when the open shed of this set is produced, the doup is slack, and the cross thread is raised by the back leaf on the left of the other two. The cross shed of the set *a e* is opened by raising the cross thread by the back leaf, and sinking the standard with the doup in the tight state on the left of the other two; and the open shed is formed by sinking the cross thread by the back leaf, while the doup is slack; and consequently, the thread sinks on the right of the other two. The cross shed, therefore, of both sets are formed by the treadle marked 1, and the open one by 2. The treadle 3, wrought alternately with 1, produces plain texture; and the treadles 4 and 5 are corded so as to make plain with one set, and twist with the other alternately, when wrought along with treadle 1.

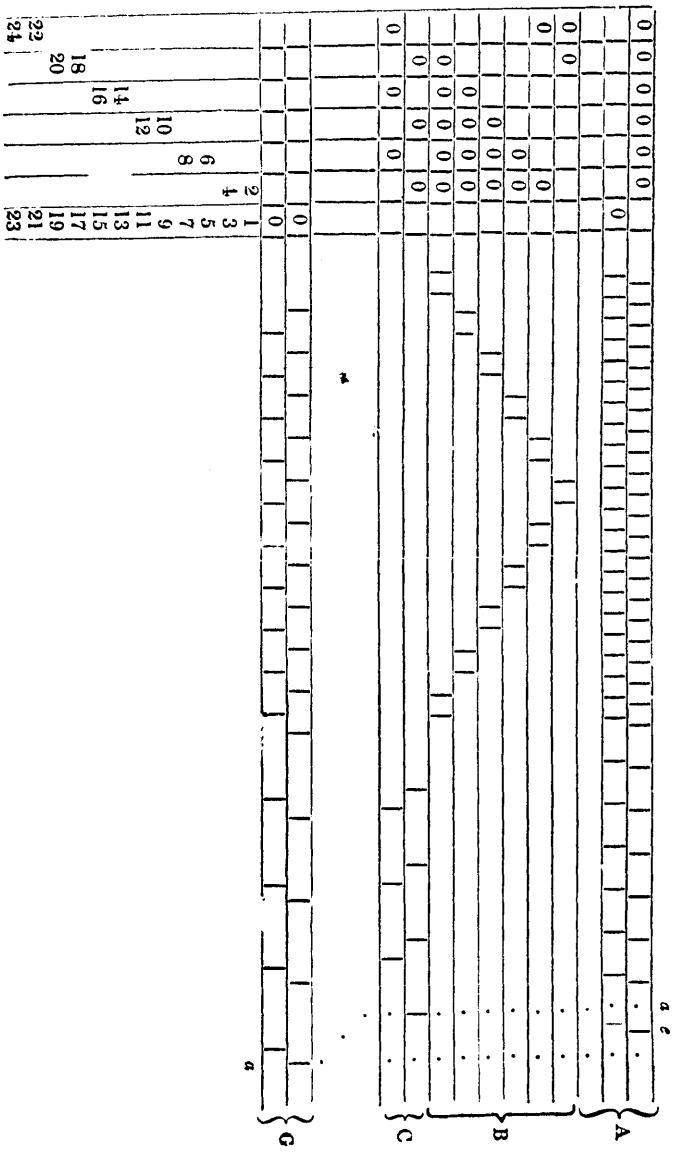
It was formerly observed, that when gauze is woven by omitting the upper doup and standard, the warp of the under doup was beamed on a separate roll from the other, that it might be slackened a little while the cross shed was forming. The same observation must be applied to the warp of the upper doup in this mounting, as these two threads act independently of each other, and have more stress to bear than the other two threads of the same splitful.

Fig. 5 is the plan of a mounting for weaving a two set Turkey gauze with four threads in the split. This mounting, however, has only one front set; for the alternate changes from the twist to the plain are effected by the back leaves. When the two centre treadles are employed, the splitful marked *e* is twisted: for the treadle 1 raises the cross thread by the doup and standard, in the tight state, on the right of the other three, while they are all sunk; and the treadle 2 raises the same thread by the back leaf, on the left of the other three, the doup being slack. The remaining cords are so placed, that the splitful *a* makes plain cloth.

Again, when the two outward treadles are wrought, the splitful *a* is twisted; the cross thread being raised and sunk

in the very same manner as in the other, while the splitful *e* is woven plain. This will obviously appear by comparing the raising and sinking marks on the treadles, with the draught. It is to be observed, however, that here the cross thread is warped round the other three, as if they were only one cord; but in Fig. 4, the two threads which have no doup, are raised and sunk alternately, whether the texture be gauze or plain. The same effect may be produced by the mounting Fig. 5, by changing the raising and sinking marks on the back leaves.

Fig. 6 is the plan of the same kind with five threads in the split. As the principle, however, is the very same as that of Fig. 5, any further description will be unnecessary.



TURKEY GAUZE AND PIQUET.

In this plan, A is a set of ground or plain leaves, on which there are two threads for each split; B are the figure leaves, which are corded for a diamond spot; C are the piquet leaves, corded to make a barley-corn spot; and G *a*, fore doup and standard, the same as in common gauze, but divided into two, or clifted, to avoid friction. The raising cords produce gauze, and the sinking ones, or blanks, the figure. The threads on the leaves B and C, are called whip; one thread of which twists round two of the ground, making three threads to the split. That is, the thread *a* on the leaf at C, rises at one shot in its present position, and at the next in the position at *a*, on the leaves G, when working gauze; but in weaving plain texture to form the figure, it raises and sinks alternately, in the position at C.

There is another variety of this kind of gauze, with four threads in the split, in which the threads are twisted by pairs in the gauze parts, while they are woven separately in the plains. The specimens which I have seen of this fabric, which is said to be of Russian manufacture, were made of linen yarn, and employed for wine rubbers.

This texture appears to be woven by taking two threads through each doup, while they are drawn on separate back leaves. By this means, the plain parts will be woven entirely by raising and sinking the back leaves, the doups being kept in the slack state; and the twists will be produced by the open and cross sheds, as in the common gauze.

GAUZE AND FLUSHING, OR TWEELED GAUZE.

In this species of fancy gauze, the figures are formed by throwing a certain number of weft shots into the open shed successively, without working them into cloth, as in the crapes. When those figures, therefore, are thrown into diagonal or biassed stripes, they bear a pretty strong resemblance to tweeling, whence, it would appear, the name is

derived. It is evident, however, that as the flushing thus produced cannot be carried to a great extent without deteriorating the fabric of the cloth, patterns of this kind must be very limited, both with respect to their number and magnitude.

One set of mounting, on this principle, produces the common veining formerly explained. With two sets are woven what are by some called chambries; and the biassed or diagonal patterns formed by four sets have obtained the name of tweeled gauze There are patterns woven likewise in the diamond draught, forming bird-eye figures, with a barley-corn spot in the centre of each diamond, which have been named Trafalgars, in compliment to that great victory: and these appear to be the chief varieties which have been woven on this principle.

It was formerly observed, that, in weaving plain gauze, the upper doup thread sinks to the race rod on the right and left of that in the under doup, alternately, so that plain cloth can be produced by reversing either of these sheds; and, therefore, that crapes may be woven either by one back set and a given number of front ones, or by one front set and the requisite number of back ones. As the tweeled gauze, however, must continue either the open or cross shed for three successive shots, while the other is opened at certain intervals only, to form the gauze twists; and as it is impossible that one set, either of back or front mounting can produce both of these sheds at the same time, it is evident that back and front leaves must be employed for each set. In order, however, to reduce the mounting as much as possible, it is usual to omit the upper doup and standard, as has been explained in the preceding section, and illustrated by Fig. 9, Plate 5; and as the open shed, in this method, extends over all the warp, while the cross sheds are opened, when necessary, by raising the fore standard with the doup tight, one leaf only will be requisite for

all the warp which, in a full mounting, would be drawn through the upper doup, and thereby the number of back leaves is considerably reduced.

Fig. 7, Plate 6, is a two set mounting of this kind, in which the warp is drawn, two splitfuls on each set, alternately. On the leaf 1 is drawn that half of the warp which wants the upper doup and standard, or that which sinks in forming the open shed; and the other half, which is raised by the front mountings in producing the twists, is drawn on the leaves 2 and 3, and passes afterwards through the doups of the standards 4 and 5, respectively. The treadle marked 1 forms the open shed of both mountings; that is, it sinks the leaf 1 with one half of the warp, while the other half is raised by the leaves 2 and 3; the two sets of doups being relieved by sinking their standards in the common way, and yield to the warp which is raised by the back leaves. The treadle 2 forms the open shed by the standard 4 and corresponding back leaf 2, while the standard 5 and its doup are raised, and produce the twist on their portion of the warp. Treadle 3 is exactly the reverse of treadle 2; it produces the open shed by the standard 5, and the cross one by the standard 4. Treadle 4 wrought alternately with treadle 1 produces gauze, and the treadles 5 and 1 make plain cloth, as will appear by inspecting the specimens of cloth attached to the Fig. where the figures at the ends of the weft shots refer to the numbers on the treadles which open their respective sheds.

Fig. 8 is a plan of the mounting of a tweeled gauze, or four sets, with specimens of the cloth which it produces. The back leaf 1, as in the preceding mounting, contains one half of the warp, and the other half, which is drawn into the doups, is distributed among the leaves 2, 3, 4, 5, in the same order as the draught of an over and over four-leafed tweel.

The open shed of this mounting is formed by sinking the

treadle 1, which takes down the leaf 1, and raises the leaves 2, 3, 4, and 5, while all the four standards are sunk and the doups slackened, so that the under doup threads are raised to the left of the others. Treadle 6 forms the cross shed over all the warp, in which the under doup threads are raised on the right of the others; consequently, this and treadle 1 produce plain gauze. Treadle 7 reverses the shed of treadle 6; these two treadles, therefore, work plain cloth. The treadle 2 sinks the back leaf 1, and raises 2, 3, 4, for the open sheds of these sets; but the leaf 5 and standard 9 must form the cross shed of this set, and therefore the leaf 5 is sunk, and the doup with its standard raised, by which the twist is effected. The remaining treadles 3, 4, and 5, are sunk in succession, and produce the gauze twist on the other three sets, respectively, as marked at the side of the specimen.

It may be observed in this species of weaving, that, as the weft shots next the key shot are thrown into a serpentine form by the crossing of the warp, especially when the warp is drawn on two sets in alternate splitfuls, if coarse weft, or weft of another colour be thrown into these sheds, it will give a variety to the fabric which has often a very pleasing effect.

From these two examples it will be easy to make a draught and cording for a bird-eye or diamond draught; and as the Trafalgar comes under the character of spotting, it will be exemplified in the next chapter, which treats on that subject.

SECT. III. OF NETS.

When the preceding varieties of cross weaving are well understood, the transition to nets will be short and easy. In the varieties of gauze, the two threads of warp which are twisted together, are confined entirely to the same interval of the reed in which they are crossed to the right and left

alternately between the shots of weft. In nets, however, either a part or the whole of the warp is crossed before the reed; and the threads of different intervals are occasionally linked together by the weft. That part of the warp which thus crosses or traverses before the reed, and forms the principal variety in the texture, is called whip: and as it has more stress to bear than almost any other kind of warp, it is generally made twofold, or of two ends of yarn twined together.

The whip parts of a net mounting which correspond to the doups and standards of a gauze, are placed before the lay, between the race rod and the reed, by which means the crossings of the whip are effected in front of the reed and standards.

In net mountings, the half leaves or doups are called bead lams, from their having small glass beads in their loops or bows, through which the threads of whip are drawn. These beads are indispensably necessary, to avoid the great friction which would otherwise be occasioned by the motion of the heddles backward and forward with the lay at each shot, as well as by the crossing of the whip, or, as it is called, *tumbling* of the beads in front of the standards, in the cross shed. The back leaves of nets are also, in general, made with beads instead of the eyes or clasps of other heddles. This species of weaving originated in the silk manufacture, though it has been successfully applied to cotton.

THE FALSE SPIDER NET.

This net, however, which is now to be explained, is an exception to the general character of nets, as the whip part of the warp does not extend beyond its own interval of the reed; and no part of the mounting, in the present method of weaving, is attached to the lay; although it was formerly woven with two bead lams, after the manner of lappets.

Spidering, as it is frequently termed, is woven by raising a thread of whip, alternately, on each side of a splitful of gauze or plain warp, every second interval of the reed, in general, being empty; which gives it a zigzag, or serpentine appearance on the cloth. The motion of the whip threads of adjacent splits are usually reversed, one rising on the right, and another on the left of its respective splitful; and the two threads thus meeting and receding alternately, form the whip into small square or diamond figures on the ground.

The mounting commonly employed for this net, consists of the fore part of the original gauze mounting, called through-puts, which has been already explained, combined with that of the ground, whether gauze or plain cloth. Sometimes the whip is raised by an under doup and standard and a back leaf, as has been explained under that method of weaving gauze.

In the first method, the two standards C and D, Fig. 6, Plate 5, are placed, one on each side of the splitful of warp, and the doups 1 and 2, which are connected together by an eye or bead, through which the thread of whip is drawn, are below the warp. When the standard C is raised by the cross treadle, the doup 2 is relieved, as in the open shed of common gauze, by which the thread of whip *a a*, is raised on that side toward C, where it is fastened by the shot of weft. At this tread, all the ground is sunk, and the whip only is raised above the shuttle, to form the upper part of the shed. The next treadle sinks all the whip, and opens a shed of the ground, into which the second shot of weft is thrown. For the third shot, the standard D is raised, and the doup 1 is slackened, by which the whip thread *a a*, is again raised on the opposite side of the splitful of warp, towards D, where it is also interwoven with the weft, the ground being sunk as before. Thus, in the net parts, one shot of weft is interwoven with the ground, and another

passes through a shed formed by sinking the ground and raising the whip, by which it is interwoven with the cloth.

Fig. 9, Plate 6, is the draught and cording of the false spider net, woven in stripes on a gauze ground, along with another stripe of plain gauze. The two leaves 3 and 4 are for the plain gauze, 5 and 6 for the gauze under the spidering; 1 and 2 are the standards for the under doups, the upper ones being omitted; and C, D, the standards for the whip, corresponding with those in Fig. 6, Plate 5. *a a*, are the threads of whip. The treadle G raises the standard C, which draws the threads of whip *a a*, from their parallel position at *i*, to the position *o*, as represented by the dotted lines, where they are raised above the shuttle. At the same time this treadle sinks the ground of the spidering, but opens the cross shed of the plain gauze. The treadle *c* sinks the whip, forms the cross shed of the ground, and the open shed of the plain gauze. Treadle H sinks the ground, opens the cross shed of the plain gauze, and raises the whip in the position *i*. Treadle *o* sinks the whip, and forms the open shed of both the gauze mountings: all of which will be easily understood by inspecting the two Figs.

The false spider net is thus woven in stripes of various breadths; but when it is formed into checkers or alternate squares, which seems to be the greatest extent in point of variety to which it has been carried, two sets of the throughputs are requisite, and sometimes two of the ground; and these sets are wrought so as to make their respective figures bosom each other; the parts of the whip which are omitted being afterwards cut away.

If we now consider the thread of whip merely as a half twist of gauze warp, and the splitful of warp round which it twines, the other half; it will easily appear that this net may be woven, like the gauze, by an under doup and standard, as has been already noticed. By this method, the

back leaf which raises the thread of whip must have its heddle on the left side of the splitful of warp, and the doup and standard on the right with the thread crossing below, for one side of the diamond, and the position of the doup reversed for the other, the open shed will therefore raise the whip on the left, and the cross one on the right of the splitful of warp in the former, and the reverse in the latter, which produces the very same effect as the method above described. It is to be observed, however, that in this method, as well as in the preceding, the ground is always sunk when the whip is raised, and the ground shot is thrown in when the whip is sunk.

This net may likewise be imitated by the lappet needles, either with a single or double frame, as is done in some of the finer kinds of nets, which will be described farther on.

WHIP NET.

This net takes its name from the warp being wholly of whip, without any other ground. The mounting of the whip net, like that of the common gauze, consists of two back leaves, two standards, and two bead lams or half leaves. The two back leaves are placed behind the reed in the usual way; and the bead lams with their standards are placed in front of the lay, between the race rod and the reed, as formerly mentioned. But as beads are frequently used instead of eyes in the back leaves also, and these mountings are generally constructed to weave dropped, as well as plain nets, the back heddles are usually divided into four leaves, by which the friction is avoided that would be occasioned by the beads being too much crowded together.

