewhat complicated and loaded with colours; each of these small bobbins or shuttles passes through only that portion of the flower or pattern in which the colour of its yarn is to appear, and stops at the one side and the other of the cloth, alternately, exactly at its limit; it then returns upon itself after having crossed the thread of the adjoining shuttle: from this reciprocal intertexture of all the yarns of the shuttles, it results, that although the weft is composed of a great many different threads they no less constitute a continuous line in the whole breadth of the web upon which the lay or batten acts in the ordinary way.

We see, therefore, that the whole art of manufacturing this

Cashmere cloth consists, in avoiding the confusion of the shuttles, and in not striking up the lay till all have fulfilled their function. The labour does not exceed the strength of a woman, even though she has to direct the loom and work the treadles: seated on her bench at the end opposite to the middle of the beam, she has for aids, in weaving shawls from 45 to 52 inches wide, two girl apprentices, whom she directs and instructs in their tasks. About four hundred day's work are required for a Cashmere shawl of that breadth.

In the Oriental process all the figures in relief are made simply with a slender pin, without the shuttle used in European weaving. By the Indians, the flower and its ground are made with the pin by means of an intertwisting which renders them, in some measure, independent of the warp.

Considered in reference to their materials, the French shawls present three distinct classes, which characterize the three fabrics of Paris, Lyons, and Nimes. Paris manufactures the French Cashmere, so called, of which both the warp and the weft are the yarn of pure Cashmere down; this web represents with fidelity, the figures and the shades of colour of the Cashmere shawl which it copies: the deception would be complete if the reverse of the piece did not show the cut ends, as in common shawl weaving. The warp of the imitation Hindoo shawl, also, woven at Paris, is composed of spun silk, which reduces its price without much impairing its beauty.

Lyons, however, has made the greatest progress in the manufacture of shawls; it excels particularly in the texture of its Thibet shawls, the weft of which is a mixture of wool and spun silk.

Nimes is remarkable for the low price of its shawls, in which, spun silk, Thibet down, and cotton are all worked up together.

It appears that M. L. Girad, at Livres, near Paris, has succeeded best in imitating Cashmere shawls, exhibiting all the variety of design and colouring, which appears in the Oriental.

The shawl merchants of India admire the ingenuity of the French artists in imitating Cashmere shawls, but condemn the cloth on account of its harshness, which may consist in a difference in the twisting of the yarn. In the shawl country, there are three coloured wools, white, light brown, and dark brown, the two last are from Thibet, the other from Bholkera; the light brown will receive four colours, viz., black, blue, green and brown; the dark brown will receive only black, brown and blue. The shawl merchants state, that the colours in the English shawls are fugitive

The colours now used do not exceed fifty in the most elaborate productions of the Cashmere loom. Formerly it was said that three hundred shades of colour were used.

The embroidery is not worked with the needle but woven in the cloth. The patterns are read off from a book, and not from a drawing. There is an embroidery language, by which the colours, number, division, and distribution and manipulations of the threads, and the forms and sizes of the flowers, foliage, &c., are symbolically designated. The looseness of twist in the web is owing to being done by the hand; these objections, however, have all lately been remedied by the ingenuity of the French artists, and particularly Messrs. Polino Brothers, of Paris.

---

## SECTION EIGHTH.

### LACE MANUFACTURE.

The history of the arts furnishes no instance of such remarkable changes in the wages of labour, and no such instructive lessons of the influence of mechanical improvements, as that afforded by the manufacture of bobbin-net lace. For some time after its commencement, in Nottingham, in the year 1809, it was common for an artisan to abandon his usual occupation and betake himself to a lace frame, in which he became a share holder, and realize by working upon it, from 20s. to 40s. per day. In consequence of such enormous earnings, Nottingham, with Loughborough, and the neighbouring villages, very soon became the theatre of an epidemic mania, unequalled in modern times.\* Many unfortunate individuals, although destitute of mechanical genius or even talent of any kind, tormented themselves both day and night with schemes of bobbins, pushers, lockers, point-bars, and needles of every variety of shape imaginable, till their minds got permanently bewildered. Indeed, several lost entirely what little sense they once possessed; and

---

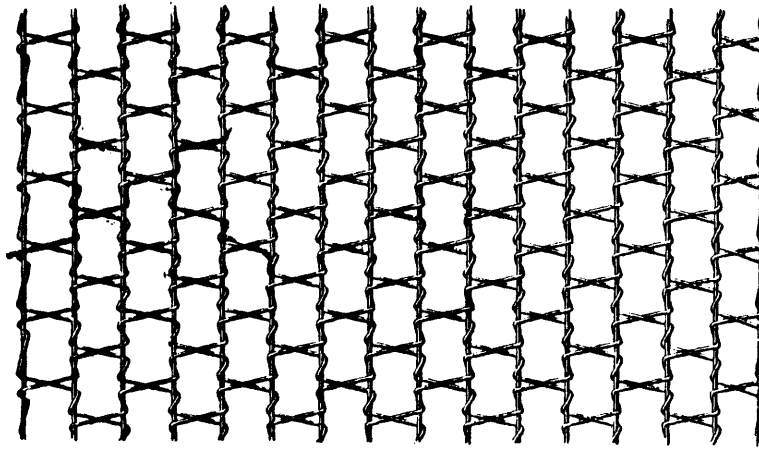
\* For an account of the lace and net-work manufactures in ancient days, the reader is referred to page 5, and from page 41 to 57.



others after cherishing visions of the most unbounded wealth, as in the dreamy age of alchemy, finding their projects abortive, sunk into the lowest depths of despair, and committed suicide, *by blowing out their brains?*

Bobbin-net lace is a light semi-transparent texture of fine cotton thread, arranged in hexagonal meshes. This species of cloth or web is produced by means of a warp, the same as in plain weaving, except that the threads are further apart. A specimen of this texture is represented at Fig. 132.

Fig. 132.



The weft or filling, however is applied in quite a different way from that of plain cloth: it consists, in the first place, of an equal number of threads with the warp; and these weft threads are made to revolve round every two threads of the warp, which changes the relative positions of the warp threads. Second.—Among all the pairs of the warp-threads which have been thus twined together by weft-thread, one of them is shifted to the neighbouring warp-thread upon the left, and connected to it by the convolution of the weft thread; after which, the shifted warp-threads change back to their first position, where they are again entwined or laced together by the weft thread, as before; and the other threads of these pairs shift to the right and are entwined or laced together in the same manner as the first or left hand set were. Third.—While this maneuvering in the positions of the warp threads is in progress, the weft threads which entwine or lace them together, also move to one side, and after the warp-threads have been laced or entwined twelve times

with a west-thread, the latter moves sideways through one interval of the warp-thread, and, if it were coloured, would produce, in the course of fabricating the cloth, a diagonal line across it. The manufacture of lace, therefore, differs from plain weaving, in this, that the threads of the warp are not alternately raised and depressed, for the purpose of introducing the west, but are shifted laterally to the next pair, to which they become united by the west-threads, working likewise in pairs, each of them entwining two individual threads at once, as in the manner above explained.

