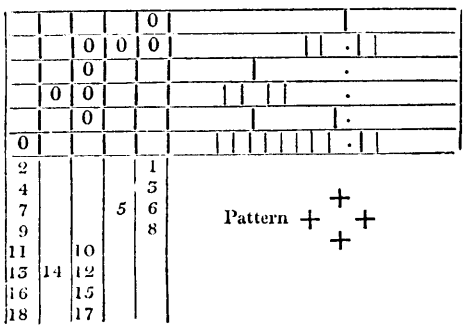
Sometimes the common spot and cut stripe are combined; and sometimes a single cord or heddleful of the spotting warp is introduced for a stalk or other slender member of the figure. The following, which forms a small cross embosomed, similar to the figure annexed, will serve for an example.

No. 71.



SECT. VI. SEEDING.

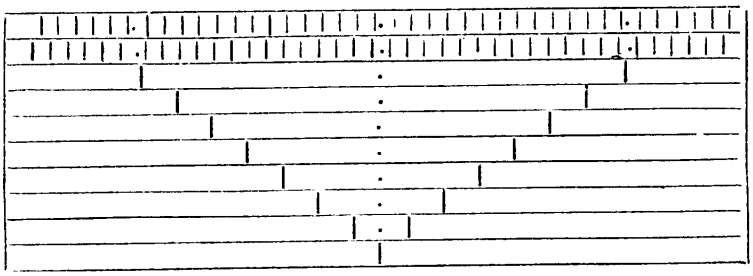
In this kind of fancy weaving, the figures are formed likewise by supernumerary warp, or rather coarse cording, made by twisting three ends of single yarn together, which is partially interwoven with the ground; but the patterns are produced by raising these coarse threads above the surface of the cloth, into little naps called seeds, after the manner of counterpanes: which process seems to have been borrowed from the method of weaving the plush velvet, explained in page 134.

The mountings employed for weaving seeding patterns consist of one set of leaves for the ground, and another

for the seeding warp. The leaves for the seeding, which in every respect resemble those of the cut stripe, are, however, usually placed before those of the ground, and so low, that the seeding warp may lie on the race rod when it is not forming a shed. It is customary also, to have two splits of the ground between the seeding cords.

The first six Figs. in Plate 10, are patterns of seeding spots: and as these are all designed for eight leaves, one draught, which is of the diamond form and inserted below, will produce the whole of these varieties; the plans of cording being unnecessary, as they are all woven with a machine like paper spots.

No. 72. Figs. 1, 2, 3, 4, 5, 6. Plate 10.



As there are commonly four threads or two splitfuls of warp between the seeding cords; so there are likewise four shots of weft between the seeding lifts; each of these cords and lifts will therefore be represented by one space on the design paper.

The method of weaving seeding patterns formerly, was, when the first seeding shed was opened, the weaver threw across a shuttle to which a cord, somewhat longer than the breadth of the web, was attached. When this cord was struck up by the reed, it raised the seeding warp above the surface of the cloth, and formed it into naps, as already

mentioned. When as many shots of the ground were woven as were sufficient to fasten the seeding, the cord was drawn out and thrown into the following seeding shed. This process, is, however, now superseded by introducing a number of steel wires into the seeding sheds in place of the cords. These wires or needles as they are called, are driven into the edge of a shaft like the needle frame of a lappet, at the distance of about an inch, and are bent at right angles, pointed and polished, with the point of one passing beyond the knee or bend of the other; so that when these wires are shifted horizontally into the seeding shed, no portion of the seeding warp, which is raised, is allowed to escape. One side of the needle is a little flattened at the point where it comes in contact with the knee of the other; so that when the extremities of these two needles are in one part of the seeding shed, the seeds may not be raised higher than the other parts where the wire is single. When the requisite number of shots are thrown into the ground, as in the former process, the weaver draws the shaft to the left side with his thumb, by which the wires are all disengaged, and are again shifted into the next shed.

The seeding warp is usually interwoven with the ground between the seeds, to secure it from being pulled out by accident. This is more particularly the case in running patterns, such as the borders of shawls or colonnades. Spots or detached figures, however, are sometimes fastened only where they begin and end. The process of weaving the seeding warp into the ground is as follows: The seeding shed is first opened, either by the machine or draw-boy, into which the weaver introduces the needles. The seeding warp is then sunk, and two shots of the ground thrown in; the same seeding warp is again raised and a shot of the ground thrown in, then another shot of the ground after it is sunk, which make four shots of ground before the warp be again raised into seeds.

When more than one seeding leaf are requisite for any pattern, it is evident that when one portion of the seeding warp is drawn in to raise the loops or seeds on the cloth, the remaining part would be slacker in proportion to the frequency of its being omitted, were it all beamed on one roll. It is customary, therefore, to have a separate roll for whatever quantity of this warp is drawn on each. Thus, in the examples given above, as these spots require eight spotting leaves, it is usual to divide the warp among eight rolls, with equal quantities on each, except that for the point, which has only one thread for each spot, while the others have two. Sometimes, however, the seeding warp is all beamed on one roll, and a small piece of lead appended to each thread, behind the mounting, to sink the parts which are thus slackened, so as to keep them all equally tight; and these sunk parts are drawn in at the face of the cloth at the end of a piece. This is now the common method in seeding harnesses.

SEEDING SHAWLS.

On this principle, shawls have been woven in great abundance and variety. The most common mountings for these shawls consist of sixteen seeding leaves for the bosom, sixteen for the side borders, and sometimes one or two for guards; the border and bosom draughts being all of the diamond allover form. Hence, as there is only one seeding cord on each point leaf, and two on each of the others, one set of the pattern will occupy thirty spaces of the design paper; and as there are commonly two splitfuls of the ground warp allowed for each space, the whole will be equivalent to sixty splits of the reed; and this is repeated to make up the intended breadth of the border. Thus for example, were the border to stand six inches broad on the cloth; in a 1400 reed, we would find that the pattern must

be $3\frac{1}{2}$ times repeated, and 9 cords over, which might be disposed of as guards: for as there are about 38 splits in an inch of a 1400 reed, these multiplied by 6 inches, give 228 splits for the breadth of the border, which divided by 60, quotes $3\frac{1}{2}$ and 18 splits, or 9 cords over; and so of any other breadth or number of leaves.

The patterns best adapted to these shawls are such as have all their sides alike, so that the figures on the cross borders and those on the sides may present similar parts to the centre of the shawl; for were sprigs, such as Figs. 1, 2, &c. Plate 10, to be adopted, the tops of the sprigs on the cross borders would tend to the bosom of the shawl, while those on the side borders would present their sides to it. Sometimes, for sake of variety, a different pattern from that on the borders is put on the corners; and this is read on the leaves of the side borders along with those of the cross heading.

Fig. 7, Plate 10, is a pattern for one of these shawls, adapted to thirty-two leaves; that is, sixteen for the border, and sixteen for the bosom. It is here to be observed, as in the case of paper spots, that the weaver has occasion for no more of the pattern than from one centre to another, both point leaves included; but these patterns are generally drawn full, that their effect may appear to more advantage on the design, before they are woven on the cloth.

As the centres of these shawls are generally filled with figures, which seldom require one-half of the seeding warp which is necessary for the cross borders, a considerable portion of it must be omitted, or dropped as it is termed, during the time of weaving the bosoms. In order, therefore, to save the seeding warp thus omitted, the weaver has a square rod which is fitted to a groove in his slabstock, or that cross bar over which the cloth passes to the receiving roll. When he has woven his cross borders, and as much of the bosom as bring the dropped warp to this groove, he

raises the ground and working part of the seeding above the dropped part, into which shed he introduces the square rod, and then presses it down with the dropped warp into the groove, where it is completely secured, after which he cuts it away from the face of the cloth, and lets it remain till he has occasion to use it in the following cross borders. In this case, it is evident, that the dropped part of the warp will require a separate roll from that part which produces the centre figures; and as these figures have generally a considerable piece of the ground plain between them, their portion of the warp will not be wrought up so much as that of the side borders, and consequently, will require another roll for itself.

SEEDING ROBES.

This is another purpose to which seeding has been very extensively applied. Sixteen leaves is also the common mounting for these patterns, and will therefore comprehend the same number of splits of the reed as the preceding mountings. Though limited in their breadth by the smallness of these mountings, seeding robes vary considerably in their depth; some being made only about eight design, as in Fig. 8, Plate 10, which is a pattern for one of these robes, and others from sixteen to eighteen, and some even as high as twenty-six designs; the patterns being nearly as large on a 1400 ground as on the design paper.

Though these patterns have hitherto been considered as woven with leaves, as is frequently the case, yet most weavers prefer them mounted in the manner of a harness, having a small tail running over pulleys, and a simple to which the lashes are attached, as in the paper spot. They are usually woven, also, with a machine, the varieties of which are so numerous, that almost every weaver fits up one to his own mind.

CHAP. IX.

FLUSHING.

THE term flushing is of frequent use in the art of weaving. Any quantity of weft which passes over or under more threads of warp than one, or extends beyond the range of the plain texture, is said to be floated or flushed. Tweels, lined work, and all the varieties of corduroys, &c. are, therefore, merely the effect of flushing, but the term is commonly restricted to a few of the inferior branches of fancy weaving, which are explained in this chapter.

Of flushed patterns, some are produced by additional warp or weft, which is, in general, either coarser, or of a different colour from the ground; and others, merely by floating certain portions of the weft above or below the warp.

SECT. I. DUMB SEEDING, FLUSHED STRIPES. CHECKS AND BORDERS.

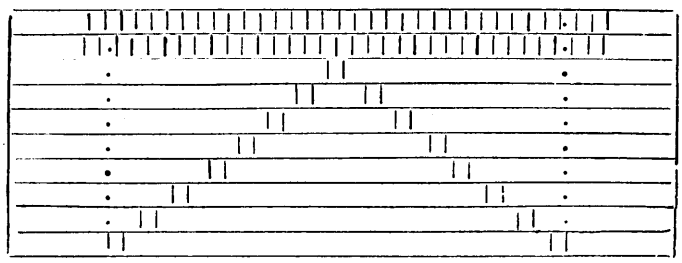
Dumb seeding, or paper flushing, is a species of ornament, in which, like the cut stripes, the patterns are produced, generally on a plain ground, by means of additional warp. In a cut stripe, however, those portions of spotting, or additional warp, which form the figures, are raised and sunk alternately along with the ground sheds; but in dumb seeding, the spotting warp is flushed over three shots of the ground, and is sunk only at the fourth.

In some of these patterns, there are two threads of spotting warp drawn into one heddle, and these are taken into the same interval of the reed with a splitful of the ground. In others, there is a heddle for each spotting thread; in which case, a thread of spotting and a thread of the ground alternately, are taken through the heddles and reed; and sometimes three, and sometimes four of these spotting threads are drawn together on one leaf. When there are two spotting threads in the heddle, the patterns are usually called dumb seeding; and when the warp is drawn in single threads, they are frequently denominated paper flushes, although it is difficult, without very narrow inspection, to discover the difference.

Figs. 1, 2, 3, 4, 5, and 6, Plate 10, may be taken for examples of spots woven on this principle; the draught of which, for two threads in the heddle, is here annexed.

Dumb seed Draught.

No. 1. Figs. 1, 2, 3, &c. Plate 10.



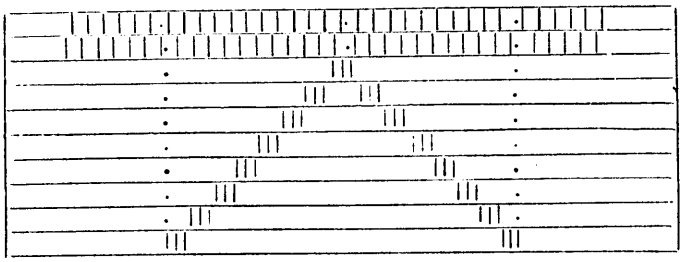
In this example, there are two splits of the flushing warp, or four threads of the ground warp in each of the small members of the spot; and as there are four shots of the ground thrown in on each lift, it follows, that these spots will be composed of a number of small square spaces, four threads

each way, very much resembling the figures on the design paper; the small spaces of which representing each four threads.

Again, it will appear that in Fig. 1 there are twenty-one lifts, eighteen of which are different from each other; and, consequently, as each flushing lift requires two treadles, besides two for the ground, the number of treadles necessary for this pattern would be twice 18=36, and the two ground treadles would make 38 in all. But as it would be impracticable to work with so great a number of treadles, the parrot, or some other such machine is always employed for this purpose. The following plan is a draught of these spots woven as a paper flush with three threads rising together, although they are frequently made with four.

Paper Flush Draught.

No. 2. Figs. 1, 2, &c. Plate 10.



When four threads are raised together to form the spot, it is only necessary to take four draughts on the spotting leaves in place of three in the above example. Sometimes this species of flushing is woven in stripes or colonnades; and sometimes it is introduced as guards to veining or purle stripes, which has a very good effect.

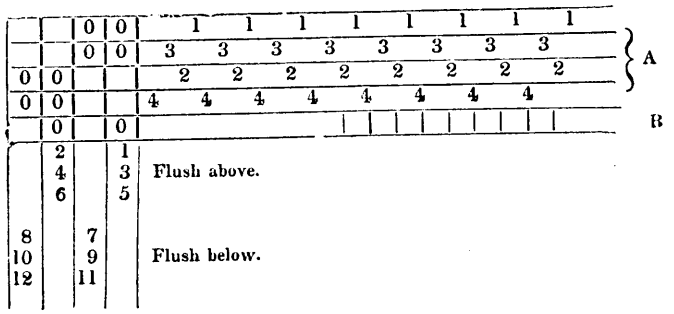
FLUSHED STRIPES.

What are usually termed flushed stripes form their patterns, likewise, by additional warp, and, when they are converted into checks or shawls, additional weft is also requisite. The warp is flushed above and below the ground, alternately, though at greater intervals than in the preceding varieties. The flushing yarn, in like manner, is commonly of a different colour from the ground or body of the web, and frequently silk is introduced for the brilliancy of its colours, especially for the borders of handkerchiefs. Two threads or ends of the flushing warp are usually drawn into each heddle of a flushing leaf, and taken through the same interval of the reed with a splitful of the ground; though some patterns are drawn in single threads, as in the paper flushing.

The most simple patterns of this kind are woven with only one flushing leaf, of which the following plan is an example.

No. 3. Fig. 9. Plate 10.

FLUSH STRIPE.



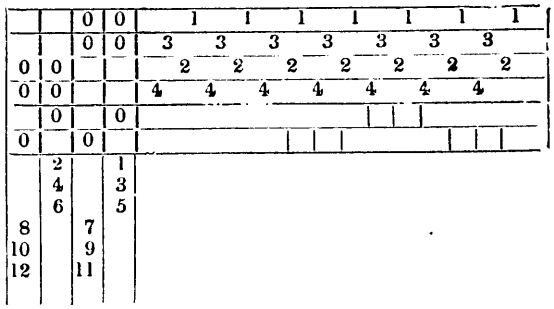
The draught of the ground A, in this example, is exactly the same as in other plain mountings, and the flushing warp

is drawn on the front leaf B, one heddleful, of two threads, immediately following each splitful of the ground. The plan is also corded, and the treading marked, so, that the flushing warp is above the ground for six successive shots, and below as many; one splitful of warp and two shots of weft being each represented by a space on the design paper.

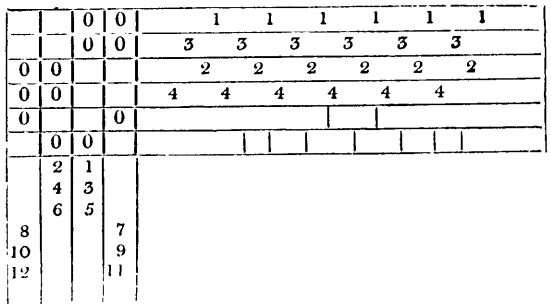
In this, as in the other branches of fancy weaving, variety depends considerably on the extent of the mountings employed; although the economical arrangement of the diaper draughts might be here introduced with great advantage; of which examples will be given farther on. The following plans will exhibit a few more varieties of flushed stripes.

DAMBOARD FLUSH.