Fig. 2, Plate 7, is a plan of the whip net mounting, with a specimen of the cloth annexed, both when it is woven plain and when it is dropped. A and B are the two back

PRINCIPLES OF CROSS WEAVING

Fig 1

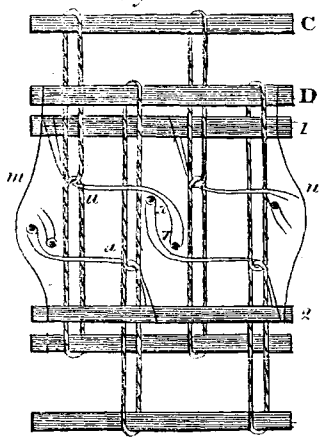


Fig 5

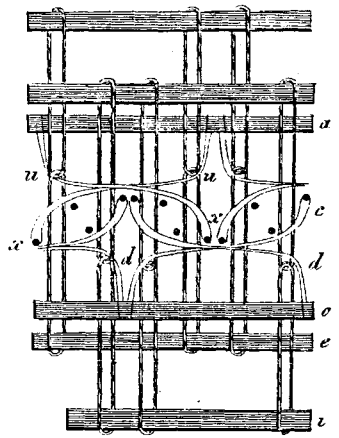
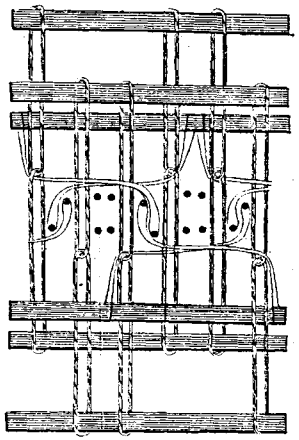


Fig 7



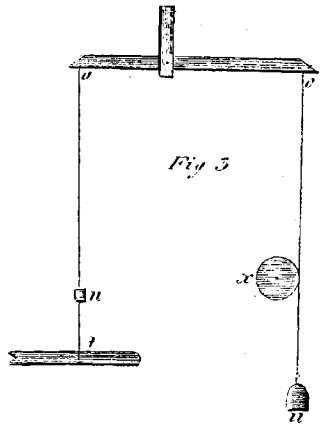


Fig 2

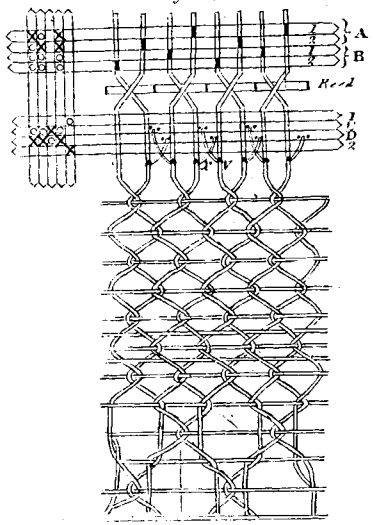


Fig 6

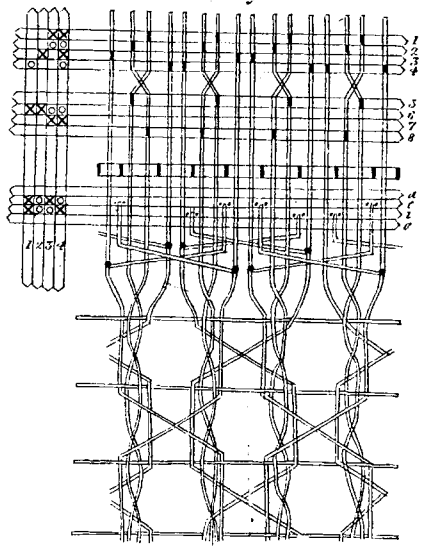


Fig 8

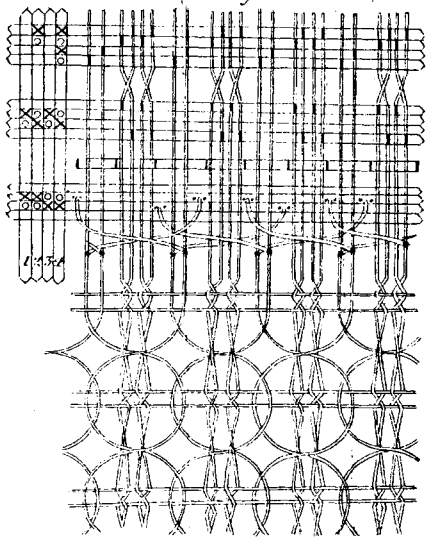
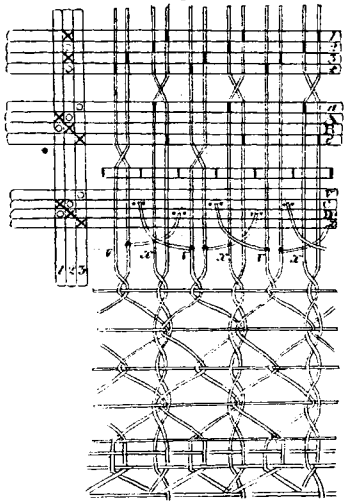


Fig 4



Drawn by J. Murphy

Published by Blackie & Son Glasgow.

Engd by J. McClure

eaves, each of which being divided into the other two parts marked 1 and 2. C and D are the standards, and 1 and 2 the half leaves or bead lams, corresponding with the doups and standards of the full gauze mounting. The reed, which shows also the position of the lay, is here seen between the back and front mountings. Let the dots on the leaves C and D represent sections of the twine of which the heddles are made, and they will point out the position of the standards. The upper bead lams, with their beads, through which the whip threads are drawn, will then appear as passing through the heddles or standards on the leaf C, the beads being in front at *v*; and the under bead lams will be seen as if rising through their standards on the leaf D, crossing below the others towards the front at *x*. The marks on the treadles will point out the raising and sinking cords, as in the plain gauze.

But the manner in which the bead lams cross in front of the standards will appear to more advantage in Fig. 1 of the same Plate. Here the upper bead lam shaft is marked 1, and its standard C; the under bead lam 2, and its standard D, as in Fig. 2. When the open shed is formed, the bead lams assume the position represented in the Fig. at *x* and *v*; that is, the bead lam *x* on the shaft 2, crosses in front of a standard on the shaft *c*, and rises on the left of the bead lam *v*, while the bead lam *v* on the shaft 1, crosses in front of a standard on the shaft D, and sinks on the right of *x*: the threads passing through these two beads being in the same interval of the reed; and this forms the open shed, which is pointed out by the weft shot 2, in Fig. 2. Again, in forming the cross shed, the bead *v* is drawn close to its standard at *u*, and the bead *x* is drawn back to its standard at *a*, while the standard D is raised, and C sunk, as in the cross shed of the common gauze. This shed is marked by the weft shot 1 in Fig. 2; and thus the crossings of the whip are effected.

Plain texture is produced, as in gauze, by working the two treadles 1 and 3. Sometimes this net is woven with a plain shot between each crossing of the whip, as represented at No. 2 in the specimen. This makes an excellent strong fabric for various purposes, particularly tambour or needle-work. The drawing of the warp into the heddles, mounting of the leaves, and applying the doup or bead lam weights, are, in every respect, the same as in the common gauze, and require no farther illustration.

It was formerly observed, that the back and front mountings of the gauze are placed at about three and a half to four inches separate, that the warp may have sufficient room to twist between them in opening the cross shed. In nets, however, the correspondent crossing of the whip takes place in front of the standards, where it is forced nearly into a vertical position. It is therefore necessary that the whip should be slackened more in the cross shed than any other kind of warp, so as to yield freely to the pressure of the cross treadle, otherwise it would be impossible to obtain a shed. The method usually employed for this purpose, both for this and the other nets, is as follows: *a o*, Fig. 3, is a couper suspended from the loft, from the end *a*, of which a cord descends to the end of a long march *n*, which is again connected to the cross treadle *t*. To the other end *o* of the couper is tied the cord *i*, which, after taking two turns round the end of the whip roll *x*, suspends the pace weight *w*. Sometimes a thong or strap of leather is used for that part which goes round the roll, and a little chalk rubbed on it to prevent it from slipping. Now it is plain, that when the cross treadle 1, Fig. 2, is pressed down, it sinks the long march *n*, and, consequently, the end *a* of the couper, by which the other end *o* will be raised, and turn the roll round on its axis by the cord *i*. By this means the whip is slackened, and a greater or lesser range is given to it, to suit any given pattern, merely by shifting the ful-

crum or centre of motion farther from, or nearer to, the end *o* of the couper.

There is another circumstance which requires particular attention in nets that does not occur in gauze. In the gauze mounting the two threads of each split rise and sink between their respective standards; and, in the cross shed, the doups are drawn tight by the weights, so as to pass each other without any friction, especially if the web be properly mounted. In the whip net, however, see Fig. 1, the bead lams project beyond their opposite standards, and therefore, were the weights allowed to act upon them with their whole force, they would be drawn so tight or close to their standards as prevent the beads from *tumbling*, as it is termed, or the cross shed from opening freely. On the other hand, were the bead lams too slack, the friction occasioned by the tumbling of the beads would soon prove destructive to the standards, besides being liable to get frequently entangled among the warp. To prevent both of these inconveniencies, each bead lam shaft is connected, at each end, to the opposite shaft of its respective standard, by a piece of twine called a bridle, as represented at *m*, *n*, in Fig. 1. By means of these bridles, the weaver can temper the front mounting to his mind, as they are made with snitches the same as those on the treadle cords. Sometimes the under bead lam shaft is bridled to the end of the couper of the front standard, by which method, the bridles are kept clear of the shuttle. In general, the bead lams project through their standards, when the mounting is stationary, about a quarter of an inch; but every weaver tempers his bridles to such a degree of tension as may best suit the state of his mounting.

It may be further observed, of nets in general, that the weaving motions should be very slow, uniform, and steady. The sheds are opened by a gradual pressure of the foot on the treadles, without any sudden jerks, which would cut

the whip, and, in a short time, destroy the mounting. At the same time the lay is put back with the same steady motion, while the shed is opening. The shuttle is driven through the sheds with equal caution, lest it should dip, or get entangled among the bead lams and standards. This, however, is in a great measure prevented by pins made of brass wire, driven into the lay immediately behind the race rod, along which the shuttle runs instead of the reed in other kinds of weaving. After the weft shot has been thrown into the shed, the treadle is relieved in the same gentle way, by which the weights have sufficient time to act upon the bead lams, and keep them in a uniform degree of tension, while the lay is brought forward by the same steady motion to the face of the cloth.

It is also of the greatest importance that all the cordage be properly tempered, which, with due attention, will easily be effected by means of the snitch knot, which must be well known to every tradesman.

As the crossing of the whip, in net weaving, necessarily produces a deal of friction, a greater power is requisite to be exerted on the cross treadle than in any other species of light fabrics. For this reason, the treadles are placed below the warp roll, and the weaver works on the ends towards him, by which he gains the whole of the lever power.

SPIDER AND MAIL NETS.

These two nets are woven in the same mounting, and have the same relation to each other as the gauze and lino.

The mounting is merely that of the common gauze, which is here called the ground, combined with that of the whip net, with which the ground is interwoven. The gauze part of the mounting, and the back leaves of the net, are placed behind the reed, and the two bead lams and their standards

are before it, as in the preceding mounting. Either of the methods for reducing the number of leaves, formerly explained, may be adopted for the ground, though the full mounting is generally preferred: for, with the full mounting, only two warp rolls are necessary, one for the ground and the other for the whip, while either of the other methods require two for the ground, that one half of the warp may yield a little more than the other when the cross shed is forming.

The spider net is woven with two treadles, which produce the texture of plain gauze interwoven with the whip: the mail net requires only the addition of a plain treadle, on which every fourth shot is thrown in.

Fig. 4, Plate 7, is a plan of this mounting, with specimens of the varieties it produces, in which the different crossings of the ground and whip may be easily traced. The back leaves of the gauze are marked 1 and 2; the standards A and B, and their doups *a* and *e*. The back leaves of the net are marked 3, 4, and these are all behind the reed, as formerly noticed. In the front, between the race rod and the reed, are placed the whip standards C and D, with their respective bead lams *v* and *x*. The position of the whip standards, with respect to the threads of warp, is pointed out by dots on the shafts C and D, one on each side of its respective bead lam. These lams appear in the Fig. as if a little slackened by the open treadle, and crossing each other in front of the standards, exhibit the whip threads passing through the beads at *v* and *x*. The crossing of the bead lams, when the open shed is fully formed, will appear to more advantage in Fig. 1, the threads of gauze warp being in the position of the letters *v* and *x*.

By comparing this plan with those of the gauze and whip net considered separately, the processes of taking the warp through the heddles, and tying up the treadles, will be obvious, and can require no further explanation; for each of

the mountings are tied to the treadles in the same order as if they had been mounted separately.

It may be necessary to observe, however, that when the full gauze mounting is employed, as in the present example, or when the back doup and standard are omitted, each treadle will produce similar sheds in both mountings; that is to say, either both open or both cross; but when the gauze part is mounted with the bead lam and standard, it is necessary to cord the treadles so as to produce the open shed of the gauze along with the cross shed of the whip, otherwise the whip would not run in between the threads of gauze warp, to form the net distinctly, as represented in the specimen.

The apparatus for slackening the whip in the cross shed, as well as the bridles for preventing the bead lams being drawn too close to their standards, are also necessary in this mounting, and are applied in the very same manner as in the whip net.

PATENT NET, OR NIGHT THOUGHT.

This net, like the preceding, consists of a gauze ground interwoven with whip. Two sets of mounting are therefore requisite, one for the ground and the other for the whip or net part; but as this net involves greater variety than any of the foregoing, it requires four treadles to work one set of the pattern. Either the full mounting, or one of the contracted methods may be employed for the gauze part; and the whip requires two back leaves, and two bead lams and their standards. When the full gauze mounting is employed, three warp rolls are requisite, one for the ground and two for the whip. These last are necessary, as one half of the whip is occasionally crossed while the other half is straight and parallel; and, consequently, each half must be slackened independently of the other. When the gauze

part is woven either with the bead lam shaft, or by omitting the upper doup and standard, two rolls are also necessary for the ground, as formerly described. Some add another roll for the selvages, which, being woven plain without any twist, do not work up equally with the other warp. This, however, is commonly avoided by beaming the selvages on the same roll with the ground, and suspending a small weight to each, below the roll, to keep them moderately tight; and the slack part is taken in at the face of the cloth, when necessary, at the end of a piece.

Fig. 6, Plate 7, is a plan of the night thought mounting, with a specimen of the cloth, as in the other examples. The shafts marked 1 and 2 are the back leaves for the gauze part, the back leaves for the whip being marked 3 and 4. 5, 6, 7, 8, are the doups and standards of the ground mounting, which, in this example, is full. The bead lams and their standards, which are before the reed, are marked *a*, *e*, *i*, *o*, and are placed exactly in the same position as in the other mountings for net weaving.

Fig. 5 is a front elevation of the bead lams and their standards, representing their position when the open sheds are formed. *a* is the shaft of the upper bead lams, and *o* that of the under ones. *e* and *i* are the back and fore standards, respectively. In the shed here exhibited, which is opened by the treadle marked 4, both the upper and under lams are slack, and, after crossing two splits of gauze and one of whip, the former are sunk and the latter raised by the whip, which is now acted upon entirely by the back leaves. That is, the upper lams cross from their standards at *u* to the interval *x*, where they are sunk; and the under ones, from *d* to *c*, where they are raised. This is likewise the open shed of the gauze mounting. In the shed formed by treadle 3, the upper lams are slack with the whip sunk, as in the preceding shed, but the under lams are drawn tight to their standards, by which they are raised with the whip

crossed. This treadle makes the cross shed of the ground. The treadle 2 draws both the upper and under lams tight to their standards, by which the former are sunk and the latter raised; at the same time the ground forms the open shed. In the shed formed by treadle 1, the upper lams are tight, and sunk by their standards, while the under ones are slack, and raised by the whip, the ground forming the cross shed. All this will plainly appear by an attentive perusal of the two Figs. 5 and 6.

PRINCESS ROYAL NET.