Fig.133

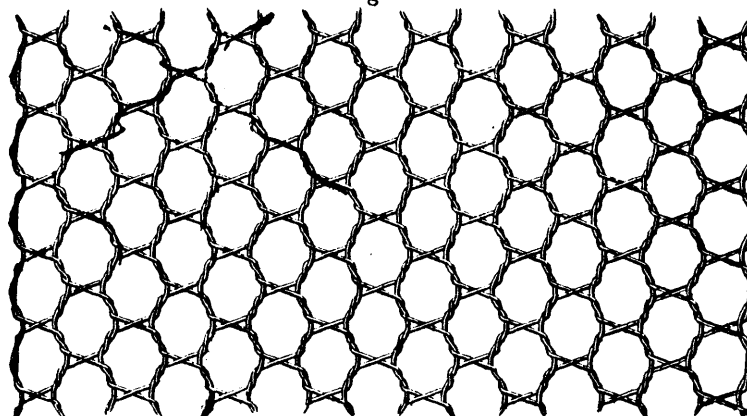


Fig. 133 will give the reader a more correct idea of the nature or mode of manufacturing this species of texture, by the crossing or twining of the warp and west-threads together. This specimen shows, upon a magnified or enlarged scale, how the fabric is produced from the conjunction of three threads; one of which proceeds from the top, downwards, in a winding or wave line (constituting Hogarth's line of beauty;) the second of these threads runs towards the right, and the third to the left, crossing each other obliquely in the centre between each two meshes throughout the series, as shown in the Fig. The warp-threads, as before stated, are placed perpendicularly in the machine, and derive their curvature from the tension of the obliquely disposed west-threads, by which they are alternately drawn to the right and to the left.

The west-threads which are to pass through the intervals of the warp, in order to interlace or entwine two threads of the latter together, are wound upon little bobbins; one of which is represented, one fourth its real size, at Fig. 136, where both an edge and a side

view are given. It consists of two thin discs, cut out from sheet brass, by a press or stamping machine; and they are so connected or riveted together, that a narrow space or circular groove is left between them, as shown in the edge view, Fig. 136. A round hole is pierced in the centre of each bobbin, as shown in the Fig., having a little notch or jog at one point, for guiding the bobbin upon a spindle with a feather upon it to fit the notch or jog; which prevents the bobbins from being misplaced on the spindle. Any convenient number of these bobbins are put upon a spindle, which spindle is then arranged in a suitable winding machine, for the purpose of filling the bobbins with weft-thread, previous to being put into their respective working positions in the lace-frame. After these bobbins have been filled with weft-thread, each of them is placed within a small iron frame, like that represented at Fig. 135, and this frame is known to lace manufacturers by the name of the bobbin-carriage: Fig. 135 exhibits a side view and section of this frame, fourth its real size. Into the circular or gouged-out space of the carriage, the bobbin is inserted, so that the grooved border of its discs embraces the narrow edge A A; and the bobbin is kept from falling out by the pressure spring B, which spring, also, communicates sufficient friction to prevent it from revolving too easily, but yet allows the thread to be given off, when pulled with gentle force. The thread, as it comes from the bobbin, escapes through the eye C, at the upper side or the top of the carriage; after which, it takes its relative position in the formation of the lace.

The variety of mechanical combinations to which this manufacture has given birth, is without a parallel in any other branch of the arts. Since 1809, when Mr. Heathcoate obtained his first successful patent, a great number of other patents have been granted for making lace. But we shall confine ourself to giving a faithful description of the most recent improvements which have been made in the manufacture of this kind of texture, namely, by the ingenious John Heathcoate, of Tiverton, county of Devon, a gentleman who may with justice be called, the father of the lace manufacture in Europe; and William Crofts, an ingenious mechanic of Radford, county of Nottingham, with whose improvements we shall commence.

Mr. Crofts' first invention consists in a mode of producing ornamental spots on a plain bobbin-net; which spots are formed while the lace is in progress of fabrication, by means of coiling up and accumulating certain of the warp threads into masses, so as to pro-

duce spots at such parts of the plain net as are required to form the intended pattern.

The invention, is an application of peculiarly jointed wires, in conjunction with hooks for catching the threads which are to be looped up, in order to form spots, with certainty and facility; the action of the hooks, being aided by the pointed wires, enables the machinery to perform without interruption, the backward and forward swinging motions, which are usually given to the bobbins and carriages, in circular comb rotary machines.

Fig. 134.

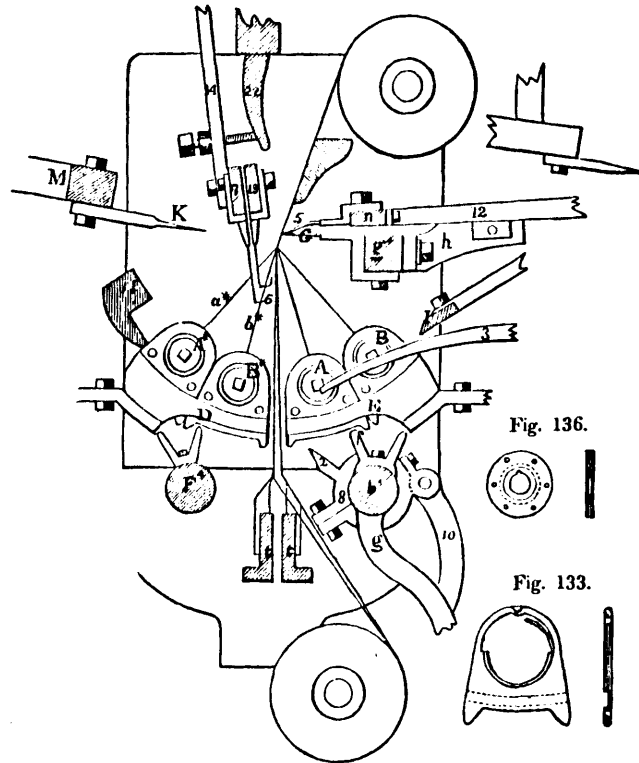


Fig. 134 represents the operating parts of a lace machine, taken in transverse section. When the spots are about to be formed, the front working points K, are drawn towards the front of the machine out of their working positions, and remain in a state of inactivity, during the formation of the spots. The bobbins A\* and B,\* with their threads a,\* and b,\* intended to form the spots, are then selected by the pushers 3, and projected forward out of their places in the

back combs E, into the front combs D. The bobbins A and B, not used for forming the spots, are locked in the back combs E, during the spotting operation, by the blade *f*, on the back locker bar F. There is likewise another blade 2, attached to the collars 8, on the locker bar F, by means of which the bobbins A\* and B\* can be locked in the back combs E when required. The locker bar F receives motion from a lever *g*; and the collars 8, receive motion from a lever 10: both levers are worked by cams, not shown in the drawing. There is another locker bar F\*, for working the carriages in the front combs D. The pointed wire bar 7 and the hook bar 13, are attached to the lever 14, by the same pin, but may receive slight shogging motions, the one independent of the other; they are raised and depressed by the lever 14, which receives its motion from various other levers and cams, but unnecessary to show in the drawings, as every person at all acquainted with the lace manufacture, will readily be able to understand them. The pointed wires 6, and hooks 1, are represented as descending amongst the bobbin threads, which are pressed on one side by the pointed wires 6, in order that they may be caught by the hooks 1; and these on ascending, loop the threads around the grooved back points G, and the additional back points 5; at the same time, the bobbin threads, by a suitable movement, are whipped twice round their respective warp threads.

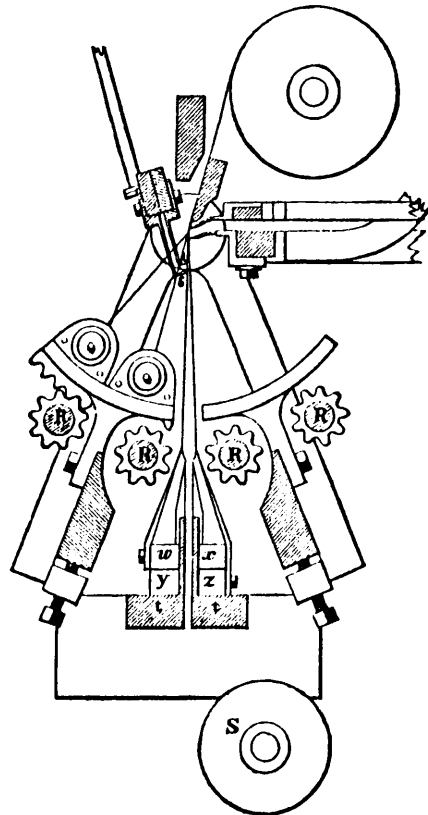
The back points G, lie below the additional back points 5, which enter into the grooves in the points G and assist in making the spots, as well as of keeping them in correct form. Their mode of application is shown in the figure; the points G being withdrawn as soon as the spotting is effected; leaving the points 5 in the centre of the spots in order to retain them in their places, until the points G are again inserted between the threads, beneath the spots.