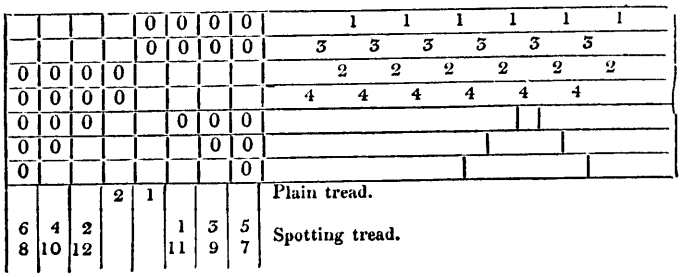
No. 4.



No. 5. Fig. 10.

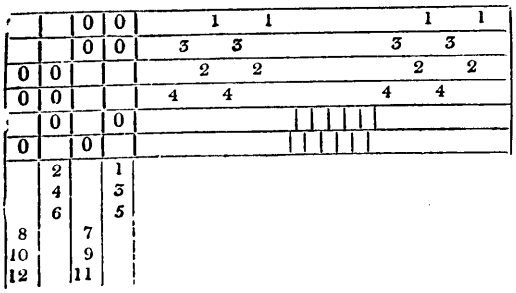


No. 6. Fig. 11.



Double Flush.

No. 7. Fig. 12.

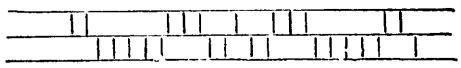


In this example there are two threads of the flushing warp supposed to be drawn in each heddle, and two of these heddles, one on each leaf, are equivalent to a splitful in the reed. Sometimes, however, these two threads are drawn into separate heddles, as in the paper flushing, which gives the pattern a richer appearance than when they are laid close together. The warps, on these two flushing leaves, are of

different colours: and when the one is above, the other is below, as represented by the Fig. in the Plate.

Fig. 13, is a diaper pattern of two divisions, converted into a flushed stripe, which, although one set of the pattern occupies 26 splits, requires only two flushing leaves. The draught on the flushing leaves, independent of the ground, will stand as under; but the draught of the ground may be supplied by adding the plain leaves, and marking a splitful of warp for each heddleful of flushing, as in the preceding examples. The cording is the same as Nos. 4 and 5, and the treading follows the same order as the draught.

No. 8. Fig. 13.

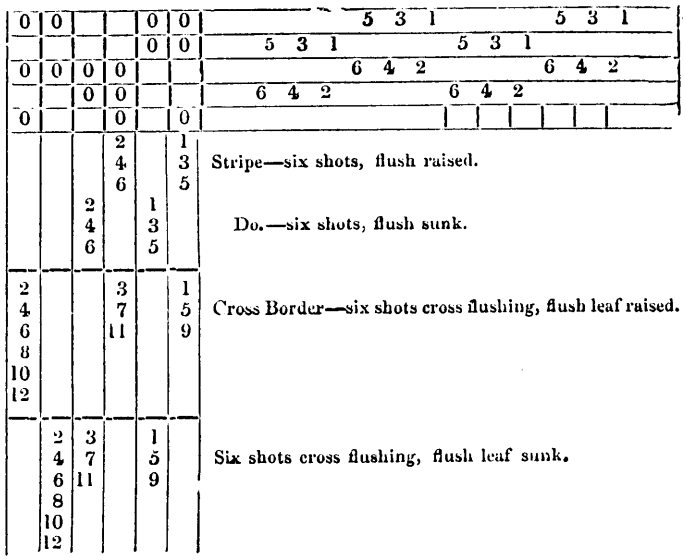


FLUSHED CHECKS OR BORDERS.

When the same figures which are woven in stripes, are to be formed across the body of the web, as in checks and the borders of handkerchiefs, the draught of the ground must correspond with that of the stripe; but double the number of leaves will be necessary to produce the same pattern, on account that both the back and fore threads of a splitful of the warp, or, in other words, both sides of the shed must be sunk when the cross flushing forms the figures above, or raised, when it forms them below. Hence it follows, that raising marks are placed on these plans where the flushing is to appear on the under side of the cloth, but sinking ones where it forms the pattern above. The draught and cording of pattern Fig. 9, adapted to a check or border, will stand as under.

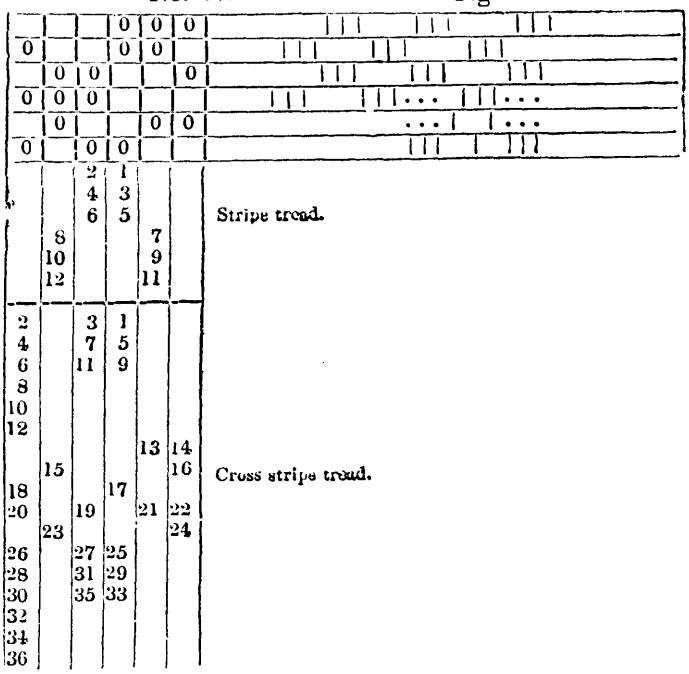
FLUSH CHECK OR BORDER.

No. 9.



In weaving the check, or cross border, a shot of the ground and a shot of the flushing are thrown across alternately; the other changes which take place in working the pattern being particularly pointed out in the plan. The following examples comprehend such varieties as usually occur in this species of weaving.

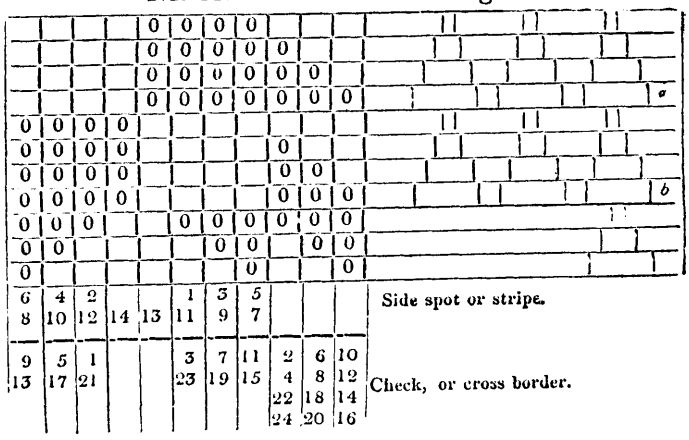
No. 10. Fig. 14.



Stripe tread.

Cross stripe tread.

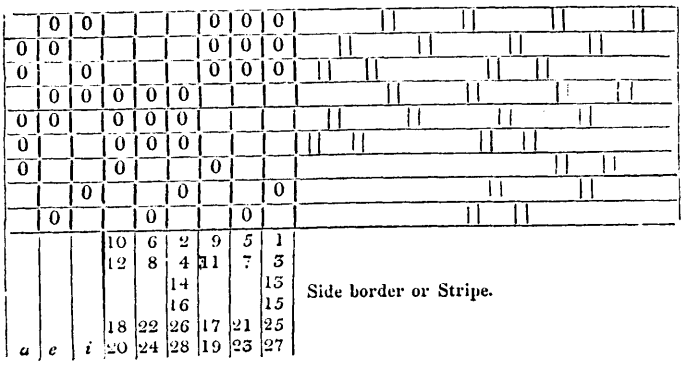
No. 11. Fig. 15.



Side spot or stripe.

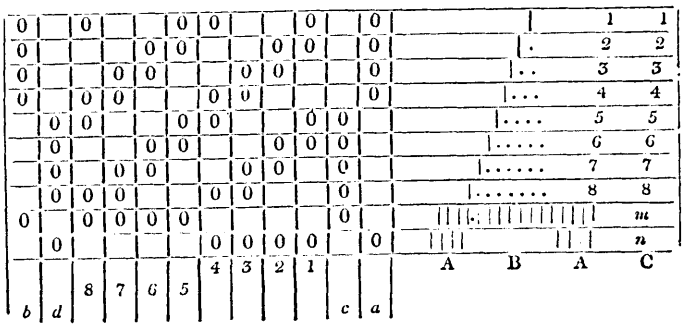
Check, or cross border.

No. 12.



The treadles *a*, *e*, *i*, are for the cross borders, which are wrought alternately with the ground, as in the preceding examples.

No. 13.

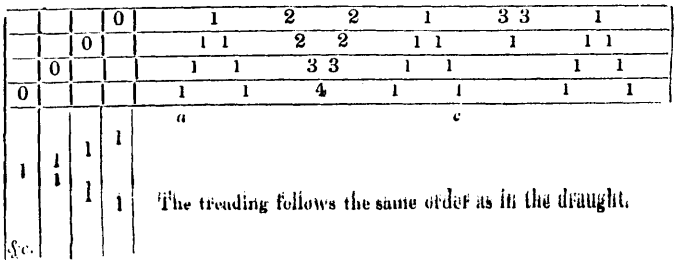


It may be of use to observe, that in No. 11, there is a splitful of plain between the spots, which requires the two

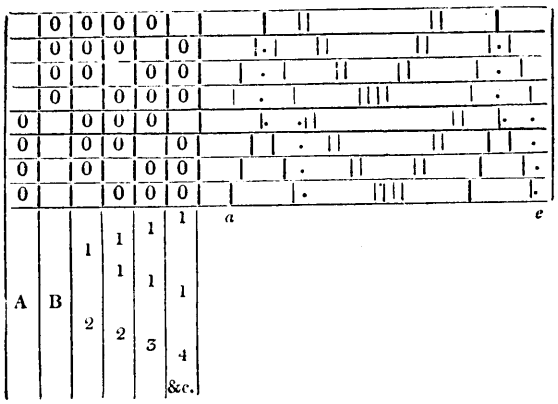
additional leaves *a* and *b*, and the two plain shots between the side spots. In No. 12, there are only two splitfuls of flushing warp drawn together on each set of leaves; but the draught may be enlarged at pleasure. No. 13, is an example of single and double flushing on a tweeled ground.—The draught at C, is for the body of the web; at B, is single flushing, drawn into the reed along with the ground; at A A, is double flushing, which requires no ground along with it. One half of the ground treadles 1, 2, 3, 4, are wrought over so long as the flush leaf *n*, is raised, and *m* sunk; but when these leaves are reversed, the other half, 5, 6, 7, 8, are employed. The other four treadles, *a*, *b*, *c*, *d*, are for the cross flushing: *a* and *b*, are tread alternately, when throwing across the double flushing with the four back leaves raised; *c* and *d*, are employed for the same purpose when they are sunk. The single flushing is thrown in, shot about, with the ground, as already directed.

The bottoms or trains of robes are sometimes ornamented with flushing, for which the patterns given under diaper are peculiarly adapted. Let Fig. 6, Plate 4, be taken for an example, the binding plan of which is here inserted, with another showing how such patterns may be adapted to flushing.

No. 14. Fig. 6. Plate 4.



No. 15.



In this example, that part of the draught from *a* to *e*, only, is drawn on No. 15, for want of room. A and B, are the plain, or ground, treadles, the other four being corded for the flushing. The succession in which these flushing treadles is wrought over in weaving the pattern, is the very same as that of the draught, and a shot of the ground is thrown in alternately with a shot of the flushing. In order, however, to give these patterns a sufficiently bold appearance on the cloth, two or three splits may be substituted for each split or draught in No. 14, and drawn on No. 15, accordingly.

SECT. II. FLUSHED NETS, &c.

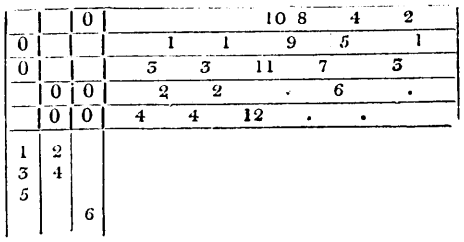
These nets are woven by flushing, at certain intervals, a few of the warp and weft threads of a plain ground, which is generally a light fabric: by which the threads that lie contiguous to the flushing, are permitted to run together

like a cord, during the process of bleaching. These are called flushed nets, to distinguish them from those of cross weaving, and are generally combined with spotting, lappets, and other species of ornamental weaving. The following plan is the draught and cording of the common flush net, woven along with a plain stripe.

COMMON NET.

No. 16. Fig. 16.

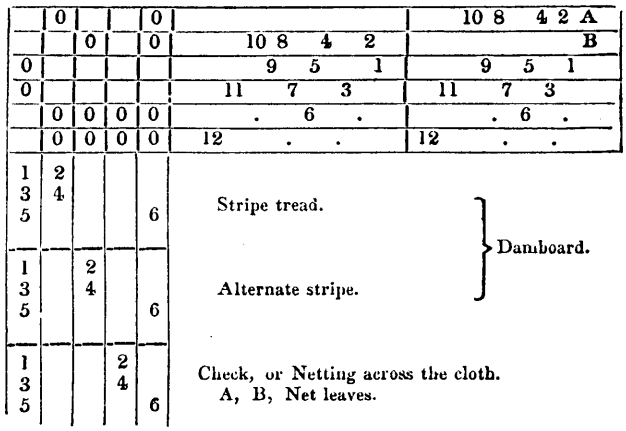
Plain. Net.



In this plan, the flush or net leaf is placed behind, and the other four leaves are merely a set of plain heddles. The dots on the two leaves, toward the front, show where the heddles are set or left empty, when the threads are drawn on the net leaf. Fig. 15, plate 10, shows the effect of this mounting on design paper. Where the small squares are black and white alternately, it is plain cloth; and when the cloth is bleached, the centre thread stands alone, while the others run together like a cord. This takes place both by the warp and weft, which will appear by inspecting the figure.

COMMON NET DAMBOARD.

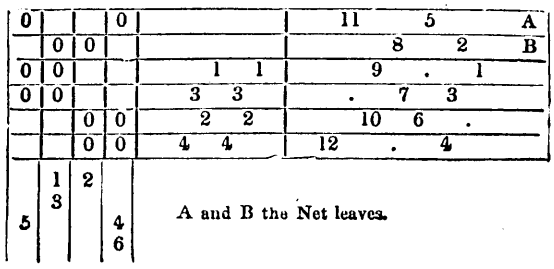
No. 17.



ARMENIA NET, AND PLAIN STRIPE.

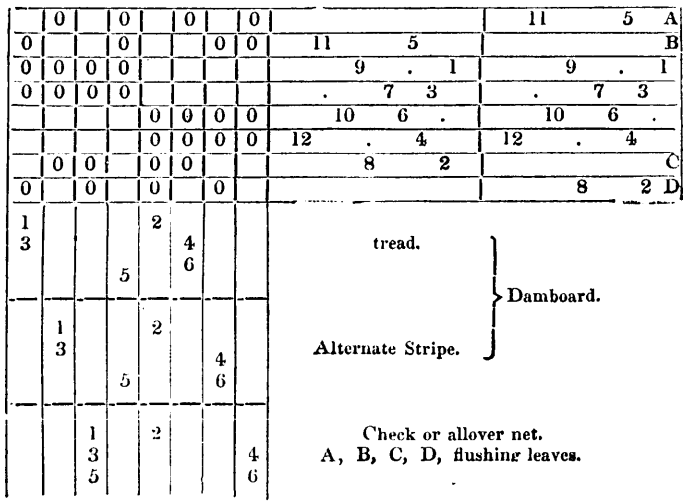
No. 18. Fig. 17.

Plain. Net.



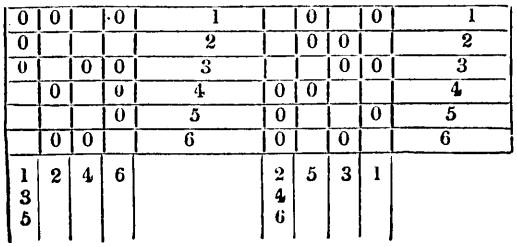
ARMENIA NET, DAMBOARD AND CHECK.