This net is woven in a mounting the very same as that of the night thought, but with a small difference in the order of taking the whip through the heddles and of tying up the treadles. But as these are distinctly marked on the plan, Fig. 8, they can require no farther explanation. Fig. 7 shows the crossing of the bead lams, in the open shed, in the same manner as in the preceding net.

DROPPED NETS.

The whip and mail nets are frequently ornamented with a variety of figures, which are formed on the cloth, merely by preventing the crossings of certain portions of the whip, for one or more shots, which leaves open spaces in the ground, larger than the common meshes of the net. This may be effected, either by preventing part of the upper bead lam whip from sinking, or of the under bead lam whip from rising, in the open shed, by means of additional back leaves applied for that purpose; the arrangement of which, to obtain a variety of patterns, being the same as in spot weaving, will be explained in the next chapter.

Omissions of this kind sometimes take place by accident in the course of weaving, which, being then considered

damages, are mended, by tying the two threads together which ought to have been crossed, with a thrum or other fine thread: but when these spaces are disposed in any regular order, so as to form figures on the ground, they produce a beautiful variety of fanciful ornament, which, in general, has very much the resemblance of lace.

An example of this kind of ornament will be seen on the whip net at *z*, Fig. 2, Plate 7. This specimen is an allover, produced by the two back leaves 1 and 2, of the back part of the mounting at A. Here it may be observed, that that half of the whip which is drawn on the two leaves at A, and which belongs to the upper bead lams, must be sunk in the sheds, to produce the crossing. But suppose, for instance, the treadle number 5, to be pressed down for the open shed; then, the leaf 1 at A, instead of sinking, is raised, and consequently prevents all the whip which is drawn on it from crossing with the corresponding threads of the under bead lams; and therefore, when the weft shot 5 is thrown across, the threads which were not sunk will run into the position represented at *z*. The cross treadle 1 is next tread, which opens the whole of the cross shed, into which the shot 1 is thrown. The next shed, which is produced by the treadle number 4, is similar to that formed by number 5, the other half of the whip of the part A being prevented from sinking by the leaf 2, and another row of spaces formed in the bosom of the former, at the weft shot 4.

The very same effect would have been produced had the two leaves 1 and 2 at the part B been alternately sunk, with the cross treadle 1 intervening; only, both of the threads *a* and *i*, at the sides of each space, would have been below the weft shot, or would appear as on the under side of the cloth in the present specimen. The same is to be understood of the dropped spider net; for the omissions are made by the back leaves of the whip part, in the very same manner as in the present example.

It is observable in the allover dropped whip net, that the two threads *i* and *a* form a twist resembling a splitful of gauze warp, thrown into a zig-zag or serpentine direction, which gives this pattern the appearance of one which was frequently woven on the silk, and known by the name of the balloon net; on which account it sometimes passes under that name.

These examples, it is presumed, will be sufficient to explain the nature and processes of net weaving, and to show that, by changing the order of the draught, cording and treading, considerable variety may be produced in these fabrics as well as in the other branches of fancy weaving. I might, indeed, have added examples of the night thought and princess royal woven without the ground or gauze part, but as these, and a great variety of other patterns are now woven without heddles, merely by needle frames, which are shifted so as to produce the requisite crossings of the whip, it would only be taking up time to little or no purpose.

SECT. IV. OF LAPPETS.

LAPPETS may, without much impropriety, be classed among the varieties of cross weaving, as the whip, which was formerly raised by bead lams, is crossed from right to left, alternately, in front of the reed while the pattern is forming.

In the original method of weaving lappets, which formerly formed a considerable branch of the silk manufacture of Paisley, the bead lam shafts were attached to the lay, behind; and a lam, or doup, from each shaft, passed through the reed at different intervals, and united in a small glass bead below the warp. The whip, which was sometimes taken through the reed, and sometimes below it, passed through these beads, so that, by raising any one of the bead lam shafts, the thread of whip was drawn by the bead towards that interval of the reed through which the lam

PRINCIPLES OF LAPPET WEAVING

Plate 8

Fig 2.

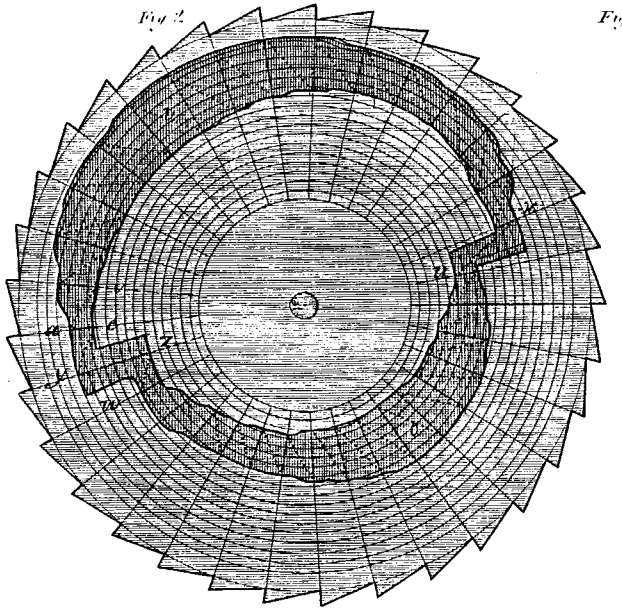


Fig 10

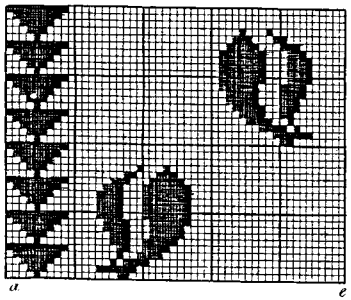


Fig 9

Fig 7

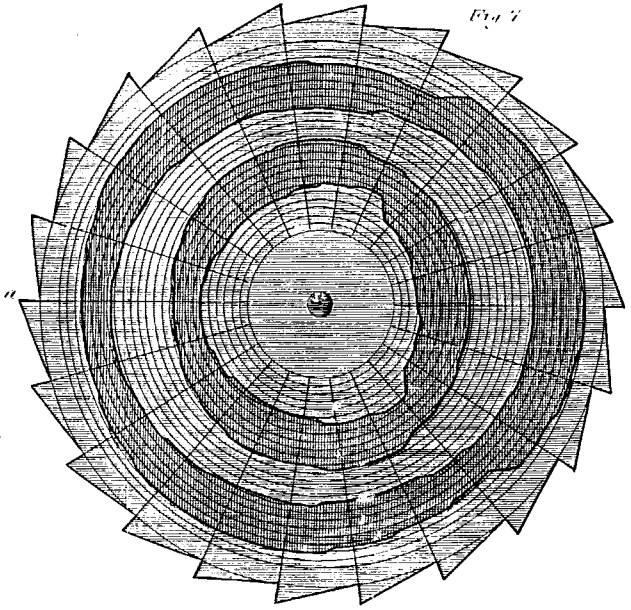


Fig 4

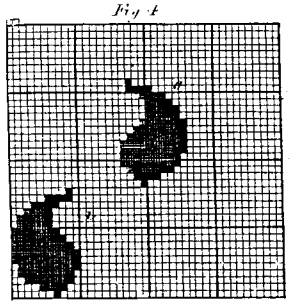
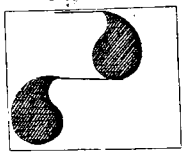


Fig 5



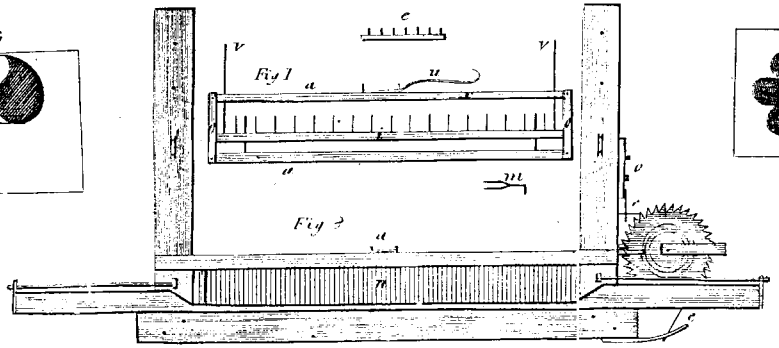


Fig 5

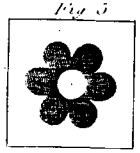
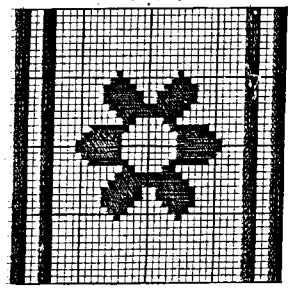


Fig 6



Drawn by J. Murphy

Published by Blackie & Son, Glasgow.

Engraved by J. Maclure

passed, and there raised above the shuttle, where it was fastened to the face of the cloth by the weft. By this means the whip could be drawn across the warp and raised opposite to any interval of the reed through which a lam passed, and formed into various figures on the under surface of the cloth, according to the number of shafts employed, and the order in which they were raised. The whip, as in the present mode, was beamed on a separate roll from the main warp, and was slackened by every treadle that raised a bead lam shaft.

This is the method by which silk lappets were formerly woven in Paisley, and which was subsequently introduced into the cotton manufacture. But as every process of weaving, in which any part of the heddles is subjected to the oscillatory motion of the lay, must be both tedious and intricate, the more simple method of raising the whip by needles placed vertically in a frame, and which could be moved horizontally, at pleasure, by the weaver's hand, was invented soon after the cotton manufacture became extensive.

SINGLE FRAME LAPPETS.

The first kind of lappets which were woven on this principle were produced by one needle frame, from which the name is derived. A representation of the needle frame, adapted to these patterns, will be found at Fig. 1, Plate 8. It consists of the two parallel wooden shafts, *a a*, which are connected together by the upright pieces, *o o*. In these end pieces are grooves, in which the needle shaft *i* moves up and down. The upper side of this frame is placed in a groove, cut in the upper shell or handle of the lay, in such a manner as the needles may stand between the race rod and the reed; and the weaver keeps his left hand on the spring *u*, which is fastened to the frame, and moves the whole apparatus from right to left, alternately, while the

pattern is weaving. At *x* is placed the rack *e*, which regulates the range or extent of the whip on the cloth. It is fixed to the upper shell of the lay, immediately below the spring catch. The spaces between the teeth of the rack, exclusive of the thickness of the catch, are each equal to the number of splits of the reed over which the whip is flushed. The needles are made of brass wire, cut to the proper length. They are flattened and pointed at the upper ends, through which a hole is drilled in each for receiving the whip. The other ends are sharpened and driven into the upper edge of the needle shaft, at the same distances as the figures are to stand on the cloth.

Different methods have been adopted for giving the vertical motion to the needle shaft, both in this and the other apparatus for weaving lappets. One of these, which is pretty common, is as follows: a small crank is made by nailing the ends of two pieces of wood together, at right angles, so as to resemble a carpenter's square; pieces cut off the end of an old heddle shaft are commonly used for this purpose. One of these cranks is screwed, by the joint or centre, to the inner edge of each sword of the lay, at the top, with one end standing upright, and the other projecting forward over the needle frame. From these horizontal arms the cords *v v*, descend to the needle shaft, passing through holes in the upper side of the frame, to confine the needles to a vertical direction. Another cord is tied to the upright arm, which is likewise connected to the back cross rail of the loom, or that above the warp roll. When, therefore, the lay is put backward, the tops of the swords, which are above the centre of motion, move in the contrary direction, and the cords which connect the upright arms to the cross rails turn the cranks round on their centres and elevate the arms which are tied to the needle shaft; and, consequently, raise the needles with the whip above the race of the shuttle. When the lay is brought toward the face of

the cloth, the cranks resume their former position, and the needle frame sinks again by its own weight.

In front of the needle frame, and immediately behind the race rod, another shaft is suspended, into which is driven a number of brass pins, sharpened into points, and which is raised along with the needle shaft, for a guide to the shuttle, in place of the reed in the common kinds of weaving.

Another method of raising the needle frame, which is considered more simple, is by taking the cords *v v*, over screw pulleys fixed into the swords of the lay, in front, and about half way up; and then tying the other ends of the cords to the cross rail of the loom, above the weaver's head. Here it is evident again, that when the lay is put backwards, the needle frame will be raised by the cords *v v*, passing over the pulleys; and as the lay is brought forward, the needle frame will sink, perfectly clear of the reed, by its own weight.

It has been already observed, that the rack and catch regulate the extent of the range which the whip takes across the warp. For example: Suppose the distance between any two teeth of the rack to be four splits of a 1200 reed, exclusive of the thickness of the catch; then it is evident, that so long as the weaver continued to shift the catch from right to left alternately, between these teeth, the needle frame, and consequently the whip, would be crossed to the same extent below, and raised alternately on each side of the four splits when the lay was put back, and tacked to the face of the cloth by the weft; forming a straight flushed stripe of that breadth, running by the length of the cloth. But were the catch shifted to any other interval of the rack, which is effected merely by the weaver slackening the spring and moving his hand to one side, the needles would be equally shifted below the warp; and by again working the catch between the teeth of the rack in this new position,

another flushed stripe would be produced: and thus, by shifting the catch to any part of the rack at pleasure, and varying the extent of these stripes, a great diversity of pattern may be produced on this easy principle. It may be farther observed, that as the needle frame must necessarily rise every time the lay is put back, the weaver must shift the needle frame at the same time; and, consequently, that every shot of the ground weft fastens one thread or ply of the whip to the face of the cloth, but at the alternate sides of the figure.

DOUBLE FRAME LAPPETS.

The first improvement which was made on this method of weaving lappets, was the application of two needle frames so mounted, that when one frame was shifted either to the right or left, the other moved in the contrary direction and reversed the figure. This was effected merely by connecting the two frames at each end, by a cord running over a small pulley, the rack, spring, and other parts of the mounting being the same as for the single frame. The patterns which were woven on this principle, therefore, were produced by first giving the two needle frames an opposite range, by working over the rack in one direction, and returning again till they met in or near the point whence they first started. Sometimes, however, the figures crossed each other at different intervals, and in various forms, and returned in the same or any other order that fancy might suggest.

It has been already observed, however, that so long as the catch continues to work between any two teeth of the rack, the figure produced by each needle will be a stripe of equal breadth throughout; and the only changes which can be effected in the pattern, arise from shifting the catch from one space of the rack to another. Hence, the stiff formality

of such patterns, which is inseparable from this process of weaving, is strikingly observable; and will exist as long as the horizontal range of the needles is confined to a determinate space of the reed. To obtain, therefore, a gradual increase and diminution of the range of flushing without shifting from one space to another, was the next desirable object; and this has been completely effected by substituting a wheel for the rack, by the revolution of which, every variety of range can be given to the needle frames which is requisite in this species of weaving.

WHEEL LAPPETS.

In the method of weaving lappets with the wheel, the needle frame is placed in the very same position, and, in general, mounted in the same manner as described under the rack lappets, and which is represented at *n*, Fig. 8, Plate 8. The wheel has a groove, in place of the spaces between the teeth of the rack, cut in one of its flat sides; and this groove varies in its breadth and is extended in length round the wheel, corresponding to the dimensions of the figure which it is to produce. The wheel possesses another capital advantage over the rack, in so much, that when two or more needle frames are necessary, each frame has a groove for itself, by which the formality in the patterns formerly complained of is entirely avoided.

The wheel is fixed by its pivots into a small frame of wood, one side of which extends to the back of one of the swords of the lay, to which it is fastened with screw nails. In place of the rack and spring, there is a wooden rod, connected to each needle frame, which runs in a groove cut in the upper shell of the lay, and in a horizontal line with the centre of the wheel, as represented in Fig. 8. On the end of each rod is fixed a piece of iron, the end of which is bent as at *m*, Fig. 8, so as to work in the groove of

the wheel by which the range of the needle frame is limited by the warp. This is called the pick or peck. The circumference of the wheel is divided into a certain number of teeth, which likewise regulate the extent of the pattern by the weft. Above the descending side of the wheel is the catch *o*, or hammer, as it is usually termed, loaded with weights, to bring it down with a force sufficient to turn the wheel one tooth. This hammer is raised, in general, by a couper and long march, connected to the right foot treadle, and sinks again when this treadle is relieved from the foot, by which the wheel is shifted one tooth when the shuttle is in the left box of the lay, but is stationary when in the right box; so that two shots of weft are thrown in for each tooth of the wheel, and the whip is also traversed, first to the left, and again to the right, in the same time, and fastened to the face of the cloth at both sides of the pattern. Nearly in the middle of the shifting rod is the handle *a*, Fig. 8, which the weaver holds in his left hand, by which he gives the horizontal motion to the needle frames, in the same manner as when working with the rack and spring. But when more frames than one are employed, their different motions are given by means of cords connected to their shifting rods, and running over pulleys on the upper shell of the lay. There is another groove round the circumference of the wheel, immediately behind the teeth, in which there is a cord fastened to a spring, by the proper tempering of which, the motion of the wheel is regulated, so that it may be neither too loose nor too tight on its axis. This cord and spring will be seen at *e e*, Fig. 8. Fig. 2, is the representation of a lappet wheel for weaving the pattern Fig. 3; and Fig. 4 is the same pattern on design paper. It is calculated for a twelve hundred reed, and stands on ten splits, with six splits for the plains between the bosoming spots. *l*, Fig. 2, is that part of the groove which produces the spot *i*, Fig. 4, and the other part of the groove, marked *o*, works the bosoming spot *o* in the same Fig.