The bar *g*' of the grooved back points G, is attached to the lever *h*, by which it is worked, and the bar 11, of the additional points 5, is attached to, and worked by the lever 12. The front points K are connected to, and worked by the lever M. H is the front driving bar, and I is the back one. The bars of the front and back guides for the warp threads are marked *t, t*. The wire and hook bars, 13 and 7, are guided up and down in front of the warp threads by the point of a gauge screw 21, bearing against the inclined face of a fixed conducting guide 22, fastened to the top of the framing.

The particular features of novelty in this part of Mr. Crofts's machinery are, the points and hooks above described, for selecting and drawing up the threads; the application of the additional back

points, for the purpose of keeping the spots and meshes of the net in correct form ; and also in arranging the various parts of the additional machinery, which is requisite for working spots in bobbinet lace ; also, in combining such arranged spotting machinery, with the usual parts of rotary machinery, so that the spotting machinery may be put in action to produce patterns in the lace, by the same rotary impulse which causes the plain net to be made, through the ordinary evolutions of the machinery to which the spotting apparatus is appended ; and also in arranging in like manner, the various parts of spotting machinery, so as to dispense with any selection of particular bobbins and carriages, and combining such arranged spotting machinery with the ordinary fluted roller machinery.

Fig. 137.



The improvements shown in Fig. 137, consist in a method of

combining the spotting machinery with ordinary fluted roller machinery. In fluted roller machinery, no selection can be made of the bobbin carriages, which are to be used in spotting; because all the carriages must go backward and forward, in complete rows; therefore, whilst the spotting is going on, all the warp threads must remain motionless, without shogging, except those particular warp threads which are hooked up to form spots.

To effect the shogging of particular warp threads, four extra series of guides and guide bars, marked *w, x, y, z*, are provided and are applied close against the ordinary guide bars *t, t*, in the usual manner of applying extra guide bars, for selvage threads. A racking or shogging motion is given to two of these extra guide bars at each time of spotting. In this arrangement, the pointed wires *6*, must have two prongs each, to include between them the warp threads, intended to form the spot; one of these prongs will then bend aside the warp thread included between them, so as to bear it into the hook *1*, and keep it securely in the hook, whilst it is going up to the points. The warp threads which are intended to be caught or hooked up, are conducted through the eyes of the extra guides *w, x, y, z*, and are supplied from two extra warp rollers, (unnecessary to show in the drawing,) one to each pair of guides. The warp roller, which supplies the other ordinary warp threads, is shown at *S*.

The fluted rollers *R R R R*, which drive the bobbin carriages, are turned by a toothed sector or fan, (in the usual way,) taking into toothed pinions, attached to their extremities. The action is so nearly the same, whether warp threads or bobbin threads are to be taken up, that further explanation is unnecessary.

Mr. Crofts's third invention or improvement in lace machinery consists of an improved mode of combining together and actuating certain parts of machinery, already known, and used for making bobbin-net lace; by means of which two thicknesses, or tissues, or webs of lace net, may be produced together, in the same machine; that is to say, the lace net which is made in the machines, by twisting together the bobbin threads and warp-threads, after being formed into regular meshes by the taking-up action of the points, is wound or rolled up around the lace roller, as fast as it is made; which lace will consist of two thicknesses, in close contact, the successive rows of meshes of both nets having been gathered up together like one net, by the said taking-up action of the points. When such lace is afterwards unrolled and removed from off the roller, it can be separated into two distinct pieces of lace net.

This improved mode of Mr. C's. may be carried into effect, by parts of fluted bar or fluted roller machinery ; *which is so called, because, the bobbins and carriages are moved backwards and forwards in the combs and between the warp-threads, by means of revolving fluted rollers, the flutes of which act between corresponding teeth, formed at the under side of the carriages, in the same manner as the teeth of pinions act in teeth of cog-wheels ; or it may be carried into effect, by parts of circular comb machinery, the bobbins and carriages of which are moved in the combs, by the joint action of what are called *swinging driving bars*, situated above the combs, and lockers, situated beneath the combs, turning on centres ; which lockers catch projecting nibs at the under sides of the carriages (see Fig. 234) and draw them out from between the warp-threads into the opposite combs to those from which they have been projected by the previous action of the driving bars.*

Fig. 138 represents the mode of operating by means of fluted roller machinery. The bobbin carriages A and 7, have teeth at their under parts to be acted upon by the flutes of the rollers C, D, and 1, in order to move the carriages backwards in the combs F, F, and 2.

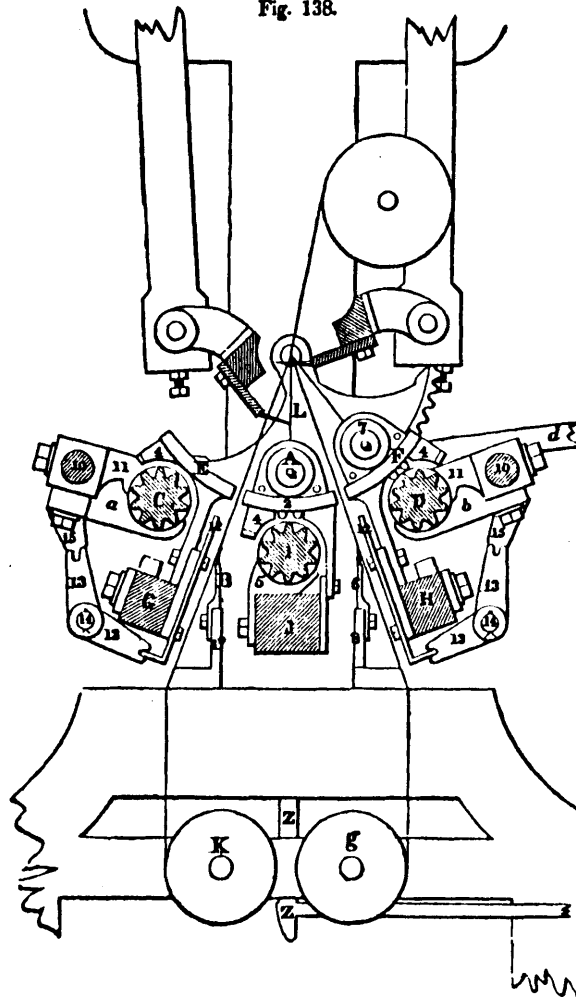
These combs have tongs, projecting from them at each end, which are cast in leads to hold the combs together, the lead at one end of each comb being adapted to be screwed against the comb bars G, H, and 3, as usual in fluted bar machinery ; but the leads 4 4 4, by which the extra tongs, at the opposite ends of the combs, are united, are for the purpose of retaining the combs steadily at their proper distances asunder.

The fluted rollers C, D, and 1, which drive the bobbin carriages, are situated beneath the centres of the combs F, F, and 2, respectively, in the arches which are left between the tongs, and are supported on pivots at their ends, in the usual manner of fluted bar machinery, each roller being steadied in the middle of its length by bearings a, b, and 5, to prevent it from bending or springing.

The guides B and 6, for the warp-threads, are cast in leads, and are screwed on guide bars 1\* and 8. These guides, instead of being close together, as usual in fluted bar machinery, are placed so far apart, that the middle row of combs 2, are included between the two rows of guides, in order that the carriage A or 7, may pass completely out from between one row of warp or guide threads, before the same carriage makes its entrance between the other row of warp or guide threads ; whereas, in common fluted bar machinery, the carriages must pass between both rows of warp threads at



Fig. 138.



once. The guide bars 1\* and 8, are capable of shogging endways, in order to rack the warp threads, as usual in other machines. The racking is effected by a lever Z, at the bottom of the machine, actuated by a cam, by which lever the middle comb bar 3, is racked endways when required to produce the traversing of the bobbins.\*

---

\* A rack of lace is a certain length of work, counted perpendicularly, and contains 240 meshes or holes.