No. 19.

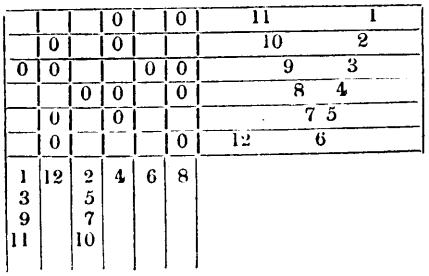


There is another kind of flushing which forms what are sometimes called diced patterns, and which are woven either on a plain or tweeled ground, but generally on a stout fabric. The three following plans are specimens of flushed ribs.

No. 20. Fig. 18. No. 21. Fig. 19.

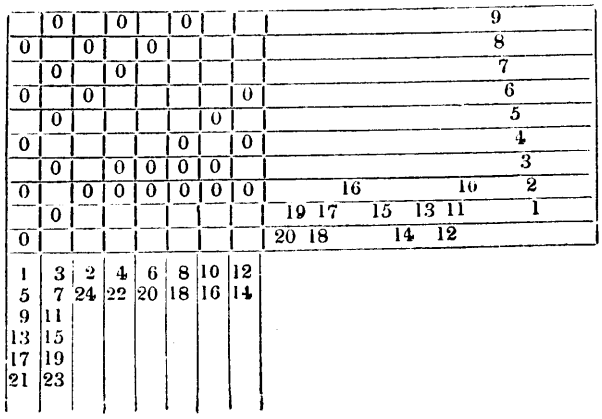


No. 22.

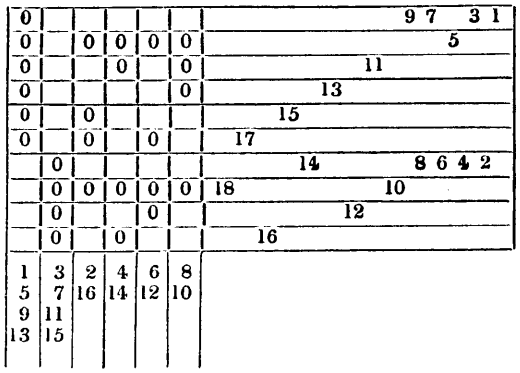


In the four following patterns, a shot of the ground and a shot of the flushing are thrown across alternately.

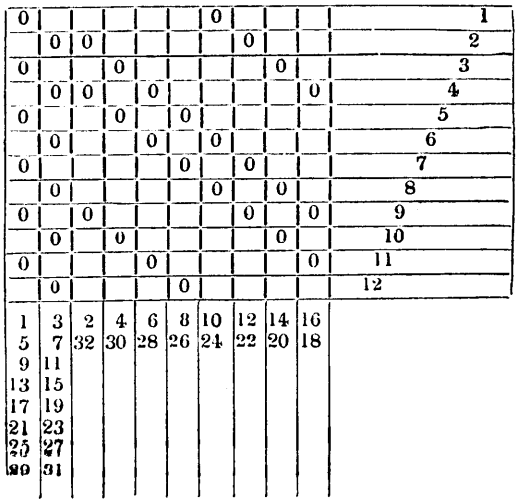
No. 23. Fig. 20.



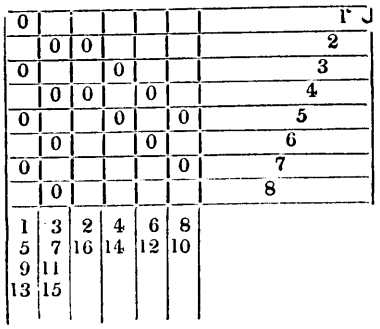
No. 24. Fig. 21.



No. 25. Fig. 22.

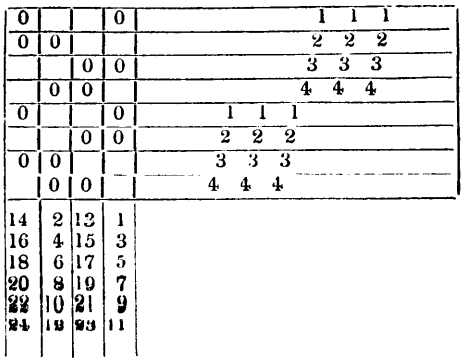


No. 26. Fig. 23.



Plan of a damboard woven in flats; that is, the one square makes plain cloth, while the other rises and sinks by splitfuls.

No. 27.



SECT. III. DUMB FLOWERS.

This is another species of flushing, in which the patterns are raised upon the ground by a mounting similar to that of a paper spot. The double or paper spot mounting is preferred to that of the common spot, because both threads of the same splitful are raised and sunk together in the figured parts, in order to throw all the weft of the figures to one side of the cloth; whereas every second thread only could be flushed by the common spot mounting. The spotting sheds of dumb-flowers, are therefore produced by opening the plain sheds of the ground alternately, and sinking the warp of the several members of the pattern as they occur, by which the weft floats above, and forms the pattern.

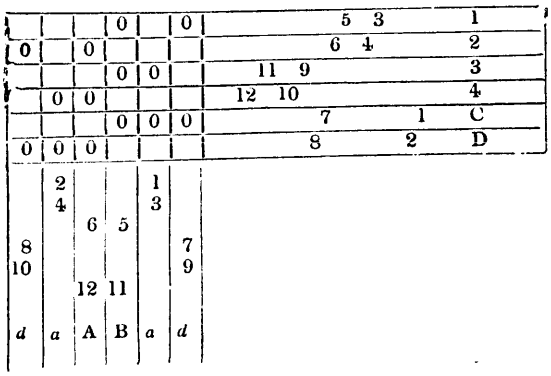
Dumb-flowers are generally woven on cambric grounds; although they are sometimes applied to the ornamenting of shawls and gown pieces, the warp and weft of which are of different colours. In these goods, the figured parts will display the colour of the warp on one side, and of the weft on the other; and the ground at a little distance, will have the appearance of that shade which arises by blending these two colours together. Thus, for example, if the warp were blue and the weft red, the figures would appear blue on one side and red on the other, and the ground would bear a strong resemblance to purple: And so of other colours.

In some of the dumb-flower patterns, there are intervening plains between the spots, for which two plain or ground leaves are requisite, as in spotting; and in others, the whole of the warp is drawn on the spotting leaves, as in allover patterns. The spotting leaves stand in sets or pairs, on which the warp threads are drawn as for plain cloth; and any set or pair can produce the texture at pleasure. Some weavers place the two leaves of each set together, and others separate them, in which case all the leaves on which

the odd threads are drawn, are placed toward the back, and those containing the even numbers in the front, so that these divisions raised alternately, will make plain cloth over the whole web. Examples of each kind are given below.

DUMB-FLOWER BARLEY-CORN SPOT.

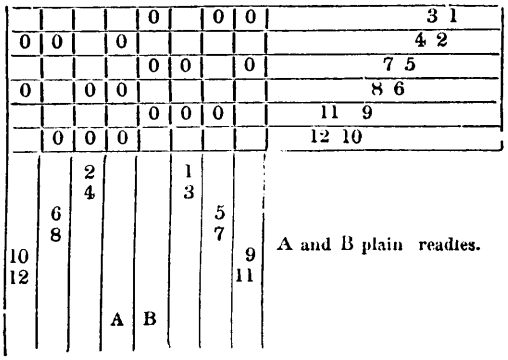
No. 28. Fig. 24.



In the above plan the leaves marked 1 and 2 are one set, which work one row of spots, and those marked 3 and 4, the other set, which work the bosom row. C and D are plain leaves which work the split of ground between the embosoming spots. The treadles *a a* work one row of the figures, *d d* the other, and A B the two shots of plain between the rows, agreeably to the pattern on the design paper, in which each space represents two threads.

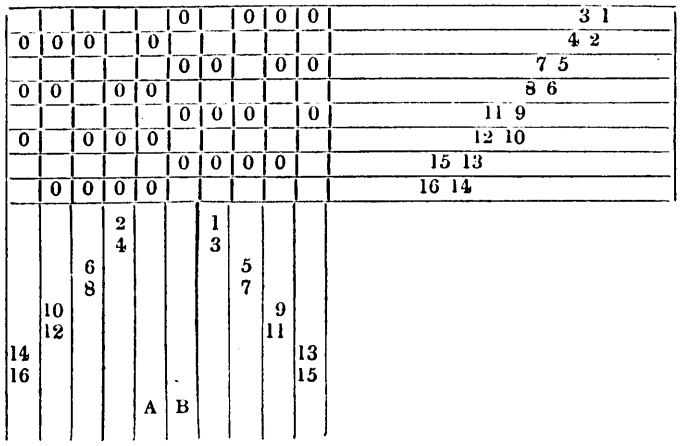
DIAGONAL SPOT, THREE SETS.

No. 29. Fig. 25.



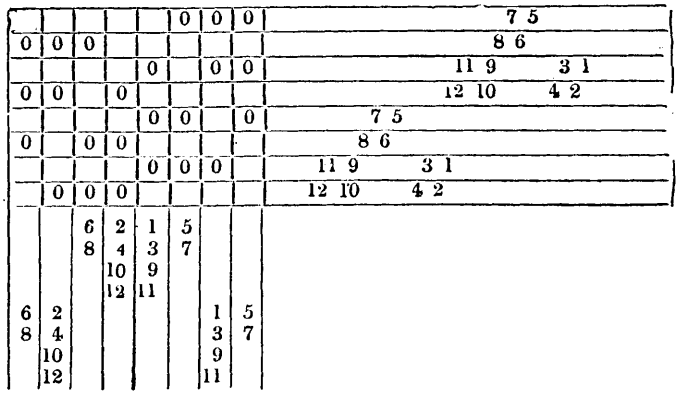
DIAGONAL SPOT, FOUR SETS.

No. 30.



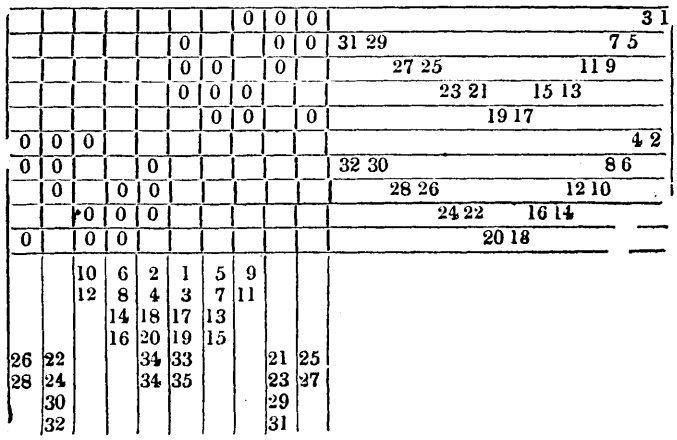
CLUB SPOT.

No. 31. Fig. 26.



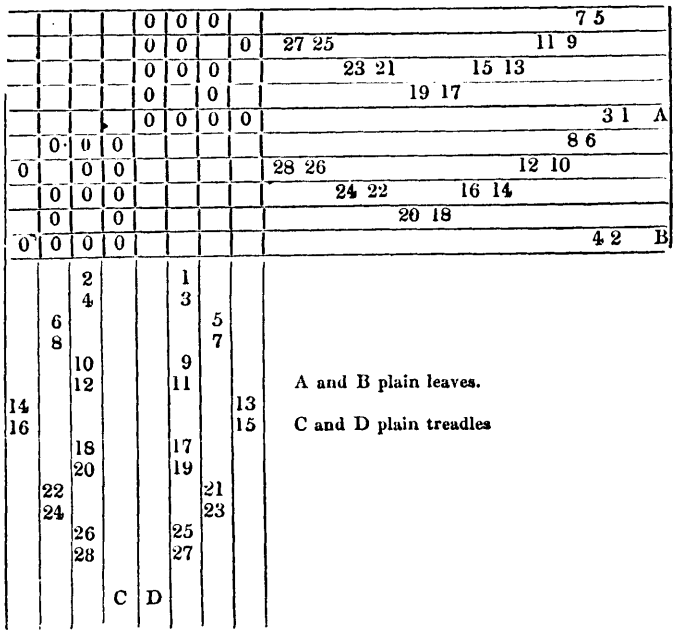
DIAMOND SPOT.

No. 32.



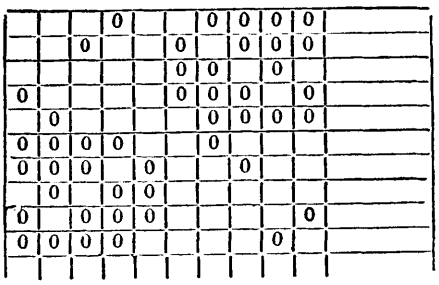
A CIRCULAR SPOT.

No. 33.



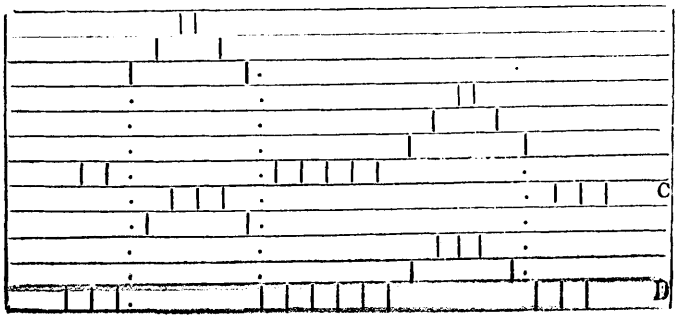
When the warp and weft of a dumb-flower are of different colours, some portions of the warp may be raised contiguous to the flushed parts of the weft, with which it will form a contrast. Thus, if the warp of the mounting No. 32 were white, and the weft black, and the cording arranged as in the following plan, the pattern produced would appear as represented in Fig. 27, in which the nine small squares would exhibit the black weft flushed over the warp, and the white squares, the warp raised above the weft.

No. 34. Fig. 27.

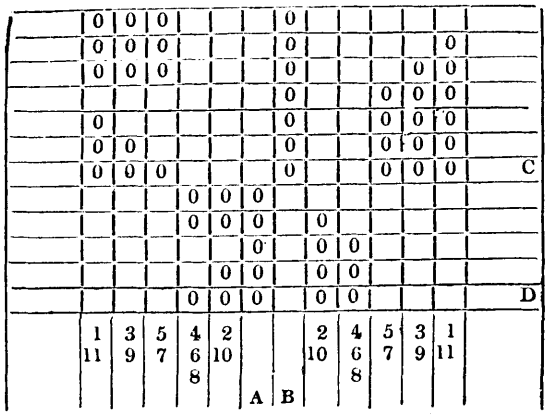


The draught and treading of this plan are the same as No. 32. When round spots or other figures which begin and terminate in a point are woven on dumb-flowers, an odd thread is usually introduced into the centre, as in the paper spot mountings. The following plan is the draught and cording of the round spot in Plate 9, Fig. 1, woven as a dumb-flower.

No. 35. DRAUGHT. Fig. 1. Plate 9.



No. 35. CORDING.



A and B plain treadles. C and D the plain leaves

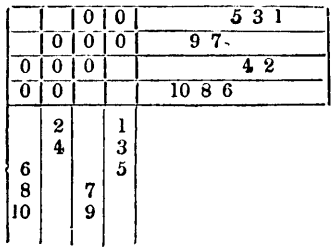
In the preceding plans, No. 28, 29, 30, and 31, have the two leaves of each set placed together, and in the others they are separated, so that the weaver may adopt either of these methods at pleasure.

It is further to be observed of these and other draughts of dumb-flowers in which the several members of the spot are drawn on two splits, that the draughts on each set of leaves may be increased to three, four, or more splitfuls, according to the fineness of the reed, or to the intended size of the figures. Particular care must also be taken in making patterns for dumb-flowers, that the flushed parts do not bear too great a proportion to the plain or ground, otherwise the fabric of the cloth would be enfeebled, not only by the too frequent repetition of the members, but also by giving the flushing a range over too many threads in one place.

The two following plans are adapted to coarse fabrics for towels, &c.