CUTTING LAPPET WHEELS.

The wheel is made of well-seasoned wood, generally of sycamore, or plaintree, and may be made of any convenient diameter; for that does not affect the pattern, provided it be large enough to prevent confusion where the lines approach the centre. When the wheel is to be made for two or more frames, however, the diameter must be made proportionally larger than for the single frame. The wood is put into a turning lathe, and turned to the requisite thickness and diameter, and the groove is cut out in its circumference for the spring cord formerly mentioned. A number of concentric circles are next described on one of its sides, at the same distances from each other as the splits of the sett of reed for which the pattern is intended. This is the method originally pursued in making lappet wheels; but it is now found more convenient, being less liable to confusion, to mark every second split, only, by a circle, as the half of the intermediate spaces may be easily ascertained by sight, when an odd split is required, as will appear on examining Fig. 2. These circles are described almost instantaneously by a very simple process. While the wheel is in the turning lathe, a piece of thin steel is applied to its side, the edge of which is formed into points, at the same distance from each other as every second split of the given reed. The circumference of the wheel is next divided into as many equal parts for the teeth, as are equal to half the number of weft shots in the pattern, or to the whole number of spaces of the design paper, counted upwards, on which the figure stands: for, as already observed, the needle frame is moved twice by the hand, first to the left and then to the right, for each shifting of the wheel from one tooth to another. It must be observed, however, that it is common in detached figures, both at the beginning and ending,

to move the needles over one splitful of the warp only, for the purpose of fastening the whip; and, therefore, in every case where this occurs, there must be one tooth more added to the number, which would otherwise be requisite for the given figure. There is another circumstance that must be attended to in calculating the teeth of these wheels, which is, as the wheel must shift an accommodating tooth while the needles are moving from the right to the left hand bosoming spots, another must be added for this purpose; but this is not necessary when the needles are moving in the contrary direction, as will be more fully illustrated farther on. When the number of the teeth have been thus ascertained and marked off, a straight line or radius is drawn from the cent of the wheel to each of these divisions in the circumference, and then it is ready for cutting the groove.

In order to explain this process, which will greatly assist in illustrating the principles of lappet weaving, we shall take for an example, the pattern and wheel already referred to. Here it will be observed, that the spot Fig. 4, occupies ten spaces of the design paper from right to left, or ten splits of warp; and as every space, counted upward, requires one tooth of the wheel, and is equivalent to two shots of the ground, it follows, that there will be fourteen teeth required for this part of the wheel, and that twenty-eight shots of the ground must be thrown in while this part of the pattern is weaving. But as there is a fastening split both at the beginning and end of this spot, two additional teeth will be necessary for this purpose, and as the same takes place in the bosoming spot, and a tooth added for shifting from one spot to the other, as already noticed, the whole number of teeth for this pattern will be 33, as represented in Fig. 2.

Again, as the concentric or reed circles are here drawn at the distance of two splits of a twelve hundred reed from

each other, and the spot occupies ten splits, it is plain that five of these spaces would be the exact breadth of the groove at its greatest extent. But as the thickness of the peck must always be added to the breadth of the groove, which, in this example, is supposed to be four splits, two spaces more must be taken into the account. Then, on the first or bottom space of the design paper, Fig. 4, it will be found that there are six blank squares, counting from the left, between the extremity of the spot *i* and the fastening split, three spaces are therefore counted off on the wheel, from the left, at the beginning of the spot at *a*, Fig. 2; where there is a mark made with a point of the compasses, for one side of the groove. Again, count two spaces more for the diameter of the peck, and add a half space for the fastening split, and make another mark at *e;* and this will point out the breadth of the groove at this tooth of the wheel. As the spot extends two splits to the left and one to the right, on the second space of the design, make a mark at a full space to the left, and a half space to the right, of the wheel; and this will give the breadth of the groove at the second tooth. On the third space of the design, the figure extends two splits more to the left and one to the right; these being marked off as before, will give the breadth of the groove for the third tooth; and so on to *x*, where the groove is again contracted to five splits; that is, four for the peck and one for the fastening split, after which the peck enters the groove of the bosoming spot *o*, which is exactly the same as the preceding, only it is reversed, and its position shifted six splits clear of the other, for the plain part of the pattern.

When the breadth of the groove is thus marked off for each tooth, the marks are all joined with a black lead pencil; observing, however, that where the groove is either widened or contracted, the changes must be made in the middle of the space of each tooth, that the peck may have

the full breadth of the groove to traverse by the time the wheel becomes stationary. This done, the edges of the groove, as marked off with the pencil, are cut out with a chisel and mallet, and the bottom cleared with gouges or other proper instruments.

It was observed in calculating the teeth of the wheel, that an odd tooth was necessary in shifting from one of the bosom spots to the other. This will be better understood by following the dotted line in the groove of the wheel, Fig. 2, which may be taken for the track of the point of the peck in one revolution. Thus, when the weaver commences his operation, the peck is at the right side of the groove, at *e;* and, when the right foot treadle is pressed down, the hammer is raised, the wheel is stationary, and the peck is shifted to the left at *a*. But before the peck returns again to the right side of the groove, the hammer has shifted the wheel one tooth; and, consequently, the peck will now touch the side of the groove at the point *v*. By tracing the dotted line still farther, it will be found that the peck will shift directly from *x* to *u*, by moving the wheel only one tooth, as in the other parts of the pattern. But when it arrives at *w*, which is the end of the spot, its next position should be at *e*, where the other spot begins; but as this would interrupt the reciprocating motion of the needle frame, the tooth above mentioned is added, and its next position is at *z*, and must return again to the left side of the groove *y*, before it can arrive at the beginning of the spot.

WHEELS FOR TWO FRAMES.

From the preceding description, it will appear, that any figure, within a moderate compass, may be produced with the lappet wheel and one needle frame, provided such figures be solid, or that the spaces on the design paper be entire from right to left: for if the

figure be broken into two, three, or more parts in its horizontal range, one frame will be necessary for every such part.

Fig. 5 is a pattern for two needle frames, adapted to a 14 hundred reed, and Fig. 6 is the same on design paper. As this figure is open in the centre, it is evident that two needle frames will be requisite, and these work in contrary directions, one on each side of the centre, coming into contact and receding from each other, alternately. Fig. 7 is a representation of the wheel for this pattern, on which there are two grooves, one for the peck of each frame; and these grooves are placed at such a distance from each other, as is necessary to secure the wood between them from being broken; the shifting rod of the inside groove being so much longer than the other, as to fit that distance. The figures in this example are not bosomed, as in the preceding, otherwise the wheel must have been considerably larger. As the two needle frames move always in contrary directions, they are commonly mounted in the manner explained under the rack double frame.

By examining Fig. 6, it will be found that the spot stands upon 22 splits, or 11 splits for the range of each needle. From the left extremity of the spot to the fastening split, on the design paper, there are six blank spaces; therefore three of the circular spaces on the wheel are counted off, and a mark made for one side of the groove; and as there are in this example, six splits allowed for the diameter of the peck, three spaces, together with a half space for the fastening split, are added, and a mark made for the other side of the groove at this tooth of the wheel; and so on with the others, as in the foregoing example. The other groove is marked off in the very same manner, only reversed; that is, the side next the centre of the wheel of the inside groove is the same as the side next the circumference of the other.

DROPPED FRAMES.

Fig. 9 is a pattern for three needle frames, and Fig. 10 is its representation on design paper. In this pattern it will be observed, that the needle frame for the small colonade is constantly working, while the other two which produce the sprig are occasionally at rest. When the working of any of the frames is omitted for a time, in this manner, such frames are said to be dropped. In weaving patterns of this kind, the needle frame which is constantly working is usually raised in the manner formerly described; but those that are occasionally dropped must be mounted separately. The common method of raising these needles is, by means of a couper and long march, which last is connected to tongues, or small pieces of wood attached to the treadles; so that, when the weaver shifts his feet forward on the tongues, the frames are raised, and the needles produce the figures; but as soon as he shifts his feet a little backward on the treadles, clear of the tongues, the needles are dropped. In calculating the needles for this pattern, it must observed, that the range for one set extends only from *a* to *e;* for the second stripe is added merely to show the position of the first needle of the second set, or the manner in which the pattern joins.

It may be further observed, that although Fig. 6 is given merely as an example of a double frame lappet, it might have been ranked among those of the dropped kind, as the figures stand detached, with plain spaces intervening, both by the warp and weft. When the whole of the frames, however, are thus omitted at the same time, it is not necessary to make any alteration in the mode in which they are mounted; for the needles can be raised and dropped at pleasure, by raising the hammer with a tongue attached to the right foot treadle. These observations apply likewise to patterns which require a greater number of frames, some of which have been lately made with six grooves in the wheel.

When lappets are made into shawls, there are one set of needle frames requisite for the side border, and another for the cross border and centre. As the spots in the centre, however, are always thinner than those of the borders, part of the cross border needles must be dropped during the whole of the time the centre is weaving. But as the spots thus omitted are usually the same as those which are continued, there is, in such cases, no occasion for an additional groove in the wheel; for the two needle shafts are placed into one frame, one above the other; and the needles of the under shaft, which pass through holes made in the upper one, are so much longer, that their points are in the same horizontal line when the two shafts are in contact; so that both shafts are raised and sunk together in working the cross border, but the under one is always sunk in weaving the centre.

Having explained, at considerable length, the construction and use of the lappet wheel, it will next be necessary to take some notice of the method of arranging the needles, so as to produce the requisite diversity of pattern. If we take, for example, the pattern Fig. 4, we will find that there are ten splits in each of the bosoming spots, and six in each of the intervening plains, which make in whole 32 splits for the range or space allotted to each needle. As the needles, in this, are all placed at equal distances, we have only to divide the quantity of warp in the web by 32, to find the number of needles, and, consequently, the number of ends of the whip which will be requisite for this pattern. Thus, suppose the cloth to be five-fourths broad, or 1500 splits of a 12 hundred reed; then

```
32) 1500 (46
    128
    ---
     220
     192
     ---
      28
```

Here we have 46 of a quotient and 28 splits over; so that by adding a few splits we will have 47 needles, or by throwing a few away, we will have 46; making, in either case, a sufficient allowance for the selvages. Again, if 32 splits be taken in a pair of dividers, from the reed scale, for a 1200, and set off along the edge of the needle shaft, each mark left by the points of the dividers, will show where a needle is to be inserted.

When the needles are set at unequal distances, one whole set of the pattern may be formed, as above, and again subdivided, agreeably to the different positions of the needles. The same is to be understood when more than one needle shaft is employed, for the position of the needles of each shaft must be found to suit the particular space allotted to it in the pattern; and the whole must be so arranged, by adapting them to their respective shifting rods, as produce the desired effect.

Although it has been observed, that patterns may be woven by means of the lappet wheel to any extent; yet this must be understood in a very limited sense: for, as the whip is never interwoven with the cloth, except at the extremities of the figures, it is evident, that, by giving it too much lateral range, the objects produced would be loose and flabby, and liable to be caught and torn out by every thing with which it came in contact. A method has, indeed, been attempted, of fastening the whip in the middle of large objects; which is, by raising a fine thread the same as the warp, by an additional needle frame, at each traverse of the whip along the face of the cloth. But this contrivance does not seem to have been attended with any material advantage, since it is now entirely neglected.

The method of traversing the lappet whip across the warp, in front of the reed, would naturally suggest the idea of crossing the whip of nets, likewise, with needles; by which a variety of patterns might be produced without heddles, as for-

merly noticed. For suppose we take two needle shafts, one with the needles upright, in the usual way, the other with their points downward, and a thread of warp drawn through the eye of each; then, if the upper shaft be shifted a little to one side, and the needles sunk on the right of those in the under shaft, so as to open a shed to receive a shot of weft; and, again, if the upper needles be raised, shifted in the contrary direction, and sunk on the left of the others, forming a shed for another shot of weft; the texture thus produced would be the common plain gauze. Hence it is easy to conceive, that, by extending the range of the needles a little further, in each direction, or by increasing the number of needle shafts, varying their motions, and sometimes omitting to raise or sink any number of the needles, all that variety of net patterns may be produced which have lately made their appearance in the market. But as the proprietors of this invention are still disposed to keep their process a secret, a detailed account of it cannot be given in this place.

CHAP. VIII.

SPOTTING.

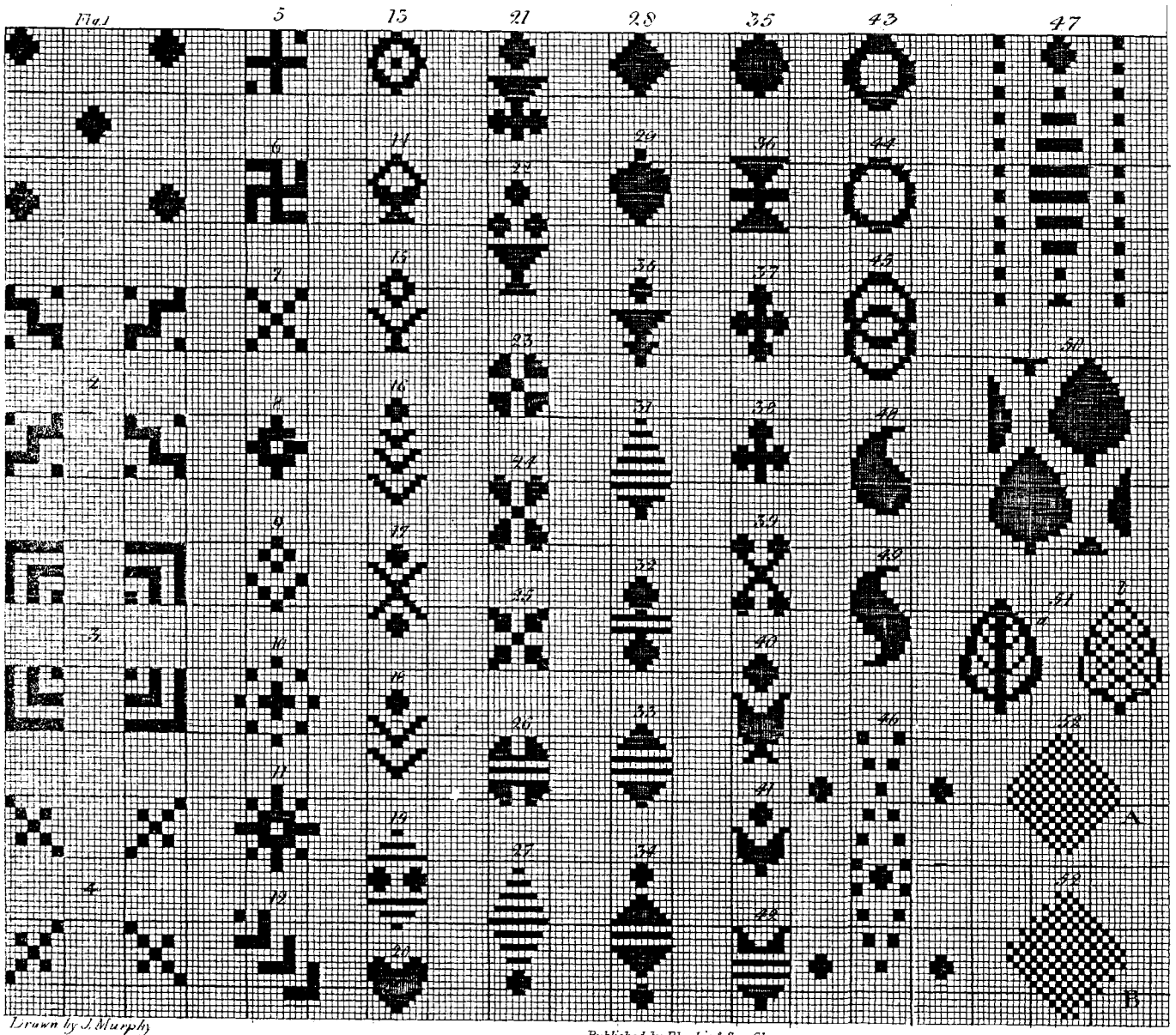
In all the preceding branches of weaving, the figures or patterns are formed by the several modes in which the warp and weft are interwoven, or flushed over each other. In this extensive branch of manufacture, however, the spots or figures are woven on the cloth by incorporating the spotting, and in some instances, the stripping, with certain portions of the ground; and those parts which are flushed over the intervals, in most of the kinds, are afterwards cut away. The spotting yarn is coarser than that which composes the ground, sometimes coloured, and is usually two or more ends wound together, without any twist.