The bobbins and carriages, combs and guides, are made single tier guage, instead of double tier guage, as used in common fluted bar machinery.\*

The middle fluted roller 1, is supported on pivots at each end, in bearings affixed to the end of the middle comb bar 3, so that it will partake of the racking motion of the middle comb bar: each extremity of its fluted part is provided with what is generally called a "*turn-again*" piece,† of the same kind as is commonly used, at one end of each of the innermost rollers, in ordinary fluted bar machines, for permitting the turn-again of the carriages, that is their transfer from one row to the other, at the ends of their respective rows.

Owing to the short length of the combs, and to their being connected by lead at each end, it would be difficult to take out carriages from the combs when required; therefore, to permit of drawing out the carriages, at the open ends of the combs, the two rollers C and D, are each supported in sockets 11, 11, which are fastened in the manner of short crank bar arms, to each end of the horizontal axles or spindle bars 10, 10, placed parallel to the comb bars. Each of the axles 10, are supported on pivots, so as to be capable of turning a little round, in order to let down the fluted rollers, as much as may be requisite, to disengage them from the teeth of the carriages, in order to set the same at liberty, and permit them to be drawn out at the outer or open ends of the combs. The pivots, at the end of the crank bars, are supported in bearing sockets, which are fastened to the ends of the comb bars; and they may be steadied in their centres by a suitable support, fixed to the middle of the comb bar.

When the fluted rollers C and D are let down, the carriages, must be prevented from sliding down by their own weights in either of the combs E or F, and entangling among the warp-threads. For this purpose the flat bars 12, 12, are slidden upwards against the inside flat surfaces of the comb bars G, and H, to which they are held by screws, passing through upright slots in the bars, and fixed into the comb bars: thus, the bars 12, 12 are enabled to be

---

\* The term "*gauge*," in the lace manufacture, means the number of *gates*, *alits*, or *interstices*, in one inch of the bolt bar comb.

† The Nottingham lace manufacturers give this part of the machinery the appellation of "*tum-again*," being a corruption of the phrase "*turn-again*." This *tum-again* bears just about the same relation to the words *turn again*, that *Hingland* bears to *England*, *Hireland* to *Ireland*, or *Halbany* to *Albany*.

slidden upwards on these screws, in order that their upper edges may raise the under side of the carriages and stop.

The bars 12, 12, must be raised up to the carriages at the same instant that the fluted rollers are let down ; which is effected by a small elbow lever 13, poised upon a centre-pin 14. The lower arm of each elbow lever 13, has a notch or opening in its end, to receive a flange at the lower edge of the bar 12, and the upper arm of the elbow lever 13, has also a notch or opening in its end, to receive a tooth at the end of a short arm 15, which projects out from the crank bar axis 10, and acts in the manner of a short lever to raise up the flat bar 12, by moving the elbow lever 13. When the fluted rollers are raised up again, the bar 12, is withdrawn by the same movements.

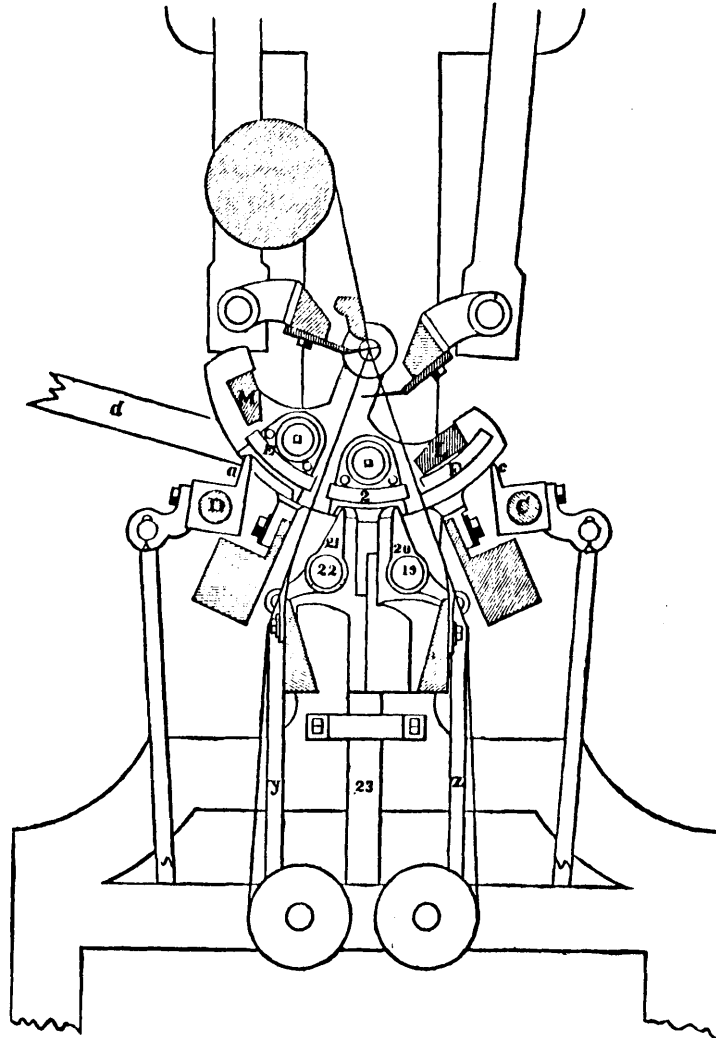
Rotary motion is given to the fluted rollers C, D, and I, by a sector L, taking into pinions at the end of the axle of each roller. The sector L hangs loosely upon one of the main centre-pins, and is moved backwards and forwards, with a vibrating or pendulous motion by means of a link *d*, from the upper end of a lever *behind the machine*, which receives its power from a pair of cog wheels. The warp-threads for both pieces of the double net, may be supplied from one large warp roller, such as is commonly used in other lace machines, instead of the two marked K and *g*.

The mode of operating in circular comb machinery, is shown in Fig. 139. The combs are placed in three rows, as before described, but their shape is a little different, because the lockers, which are to act beneath them, will not permit of having projecting tongs (as in Fig. 138,) at the end of each comb. The middle comb 2, has the tong in the centre of its length, and the back and front combs, have their tongs at their ends.

The form of the carriages is similar to those used in circular comb machines, with two nibs or teeth, at the under side of each carriage for the blades *c*, *a*, of the locker to take hold of (see Fig. 136.)

The lockers C, D, are the same as in common circular comb machinery ; and are placed beneath the front and back combs, E, and F, in a suitable position for their blades *c*, and *a*, to catch the outer teeth of the carriages which are pushed into the combs over the lockers, so as to draw out those carriages from between the warp-threads, when the blades of the lockers are turned upwards, but when they are turned downwards, their acting edges descend below the range of the nibs of the carriages and allow the nibs to pass over them. There are, likewise, two other lockers 22, and 19,

Fig. 139.



with blades 21, 20, which assist in passing the carriages out of the centre combs; they are raised by the upright sliding rod 23, which supports the sockets of the lockers; *y* and *z*, are links attached to the locking lever.

The driving bars *L* and *M*, are the same as are used in circular comb machinery, and act with a vibrating or pendulous motion, to push the carriages along in their combs and pass them beneath the warp-threads, but the driving bars *L*, *M*, cannot push the car-

riages quite through the warp-threads: therefore, as soon as the nibs of the carriages, which are foremost, get far enough over the blade of that locker, situated at the opposite side of the warp-threads, then that locker is turned up and its blade will draw those carriages quite through the warp-threads.