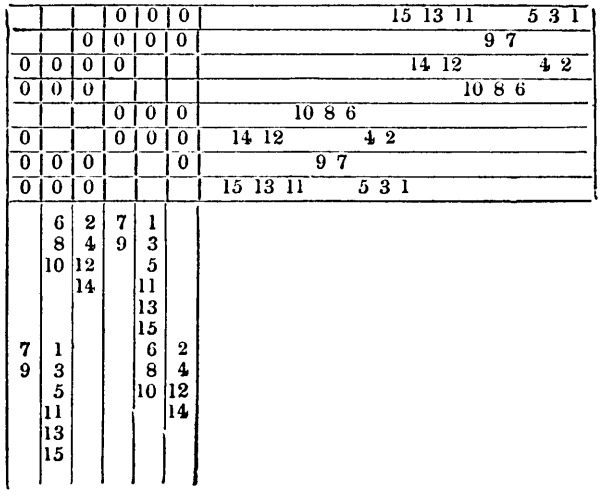
HUCKABACK.

No. 36.



DARLINGTON.

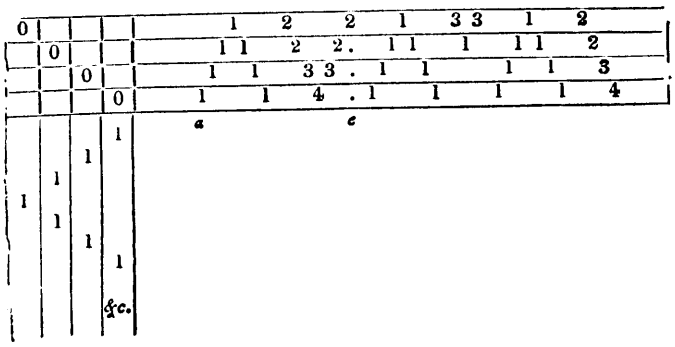
No. 37.



As the diversity of the diaper pattern draughts has been introduced with advantage into several other branches of fancy weaving; so it may be made to afford a very extensive variety in dumb-flowers. It is necessary to observe, however, that the greater proportion of the sets or divisions must be appropriated to the ground or plain parts, and the smaller to the flushing, to prevent the fabric from being too much weakened, as formerly noticed. Thus, were No. 2, Chap. iv. to be selected for a dumb-flower draught, it is evident that the patterns, Figs. 5, 6, 7, 8, Plate 4, are to be preferred to Fig. 9 on this account, though all produced by the same mounting. The following plans will show how Fig. 5 may be woven as a dumb-flower.

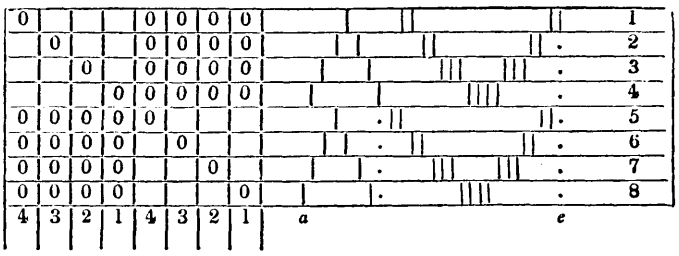
BINDING PLAN.

No. 38.



DUMB-FLOWER PLAN.

No. 39.



The draught in this plan is only that part of the original from *a* to *e*, to save room. In working over the treadles, the weaver takes the treadles 1, 1, alternately, which raise the two corresponding leaves 4 and 8 for the flush, while the others rise and sink alternately for the plain ground.—He then changes the treadles, in pairs, in the same order of succession as the draught, as in the other examples of diaper patterns.

CHAP. X.

COMPOUND MOUNTINGS, WITH THEIR DRAUGHTS AND CORDINGS.

It was observed at the commencement of this work, that the fundamental branches of weaving are, the plain texture, tweeling, spotting, double cloth, flushing, and crossed warps. The principles on which these branches are woven, as far as leaves are usually employed, have been investigated in the preceding Chapters. In the course of these investigations, the reader will perceive the facility with which patterns that are considered peculiar to one branch of fancy weaving, may be adapted to another. This has been fully illustrated in the application of diaper patterns to the several branches of double cloth, crapes, spots, &c. in which it will be observed, that this is effected merely by substituting what is termed one set of leaves peculiar to each branch, for one leaf of the binding or original plan. Thus, in the common and gauze spot mountings, the draught is the same as the binding plan, as each spotting leaf may be considered one set: but two leaves are requisite for one set of the paper spot, crape, flushing, and dumb-flowers, respectively; four for double cloth; while one set of tweeling leaves are substituted for each leaf of the binding plan in diaper.

By keeping this observation in view, the manufacturer will find ample scope for improving and diversifying his patterns in any particular branch of weaving; for, to what-

ever branch his attention may be chiefly directed, he can at all times avail himself of what is new or approved of in the other branches, and appropriate it to his own use.

But the great source of variety from which the cloth manufacture has been enriched, and which still continues to supply its demands, is the judicious selection and combination of those single mountings which are employed in the fundamental branches of weaving, and which remain to be explained in this Chapter; and first of

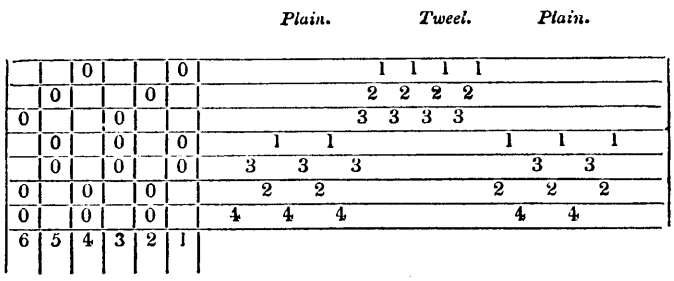
Spaced Draughts. When two or more mountings are requisite for any proposed pattern, a calculation must be made in order to ascertain the number of splits of the reed that will be contained in one set of the draught, the number of times the draught is to be repeated, and also of that portion of the draught which is to be allotted to each mounting. When these have been determined, they are all marked on their respective leaves in the plan of the draught, agreeably to the different kinds of texture or ornament of which the pattern is composed; and the cording of each kind is marked, if necessary, on those treadles which are to open the compound sheds.

The heddles for the coarser kinds of fancy goods, as formerly noticed, are usually knotted on the backing in such a manner that they may be shifted at pleasure, to suit any proposed change of pattern. For the finer kinds of goods, however, the heddles are always spaced on their shafts; that is, the heddles appropriated to each kind of texture or other ornament, are placed on their respective shafts directly opposite to those spaces of the reed through which their warp threads are to pass, leaving blank or vacant spaces for those parts of the pattern which are to be woven by the other mountings.

In order to mark these spaces off on the shafts, so as to correspond with their respective portions of the reed, the heddle-maker takes the number of splits in one set of the

pattern from the reed scale in a pair of dividers, and sets it off along a small rod made for this purpose, as often as the pattern is to be repeated, which is commonly specified in the weaver's ticket accompanying the chain. This rod is rounded on one side and flattened on the other, so as to remain steady in the frame below the backing, while the heddles are constructing, and pointing out by the marks of the dividers where they are to be knotted on that cord. Some attention is necessary, however, in taking these divisions from the scale; for a very small error, even though imperceptible at first, will accumulate to something considerable when often repeated. To avoid inconveniences of this kind, it is better to mark off the whole breadth of the heddles on the rod at first, which may be taken either from the reed, or measured off from the scale; and if the number of times the draught is to be repeated can be divided into any number of smaller parts, then divide one of these parts into spaces equal in size to one set of the pattern; after which, these spaces will be easily transferred to the other divisions without any risk of error. If the number of times that the draught is to be repeated should not admit of such division, one or more sets of the pattern may be deducted, by which a number can at all times be found which may be divided into smaller parts. When the divisions for one set of the pattern are thus marked off, they must be again subdivided into those spaces which are to be occupied by the different mountings; and the spaces for each leaf are either marked on a separate rod, or on different parts of the same rod, when the pattern is not too complex. To exemplify these remarks, we shall take the draught of a three leafed tweel stripe woven along with a plain ground.

No. 1.



This draught will be found to contain ten splitfuls of plain, and six of tweeling warp, which taken together, make sixteen splits in one set of the pattern, or as it is commonly termed, once over the draught. Suppose this web were to be woven in a 1200 reed and yard broad; and that two porters or 40 splits additional were allowed to uphold this breadth, making in all 1240 splits; then divide this number by 16, the number of splits in one set of the draught, and the quotient will show how often the pattern is to be repeated. Thus,

16)1240(77
112

120
112

8 splits over.

Now we find that the draught is to be 77 times repeated, to make up the breadth of the web, and 8 splits over, to which a few splits more may be added for selvages, less or more, as the manufacturer may find necessary.

Were the heddles of this mounting to be spaced, it would

be obvious, that by taking 16 splits from the scale for a 1200 reed in a pair of compasses, and setting this space off 77 times along the rod above mentioned, the marks would show where each set of the draught should be placed on the leaves, to make it correspond with the reed. Or, if the whole breadth of the web were first marked off on the rod; then, as the number 77 is composed of the numbers 7 and 11, viz. $7 \times 11 = 77$, the whole breadth may be divided either into 7 or 11 parts, and each of these again, subdivided into spaces equal to one set of the pattern, which would prevent any error which might take place by the frequent repetition of the smaller divisions.

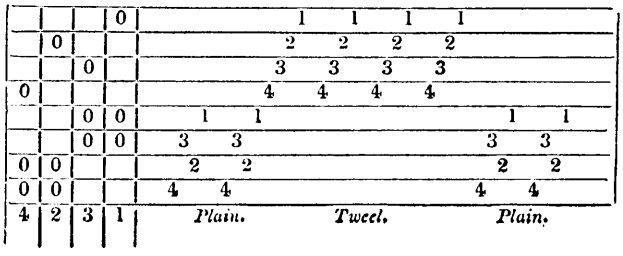
Again, by dividing each of these small spaces in the proportion of 10 to 6, leaving 5 splits at each side, that the half of a plain may be left between the stripes and selvages, the respective positions of the plain and tweeled stripes will be truly ascertained. It is not customary, however, to space such simple mountings as this example, especially for the plain parts, as a full set of plain heddles is commonly employed, and those heddles opposite the tweeled parts are left empty.

If the tweeled stripes were made of coarser warp than the plain, with two threads in each heddle, and two heddles to a split; then, to find the number of porters or beers of each kind of warp, supposing two threads to the split of plain, we multiply the number of times which the draught is repeated, viz. 77, by the number of splits in each plain, viz. 10, and the product gives the number of splits of plain or fine warp; but to this the allowance for selvages must be added. Thus $77 \times 10 = 770$ splits, or $38\frac{1}{2}$ porters, exclusive of the selvages. Again, as there are six splits in the tweeled stripe with four threads, or two ordinary splits in each, it will be $77 \times 12 = 924$, or 46 porters and 4 splits for the coarse portion of the warp; and so of any other of the same kind.

TWEELED AND PLAIN TEXTURES.—For patterns of this kind, the mountings, as will appear by the preceding example, will consist of one set of plain, and one set of tweeling leaves, and the raising and sinking cords of the plain mounting are tied alternately on the tweeling treadles. It must be observed, however, that in all mountings which have an odd number of tweeling leaves, double the number of treadles are requisite, in order to make the plain sheds alternate without interruption. Thus, in the foregoing example, which is the plan of a three leafed tweel stripe, it will be found that the first and third treadles would raise the same plain leaf; as will also be the case with the first and last treadle of every odd leafed tweel; consequently, these treadles cannot follow each other without interrupting the order of the plain sheds; and, therefore, the number of treadles must be doubled to maintain this order. All tweel stripes, however, which have an even number of tweeling leaves, are woven with one set of tweeling treadles, as the sheds of the plain parts can then be made alternate without any interruption. The following examples will sufficiently illustrate these remarks.

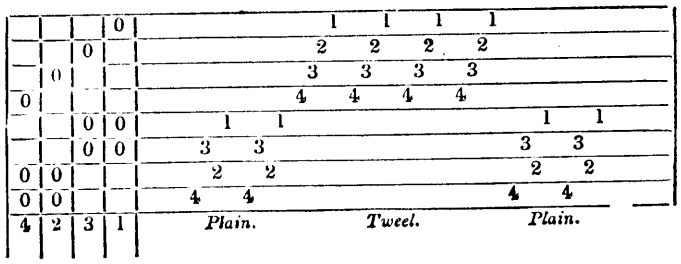
No. 2.

A FOUR LEAFED REGULAR TWEEL AND PLAIN STRIPE.



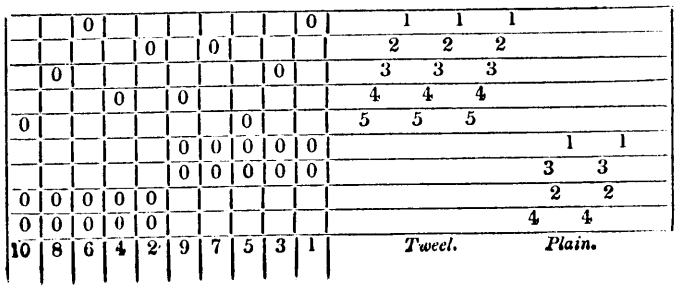
No. 3.

A SATINET TWEEL AND PLAIN STRIPE.



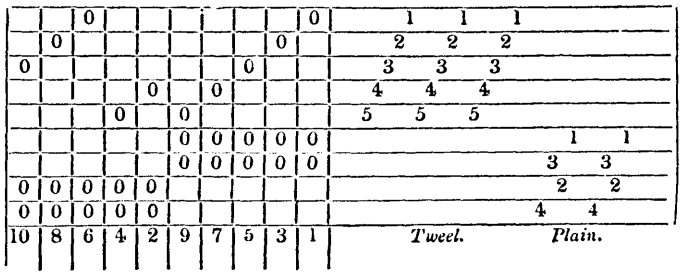
No. 4.

A FIVE LEAFED REGULAR TWEEL AND PLAIN STRIPE.



No. 5.

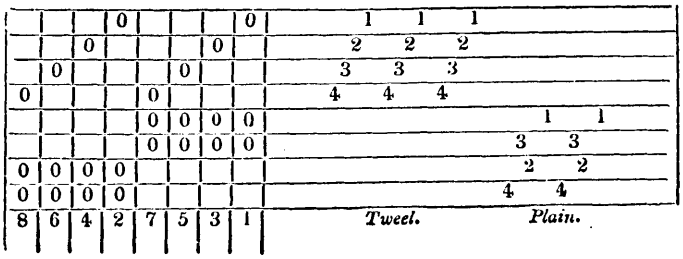
A FIVE LEAFED SATIN TWEEL AND PLAIN STRIPE.



In the following plan of a four leafed tweel stripe, each tweeling leaf is raised twice in succession, in order to lengthen out the flushing, which renders eight leaves necessary to raise the plain leaves alternately.

No. 6.

LONG TWEEL.

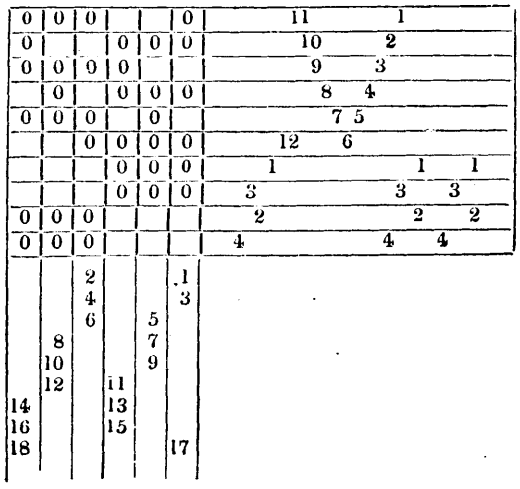


In all these examples, the greater portion of the tweeling leaves are sunk, and therefore, the weft will appear to most advantage on the upper side of the cloth while in the loom. This method is generally adopted when the pattern will permit, as the weaver finds it most advantageous to raise the smaller, and sink the greater portion of leaves.

Sometimes the draught of a tweeled stripe is made in the diamond form, and the pattern produced is commonly called a dart stripe, or herring bone. The following plans are examples of these stripes.