Spots which are woven on a plain ground or texture, are usually divided into two kinds, namely, the *common spot* and the *paper spot;* for, on any other ground, this distinction is unnecessary.

SECT. I. COMMON SPOTS.

The mounting of a common spot consists of the *fore leaf*, the *ground leaf*, and the *spotting leaves* by which the patterns are produced. The fore leaf contains that half of the warp which would have been drawn on the front leaf of a plain web; and the ground and spotting leaves, taken together contain the other half; so that, on the ground leaf are drawn those portions of the warp, only, which fall into the intervals between the spots.

PRINCIPLES OF SPOT WEAVING



Drawn by J. Murphy

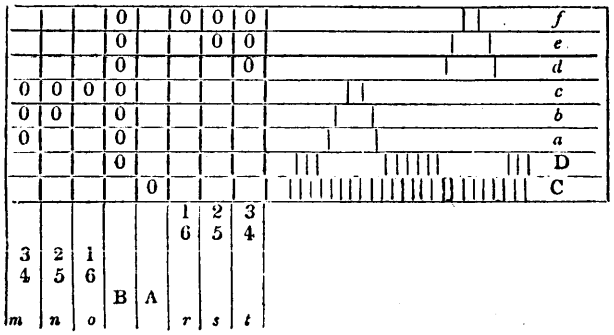
Published by Blackie & Son, Glasgow.

Engraved by J. Maclure

By an attentive perusal of the following plan, and its description, the principle on which common spots are woven will become obvious: it is the draught and cording of what is called a

ROUND SPOT.

No. 1. Fig. 1. Plate 9.



In this plan, which contains six spotting, and two plain leaves, the letter C points out the fore leaf, D the ground leaf, and the small letters *a*, *b*, *c*, *d*, *e*, and *f*, the spotting leaves respectively. The leaves *a*, *b*, and *c*, however, are sufficient to form the figure; but, as it is common in spot weaving to throw one row of spots into the bosom of the other, as in the figure on design paper accompanying this example, the leaves *d*, *e*, *f*, are added for this purpose.

It will appear by the marks on the draught, each of which denotes one thread of warp, that there are three splitfuls of plain, drawn in alternate threads on the ground and fore leaves D and C, exclusive of selvages, which are considered separately from the warp, and are also drawn on these two leaves. Then the first thread of the spot is drawn on the spotting leaf *d*, and the other thread of the same splitful

on the fore leaf. The second thread of the spot is drawn on the leaf *e*, and another thread to complete the splitful on the fore leaf. The third spotting thread is drawn on the leaf *f*, and another on the fore leaf; and so on with the other half of the spot. The next part of the draught contains six splitfuls of plain, because there are six splits in the extent of the spot; or, in other words, the spot is said to stand upon six splits: and this makes what is termed a *half cover.* Then we come to the bosoming spot, which is drawn, in every respect, in the same manner as the first, but upon the leaves, *a*, *b*, and *c;* and then follow three splits of plain to make a complete interval with the three first drawn: and this constitutes one set of the pattern, or once over the draught, which is to be repeated as often as necessary to produce the given breadth of the web.

Again, the two treadles A and B are corded to weave plain cloth: A raises the fore leaf C and sinks the others; B raises the ground and spotting leaves, and sinks the fore leaf. The spotting treadle *r* raises the point leaf *f*, and sinks all the warp except what is drawn on that leaf; the treadle *s* raises the leaves *e* and *f*, sinking the others; and the treadle *t* raises the three spotting leaves *f*, *e*, and *d;* and thus one half of the spot is produced, the other half being formed by reversing this order of treading, as pointed out by the figures on the treadles. This finishes one row of the spots, and the bosoming one is produced, in like manner, by the treadles *m*, *n*, *o*.

In all patterns woven on the common spot principle, there are two shots of fine weft thrown across, on the plain treadles, for each shot of spotting, in order to reverse the plain sheds, and complete the texture of the ground below the spot. In this example, therefore, after throwing across a shot of spotting on the treadle *r*, the weaver works two shots of fine on the treadles A and B for the ground; then another coarse shot on *s*, and two fine on A and B; and so

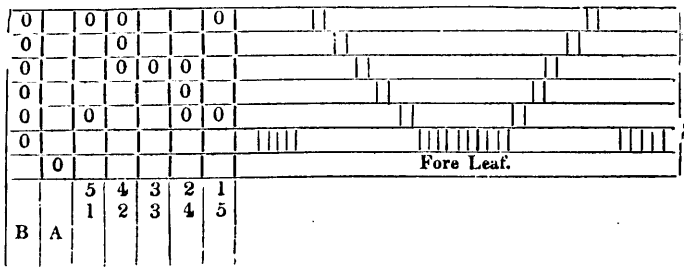
forth with the remaining part of the spot. After weaving twelve shots of fine for the plain, which, in this example, is of the same extent as the spot, the bosoming row is woven in the same manner as the first.

Of this and the following plans, it may be observed, that although the warp of the plain parts be marked as if drawn on two leaves only, to render the principle as perspicuous as possible; yet it is usual, as in plain weaving, to divide the warps of C and D, respectively, between two leaves, that the heddles may not be too much crowded in those parts.

Common spots are usually designed on 10 by 10 paper, except considerably more weft than warp be required, in which case, either 8 by 9 or 8 by 10 may be employed; and as one thread, only, of each splitful rises in the formation of the spotting sheds, each space on the design paper, running vertically, will represent one splitful, or two threads of warp. Again, as there are two shots of fine or ground thrown in for each shot of spotting, these three threads will likewise be included in one space from right to left.

In looking back on the different methods of varying the draughts and cordings which have been explained in the preceding chapters, it will readily be perceived, that an extensive variety of patterns may likewise be produced on this principle. It will only be necessary, however, in what follows, to explain those forms of mounting which are of most use in practice. In the following examples, two threads are drawn on each spotting leaf; but, instead of the spots being embosomed, as in the preceding plan, they stand in an inverted position in the same row.

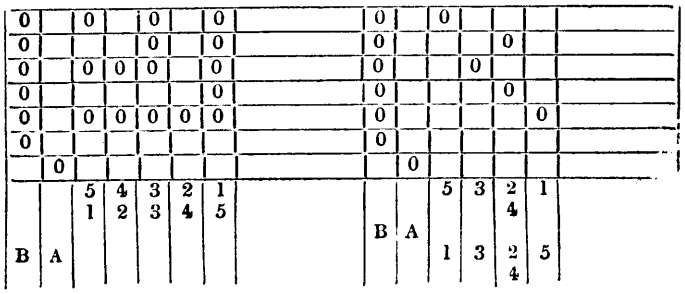
No. 2. Fig. 2. Plate. 9.



No. 3. No. 4.

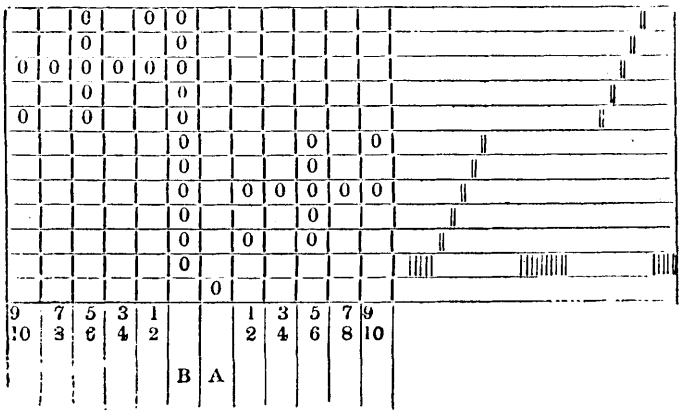
Fig. 3. Fig. 4.

Draught same as No. 2.



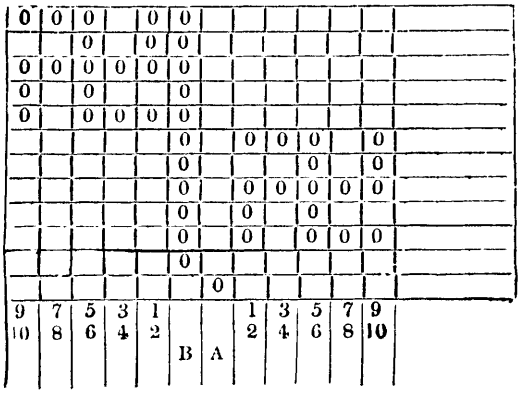
In the following plans the figures are bosomed, which, consequently, require double the number of spotting leaves. To save room on the Plate, however, only one spot of each pattern is drawn. These and the eight following Nos. have two shots of spotting on each treadle.

No. 5. Fig. 5.

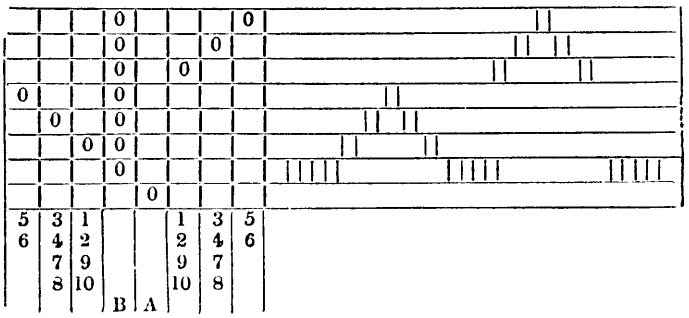


No. 6. Fig. 6.

Draught same as No. 5.

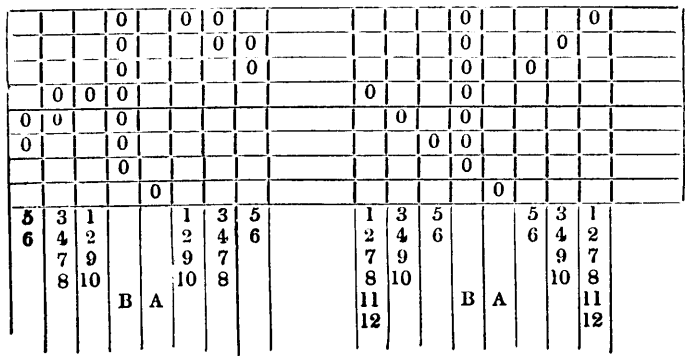


No. 7. Fig. 7.

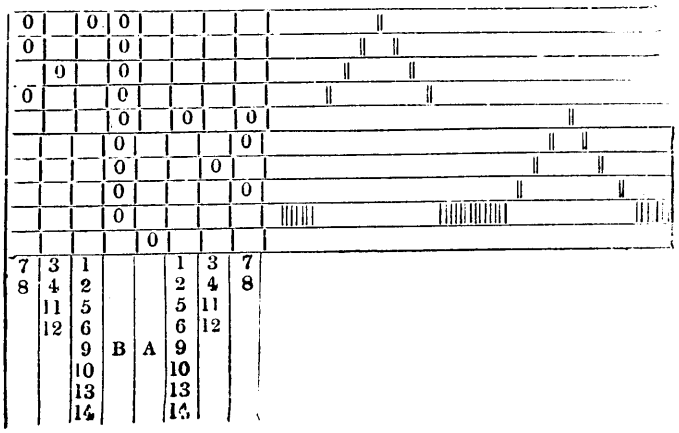


No. 8. No. 9.

Fig. 8. Draught same as No. 7. Fig. 9.

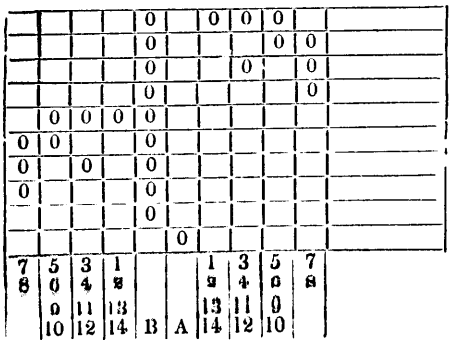


No. 10. Fig. 10.

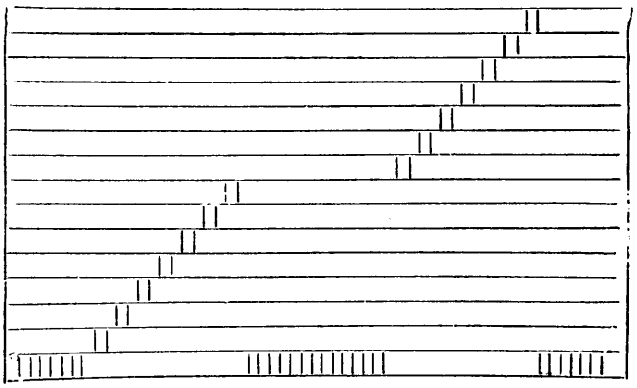


No. 11. Fig. 11.

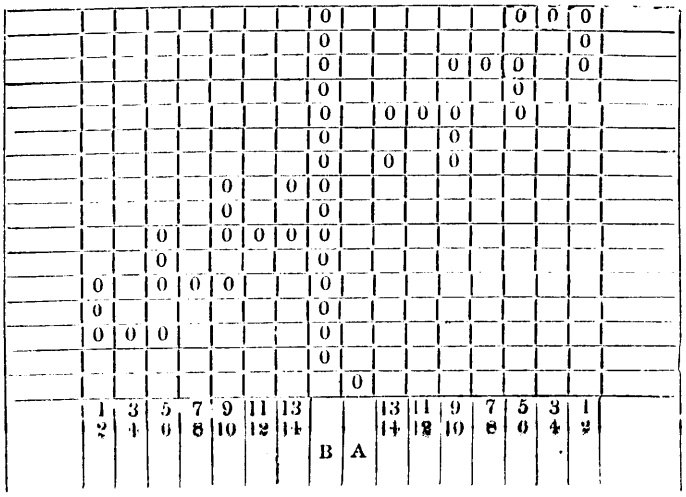
Draught same as No. 10.



No. 12. Fig. 12. Draught.

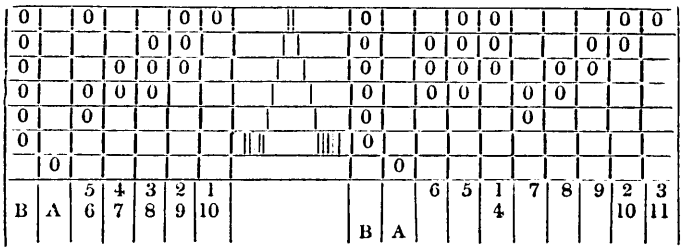


No. 12. CORDING.



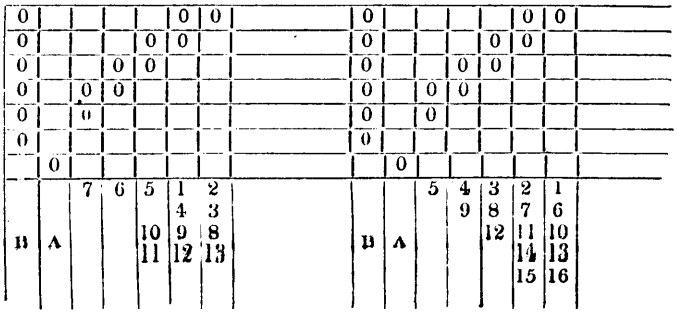
These examples will give the reader some idea of the manner in which spot mountings may be diversified. But, as the diamond draught, of which No. 1 is an example on a small scale, is of most frequent use, both for common and paper spots, it will be of great advantage to the tradesman to be able to produce a variety of patterns from any given mounting of this form. The following example, in which thirty varieties are given, by a mounting of five spotting leaves, will show how this may be effected. In these plans, the draughts and cordings are made for one row of spots, only; but the bosoming spots may be easily supplied, if necessary. The draught is the same for all these patterns to No. 42, and need not be repeated.