The leading features of novelty in this part of Mr. Crofts' machinery consist in combining and arranging certain parts in such a way as to have a middle row of combs, with a row of warp-threads, on each side of those middle combs, whereby one row of carriages may be passed entirely through one row of warp-threads, before the other carriages arrive at the other row of warp-threads; and of actuating the parts of machinery, for making lace, with suitable racking movements to cause parts to make a double web or tissue of lace-net, in the manner herein described; which, when taken out of the machine, can be separated into two distinct pieces of lace-net, by cutting the turn again, traversing bobbin, by which the borders or edges of the piece of double net were united together, during its fabrication.

Mr. Crofts' fourth improvement in lace-making machinery consists in certain alterations or arrangements in the structure and mode of working that class of lace machinery called "*the levers*,"\* and the circular comb machinery, for the purpose of making a particular pattern of lace, having large holes in it at certain intervals, called bullet holes.†

In applying this improvement to the lever machine, the parts called pushers, which are used for dividing the carriages into two ranges, together with the pusher-bars, and all their supports and appendages, must be entirely removed from the landing bars; because, in the proposed method of working, no traversing of the carriages will be required. The comb-bar wheel, with its bolt and connections for racking the front comb-bar, must also be removed; the front comb-bar being kept stationary by its gauge screws.

If the machine has been used for making narrow breadths of lace, the turn-again combs and bar are removed, and the back combs cast anew. If it has been used for making only plain net, without bullet holes, the selvage guides are removed from their bars, and their racking wheels also.

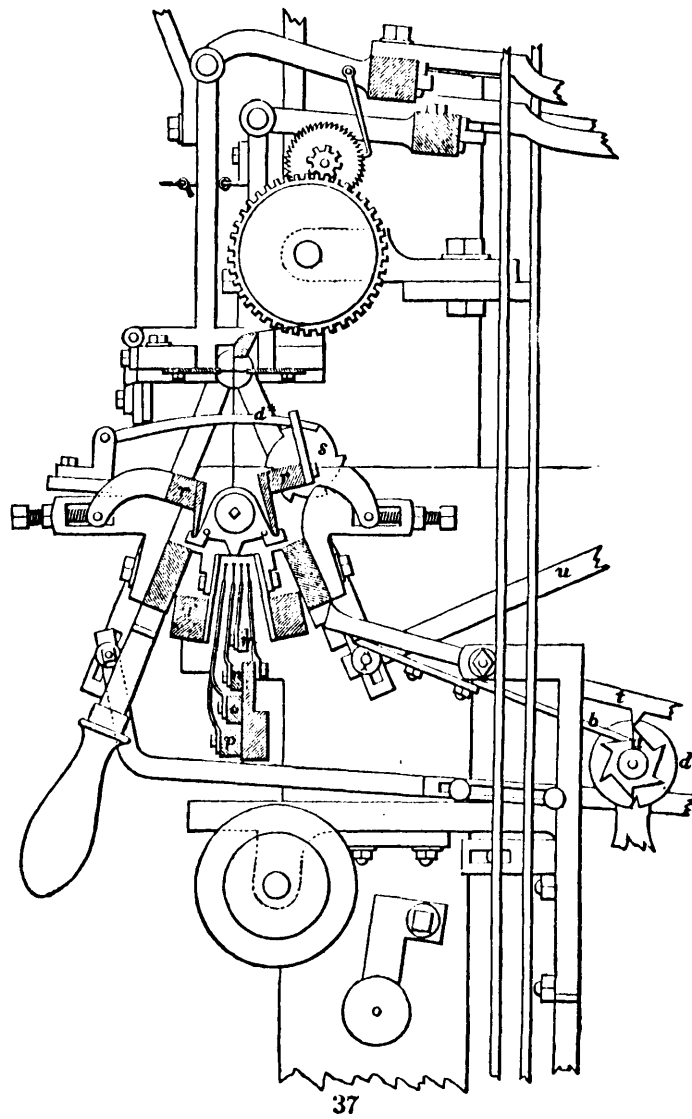
The ratchet wheel, on the axles of the racking wheels, which has

\* The machine here referred to (the lever machine) was invented by Mr. John Leavers, of New Radford, in the year 1811.

† See "Egyptian Shebetz," page 46 of Introduction.

eight teeth, must be changed for a new one, with only six teeth; and the guide-bar racking wheel must be removed, and a new one cut, having three steps or elevations on its circumference. The catch-bar wheels, for lifting and letting fall the catch bars, are removed; and others, with three deep notches, are substituted, their ratchet wheels having six teeth. The number of points are to be

Fig. 140.



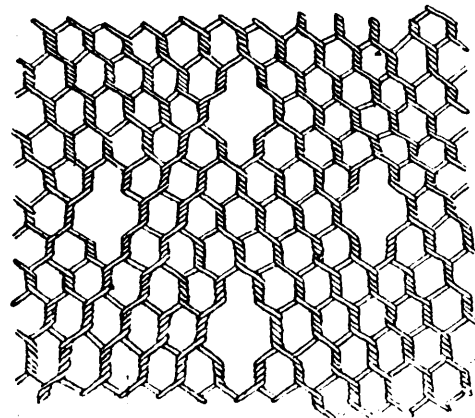
doubled; that is, in what is called a ten point machine, twenty points are placed in every inch.

The pump apparatus or lever, for lifting and letting fall the catch bar when either of the point bars come down and go up again, must be disconnected from both point bars.

Fig. 140 represents a sectional elevation, taken transversely through the machine, for the purpose of showing the forms and positions of the working parts. The ratchet wheel *a*, which usually has eight teeth, must be changed for one of six teeth as in the figure.—This ratchet drives the notched wheel *d*, which governs the half way or dividing stop. This stop must be adjusted, so as to catch and detain the back landing bar *t*, when the two landing bars *t*, *u*, are quite down, or closed together, instead of detaining them at a little distance apart, as in the ordinary positions, for the divided carriages to be caught by the catch bars, in common lever machines.

The large guide-bar racking wheel, must also have thirty-six teeth, and the large racking wheels, for the extra guide-bars, for bullet holing also have thirty-six teeth; none of which parts are shown in the figure, being already well known and in common use. The threads, to form the bullet holes, are provided with the extra guides *m*, *n*, *o*, *p*, which are attached to the usual guide-bar, and each receives a separate racking motion, the bullet holes being formed by the ordinary method. A magnified portion of the lace ornamented with bullet holes, is shown at Fig. 141.

Fig. 141.



The ratchet wheel *a*, affixed to the notched wheel *d*, is turned

by the driver *b*, and in place of driving-bars and lockers, two catch bars *r r*, are applied, their ratchet wheel *s*, being turned by the driver, *d*.\*

The selvages of the net are formed by strong warp threads, stretched tight, provided by a roller, distinct from the warp roller. In applying these improvements to circular comb machinery, the front comb bar is kept stationary, and its racking wheel is removed. The points are also doubled in this machine, being changed from ten points to twenty points per inch. The racking wheels are changed for new ones,—one having eight different projections, and the other five, which are turned by a ratchet wheel of twelve teeth.

We are informed by Mr. Crofts that this kind of lace-net (see Fig. 141) will be of a much more simple texture than ordinary bobbin-net, being without traversing threads, and therefore can be made more expeditiously.