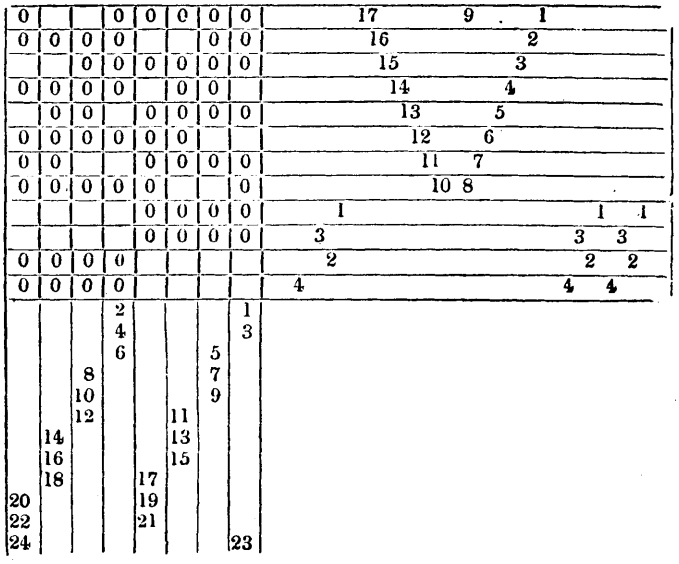
No. 7.

DART STRIPE.



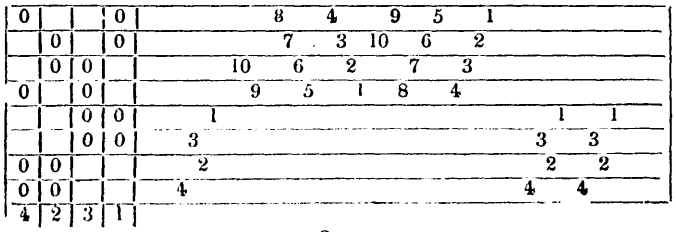
No. 8.

DART STRIPE.



No. 9.

A HERRING BONE STRIPE. Fig. 27. Plate 1.



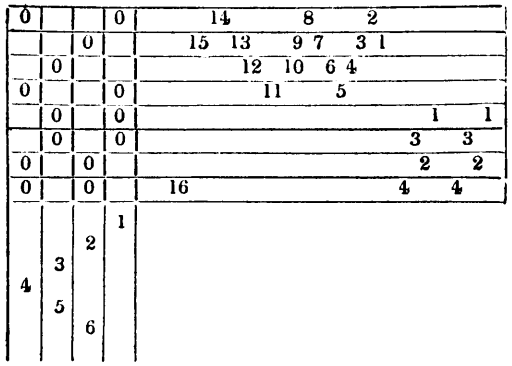
In Nos. 7 and 8, the tweeled warp is thrown to the upper side of the cloth, and the flushing is lengthened by continuing the treading on each pair of treadles, to six shots.

In No. 7, there are twelve draughts in the dart stripe, which, supposing two threads in each heddle, and two heddles to make a splitful, would fill six intervals of the reed. But as the dart forms a point at the sixth draught, where there is only one thread on that leaf, the stripe would be complete with only eleven heddlefuls. This, however, would leave only one heddleful for the last split of the stripe, which would have been taken into the reed along with the first thread of the following plain, if the twelfth thread had not been taken into a heddle on the fore leaf at 12. This method of disposing of the twelfth thread, to make complete splitfuls of tweeling warp, occasions no other injury to the figure, than that one barb of the dart is a little longer than the other. In No. 8, the odd thread is introduced at the point where the threads 8, 9, 10, are taken through one interval of the reed. Each of these methods is occasionally adopted, as the manufacturer may suppose best to suit his purpose. It may be further remarked, that when stripes are wanted broader than these examples, it is only necessary to repeat the draughts on each side of the point as often as is necessary to make the requisite breadth.

Bird-eye patterns, such as those explained in Chapter III. may also be woven in stripes along with plain or other textures. The following are examples:—

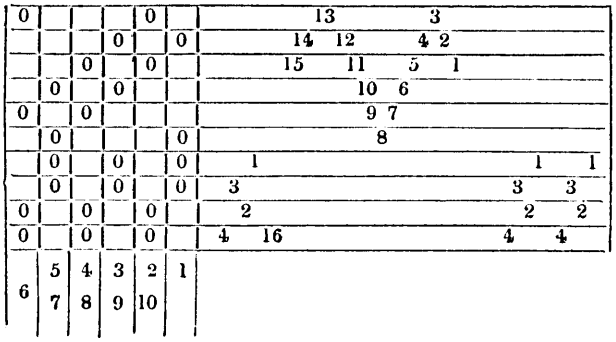
No. 10.

BIRD-EYE STRIPE.



No. 11.

BIRD-EYE STRIPE.

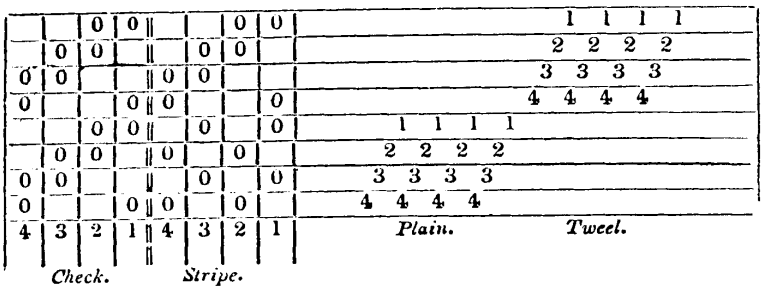


In these two draughts, the threads marked 16 of the plain stripe, are taken into the same intervals of the reed along with 15, in their respective mountings.

When the web is to be tweeled across, in order to form checks or the borders of handkerchiefs, the same number of leaves must be employed for the ground that are requisite for the tweeled stripe. Thus, to convert a four leafed tweel stripe into a check, the common plain mounting of four leaves, will produce a similar tweel across the web. But should the stripe be woven in a six or eight leafed tweel mounting, the plain parts must also be drawn on six or eight leaves, and each leaf is corded so as to rise and sink alternately in the plain parts, but to produce the tweel in the check. Hence it will appear, that a stripe with an odd number of tweeling leaves will not admit of a similar tweel for the crossing or check, as the ground leaves must always be divided into equal portions in weaving the plain parts.

No. 12.

A FOUR LEAFED TWEEL CHECK.

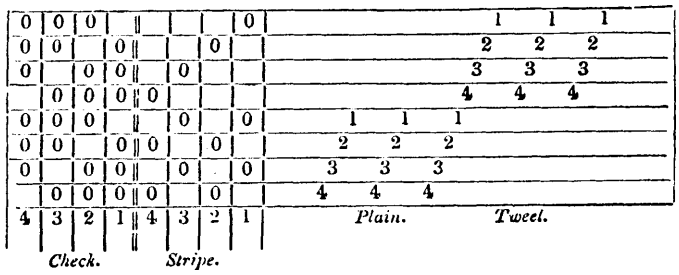


In this example the tweeling is alike on both sides of the cloth; but in those that follow, the warp of the tweeled

stripe and weft of the check or cross border, appear on the under side of the cloth while in the loom.

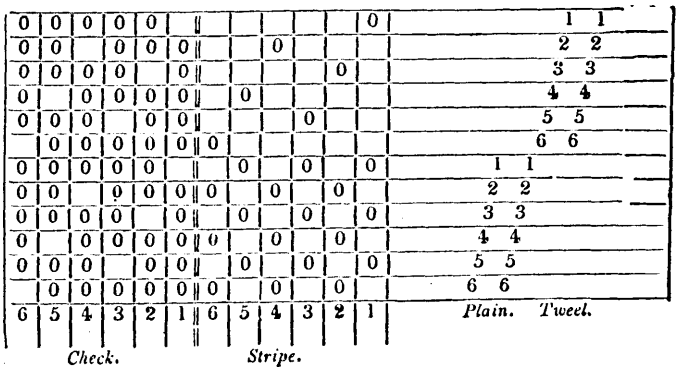
No. 13.

FOUR LEAFED REGULAR TWEEL CHECK.



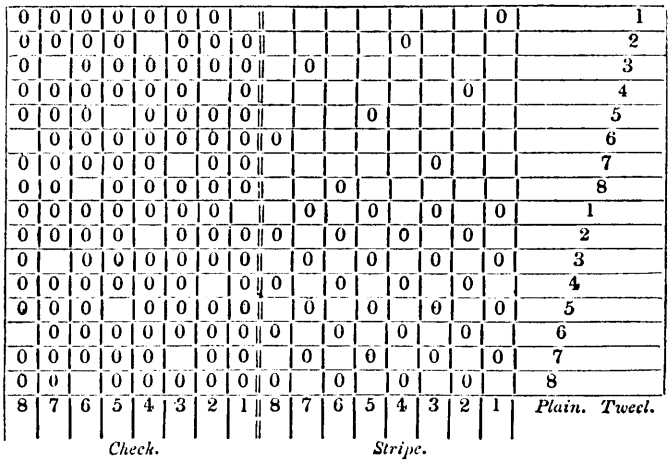
No. 14.

SIX LEAFED SATIN TWEEL CHECK.



No. 15.

EIGHT LEAFED SATIN TWEEL CHECK.



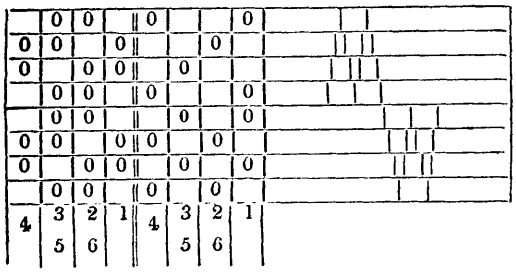
In Nos. 13, 14, and 15, the treadles of the stripe raise and sink the plain leaves alternately, and each treadle raises one leaf of the tweel, leaving the greater proportion of the warp below: but the check treadles raise all the leaves but one, both in the plain and tweel; and consequently, the check weft will also be thrown to the under side of the cloth, so as to correspond with the warp.

From these examples it will obviously appear, that any tweel of an even number of leaves may be converted into stripes and checks; and if the stripe be formed into a dart or herring bone, the plain may be woven by a single over and over draught, and converted into a check the same as the stripe, by working over the treadles in one direction for half of the cross stripe, and reversing the order of treading for the other.

Bird-eye patterns may also be woven in checks after the same manner; one example of which is subjoined.

No. 16.

BIRD-EYE CHECK.



COMBINATIONS OF GAUZE, &c.

Gauze, veining, purles, spidering, &c. are also variously combined with several of the other branches of fancy weaving, and produce some of the most beautiful and delicate patterns in the silk and cotton manufactures. But as it is not customary to accompany these compound draughts with a plan of cording, on account of the difficulty of representing the mountings of crossed warps on paper, one example will be sufficient to show how this may be effected.

Fig. 11. Plate 6, is the plan of a mounting for weaving plain gauze, plain texture, and veining, in stripes; consequently, three distinct mountings are requisite. The treadle marked 1 opens the cross shed of the vein and one of the sheds of the plain mounting, but sinks the whole of the plain gauze warp. Treadle 2 opens the cross sheds of

both vein and gauze, and reverses the shed of the plain mounting. Treadle 3 produces the open sheds of both gauze and vein mountings, and the same plain shed as treadle 1; and the treadle 4 produces the open shed of the vein, and the same plain shed as treadle 2, but sinks the whole of the gauze warp. The order of working over the treadles, therefore, will be 1, 2, 1; 4, 3, 4. The weft which is flushed over the plain gauze is afterwards cut away, as in spotting.

It must be observed, however, that when gauze and plain are woven in alternate stripes, those parts of the reed which are occupied by the plains will be full; but in the gauze spaces, a splitful of the warp passes through every second interval only; consequently, the set of reed in the former, will, in general, be double of that in the latter. And hence, when additional weft is thrown in, as in the above example, the plain texture will make a pretty bold contrast to the light transparent fabric of the gauze.

Other proportions, however, have been assumed between the gauze and plain grounds, so as to combine a finer sett of the former with a coarser sett of the latter. Thus, a 1200 gauze woven with an 1800 cambric or jaconet, has been considered a very good proportion; the fine gauze setting off the plain ground to more advantage than when it is only half of the sett of reed. In webs of this description, the reed must be spaced to the pattern, the warp of both gauze and plain being suited to their respective fabrics: and the greater proportion of weft which is necessary for the 1200 reed, renders only one shot of plain requisite between the shots of gauze.

When cambric and gauze are woven in alternate squares, or checker patterns, two sets of gauze and two of plain heddles are necessary; and when greater variety is required, additional sets of each must be added, as in the other branches of fancy weaving. When the number of gauze

sets, however, exceed two, they are, in general, curtailed, by omitting the upper doup and standard, in the manner formerly explained.

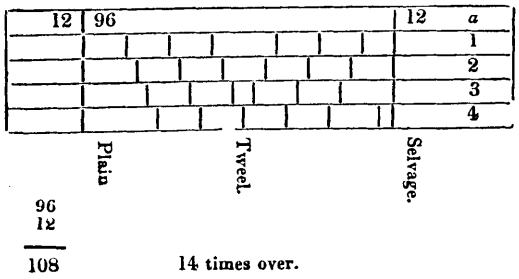
As the warp of gauze, when converted into plain texture, produces but a very thin or flimsy fabric, it is necessary to introduce additional warp as well as weft into those parts which are woven plain, which, one being flushed above, and the other below, the gauze spaces, are afterwards cut away. A splitful of this additional warp is taken into the reed alternately with a splitful of the gauze; so that the former, as noticed above, is exactly double the set of the latter.

This method of forming patterns with gauze and cambric, like some of the other branches of fancy weaving, may be extended to all the varieties of a diaper mounting: for any draught of the latter may be adapted to the former, merely by substituting one set of gauze, and one of plain leaves, for each set of the tweel, and varying the succession of the draught and treading accordingly.

It is not customary, as was already observed, for the manufacturer to annex the plans of cording to these compound draughts; neither is it always necessary, particularly in extensive business, to represent in the draught every leaf which is requisite in the mounting. All that is commonly required in the draught is, to point out to the heddle-maker, the quantity and arrangement of each kind of warp in one set of the pattern, with the number of times the pattern is to be repeated; and to the weaver, the order of succession in which these several warps are to be drawn into their respective mountings; each being supposed to understand his own department. The following examples will illustrate these remarks.

No. 17.

A 1200 $\frac{5}{4}$ TWEEL STRIPE LAPPET.



96
12

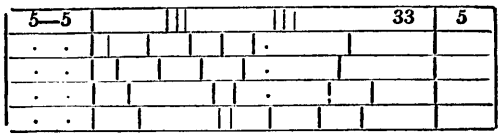
108 14 times over.

Here the leaf *a* represents the plain mounting; but it is necessary to draw all the four leaves of the tweel, to show the variety in the draught. There are 12 splits of selvage on each side, which are 12 splits of the reed; but as there are usually a few splits single, or clear of the selvage, which suppose to be 5, there will 7 neat remain for the selvage, which must be double, that is, two threads in the heddle, and two heddles to the split, so that 7 additional splitfuls of warp must be allowed on each side for this purpose.

Again, there are 96 splits plain on which the lappet is woven, and 12 splits in the tweel stripe, which make 108 splits in one set of the pattern, or once over the draught. This multiplied by 14, the number of times the draught is repeated, gives 1512 for the neat warp. To this must be added 24 for the two selvages, together with 14 for the seven twists or double warp on each side; so that the whole warp in the web will be 1550 splits. But when the tweeled stripe has two threads in the heddle, and two heddles to the split, which is commonly the case, the striping warp must be doubled. Another example of the same kind.

No. 18.

A 1100 $\frac{5}{4}$ TWEEL STRIPE LAPPET.



Selvage. Clear.

33 Plain.
3 do.
3 do.
11 Tweel.

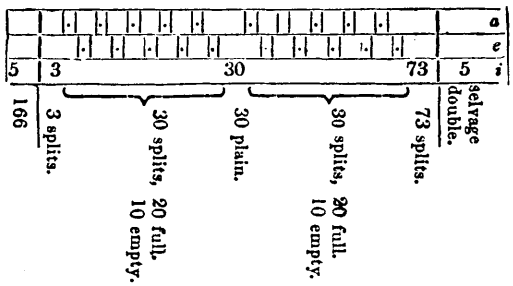
50 27 times over.