No. 13. Fig. 13.



No. 14. Fig. 14.

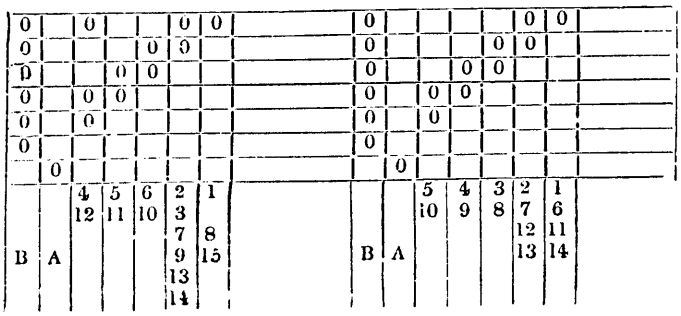
No. 15. Fig. 15.



No. 16. Fig. 16.

No. 17.

Fig. 17.

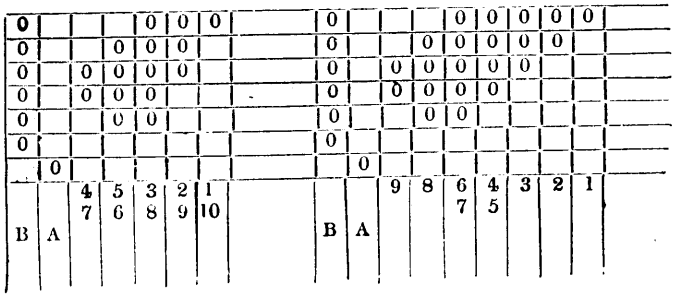


No. 18

Fig. 18.

No. 19.

Fig. 19.



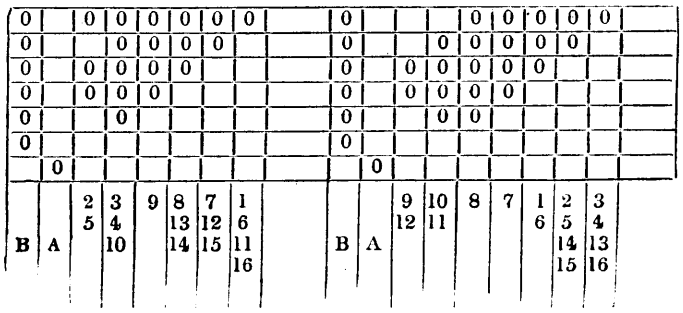
No. 20.

Fig. 20.

Note. In Figure 19 there are four shots of ground between the spotting shots, if a plain texture, or two if gauze.

No. 21.

Fig. 21.

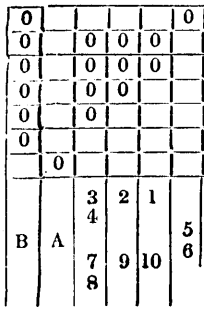


No. 22.

Fig. 22.

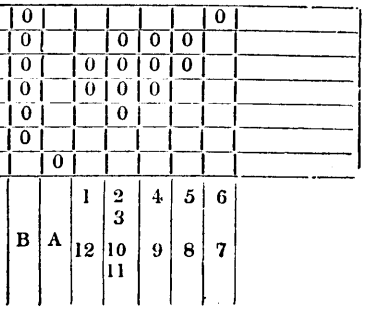
No. 23.

Fig. 23.



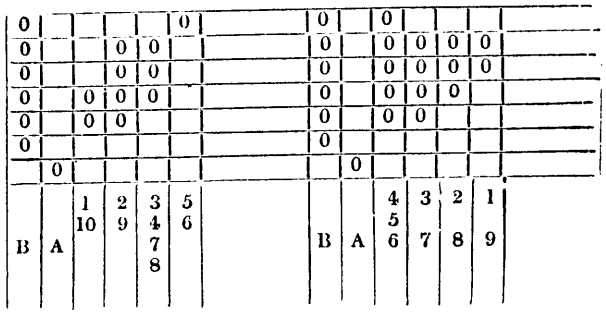
No. 24.

Fig. 24.



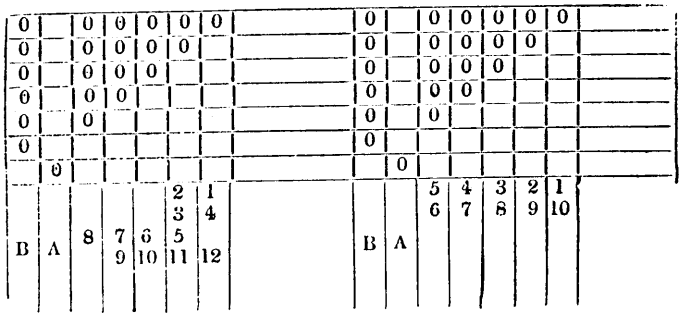
No. 25. No. 26.

Fig. 25. Fig. 26.



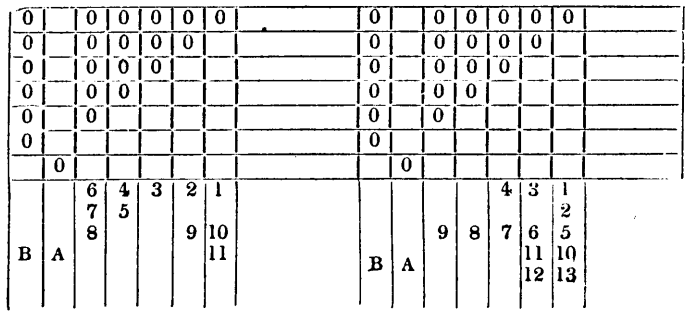
No. 27. No. 28.

Fig. 27. Fig. 28.



No. 29.

Fig. 29.

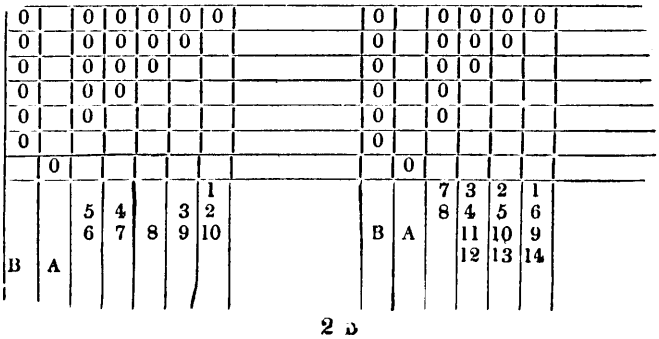


No. 30.

Fig. 30.

No. 31.

Fig. 31.

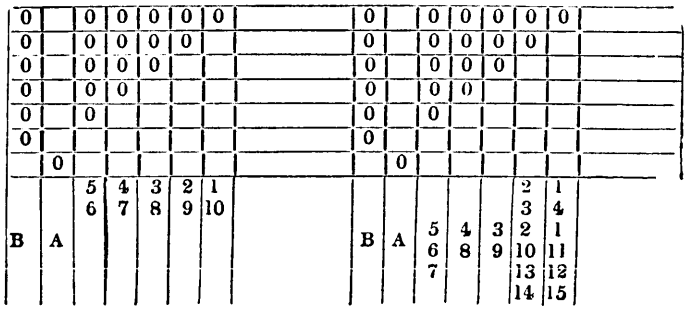


No. 32.

Fig. 32.

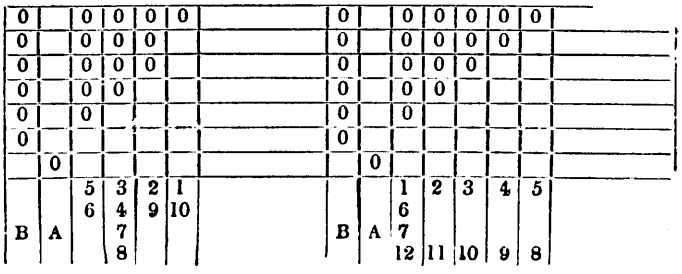
No. 33. No. 34.

Fig. 33. Fig. 34.

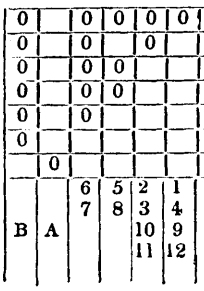


No. 35. No. 36.

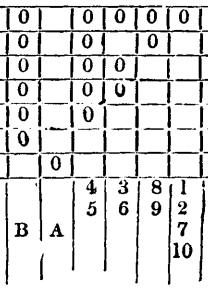
Fig. 35. Fig. 36.



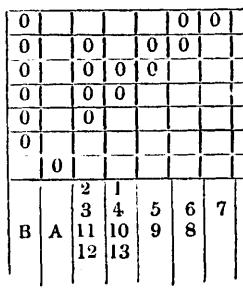
No. 37. Fig. 37.



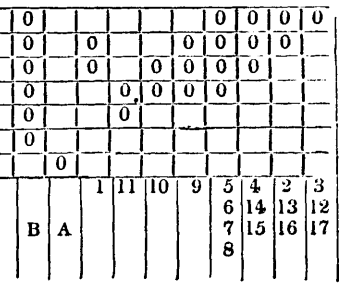
No. 38. Fig. 38.



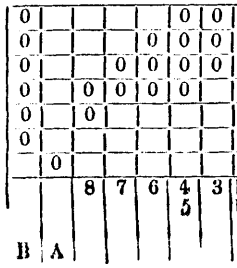
No. 39. Fig. 39.



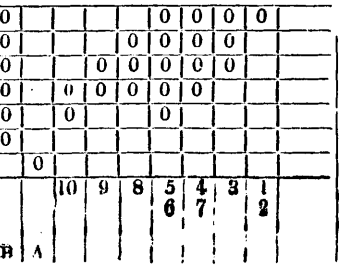
No. 40. Fig. 40.



No. 41. Fig. 41.



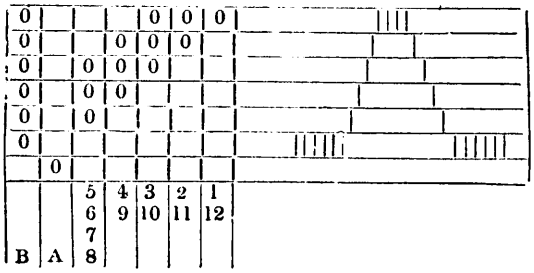
No. 42. Fig. 42.



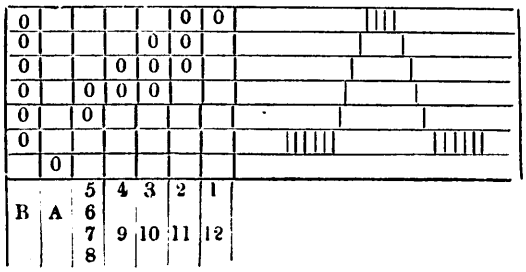
It is sometimes of advantage to the weaver to have his draught made upon a larger scale than is barely necessary for the intended pattern. By this means he has it in his power to increase the variety of pattern considerably, without incurring the expense of many different mountings. For this reason, Figs. 23, 25, 26, 32, 35, 37, and 38, are included among the preceding specimens, although it must be obvious that they could be woven with only four spotting leaves.

If four threads be drawn on the point leaf, instead of two, in the preceding mounting, other varieties will be obtained, of which the following are given as examples.

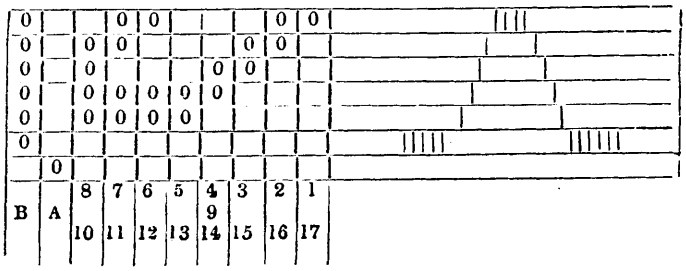
No. 43. Fig. 43.



No. 44. Fig. 44.

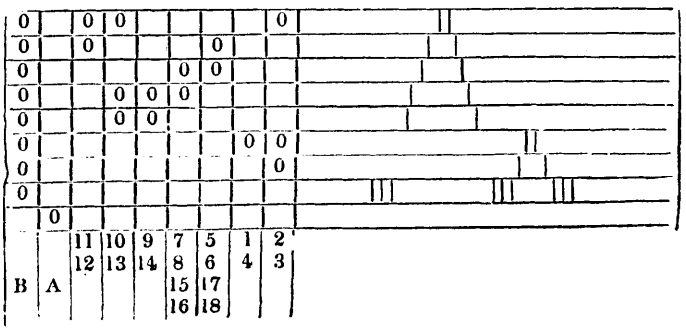


No. 45. Fig. 45.

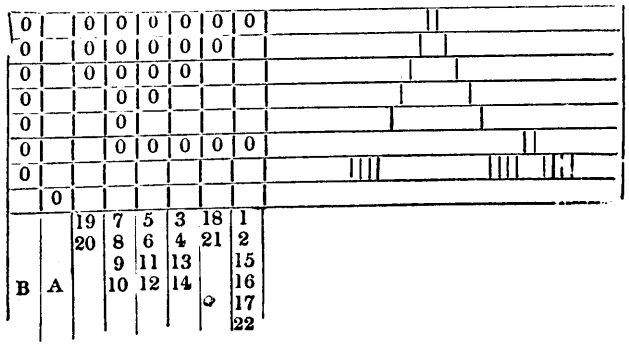


Spots of this or larger size are frequently embosomed with some inferior figure, such as a barley-corn, club, or round drop, which will require only one, two, or three leaves; by which means, mountings may be considerably reduced, while, at the same time, they are capable of producing a very extensive variety of pattern. The two following plans will suffice for examples.

No. 46. Fig. 46.

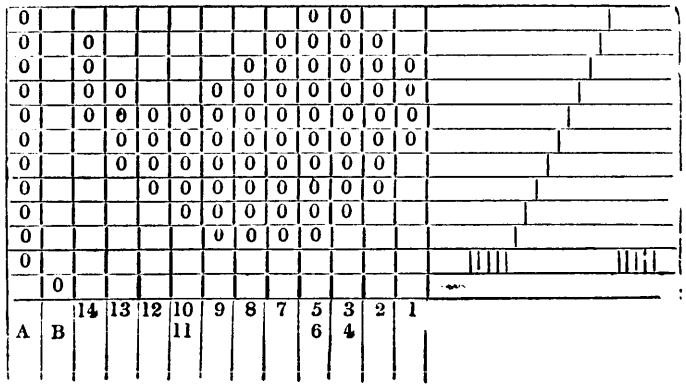


No. 47. Fig. 47.

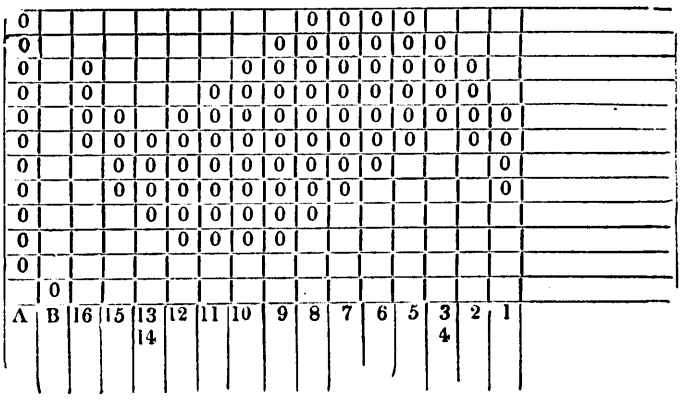


It is observable of the diamond draught, that whatever variety of figures it can produce, they are always alike on each side, or diverge, as it were from a centre. There is another spot draught, however, which obviates this formal appearance of these figures, but which requires double the number of spotting leaves to produce a pattern of the same extent. This draught runs straight over the leaves like the draught of a regular tweel; by which each thread of the spot may be raised independently of the others, and any variety can be produced within the limits of the draught. This mounting, however, owing to the number of leaves requisite for a spot of but moderate size, is not in such general use as the diamond draught. The two following examples will show the effect of this mounting.