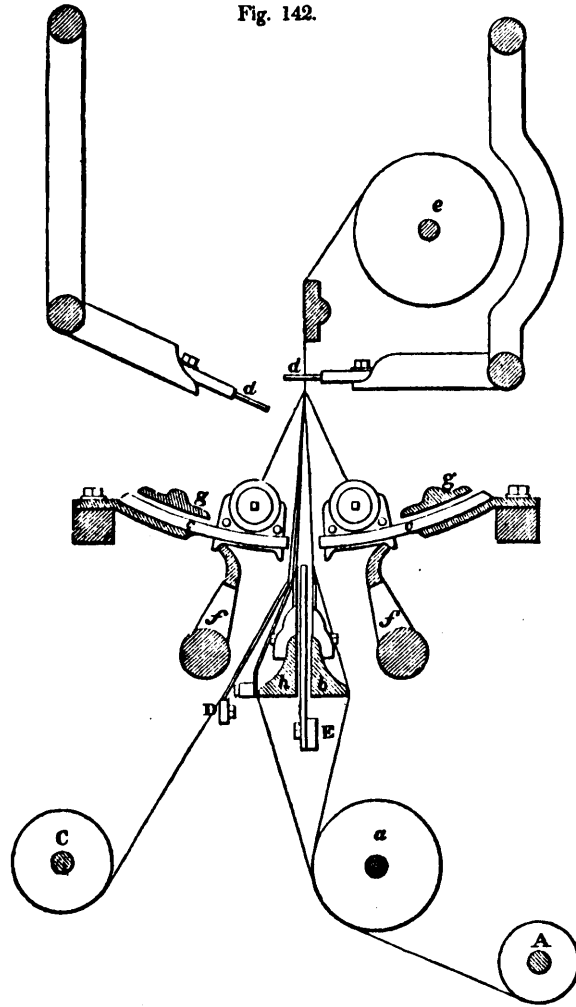
Having given the reader a faithful description (a practical one) of Mr. Crofts' improvements in lace machines in general, and illustrated the same by suitable engravings, etc. we pass on to describe a few improvements of quite a different character, made by our ingenious and worthy friend, John Heathcoate Esq., of Tiverton. The first of these inventions consists in a new mode of manufacturing bobbin net-lace, by inserting sewing thread between the breadths of lace, during the fabrication and finishing of it. In this improved mode, the lacing thread passes in front of the warp-thread that forms the selvage, and behind the two bobbin threads which compose the meshes of the lace, and then re-passes in front of the warp-thread to the adjoining breadth, on which it acts in a similar manner. Another part of the improved mode, consists in ornamenting the lace, by passing the lacing thread round the two bobbin threads, composing the top of the meshes.

Fig. 142 represents, in section, the principal working parts of this machine. *d, d*, are the points; *f, f*, the lockers; *g, g*, the driving bars; *c, c*, the combs; *e*, the lace roller; *a*, the warp roller; *h, b*, are the ordinary guide bars, with their guides.

The selvage threads are supplied from the roller *A*, one row of threads passing through the ordinary guides on the common guide bar *h*, and the other row through the guide *b*, which is attached to the guide bar *h*. The ordinary warp-threads proceed from the roller *a*, through the guides on the guide-bar *b*. The bar *E*, is called the "*poppet bar*," and has a vertical movement, for the purpose of stopping the turn-again carriages, by means of suitable catches on its upper end. The parts by which these improve-



Fig. 142.



ments are effected are the guide D, and the lacing thread roller C. The guide D has a separate racking movement from the other guides. The improvement in this part of Mr. H's invention consists in the mode of inserting the lacing thread, by passing it across the warp-threads and behind the bobbin threads; and likewise the mode of ornamenting the lace, by passing the lacing threads round the bobbin threads, which compose the top of the meshes.

The second part of this gentleman's improvements, in lace machinery &c., which we shall now endeavour to explain, consists in a method of manufacturing ornamental work or figures composed

of edgings, neiges, tattings, or narrow stripes, of gauze or of any other suitable fabric, so as to assume new forms and shapes, by being put upon pins, arranged to receive the same, in curves, angles, circles, or other figures.

The indentation required for producing one pattern, and the form which is given to the edgings in that particular design, by putting them on pins, as shown at Fig. 144, will sufficiently illustrate the nature of the invention; and it will be evident, that by varying the forms of arrangement of the pins, with corresponding or suitable indentations or spaces in the edgings, varieties of figures or patterns may be produced.

The third part of Mr. H's inventions consists in certain machinery, tools, implements, or apparatus, to be used in applying such ornaments, ornamental work or figures.

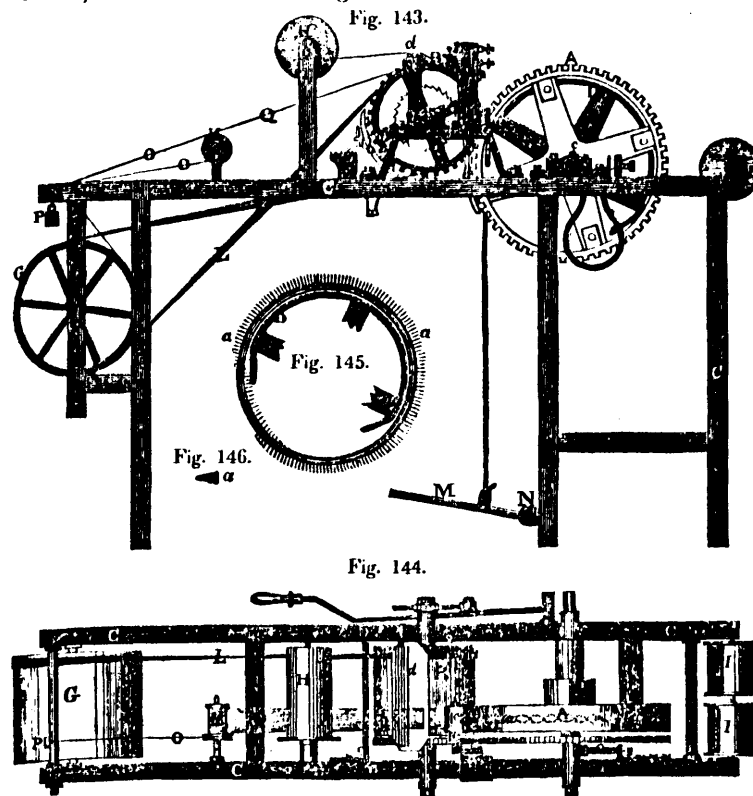


Fig. 143 represents a side view or elevation of the machine, composed of the large cylinder A, and the small cylinder B, and their accessories, mounted upon a frame C. The rim of the large

cylinder is pierced with holes, to receive the pins *a, a*, (see Fig. 145 and 146;) which holes are made in curves, or other figures, according to the pattern or design intended to be produced, as will be seen more clearly in the plan, Fig. 144. These pins are sustained by a curved plate *D*, (see Fig. 143 and 145,) supported from the axis of the cylinder *A*, within or underneath the upper portion of the cylinder rim *A*; which plate is so shaped and kept stationary by the brace *e*, as to allow the pins to be pressed back within the perforated cylinder *A*, as they are successively brought in contact with the small cylinder *B*; by which means the borders, sprigs, or other figures, are liberated from the pins. As the cylinder *A* revolves, the pins *a, a*, descend by their own weight, whereby the points again project from the cylinder *A*, and are kept by the curved plate *D*, in that position, as they move in succession towards the upper part of the circle, as will be best seen detached at Fig. 145.

Upon these pins, the edgings or other texture, (which may be conveniently supplied from the bobbins *II*,) is put, and the revolving of the cylinder *A*, carries it forward towards the cylinder *B*, which, on its part, draws off the lace-net, or other fabric, from the roller *H*, and bears it on the upper part of its surface towards the cylinder *A*.

The surfaces of these two cylinders, *A* and *B*, being moved simultaneously and equally, (by means of the wheels, upon their respective axis, working into each other,) the net and the edging or border are brought together, and pressed closely between them: over the small cylinder *B*, the sizing roller *E* (see Fig. 143) is made to press upon the net, the surface of the roller being formed according to the figure which the edging assumes upon the cylinder *A*. (See a sample of edging on the cylinder *A*, at Fig. 144.)