Here there are 5 splits double for selvages on each side, and 5 clear between the tweel and selvage on the left. This calculated as in the preceding example will give 1370 for the warp, including the selvages. It may be farther observed, that each mark on the leaf representing the plain mounting denotes one splitful of warp, while those on the tweeling leaves are only single threads.

When gauze, veins, &c. are introduced into a pattern, one leaf will also represent a set of each kind; and these mountings will be sufficiently distinguished from the plain ones, by placing dots where the empty intervals of the reed occur, as in the following examples:—

No. 19.

A 1200 $\frac{5}{4}$ PURLE STRIPE.



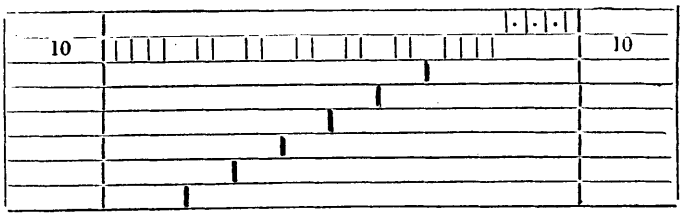
a and *e* are the two sets of gauze mounting for the purle, and *i* the set for the plain.

In this example there are 166 splits of the reed in one set of the pattern. Now suppose 1500 splits of warp, or rather 1500 splits to be counted of the reed; then 1500 divided by 166, gives 9 times over the draught, and 6 remaining, to which add 4, makes 10 for the selvages. Now to ascertain the quantity of warp of each kind, we have 73 for one stripe of plain, 30 for another, and 3 for the third, which added together make 106. These multiplied by 9, the number of times the draught is repeated, gives 954, to which add 20 for the two selvages, four threads being a splitful, and the sum will be 974, or 48 porters and 14 splits, for the whole of the plain warp.

Again, there are 40 full splits of the purle, 20 in each stripe, which multiplied by 9, gives 360 splits, or 18 porters of gauze warp, making in all 66 porters and 14 splits. After the same manner may the warp of the following draughts be calculated.

No. 20.

A 1300 $\frac{4}{4}$ VEINED SEED.

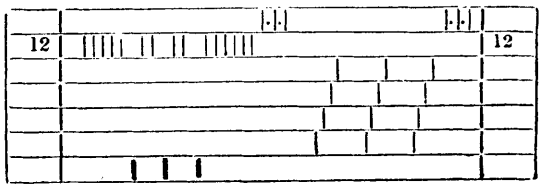


25 splits in the draught.
47 times over.
5 splits selvage, and 5 clear.

In patterns of this kind, the seeding cords which are marked bolder in the draught than the others, are supernumerary, and are taken into the reed along with a splitful of the ground. They must therefore be calculated separately from the warps. Thus, there are 6 seed cords in one set of the pattern, which multiplied by 47, the number of times the draught is repeated, gives 282 for the number of cords in the web. Another example will sufficiently illustrate these remarks.

No. 21.

A 1400 $\frac{4}{4}$ TWEELED VEIN SEED.

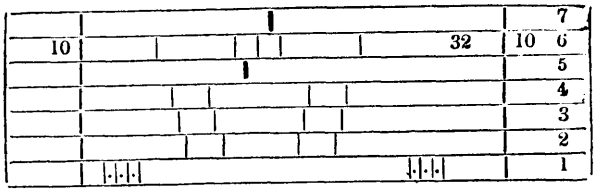


31 splits. 44 times over. 5 splits selvage, and 7 clear.

When spidering forms a part of the pattern, one leaf likewise represents that part of the draught: but as this mounting is usually placed before the other leaves, its representative is sufficiently distinguished from the other varieties of gauze, by placing it in front, as in the following plan.

No. 22.

A 1100 $\frac{5}{4}$ TWEELED SPIDER CORD.



50 splits. 22 times over.

Here the leaf 1 represents the spider mounting; 2, 3, 4, the leaves of a three leafed tweel; 5, a cord leaf; 6, the plain mounting; and 7, another leaf for a cord. In this pattern, each cord is taken into an interval of the reed distinct from the ground.

THE DRAW LOOM

Plate II

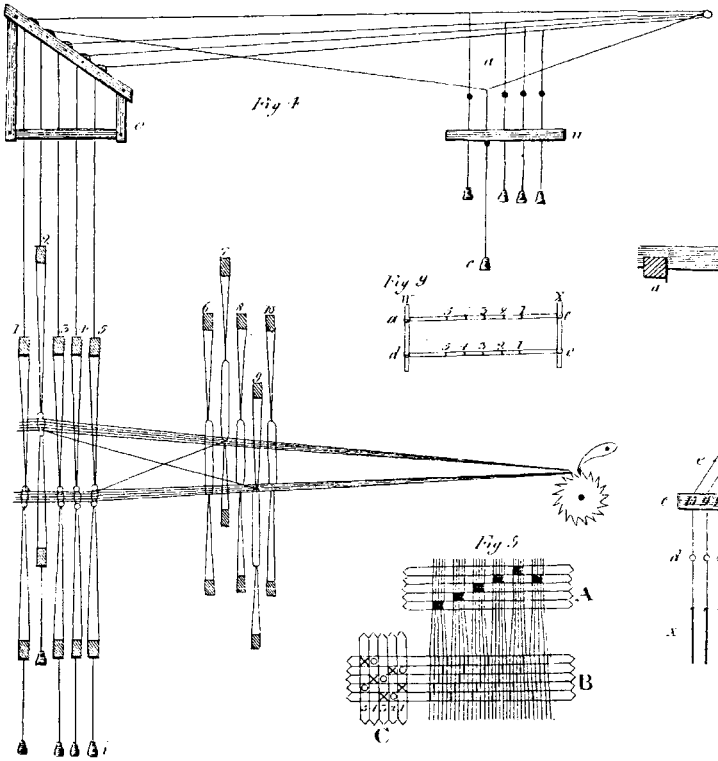


Fig 4

Fig 9

Fig 5

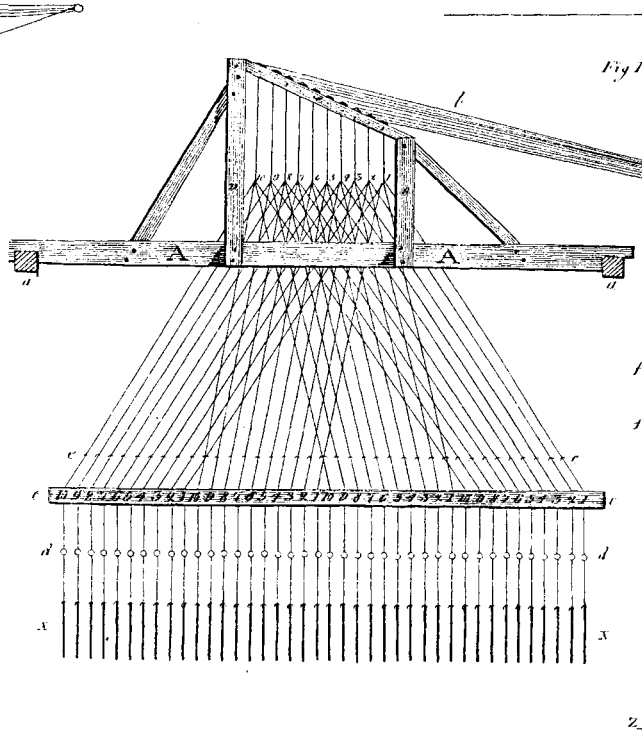


Fig 1

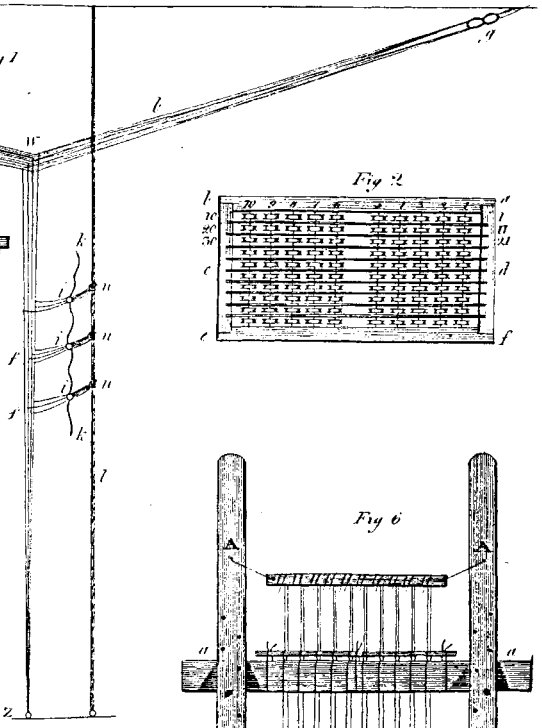


Fig 2

Fig 6

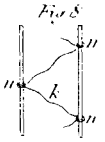


Fig 8

Fig 7 Reed Scar. 37 Inches

				A	B	C
20	2|0	4|0	6|0	54	65¾	108
19	2|0	4|0	6|0	51	62½	102
18	2|0	4|0	6|0	49	59	98
17	2|0	4|0	6|0	46	56	92
16	2|0	4|0	6|0	43	52¾	86
15	2|0	4|0	6|0	41	49	82
14	2|0	4|0	6|0	38	46	76
13	2|0	4|0	6|0	35	42¾	70
12	2|0	4|0	6|0	32	39¾	64
11	2|0	4|0	6|0	30	36	60
10	2|0	4|0	6|0	27	33	54
9	2|0	4|0	6|0	24	29¾	48
8	2|0	4|0	6|0	22	26	43
7	2|0	4|0	6|0	19	23	38
	1	2	3	4	5	6	7			

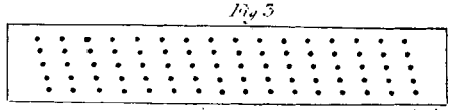


Fig 3

Drawn by J. Joseph

A. Splitsman Inch. B. Manchester and Bolton. C. Stockport. Pubd by Blackie & Son, Glasgow.

Engraved by J. Maclure

CHAP. XI.

OF THE DRAW LOOM.

SECT. I. OF THE COMPONENT PARTS, AND CONSTRUCTION OF THE DRAW LOOM.

HAVING explained in the preceding Chapters, the elementary principles of Fancy Weaving, exhibited some of their most useful combinations, and illustrated the whole with numerous and appropriate examples, it now remains to show how these principles are extended beyond the power of leaves, by means of the draw loom.

DESCRIPTION.

The principal parts of the draw loom are the carriage and pulley box, the harness and hole board, the tail, the simple, and the lashes. Fig. 1, Plate 11, is a front view of the common draw loom, or rather an outline of it, for the whole could not be represented on paper without running into the utmost confusion. The frame, A A, is called the carriage, from its use in supporting the harness, and rests on the side rails, or capes of the loom, which are seen in section at *a a*. On the top of this frame is fixed the pulley box *e*, which contains the pulleys or whorles, over which the tail cords *b b* run, when any part of the harness is raised to form a shed. This box, a horizontal view of which is given in Fig. 2, is placed in a slanting position, the slope

being made sufficient to allow the tail-cords *b*, to sink in opening the sheds, without obstruction from the frame or pulleys below.

The harness is that part of the draw loom which supplies the place of the spotting or flowering leaves; and, exclusive of its appendages, extends from the figures, 1, 2, 3, &c. between *u* and *o* in the carriage, down to the leads *x x*, and is composed of the following parts: namely, the neck twines, which extend from the neck at the figures 1, 2, 3, &c. to the knots at *e e*, the sleepers which connect the neck twines with the mails at *d d*; the mails which are the substitutes for the eyes of heddles through which the warp is drawn, and of which a more distinct view will be found in Fig. 4; the twines which connect the mails and leads, or weights, at *x x*, called hangers, and the leads, which are cylindrical pieces of lead attached to the harness, to sink the mails after they have been raised to form the sheds.

C C is the hole board, through which the sleepers pass, and which regulates the distance of the mails and the fineness of the harness. The face of this board is represented in Fig. 3; in which it will be observed, that the holes for the harness twines run in oblique lines, that the mails, or eyes, may have sufficient room to stand directly opposite to their respective intervals of the reed, without being too much crowded together. The reed and hole board, therefore, must be of the same sett, or fineness; or, should a hole board of a finer sett than the reed be at any time employed, the supernumerary holes must be left empty at regular intervals, and in complete rows, as in the method followed by weavers in setting their heddles. It may be observed, however, that although the setts of reeds in Scotland be calculated on 37 inches, yet the setts of the hole board are comprised in 36; so that in 37 inches of the hole board, there will be the number of splits contained in one inch of any given sett, more than in the same breadth of the reed. As

each part or division into which the harness is tied, begins always with a complete row of the hole board, this addition is made as an allowance for any holes that may be left empty at the ends of such parts as are not multiples of five.—Thus, were the harness to be tied into such parts as 60, 65, 70, 75, &c. mails, every part would exactly fill a certain number of rows in the hole board, when there were five in each row; but in a tie of 72, for instance, there would be three holes left empty at the end of each part; which consequently would make the harness considerably broader than the reed, were it not for the above allowance. It may be farther remarked, that although in the present example there are only five holes in each oblique row in the board, which is the number appropriated to four thread harnesses; yet, in split and full harnesses, where a greater number of mails must necessarily occupy the same space, the number of holes in each row is extended to ten. From these observations, it will evidently appear, that two mails, or eyes, will stand opposite to one split of the reed in a full harness; one in a split harness; and in a four thread harness, one mail will occupy the space of two splits.

The tail *b w b*, extends from the knots at the neck to the tail stick *g*, by means of which it is fastened to the roof or ceiling of the shop. From the tail at *w* descends the simple cords *f*, or as they are termed collectively, the simple or symbolt, down to the floor at *z*, where they are fastened by another stick similar to that of the tail. It is on this part of the draw loom that the pattern is read from the design. The twines at *i*, are termed the lashes, or leashes, and are necessary for separating the simples of any shed which is to be opened from those that remain stationary:—*n n* are the heads to which the lashes are attached, and which are made with a noose to run on the gut-cord *l*, at pleasure. The gut-cord commonly extends from the roof of the shop to the floor, parallel to the simple: *k k* are the bridles,

which being connected to the lashes, at equal distances, draw them down in succession, as they are wanted by the draw-boy.

The number of mails necessary to produce one set of a pattern, or, as it is termed in leaf mountings, once over the draught, make what is denominated a part, or the tye of the harness: and, as every mail in one part must rise independently of the others, each must have its respective cord, both in the tail and simple; so that the greater the range of the pattern, the greater will be the number of simple cords. Hence, it is evident, that were a harness to be tied in one part only, there would be a tail and simple cord for each mail in the breadth of the web. But as patterns of this extent are not very common, it is usual to divide the harness into such a number of parts as may be most suitable to that species of goods on which it is to be employed; and these parts are repeated, to make up the full breadth of the web. By this means, the number of tail and simple cords, together with the pullies, 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.

CONSTRUCTION.

When a harness is to be mounted, or built, as some term it, a frame such as is represented in Fig. 6, must be procured, and the two upright sides A A, called standards, are fastened to the inside of the loom, one on each side, and in the very same position between the cloth and warp rolls, which the harness is afterwards to occupy. The cross bar of wood, or slabstock *a a*, slides up and down

in grooves cut in these side pieces or standards, 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 slabstock, which is somewhat rounded, is a groove, into which the under ends of the mails are inserted during the process of mounting the harness.

The frame or standards 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 hole in 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 both backward, one on each side, to knot them together. These twines or hangers are made of flaxen yarn, from three to five ends laid together and well twisted, but the number of ends depends much on the weaver's choice. This is the same kind of twine which is used in the construction of heddles, mentioned in pages 2 and 3.

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 of 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 filling, 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, 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 proportionally lighter, and the contrary. The leads for the borders of a two thread, or split harness shawl, are the same as those of the four thread, provided the borders are not gathered; but for gathered borders, which doubles the number of leads attached to each simple cord, they are from twenty to twenty-five in the pound, and of the same length as the fourteen. 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 heavier must the leads be 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. The border leads of full harness shawls are the same as those of the split harness.