No. 48. Fig. 48.

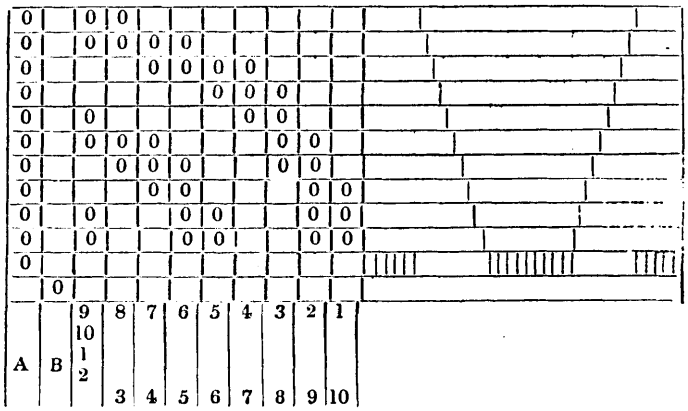


No. 49. Draught No. 48. Fig. 49.



The cordings of these spots are given, that they may be compared with those of the diamond draught; but as patterns of this kind require double the number of spotting leaves, they are seldom woven with treadles, but by the machines already described, the application of which will be explained under paper spots. The same variety of pattern may be woven without the embosoming leaves, if the draught be reversed, as in the following plan, the effect of which may be seen by taking it off on design paper.

No. 50.



SECT. II. ALLOVER SPOTS.

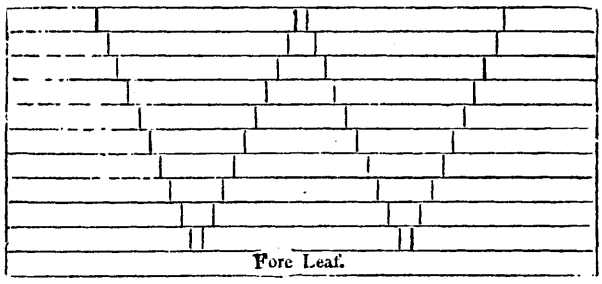
In the preceding spots, the figures stand detached from each other, with portions of intervening plain, which is generally calculated for half cover; although this proportion of cover is not always adopted, but varies with the intended richness of the pattern. When the draughts of the spots, however, are connected together without any such plains, and the spotting continued without intervals, the

pattern is said to be an allover, or full cover. Hence, as the selvages, only, are woven plain, the ground leaf is retained merely for a few heddles on each side for this purpose.

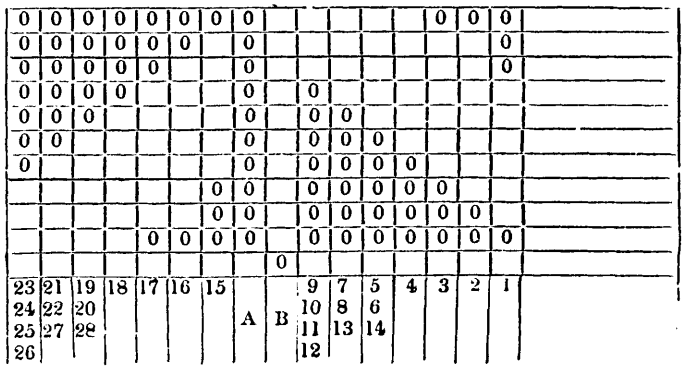
The draughts of allovers, like those of detached spots, are of various forms; but that which is in most use is the diamond draught, an example of which is here given.

No. 51. Fig. 50.

Draught.



No. 51. CORDING.



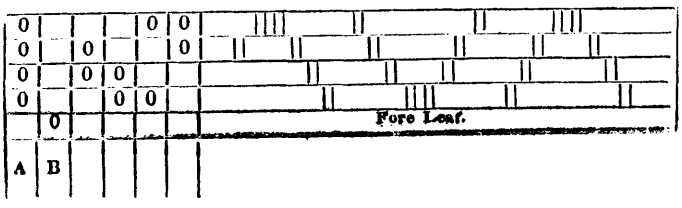
This draught is, in effect, the same as No. 13 without the plains; only the draught of the bosoming spot is inverted,

that the plan of cording may appear to more advantage. By this arrangement we have the power of twenty splits with only ten leaves; and therefore, any similar sided figure, to the extent of that space, may be woven with this mounting. We also see by the design, that when distinct figures are produced by this mounting, one row of these figures may overlap or run a considerable way into the bosom of the other, both by the warp and weft: and what one spot, in such cases, takes more than its own proportion of the draught, is said to be borrowed from the other; and also, whatever part of the one spot is woven before the other is finished, has its raising cords tied on the opposite side of the treadles, as exhibited in the above plan.

This pattern, as well as the other spots, is corded to be woven solid, where there is no clipping; but large figures of this kind are sometimes flushed or diced, as represented in Fig. 51.

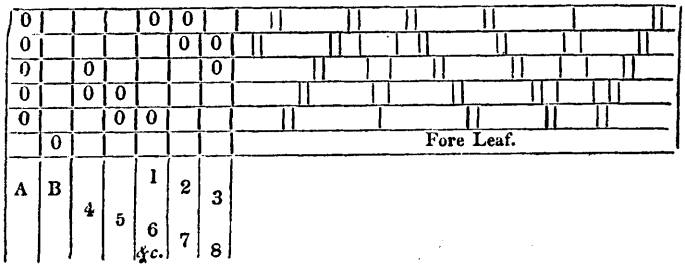
It may be observed, that the single over and over draught, No. 48, cannot be employed for allovers with any degree of advantage, until it be extended to a harness. There are, however, other methods of making a great diversity in allover spots, by varying the order of the draught, as in lined work, where the double, triple, &c. draughts are explained: or by the more varied form of the diaper draught, as exemplified under crape. The following is a plan of an allover spot mounting, with a double draught, the pattern of which may be easily traced on design paper, by making the spot treading follow the same order as the draught on the leaves.

No. 52.



The following plan admits of still greater diversity; and the figure may also be exhibited on design paper, by following the directions given, under diaper.

No. 53.



To adapt this and some of the other diaper patterns to the common spot, it must be observed, that, in some of the points, only one thread of the warp is raised, as is never the case in this species of weaving, because it does not take a sufficient hold of the spotting. This may be obviated, however, by doubling or tripling the number of draughts on each leaf, according as the web is of fineness; or if more minuteness and delicacy be required, a warp thread of cording may be introduced for the points, and wrought out when it is not requisite in the figure, after the manner of a cut stripe.

SECT. III. PAPER SPOTS, JAPAN SPOTS, OR BROCADES.

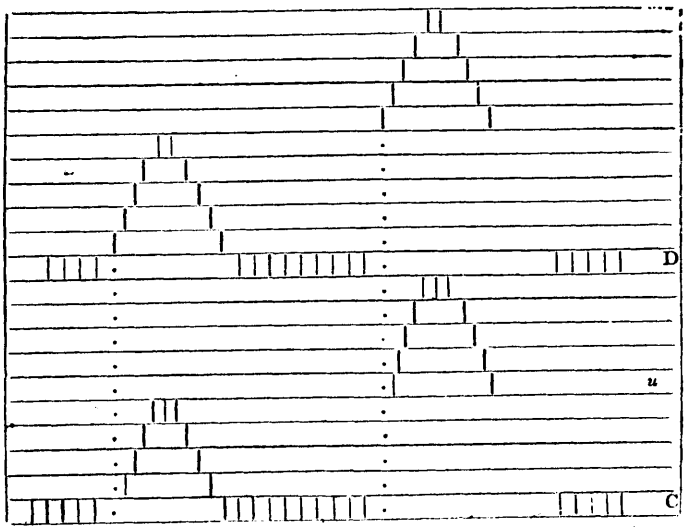
It has been already observed, that in the common spot mounting, one half of the warp is drawn on the ground and spotting leaves, and the other half on the fore leaf; by which two shots of the ground are necessary to bind each shot of spotting. In paper spots, however, that half of the warp, which, in common spots belongs to the front leaf, is

drawn on a corresponding set of spot mounting; and the spotting sheds are formed, alternately, from the back and front sets. By this arrangement, each shot of spotting is sufficiently fastened by one shot only, of the ground: for, from whatever set the leaves are raised to form any of the spotting sheds, that shed will be reversed, by raising the other set for the following shed of the ground: and thus, by allowing the spotting weft to go much closer together than in the common spot, the figures have a more rich and solid appearance, which, probably, has procured them the name of paper spots.

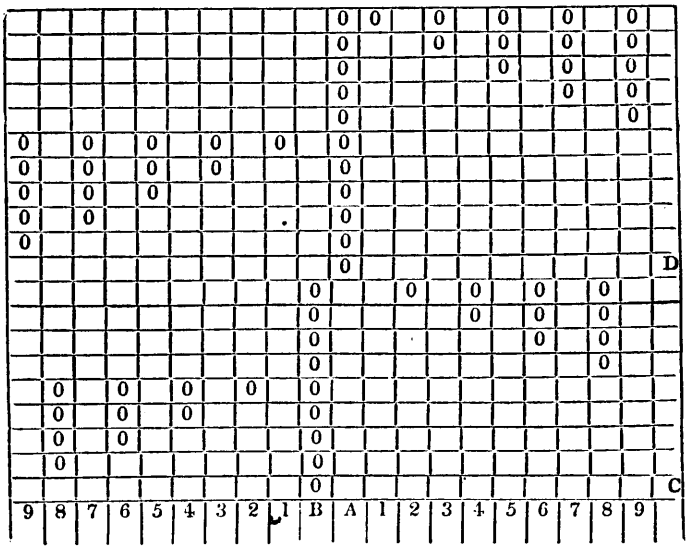
The annexed plan of a paper spot mounting, which is adapted to the very same figures which are produced by the draught of No. 13, will give a comparative view of these two species of spot weaving.

PAPER SPOT DRAUGHT.

No. 54. Fig. 52.



No. 54. CORDING.



In this example, the ground leaves of the two sets are marked C and D, respectively; and the treadles for weaving the ground are marked A and B. As one half of the warp, or all the odd threads as they occur in the draught, are drawn on the back set of spotting leaves and ground leaf D, and the other half, or even numbers, are drawn on the front set and ground leaf C; it follows, that when these two sets with their ground leaves are raised alternately, plain cloth will be produced, agreeably to the cording on the treadles A and B.

Again, when a shot of spotting is thrown into the shed formed by the treadle 1 of the right hand set, which raises a spotting leaf of the back set, the treadle B is pressed down for the succeeding shot of the ground, which reverses that part of the spotting warp that was raised by this leaf. The

next spotting treadle is 2, which raises one of the spotting leaves of the front set; but, to reverse the warp for the next ground shot, the treadle A must be pressed down; and so on, forming the spotting sheds from the back and front sets, alternately, and raising the contrary set for the following shot of the ground.

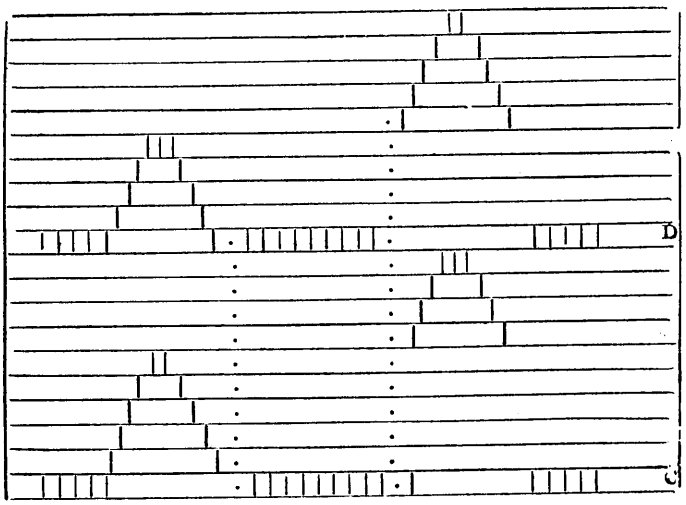
The principal consideration in making draughts and cordings for paper spots, is, to avoid a defect in the figures which is commonly known among tradesmen by the name of *teething*. In order to explain this, it must be observed, that if the two sets of spotting leaves were exactly similar, or, that the corresponding leaves on the back and fore sets were to raise the same number of threads, one side of the figure would increase or decrease by single threads, while the other side would be indented in the manner exhibited in Fig. 52, letter B. For, suppose the two point leaves of the preceding mounting to raise two threads each, instead of the present form; then, as the first spotting shed is opened by the back point leaf, which raises the right hand thread in each interval of the reed; and the second, by the point leaf of the front set, which raises the left hand threads; it will follow, that a regular figure would be formed, extending, by single threads, towards the left side of the web. But the third shed would consist of four threads, which are raised by the back point leaf and the one next it; consequently, two of these will continue the diagonal towards the left, while the other two will extend towards the right: and all the four threads of the fourth shed will again incline to the left; and so on, alternately. Hence, all the members of any pattern produced by a mounting or harness of this description, will be regular, or extend by single threads towards the left; but such members as run towards the right will advance by two threads at once, and thus produce that rugged appearance which has obtained the appellation of teething; probably from its resembling the indentations of a saw. But

this defect is entirely obviated by introducing an odd thread into the point leaf of one set of the mounting, as in the example given above; and its effect will be the same as represented at A, Fig. 52.

The introduction of this odd thread into the paper spot draught causes some deviation, in taking in the warp, from that regularity which is observable in common spots: for it will appear by examining the draught of No. 54, that there are five full splits drawn on the ground leaves D and C, beginning on the leaf D, before the spot part of the draught commences. Then, the first thread of the spot is drawn on the leaf *e*, the second on the leaf *u;* and so on, to the last thread of the spot, which is drawn on the leaf *e;* so that both the first and last threads of this spot belong to the back set. Hence, it is evident, that the first thread of the following plain must be drawn on the fore ground leaf C, and be taken into the same interval of the reed with the last thread of the spot to complete the splitful. The draught then proceeds in regular order to the last thread of the bosom spot, which requires, in like manner, another thread to be drawn on the leaf C to fill the split.

The following plan will exhibit another method of arranging the leaves of a paper spot, in which, it will be observed, that the number of spotting leaves in each set is equal. The cording may be supplied by comparing it with that of No. 54.

No. 55.



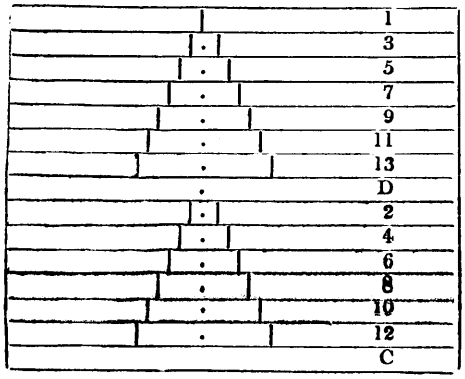
The texture of the figure in this example, which was originally called the paper spot, is similar to that of plain cloth, and which, as formerly noticed, is more rich and solid than that produced by the common spot mountings. Paper spot mountings, however, possess another important advantage over those of the common kind; which is, that although the latter may be corded so as to flush the spotting weft on the upper or cut side of the figures, which, on account of the roughness round the edges, is commonly called the wrong side; yet, as the spotting leaves have the command of one half of the warp only, they can never affect that half which lies in the bottom of the shed; so that the spotting cannot be made to appear to more advantage on the right side of the cloth, than when the figures are woven solid. The case is widely different, however, with the paper spot mountings; for any number of contiguous threads, within the range of the figure, may be raised or

sunk, at pleasure. And, therefore, the spotting may be tweeled, brocaded, or flushed on the right side of the cloth, in any manner that may be required, provided it has a sufficient hold of the ground; and hence, the patterns thus flushed are usually denominated japan spots, or brocades; although the plain texture, wherever it is introduced, still retains the name *papering*. Figs. 53, 54, and 55, are examples of this species of spotting.

The example given in Fig. 53 will, however, be sufficient to illustrate the principle on which these patterns are produced; the other two being added merely as varieties of the same draught.