The cement is applied to the net only where the edging will come upon it when the pressure, just alluded to, causes the edging to adhere to the sized net. The roller *E*, is supplied with size or cement by a small roller *F* (see Fig. 144) the under surface of which dips into the trough containing the same (as in sizing warps for power looms; and as the rollers *E* and *F*, by the wheels upon their respective axis are connected, and in due proportion with the cylinders *A*, and *B*, a proper supply of size is in succession applied to those parts of the net, or other fabric, intended to receive the ornamented border or pattern.

The surface of the roller *E*, must, of course, be covered with woollen cloth, or other suitable elastic substance, which will yield to

any inequality of the material passing under it. G, is a cylinder to receive the lace; it is moved by a band or belt L, passing over the cylinder B, which it causes to draw the lace therefrom, and to overcome any tendency which it may have to adhere to the cylinder B. But to prevent the lace from being stretched or elongated, and also the better to separate it from the cylinder B, a number of silk threads Q, are passed over the cylinder B, as shown at Figs. 143 and 144. These threads effectually strip the net or lace from the cylinder, and continue in contact with it until the whole operation is completed, and are not separated from it until the lace is taken from the cylinder G. Wet sponges *b, b*, (see Fig. 143) are made to press against the left hand side of each of the cylinders A, and B, to take off any size which may adhere to them. Motion is given to the cylinder B, (which by the train of wheels and the band or belt L, communicates it to the other cylinders and the roller,) by a treadle M, acting upon the ratchet-wheel, fixed upon its axis N, or by any other suitable contrivance. *e, e*, is a spring governed by a set screw (see Fig. 143) which, by its action against the bearing of the cylinder A, regulates the pressure upon the net and border between the two cylinders A and B.

The trough which contains the size or cement, is regulated, so as to allow a proper quantity to adhere to the surface of the roller F, the excess being retained by the contact or pressure of the side of the trough against it; which, of course, is well understood.

The net or other fabric, *destined* to receive the border, is to be passed alternately under and over the wires *d*, in order to keep it flat and moderately tight. Tension cords O, and weights P, are likewise applied to the bobbin K, and cylinder G, so as to give the required tension to the silk threads Q (see Figs. 143 and 144) and finished work.

For the purpose of better exhibiting the several parts of the apparatus, we have left out the work altogether in the plan, Fig. 144.

It may be useful to add, that the wet sponges *b, b*, may be advantageously applied to the surfaces of the cylinders A, and B, by the pressure of levers and springs.

By the term *edgings*, is meant, any suitable stripes of woven or manufactured texture, proper for being formed into figures or patterns; and the term *borders*, is meant to designate such edgings, formed into designs and attached to net, muslin, or other suitable texture.

We have, for the sake of more clearly describing this pro-

cess or manufacture, shown an uninterrupted succession of pattern or design, or borders; but, it is evident, that if alternate intervals or spaces were left between portions of pattern, detached objects of the nature of sprigs, groups, or boquets, may be produced, according to the taste of the designer, and the consequent arrangement of the pins *a, a*, and the roller E, by which the gum or size is applied to the net.

If the object be to produce *imitation of Brussels lace, or Honiton sprigs*, the edging must be made of such forms and materials as will, when formed and pressed into the proper shapes, most nearly resemble the work made by the hand with the bobbins or needles; and the method of sewing them to the net, which is practised with regard to the Brussels and Honiton sprigs may be adopted; and also in imitation of Chantilly and other blonde laces, in case it should be deemed necessary.

The pins *a, a*, (one of which is shown enlarged, at Fig. 146) are suitable where the edgings have holes or open places, by which it can be readily put upon them; but in case the edging is of a close texture, the pins must be smaller. The size or cement may be made of various kinds of gum, or other adhesive matters. Gum-arabic, dissolved in water, and of the consistence of thick cream will answer the purpose very well.

We shall now conclude this part of our subject, by laying before our readers a copy of a letter, containing an account of the specimen of ancient Egyptian lace or net, to which we alluded in the introductory part of this Work. (See pages 46 and 47.)

A representation of this specimen is given at Fig. 147; which we think demonstrates, beyond the possibility of a doubt, that the lace machinery used by the ancient Egyptians, must have been brought to great perfection indeed, before such a fabric could have been produced. But the following letter, from Mr. Kersivenus, will convey a better idea of the subject than anything we can say.

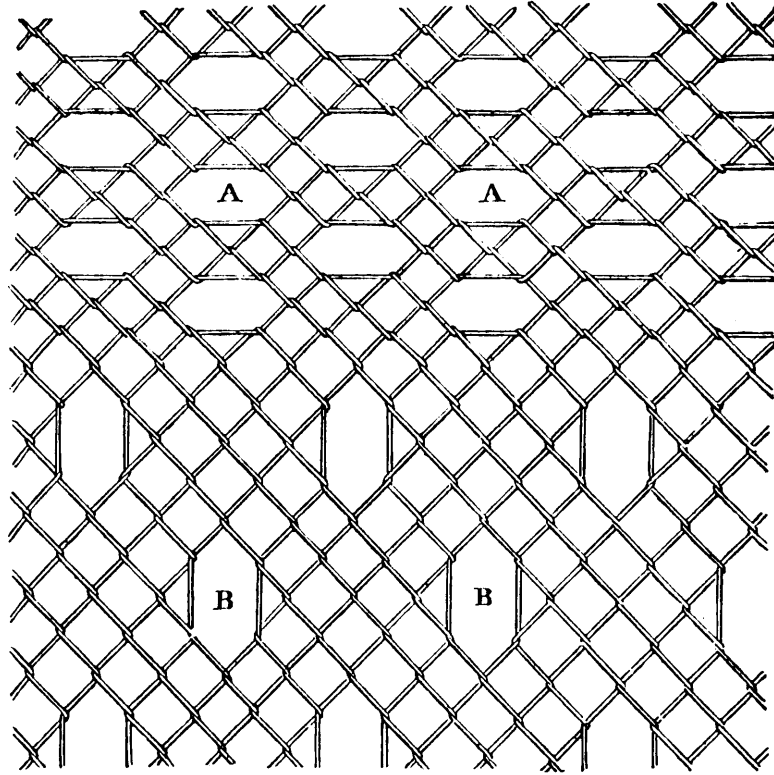
*Thebes, October 17th, 1843.*

Dear Friend,

Your favour of the 19th May last, was handed to me last evening, by our worthy friend Amasis Osirtasen, who arrived here yesterday morning, on business of importance for his Majesty.

With regard to what you say about the sample of lace or net, it is lucky indeed, that your letter reached me in this place; because I am thus enabled to furnish you with a drawing of it, and

Fig. 147.



also some explanation, more easily than I could otherwise have done.

On receipt of your letter, I lost no time in calling upon our esteemed acquaintance, Lepsius, who very fortunately happens to be here at present; and after mentioning to this scientific gentleman the object of your letter, he at once consented to aid me in searching for the sample, as he says, that he feels interested in your success, and has done so, ever since he first saw you in Berlin, while you were there in 1833, obtaining a patent from the Prussian Government, for a carpet power loom, with what the Doctor calls, "*lunar detached revolving shuttle boxes.*"

We proceeded this morning, a few minutes before sunrise, at which time we commenced our search; and we continued it without intermission until 10 $\frac{1}{4}$  o'clock A. M.; at which time we had given up nearly all hopes of success; and, in fact, were just at the point of leaving the scene of investigation, when fortunately the Doctor's eye (which you know is always on the sharp look-out)

caught a glimpse, while looking over my shoulder, of the very identical object of which we were in search. You may guess how overjoyed the Dr. and I became on making this re-discovery,\* not only for your sake and for that of your country, but also for the interest of *science*, which you are aware is always a favourite hobby with the Doctor. We proceeded forthwith to make the necessary drawing; and, although the sample has become much obliterated from age; yet, with the help of the Dr's. excellent triple lenses (which you know possess most awful powers of penetration) I have been enabled to make a tolerably correct outline, and, in fact, as a whole, not a bad drawing.