When the leads are all hung, and the under ends of the mails inserted in the groove of the slabstock, a piece of strong wire flattened by passing it between a reedmaker'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 foot 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. 6.

When eyes are to be formed in the harness instead of mails, the wire above-mentioned is used in the round state. These eyes are cast on the round wire after the leads are hung, by taking that part of the twine called the sleeper, through the upper bow or loop of the hanger; then taking one end on each side of the wire, and casting two knots, after the manner of making eyed heddles. As it would be difficult, however, to extricate the wire out of so many knots, all pretty tightly tied, a small slip of wood is placed on the top of the wire where the knots are tied, and drawn out gradually as the operator proceeds, leaving the wire only in the eyes at the end of the process. This gives relief to the wire, and allows the eyes to be shifted with ease to their respective places in the hole board.

When the sleepers are thus attached, either by forming eyes, or 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 number of which, and mails in each, having been previously ascertained. The holes in the hole board are then counted off for each part, commencing with the hole nearest the right hand selvage, which, if a right hand harness, will be in the front as at *a*, 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 hole board. Then if the part be composed of any number of fives, as 50, 55, 60, &c. ten, eleven, twelve, &c. of the oblique rows are set off for each part, respectively; but if the part is not divisible by five, as for example, 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 double, through their respective holes in the board, in the same succession as an over and over draught, each part, as already noticed, beginning with a complete row.

The hole board is next fixed very firmly in the centre of the loom, exactly in the same situation in which it is afterwards to stand, and at the height of about seven 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 hole board, about fifteen 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 farther than a full harness from the slabstock, which is that wooden bar over which the cloth passes to the receiving roll. The common distance of a pressure harness from the slabstock, is about twenty-two inches; of a full harness, eighteen; and of a seeding harness, which, in general, is placed before the ground leaves, about twelve. The height of the mails in a full harness is about three-fourths of an inch below the level of the slabstock; in the split and four thread harnesses, the mails should stand about an inch, or inch and quarter below this level; and to these respective heights the hole 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 hole 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 denominated beeting 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 breadth of the harness. For example, for a harness fifty-four inches

wide, the neck twines may be about from four, to four feet six inches long.

In the process of beeting the harness, the snitch knot used on the treadle cords is sometimes employed, to enable the weaver to temper 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; in which case, the two ends of the sleeper are tied together, and formed into a snitch, through which the two ends of the neck twine are taken, and afterwards knotted.

Before the operator can proceed farther, the tail must be warped; which is effected by winding the twine of which it is composed round two nails or pins fixed in the wall or other convenient place, at a distance from each other equal to the whole length of the tail, and which is commonly about fourteen feet; though some tails are now made as short as twelve. 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. It is commonly made of yarn spun from Dutch flax, three ends or plies well twisted, and reeled into hanks containing 144 feet; from 19 to 22 of these hanks weighing a pound. Each hank, therefore, will produce ten tail cords, fourteen feet long, or twelve of twelve feet.

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 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, as represented at *g*, Fig. 1. The other ends of the tail cords are taken through the pulley box, with the assistance of a small hook, in the following order, that is, supposing the tail cords to be numbered 1, 2, 3, 4, &c. from the back of the tail as they occur in the lease, and the pulleys in the box, Fig. 2, likewise to be numbered 1, 2, 3, 4, &c. from the bottom of the backmost row at *a* to the top at *b;* then, the first ten cords will pass over the pulleys from 1 to 10, respectively; the second ten cords, over the pulleys from 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*. All these arrangements being made, and a wooden frame, called mounters or justers, such as that employed in mounting leaves with coupers, 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 ready for tying.

In the plan of a harness, Fig. 1, it will be observed, that there are ten mails numbered on the edge of the hole 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 hole board. But as there are five such holes in the board, Fig. 3, though, to save room in the Plate, there are only sixteen oblique rows, the harness may be calculated upon fifty mails for each part, which, though still on a very limited scale, will be sufficient to explain the principles on which the draw loom is mounted. Then either one or more assistants, as the extent of the harness may require, are stationed at the side of the hole board, to take up the harness twines in the order in which they occur, and hand them up to the person who ties the neck. In this example, the right hand twine of each part is selected and given to

PRINCIPLES OF HARNESS WEAVING

Fig 1

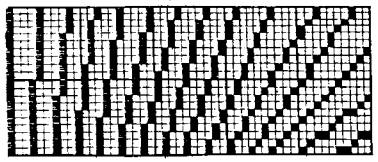


Fig 2

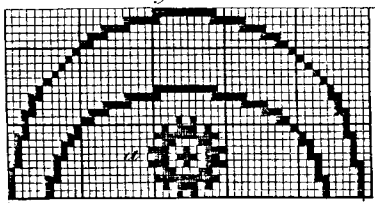


Fig 3

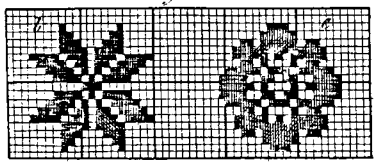
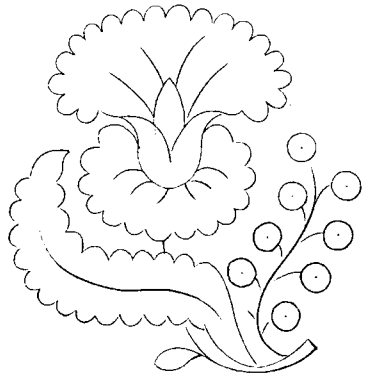


Fig 4



Drawn by J. Murphy.

Fig 6

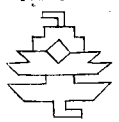


Fig 7

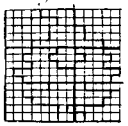


Fig 8

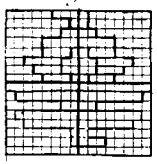


Fig 9

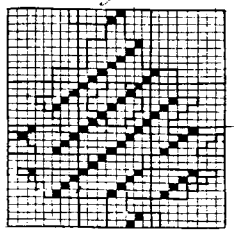


Fig 10

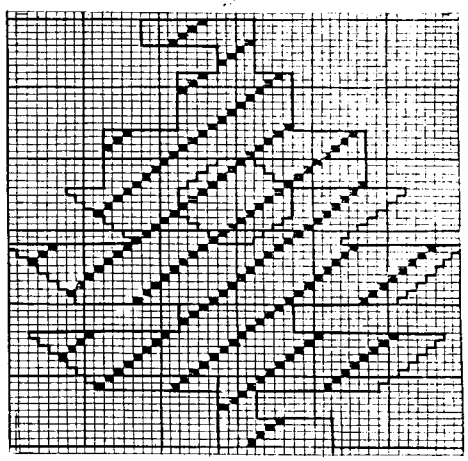


Fig 11

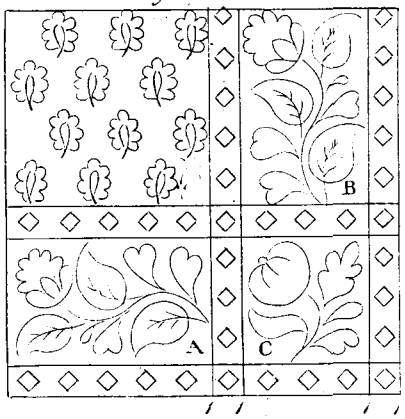


Fig 12

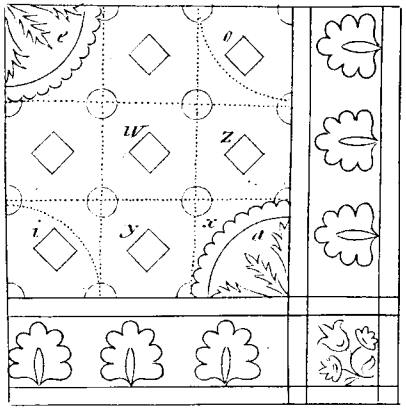


Fig 13

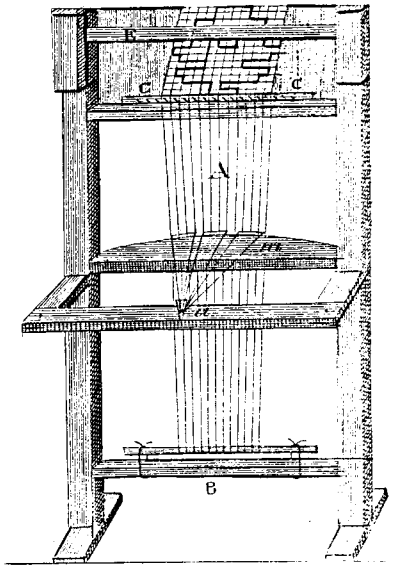


Fig 14

Fig 15

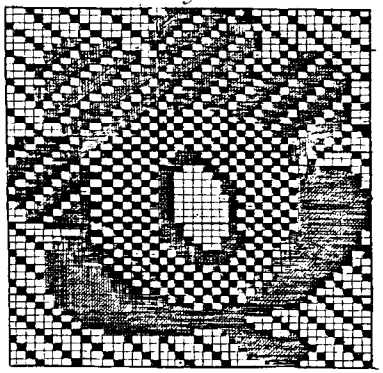
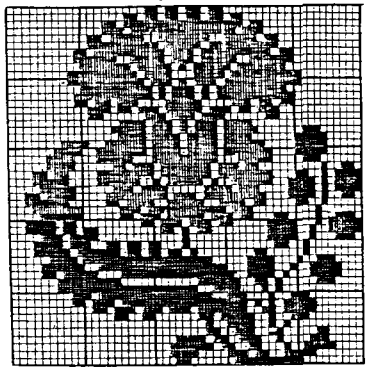


Fig 5



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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. It must still be remembered, however, that when the first ten tail cords are tied, which completes the first row of pulleys, the operator must commence again at the bottom of the box as at first.

The knot here employed is formed by taking the ends of the four neck twines in one hand, and the end of the tail cord in the other; then laying the former over the latter, the operator takes the turn of a knot on the upper part of the tail cord, or that part immediately above the figures in the drawing, 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 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 hole board.

The next step of the 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*, 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, three or more rows, according to the number of cords which it contains, as represented 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 *i i*, are formed by taking the lash twine round certain portions of the simple cords, as pointed out by the pattern on design paper, to be explained in the next section, and which, as formerly noticed, serve to select the simple 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 twist, and from six to eighteen ends or 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 where only few lashes are requisite for the pattern; but the more lashes that are on the simple, the finer kind of twine is applied, to occupy less space, and 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 *n n*, are small pieces of twine, which, as formerly observed, connect the lashes 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 cord.

The bridles *k k*, 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 generally from nine to thirteen inches between the heads; the longer ones being necessary when the draw employs what is termed a *dog*.

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 such as are made from 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. 8. 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. 9, in which *w* and *x* are two gut cords, placed at the distance of eleven to 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 foot 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 by the Figs. 1, 2, 3, 4, 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, then 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. 1, it will be observed, that as the harness twines incline from the hole board to the neck in very different angles, those towards the selvages, especially of 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, &c. 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 or standards, 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 hole 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 slabstock.

The process of drawing the warp through a harness, differs very little from that formerly explained under tweeling. 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 again 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. 1, 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; but all the tail and simple cords would retain their relative positions and connexions, 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 patterns on the simple, which will be further explained under that head.

It may be again observed, that in Fig. 1 the tying of the harness commenced at one side, or at the figure 1 in the hole 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 position 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 two former, 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 the teething mentioned under Paper Spots.

Again, were the same example, Fig. 1, to be taken for

the bosom or filling 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 represented in Fig. 2, and the tye of the harness would be said to be fifty bord 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, numbered 1 in Fig. 2, is tied to the first neck twine of each border, or those at the extremities of the hole board at *a* and *e* Fig. 3. 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 *e* 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, and so forth;

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. The body parts of the harness may therefore be considered as an extension of the spot draught, No. 48, page 215, the borders as a part of the diamond draught, and the gathered body, as the diamond draught on a more enlarged scale, which may all be carried to any practical extent.

But although the two borders in this example be actually gathered, yet this mode of tying does not produce what is commonly understood by a gathered border. In tying the latter, the two outside mails of each border are connected to the first tail cord, counting from the body; the two next in succession, to the second; and so on till they meet in the centre of the borders, when, in a right hand harness, the last tail cord will be at the right hand side of the tail. Hence it is obvious, that the tye of each border will form exactly what is termed the diamond draught; and consequently one half of the pulleys, tail, and simple, will produce a border of the same extent as the preceding method, although the diversity of patterns will be much more limited.

Sometimes corners, and frequently both corners and a centre flower are woven on shawls. In the former case, the border parts are made of a size sufficient to include the corners, but in the latter, a part equal to the size of the centre flower must be gathered in the middle of the harness. These, however, will be farther explained in the next section, under the Designing of Patterns.

CROSS' DRAW LOOM

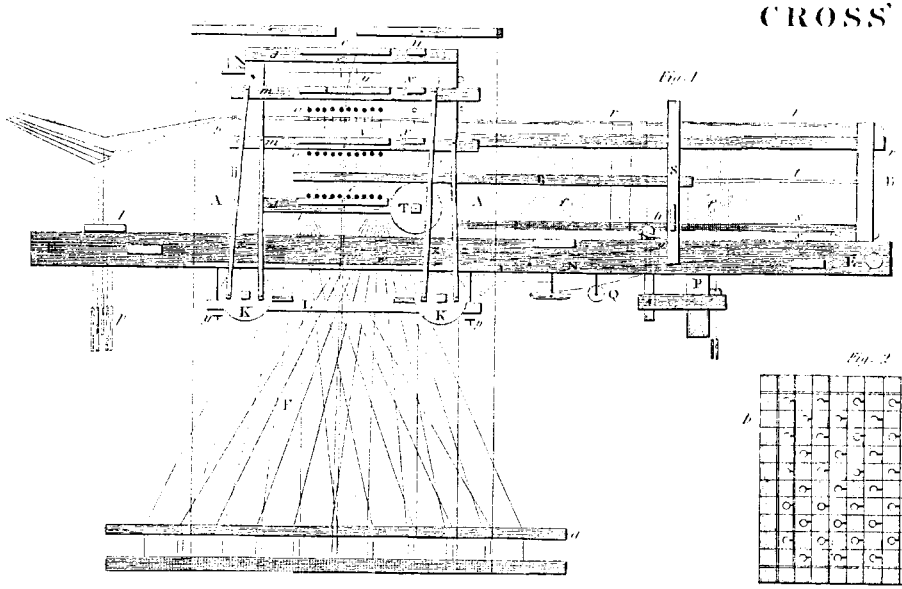


Fig. 1

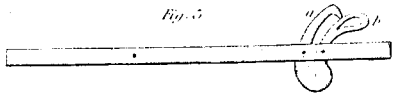


Fig. 5

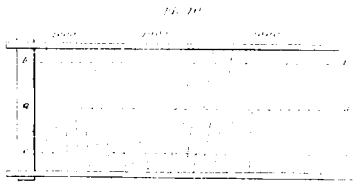


Fig. 10

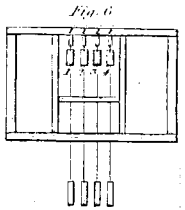


Fig. 6

Fig. 4

Fig. 2

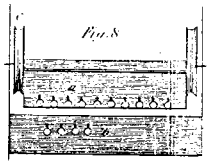


Fig. 8

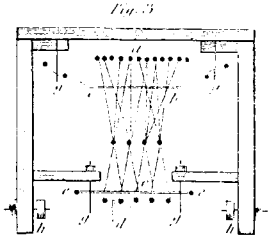
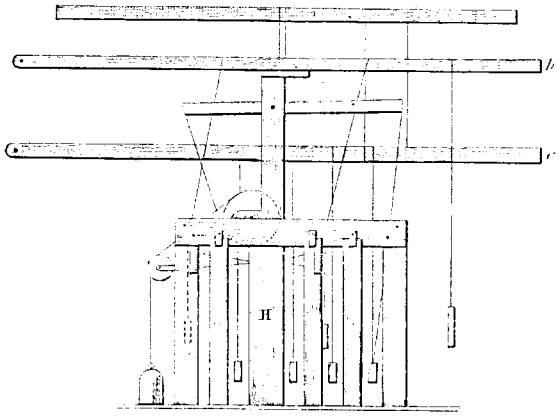


Fig. 3



G

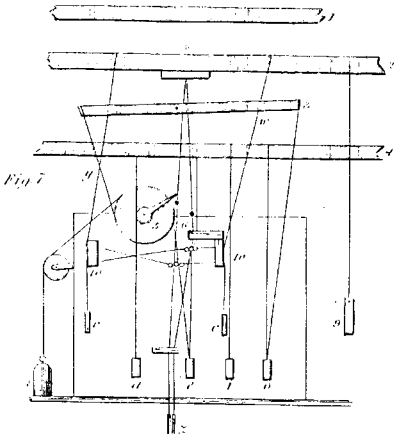


Fig. 7

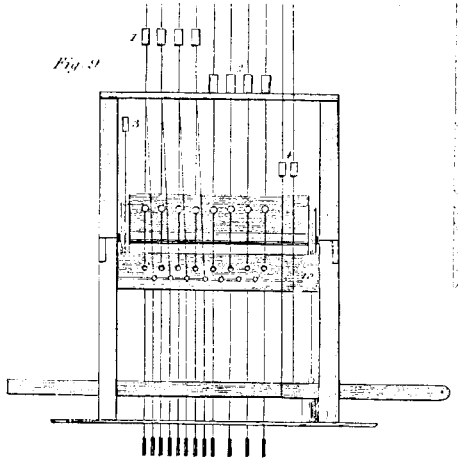


Fig. 9

Fig. 11

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CROSS'S COUNTERPOISE HARNESS AND MACHINE FOR SUPERSEDING THE USE OF THE DRAW-BOY.

A machine that would effectually supersede the use of draw-boys in the various branches of harness work, without deteriorating the quality of the cloth, has long been a desideratum in fancy weaving; and many attempts have been made, from time to time, to supply so great a want. But all the attempts that have been made in this country, especially such as were constructed on general principles, have either proved abortive, or have at last been confined to particular branches of weaving.

The machine called the counterpoise harness, invented by the late James Cross, Paisley, promises, however, to be of general utility to harness weavers, especially for weaving imitation shawls, plaids, and other heavy covered goods. This machine, taken as a whole, 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. 1, plate 13, is a front view of these three parts connected together as they stand in the loom. The harness F is the very same as in 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 A A, and the whole is supported by the carriage E E, which rests on the capes of the loom, as in other draw looms. In the frame A A are four boards, *e*, *u*, *v*, *i*, which are perforated with a number of corresponding holes, equal to the tye of the harness or size of the simple. The two boards *e*, *i*, are morticed into the bars *d*, *d*, which are fixed in the upright frame A A; the former of which is called the suspension board, from its bearing the weight of the harness and leads, and the latter, the neck, or directing

board, as it answers the purpose of rollers, as well as keeps the neck cords at regular distances. The other two boards *u*, *v*, which are morticed 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 diameter, to allow the knots on the cords *o*, to pass freely through them; and at the side next the simple, there are saw draughts, or cuts in the edges of the holes, to admit the cords, but support the knots, as represented in Fig. 2. These cords, which are termed knot cords, and are substitutes for the tail, have two rows of knots *o*, *o*, for the purpose of raising the harness by the trap boards. They are fastened to the suspension 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, where other two rotators are similarly fixed. *z*, *z*, *z*, *z*, are small bars of wood, called pushers, and which connect the trap board arms to the rotators on each side of the frame. *w* is a wooden rod which connects the rotators; so that whatever motion is communicated to one, is instantaneously transferred to the other. L is a bar of wood, with a corresponding one on 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 way; for the operator commences tying the neck at the back row of the holes in the neck board, 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 other draw looms. In the Fig. 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* is the hole board, *b* and *c* marches, and G heddles.

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 trap board, *u*, and sink the trap board, *v*; and when the rotators are turned the contrary way, the motion of the trap board 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. In this apparatus, the simple *r*, *r*, is extended horizontally at the top of the frame A B, 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 *q*, where it is supported by a half leaf of heddles, 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 hole board for regulating their distances. *s*, *s*, are gut cords for keeping the heads of the bridles open for the hooks. S is the lash driver, and R the shaft which communicates the motion from the whorle T, which is acted upon by a treadle, and on the axle of which are a number of eccentric whorles, one for each cover, for gaining power in the preparation of the lashes. The form of these whorles will be seen at Fig. 4. *g* is an inclined plain, moveable on its centre, over which the lash driver moves on small castors, in approaching the harness, and below it when returning with a lash. Fig. 8 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*, Fig. 5, for drawing the lashes is pointed out at *d*. *g*, *g*, *g*, *g*, are iron pins which drive the lashes to their proper place for the draught. *h*, *h*, are the small castors on which the lash driver moves. Fig. 5, 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*, are opened by means of 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 are one of these levers for each cover, and their position in the frame is exhibited by the dotted lines at N, Fig. 1. P is the frame in which these levers are placed, and which will be seen to more advantage at Fig. 6, where 1, 2, 3, 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* is the escapement for opening the hooks, and allowing one set of lashes to escape and another to enter. Q 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, which are shown in the drawings as connected in the loom, 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. 1, but the several parts are more distinctly represented at Fig. 7, the principal of which are as follow: 1, is a knee shaft; 2, short marches, one for each leaf; 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* for opening a flowering or

counterpoise shed, *e* for a ground shed, *i* for a counterpoise shed, and *o* another treadle for a ground shed. 5 is the wheel or pulley of the trap board, represented at *c*, Fig. 8. 6 are the knots 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. 10, 10, are hole boards for conducting the knot cords, one of which is seen at 10, Fig. 9. *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 *z*, weights for keeping the knot cords tight. *a*, Fig. 8, 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. 9, is a side view of the machine, in which 1, 2, 3, 4, are the ends of the shafts, marches, and couper, represented in Fig. 7, with the same figures of reference. The tweeling cords are tied to the marches 2, brought down through the board 10, 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* 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 shed.

FRENCH DRAW LOOM.

Since the introduction of Mr. Cross's machine into the trade, another apparatus for superseding the draw boy, has been imported from France, which, for simplicity of construction and operation, far excels any attempts at the improvement of the draw loom that have hitherto appeared in this country. This loom has neither tail, simple, nor lashes; and the pattern, which is cut out on small pieces of

pasteboard, may be changed without the weaver stopping his shuttle.

The harness of this draw loom, see plate 14, Fig. 1, is constructed, from the neck upwards, similar to Cross's counterpoise; having knot cords arranged in the very same manner, but only one trap board. E and A are the carriage and uprights, as in Cross's machine; C, the knot cords, and *a*, the trap board, the same as represented at Fig. 2, plate 13. *i* are needles, or pieces of wire, one attached to each knot cord by taking a turn round it. *d* is what the weavers term the cylinder or barrel, though it is an oblong square piece of wood, perforated with holes on each of its four sides, equal to the number of the needles employed, as exhibited in Fig. 2. This barrel, besides its rotatory motion, vibrates on pivots like a pendulum. *b* are small pieces of pasteboard, about ten inches long, and from two to three broad, perforated with holes to receive the ends of the needles, and are arranged agreeably to the order of the tacks in lashing the pattern for the other draw looms, as shown at Fig. 3. There is one of these pasteboards for each lash; and all the boards for one pattern are connected together like an endless chain, with twine, at equal distances, so as to fit exactly the flat faces of the barrel. *g* is the receptacle of the pasteboards; and, in some looms, is composed of thongs of leather suspended from the guide *s*, at one end, and from the cape of the loom at the other. In other looms it consists of parallel slips of wood, connected together with cords. D is a lever for raising the trap board, to which it is connected by means of the circular pieces of iron *x*, one on each side, with a bar across, to the centre of which the end of the lever is connected by a piece of wire. *o*, *o*, are cross bars of wood, with holes in their centres, through which run pieces of strong iron wire, which are fixed into the trap board at each side, to keep it steady while in operation. At *m* are spiral springs, for

regulating the motion of the needles; and into the cross bar of wood, *r*, is inserted another piece of wood, moving on springs, which yields to the pressure of the needles, which are forced back by the barrel, and recovers them when the barrel is withdrawn. Fig. 4, is an end view of the barrel with the apparatus for turning it round, which, like the rest of the machine, is extremely simple. It consists of two catches, *b*, *c*, which are attached to the opposite end of the frame. When the barrel is turned round from right to left, the catch *b* is lowered by means of a cord connected to a treadle, till the tooth of the catch, *i*, comes in contact with the corner of the barrel in its motion backwards, and turns it round till a new face and pasteboard are presented to the needles. When it is turned from left to right, the catch *c* is employed in the same manner. *z* is a cord connected to the barrel, which, after passing over two pulleys, as seen in the Fig. is tied to the end of a long march; and *y* is another cord which descends from the lever D, to another long march; and these two marches are connected to separate treadles, which are wrought alternately.

From this description of the machine, its mode of operation will be obvious. The weaver presses down the treadle which pulls back the barrel *a*, by means of the cord *z*, and in this state all the knot cords are into the saw draughts of the trap board. As this treadle is relieved and the other pressed down, the barrel is drawn by springs against the ends of the needles, which enter into the pasteboard wherever there is a perforation, but where there is none, they are driven back; and, consequently, drive their respective knot cords out of the saw draughts of the trap board, which are thus allowed to remain stationary, while the others are raised.

The reading of the patterns on these pasteboards is the only tedious process connected with the machine. The

method in common use is, for one person to read over the tacks of the design, and another with a punch to strike out the holes in the pasteboard, agreeably to his instructions. Thus, on the line 1, Fig. 3, there are three dots, which denote three holes for the wires. The person who gives the instructions, says, take 3. The other person immediately strikes out these three holes with the punch. Then, as there is a blank on the upper cross line, and two on the under lines at 2, three are ordered to be passed. Then 2 on the line 2, and 3 on the line 3, are next to be cut out; and so forth, always beginning at the bottom of the lines, as in the process of taking the harness twines through a hole board. In this example there are only four cross lines or rows of holes, but in practice there are eight, corresponding to eight horizontal rows of the needles. The four small holes on each end of the pasteboards are for laceing them together, agreeably to the succession of the lashes. The larger holes, *a*, *a*, are made to fit the studs, *a*, Fig. 4, on the ends of the barrel, by which the pasteboards are drawn into their proper positions to receive the ends of the needles.

THE PATENT OR COMB DRAW LOOM.

The patent or comb draw loom was invented some years ago, by Mr. David Bonnar at Dunfermline, and has since been chiefly employed in the manufacture of that place.

The principle on which this draw loom is mounted is, that that part of the harness which corresponds to the tail of the common harness, instead of extending across the roof of the shop, is here tied perpendicularly in a frame, which is nailed to the carriage or table above. From each of these tail cords a simple cord extends, horizontally, back over the weaver's seat, as in the back harness, the lashes hanging below, ready to be pulled by the weaver's hand instead

of the draw-boy. A little above the simple, there is a knot tied on each cord of the tail; all of which knots must be in a straight line, and equally high. Hence, the tail cords in this harness are called knot cords. Below these knots, and above the simple, is placed a flat board, moving upon pivots, one edge of which is indented so as to resemble the teeth of a comb, from which it has derived its name. To the opposite side of this board or comb, is nailed a long handle or lever, which, when pulled down, raises the indented side, or teeth, after the knot cords have been drawn in between them by the lashes. To the other end of this lever is fastened a strong wire, or cord, which descends through the warp, in broad webs, or past the selvage in narrow ones, and is fixed by the other end to a stout treadle below, clear of those which are used for the ground. Hence, when any shed is to be opened by this harness, the weaver pulls down the corresponding set of lashes, which draws the knot cords of that shed between the teeth of the comb, while at the same time he presses down the treadle that is thus connected to the comb, with his foot, and places it in a catch below, where it remains so long as he has occasion for the harness shed.

SECT. II. OF DRAW LOOM PATTERNS.

THIS is perhaps the most important, as well as the most delicate department in the whole course of fancy weaving; for it is on a judicious selection and extensive variety of patterns, combined with economy in the disposal of colours, that the success of the manufacture will ultimately depend. The manufacturer, therefore, though no designer himself, should possess a competent knowledge of drawing, or at least of hand sketching. This would not only improve his taste, but would enable him, when any new or striking objects occurred, to communicate his ideas with precision to

the pattern drawer, and to make a more tasteful selection from the productions of others. This is, in general, the case in France; and the consequence is, that French patterns are usually distinguished for the ease and elegance of their style, while the greatest economy is observable in the use of the materials of which they are manufactured.

On the other hand, 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 an unlimited fancy, and a strong and lively imagination; to be deeply impressed with the beauties and charms 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 heightened and improved by a little knowledge of geometry, particularly of symmetry and proportion; for nothing can be more offensive to a person of genuine taste, than a pattern or picture crowded with an incongruous assemblage of distorted objects.

TASTE.

Since taste therefore is essential in every department of fancy weaving, as well as in other works of genius, while at the same time it is so very difficult to distinguish between a good taste and one of an inferior kind, it would be of use here to inquire what is the standard by which the different tastes of men might be compared, so as to discriminate between the true and the false. As this, however, would lead to a discussion, which, to some might appear foreign to the

present undertaking, I shall content myself with quoting a few remarks on taste from Dr. Blair, referring the reader who wishes more information on this subject, to the second, third, and fifth of his lectures on Rhetoric and the Belles Lettres. "Taste," says he, "is the power of receiving pleasure from the beauties of nature and art."—"Nothing that belongs to human nature is more general than the relish of beauty of one kind or other, of what is orderly, proportioned, grand, harmonious, new, or sprightly."—"But although none be wholly devoid of this faculty, yet the degrees in which it is possessed are widely different. In some men only the feeble glimmerings of taste appear, the beauties which they relish are of the coarsest kind, and of these they have but a weak and confused impression; while in others, taste rises to an acute discernment, and a lively enjoyment of the most refined beauties. In general we may observe, that in the powers and pleasures of taste, there is more remarkable inequality among men than is usually found in point of common sense, reason, and judgment."

"The characters of taste when brought to its most improved state, are all reduceable to two, delicacy and correctness."

"Delicacy of taste respects principally the perfection of that natural sensibility on which taste is founded. It implies those finer organs or powers which enable us to discover beauties that lie hid from a vulgar eye. One may have a strong sensibility, and yet be deficient in delicate taste. He may be deeply impressed by such beauties as he perceives; but he perceives only what is in some degree coarse, what is bold and palpable, while chaster and simpler ornaments escape his notice. In this state, taste generally exists among rude and unrefined nations. But a person of delicate taste both feels strongly and accurately. He sees distinctions and differences where others see none, the most latent beauty does not escape him, and he is sensible

of the smallest blemish. Delicacy of taste is judged of by the same marks that we use in judging of the delicacy of an external sense. As the goodness of the palate is not tried by strong flavours, but by a mixture of the ingredients, where, notwithstanding the confusion, we remain sensible of each; in like manner, delicacy of taste appears, by a quick and lively sensibility, to its finest, most compounded, or most latent objects."

"Correctness of taste respects chiefly the improvement which that faculty receives through its connexion with the understanding. A man of correct taste is one who is never imposed on by counterfeit beauties; who carries always in his mind, that standard of good sense, which he employs in judging of every thing. He estimates with propriety the comparative merit of the several beauties which he meets with in any work of genius; refers them to their proper classes; assigns the principles, as far as they can be traced, whence their power of pleasing flows, and is pleased himself precisely in that degree in which he ought, and no more."

"It is true that these two qualities of taste, delicacy and correctness, mutually imply each other. No taste can be exquisitely delicate without being correct, nor can be thoroughly correct without being delicate. But still, a predominancy of one or other quality in the mixture is often visible. The power of delicacy is chiefly seen in discerning the true merit of a work; the power of correctness in rejecting false pretensions to merit. Delicacy leans more to feeling, correctness more to reason and judgment. The former, is more the gift of nature; the latter, more the product of culture and art."

SKETCHING.

Those who would attain to excellence in the art of drawing, should place themselves under the tuition of an ex-