You will not fail to perceive, that the part of the sample marked A A in the figure, differs very materially from that shown at B B; and although this feature appeared to me, at first sight, as quite a simple circumstance, our learned friend, who is deeply skilled in the mysterious art of weaving, is of opinion that no machinery at present used in the lace manufacture is at all capable of producing the same effect: he, therefore, concludes, that some very ingenious piece of mechanism, unknown to moderns, must have been employed in the manufacture of this specimen. It will be seen, on close examination, that the same threads which form the weft in the part A A, constitute the warp at B B: this actually puzzles the Doctor, and is, no doubt, worthy of your attention as a practical weaver and manufacturer.

Lepsius tells me, that each thread of the net, although fine of itself, was composed of 598† other threads, all distinct; the quality of the fabric being similar to that of the corslet dedicated to Minerva, at Lindus, by Amasis, King of Egypt. This explanation, he was enabled to decipher, by the aid of one of his best glasses, from a few *obliterated* characters; which, on the closest examination with the naked eye, I was unable to perceive!

The Doctor entertains strong hopes of becoming, in the course

---

\* It appears that Mr. Kersivenus saw this specimen while at Thebes, in the month of March 1835, and of which circumstance he at that time made mention to us in a letter; but being hurriedly called away, on business of importance, he lost all recollection of the occurrence.

† Sir Gardiner Wilkinson, in his interesting work, entitled, "Manners and Customs of the Ancient Egyptians," gives us an account of a corslet, of linen, ornamented with numerous figures of animals, worked in gold and cotton. Each thread of the corslet was worthy of admiration; for though very fine, every one was composed of 300 other threads, all perfectly distinct. See vol. III, page 127.

of a short time, possessed of the machinery by which nets of the kind here represented were manufactured; and, judging from the rate at which excavations are progressing, at present, in this neighbourhood, I, myself have little doubt that his most sanguine expectations will be realized. No farther back than yesterday, about 5½ o'clock P. M., some of his workmen dug up an electrical machine, bearing the name of that ingenious but ancient individual, Tubal-cain; and this instrument according to the Doctor's statement, is the only thing of the kind preserved from the wreck of the anti-diluvian world, Shem, (the first son of Noah,) having taken it with him into the Ark!

Lepsius employs, in these *excavating operations*, a kind of people called "*Irishmen*," and from what I can learn regarding them, they are famous for making headway in this kind of work: each one, of whom, I am sure, is at least worth eleven of my own countrymen.\*

And now, Dear Friend, while owls by night, with mournful scream, rouse echo from her idiot dream, may I your humble servant be.

ALEXIS KERSIVENUS,  
Civil Engineer,  
Homeopathic Physician, &c.

P. S. My family are all well. Cleopatra sends you her love, and  
three \* \* \* \* \*

#### EMBROIDERY.

"Here the needle plies its busy task,  
The pattern grows; the well-depicted flower,  
Wrought patiently into the snowy lawn,  
Unfolds its blossom; buds, and leaves, and sprigs,  
And curling tendrils, gracefully dispos'd,  
Follow the nimble finger of the fair:  
A wreath, that cannot fade, of flowers that blow  
With most success when all besides decay."—COWPER.

Embroidery is the art of adding to the surface of woven textures, a representation of any object we wish to depict, through the medium of the needle, threaded with the material in which the

\* It may be well to state that Mr. Kersivenus is an Egyptian by birth; but received his professional instruction in France; where we first had the pleasure of forming an acquaintanceship with him.



work is to be executed. This may be effected by various methods, and on most descriptions of fabrics.

Our object at present is, not to enter into a general description of the different articles used by ladies for the purposes of needle-work, nor the methods of applying them. Indeed, the fair sex cannot expect from us any practical information upon such subjects as, *fern-stitch, sunny-stitch, old-stitch, new-stitch, chain-stitch, braid-stitch, queen-stitch, Spanish-stitch, rosemary-stitch, whip-stitch, back-stitch, side-stitch, Galway-stitch, Kilkenny-stitch, Limerick-stitch,* and *Tipperary-stitch*, we shall therefore, confine ourself to giving our readers a brief historical account of the art; and a description of the application of machinery to it, as successfully accomplished by the ingenious M. Josué Heilmann, of Mulhausen, France.\*

We are indebted to the luxury and magnificence of the nations of the East, for the invention of embroidery,—an art that has not inaptly been termed the mother of painting, its discovery claiming the priority by many centuries. In more modern times, it has been called the humble sister of the latter art; and the aim of the needlewoman has been to imitate, as closely as possible, the productions of the pencil, a labour in which she has been assisted by some of the most celebrated masters, many of whose chef-d'œuvres have been executed for the express purpose of being copied in needlework or tapestry.

The Greeks gave the honour of the invention of embroidery to Minerva: by Pliny it has been assigned to the Phrygians; hence he says the Romans called embroiderers "*Phrygiones*," and embroidered garments, "*vestes Phrygionæ*." The women of Sidon, before the Trojan war, were especially celebrated for their skill in this art: and Homer mentions Helen as being engaged in embroidering the combats of the Greeks and Trojans:

" An ample web magnificent she wove,  
Inwrought with num'rous conflicts for her sake,  
Beneath the hand of Mars endured by Greeks."

Andromache also—

" She in her chamber at the palace top,  
A splendid texture wrought, on either side  
All dazzling bright with flowers of various hues."

---

\* Those of our readers who wish to obtain a knowledge of this art, as practised by ladies, are referred to Miss Lambert's excellent "*Hand-Book of Needlework*."

The art of embroidery was greatly practised among the ancient Egyptians; even the sails of some of their ships were wrought with fanciful devices, representing the phenix, flowers, and various emblems.\* In the time of Moses, Aholiab, the son of Ahisamach, of the tribe of Dan, was celebrated as "a cunning workman," and as an embroiderer in blue, in purple, in scarlet, and in fine linen.† The curtains and ornaments of the Tabernacle, and the vestments of the priests, were decorated with embroidery. The prophet Ezekiel, reproaching the women of Israel with having abused the benefits of Providence, after mentioning their bracelets and chains, jewels for their foreheads, and earrings, and their crowns, still farther names their robes, dyed and embroidered of divers colours.‡ Attalus, king of Pergamus, is said by Pliny, to have invented the art of embroidery with gold thread.

According to Diodorus Siculus,§ Zaleucus, a disciple of Pythagoras, and a lawgiver of the Locrians, forbade the use of embroidery, except to courtesans: and Dionysius Halicarnassus|| informs us, that Tarquinius Priscus, who first distinguished the monarch and senators by particular robes and ornaments, was the first Roman king who wore an embroidered garment.

The term embroidery, as employed in the writings of the ancient historians, has reference to all kinds of ornamental work done with the needle; thus comprehending within its meaning every description of decorative needlework, including tapestry and some descriptions of weaving. At the present day, the term is much more limited, relating to one kind of needlework only, which, however, embraces an almost innumerable variety, both as to the materials employed, and the mode of using them. In the extended meaning of the term, therefore, nations and savage tribes unknown to the ancients, may equally claim the honour of a similar invention, as most of them have a species of embroidery peculiarly their own.¶

---

\* Cloth, of embroidered linen, appears to have been made in Egypt expressly for sails, and was bought by the Tyrians for that purpose (Ezekiel xxvii. 7,) but its use was confined to the pleasure boats of the nobles, or of the king himself; ordinary sails being white. We are informed by Pliny (lib. xxx. c. 1.) that the ship in which Antony and Cleopatra went to the battle of Actium was distinguished from the rest of the fleet by its purple sails, which were the peculiar privilege of the Admiral's vessel.

† Exod. xxv. 35. ‡ Exekiel xvi. 13. § Lib. iii. c. 62. || Lib. xii. p. 299.

¶ The word embroidery is derived from the French *broderie* which some deduce by transposition from *bordeur*, because they formerly only embroidered the borders of their stuffs, whence the Latins sometimes called embroiderers