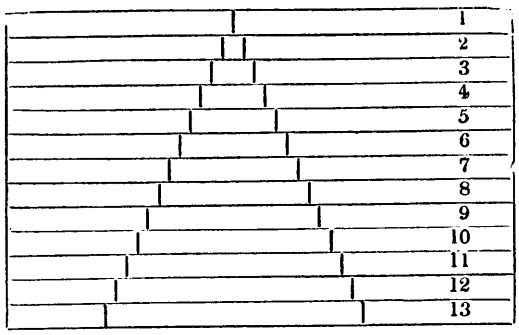
The pattern Fig. 53, requires thirteen leaves, or, if the figures are embosomed, twenty-six, exclusive of those for the ground. The draught is of the diamond form; but, as the odd thread, which is introduced into the centre of paper spots to prevent the teething formerly noticed, is occasionally raised independently of the others, it must have a separate shaft; and, consequently, one leaf more will be requisite in these mountings than in the foregoing example, for spots of the same extent. The draught, therefore, will stand as under; there being no occasion for a plan of cording, as the figure on design paper supplies its place.

No. 56. Fig. 53.



It is necessary to observe, however, that although this arrangement of paper spot mountings be generally adopted by weavers, on account that it places together the leaves of each side of the plain sheds, or divides them into what are termed the back and fore sets; yet it is by no means to be considered the most natural order in which the leaves can be disposed: for if, instead of placing all the odd numbers together for the back set, and putting all the even ones together for the fore set, they had followed the natural or progressive order of the numbers 1, 2, 3, 4, &c. the draught would then have corresponded with the pattern on design paper; and the pattern could also have been read, with more facility, on the parrot, or other machine by which these spots are commonly woven. This will obviously appear, by comparing the preceding draught with the one following, in which this arrangement is observed.

No. 57.



Here the natural order of the leaves is preserved; but another inconveniency arises with respect to the formation of the plain sheds: for it is evident that, as the odd numbers are all raised for one shed, and sunk for the other, the leaves 1 and 13, for example, which are at the two extremities of the draught, will always rise and sink together

while weaving the ground, by which the sheds are not only rendered rugged and unevenly, but one part of the warp will be strained considerably more than another. These inconveniences, however, have been obviated of late, by applying a set of plain leaves in front of the spot mounting, after the manner of the draw loom. In such cases, the warp is first drawn into the spot mounting in the usual way, and afterwards through the plain leaves. There is no occasion for the ground leaves in these mountings, except to preserve a uniformity in the plain sheds. The front mounting, formerly, consisted of four leaves of common clasped heddles; and the first thread of the draught was taken below the clasp of a heddle on the back leaf, and above the clasp of a heddle on the leaf next to it; so that these two leaves could produce only the effect of one. The second thread was taken below the clasp of a heddle on the third leaf from the back, and above the clasp of a heddle on the front leaf, which completed one splitful; and the whole draught was only a repetition of this process. Hence, when any portion of the spotting warp was raised to form a shed, that leaf or leaves were also raised which had the warp threads drawn below the clasps of their heddles; so that the spotting sheds could thus be formed without obstruction. But it is now become common to make use of heddles with eyes of a length sufficient to allow the spotting warp to open the sheds, while the spotting leaves remain stationary.

DESIGNING PATTERNS, &c.

It was formerly noticed, that cording plans are unnecessary for these patterns, as they are all woven with machines, which require the figures to be painted on design paper. It is customary, however, to sketch the patterns first on common paper, of the same size that they would stand on the cloth. One of these figures is represented at A, Fig. 53.

It is calculated for a 1400 reed, and to stand on $12\frac{1}{2}$ splits, which are equivalent to thirteen leaves; for every split counts a leaf, and the half split counts one also for the point. This will plainly appear by comparing these remarks with the draught. The reason for introducing the half split, or odd thread, which must always have a place in these draughts, has been already explained.

When the requisite number of leaves for any spot has been determined, this number is counted off on the design paper, taking one space for the centre or point leaf, and the others to the right or left, at pleasure: for one half of the design, including the centre space, is sufficient both for the pattern drawer and weaver, although the spots are commonly made complete, that their effect may be seen to most advantage. When the length of the spot is limited to a given number of shots, which is frequently done by the manufacturer, these are counted upwards on the design, one space for each shot; but if no restriction of this kind be made, the length must be taken in proportion to the breadth of the original; that is, if the figure be just as long as broad, the design paper must be taken square; but if it exceeds or falls short a little of this, a few spaces may be added or deducted accordingly, which, after a little practice, will easily be ascertained by the eye.

When the limits of the pattern, in its enlarged state, are thus determined, the outlines of its several members are again sketched on the design paper, always taking care that they preserve the same proportion to each other as in the original. The outlines are then filled up with a camel hair pencil and paint of one shade, and tweeled or brocaded afterwards with one somewhat darker. See Figs. 53, 54 and 55.

To those, however, who are not much accustomed to hand sketching, the following instructions will be found of some advantage. When the number of leaves has been counted off on one side of the design paper, as from *a* to *e*,

at C, Fig. 53, take a pair of compasses and place one point in the middle of the centre space at *a*, and the other in the line at *e*, at the extremity of the number of leaves. Set off this distance from *a* to *e*, or from *a* to *i*, on a piece of common paper B, and draw the line *a*, *b*, for the centre of the spot. Draw another line parallel to this at either extremity of the figure, and this will give the limit of the spot, by the breadth, for the design paper. Take the extent of the figure by the length, which has been ascertained for the design paper, and set it off from *a* to *b*, and draw another line parallel to *ae*, and these will give the boundaries of one half the figure, which is sufficient in the present case. Now, if this and the original be divided into any equal number of squares, whatever part of the spot is in any one square of the small figure, may be easily transferred to a corresponding square of the large sketch; and this process is continued till the sketch be finished. If the sketch be wanted complete, it is only necessary to fold the paper by the centre line *a b;* and then by rubbing it hard with a smooth instrument or with the thumb nail, a mark will be left by the black lead sufficiently strong to show where the reverse side may be traced.

When the sketch has thus been made out on the large scale, it is transferred to the design paper in the following manner: take a piece of common writing paper, on one side of which black lead has been rubbed, and place it on the design paper with the blacked side downward. Then lay the sketch over both, keeping the line *a b* directly over the space allotted for the centre or point leaf, and with a tracer or blunt steel point, trace over the outlines of all the members of the figure, with a moderate pressure, and the black lead will leave a copy on the design paper as exact as the original; after which they may be filled up as formerly directed.

It may be here observed, however, that although the figure A be given for a 1400 reed, it is not necessary to

confine it to that sett; for it will equally suit a reed finer or coarser, though in the former case it will be less, and in the latter, larger on the cloth than here represented. In like manner, there is no necessity for confining it to thirteen leaves: for it may be woven in a mounting that has either more or fewer, provided the same proportions be still preserved; but the greater the number of leaves, the more distinct the several parts will be.

Now, in order to read this, or any other pattern of the same kind, on the machine for opening the spotting sheds, it will be observed, that the coupers at A, Fig. 9, Plate 1, are numbered in the same regular order as the leaves in the draught No. 57, though there be only ten given as an example in the drawing; and supposing the spaces on the design paper also to be numbered from *a* to *e;* viz. the centre space *a* to be 1, the second space to the right 2, the third 3; and so on to the outward space at *e*, which would be 13; then, as it is only the light shaded spaces that are to be taken, or the threads which they represent that are to be raised for the spotting sheds, we must take, for the first shed, the leaves 1, 2, and 4, omitting the dark shaded space 3 for the tweel. The coupers, therefore, which are numbered 1, 2 and 4, are connected to the bead cord *a*, above the hole-board; so that when the parrot pulls down this bead, the leaves connected to the coupers 1, 2 and 4, or those marked 1, 2 and 4, in the preceding draught, are raised for this shed. For the second spotting shed, the coupers 1 and 3 are connected to the second bead cord, omitting as before, the dark shaded space 2 for the tweel. In like manner, the third shed has the second leaf only attached to the third bead cord. The fourth bead has the coupers 2, 3, 4 and 5; and the fifth has Nos. 2, 3, 4, 5, and 7; and so forth with the remaining sheds. The same effect would have taken place though the reading had commenced at the centre *a*, and counted towards the left, provided the centre space be always included, as was formerly noticed.

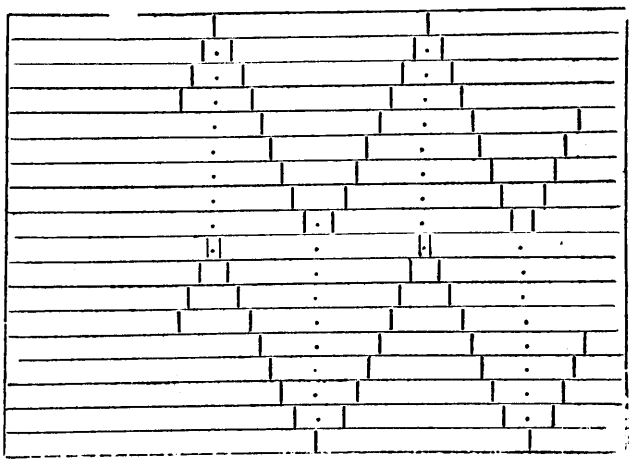
In referring again to Fig. 9, Plate 1, it may be observed, that the two marches immediately below the coupers are employed for weaving the ground, when the mounting wants the plain leaves in front: for all the leaves, or rather the coupers, of the back set are connected to one of these marches, and those of the fore set to the other; so that when they are raised and sunk alternately, by means of long marches connected to the treadles below, plain cloth is produced.

It may be farther added, that a piece of wood F, with teeth cut in it resembling those of a saw, is sometimes employed for shifting the cock or parrot along the beads, instead of the cord *w*. In this case, the motion of the saw never extends beyond the space of one tooth; for, at every time it is drawn back by a weight *t*, a new tooth catches a wire in the parrot, see Fig. 10, and at the next tread, brings it forward to the succeeding bead.

Sometimes these spots are mounted without any top coupers whatever; for the leaves are connected by cords running over pulleys above the loom, to a tail which extends across the shop, similar to that of the draw-loom; the cords of which being numbered, and the lashes applied to the bead cords, in the manner already explained.

In making draughts for paper spot allovers, the same precautions to prevent the teething are necessary, that were mentioned when treating of the detached spot mountings: for, as already noticed, in all figures woven on this principle, every member that extends obliquely towards the left, will be regular, while those that run towards the right will be rugged, unless an odd thread be introduced into the central parts, or where the threads of warp diverge from a point. One example will be sufficient to show the most common form of these draughts. The leaves are separated into sets, as in No. 56, but if a front set of plain leaves be employed for the ground, the arrangement may be changed to that of No. 57.

No. 58.



When spots are woven on tweeled grounds, the paper spot mounting is employed with a set of tweeling heddles in front for the ground, similar to that for the plain ground in No. 57.

FINGER SPOTS OR BROCADES.

This species of ornament was very common on silk grounds while that manufacture flourished in Paisley. It formed also a considerable branch of fancy weaving in the earlier stages of the cotton manufacture; though, at present, it be entirely neglected, probably from the great expense attending the process of weaving.

The mountings for these patterns were the same as those of the common spots; but the spotting was wrought in with the hand, instead of being thrown into the sheds with the shuttle. The spotting employed for silk grounds was soft

silk; but for cotton goods, incle or boss. This last consisted of linen yarn bleached and beat on a smooth stone with a wooden mallet, till it acquired a fine glossy appearance, resembling silk. The spotting was all cut into short pieces, each piece being sufficient for a single spot. The weaver had a boy or girl on the loom along with him as an assistant when the web was narrow, but two when broad; and when a spotting shed was opened, these threads of spotting were taken individually, through their respective lifts with the hand, leaving a fine selvage round the edge of each figure, where, in the common spots, the flushed parts of the spotting were cut away. By this means the brocading was shown to advantage by the common spot mounting, as it now became the right side of the cloth. The figures at 51, plate 9, are adapted to this species of spots.

ROVE SPOTS OR BROCADES.

This is another kind of ornament which has lately become common in the cotton manufacture. The spotting employed in these patterns is rove, or loose-twined cotton yarn. The figures are flushed or brocaded as in the preceding case; and when the rove is neatly cut round the edges, they have pretty much the appearance of finger brocades. As it is common, however, to have two threads of warp raised round the edges of these figures to secure the spotting, the paper spot mounting will be found preferable to that of the common spot, for this purpose.

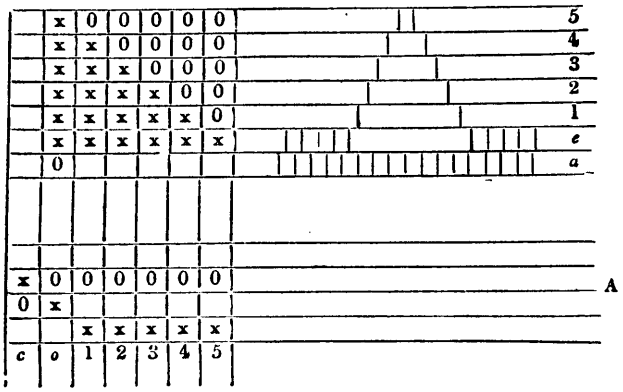
SECT. IV. GAUZE SPOTS.

On the gauze, as a ground, may be woven all that variety of figures or patterns which is produced by the common spot mounting. Like the common spot also, only one thread of a splitful, namely, that which passes through the upper doup,

is drawn on the spotting leaves: for as this half of the warp crosses above that of the under doup, it is at liberty to rise in the spotting sheds without any obstruction. Hence, the back leaf through which the upper doup warp of a plain gauze is drawn may be considered as the ground leaf of these spots; for it will contain only those portions of the warp which fall into the intervals between the figures; and, consequently, in allovers and the draw-loom, this leaf is altogether unnecessary. It will farther appear, that as the plain shed of a gauze mounting is formed by raising the upper doup warp, all the shots of spotting will be thrown into portions of this shed, and therefore, whatever shed follows, whether open or cross, the warp will be reversed, or the spotting warp will be sunk; so that one shot of fine or ground weft will be sufficient to bind each shot of spotting, as in the paper spots.

The warp of a gauze spot is drawn through the back leaves from the very same draught, and in the same manner as the common spot, the ground and spotting leaves being made with eyes: and each alternate thread is taken through the upper part, or above the clasp of a heddle on that leaf which contains the under doup warp; which, in this case, may be taken for the fore leaf. The warp, after a new lease has been formed, is again taken through the front mounting, in the same manner as in the plain gauze. As the nature of spot mountings, however, has already been minutely explained, one example will be sufficient to show their application to gauze. It is the same draught as No. 13.

No 59. Figs. 28, 29. Plate 9.



Here the leaves 1, 2, 3, 4, 5, are for the spot, and *e* the ground leaf, which, taken together, contain the upper doup warp; and the leaf *a*, which corresponds with the fore leaf, contains the under doup warp. The leaves at A are for the doups and standards, as represented in the other plans of gauze mountings. The cross treadle *c* is corded as in plain gauze; but the open treadle *o* sinks all the spotting leaves, together with the ground leaf for the open shed. The spotting treadle 1 raises the leaf 5, all the rest of the warp being sunk; but the standard of the upper doups is raised to relieve the spotting warp. The same is to be observed of the other spotting treadles, due regard being had to the number of leaves which they raise.

Since the warp of the upper doups is partly raised and partly sunk in all the spotting sheds, it is evident that those doups which rise will be slack, while the others are kept sufficiently tight by the warp sinking to the bottom of the shed. These slack doups have been found very inconvenient to the weaver, by crossing, or otherwise getting entangled, so as

frequently to obstruct the opening of the succeeding sheds. This inconvenience has, however, been obviated some time ago, by applying an additional standard to the upper doups: by which contrivance, while one standard rises to relieve the spotting warp, the other sinks, and keeps all the doups equally stretched. The manner in which this is effected, will be better understood from a drawing than by any description, and therefore a representation of it is given in Plate 6, Fig. 10. F is a leaf of common clasp heddles, which is placed immediately behind the standard of the under doups. The standard B, which is also a leaf of common heddles, is placed behind, and the doup 1 stands between them, passing through below the clasps of both standards in the same direction. The thread of warp is drawn through the double or bow of the doup, where the dot is placed in the Fig.

When both of the standards F and B are sunk, the doups are all kept tight as in the cross shed: when both are raised, the doups are relieved as in the open shed. In all the spotting sheds, however, the leaf B is raised and F is sunk; so that the former permits the spotting warp to rise in opening the spotting sheds, while the latter, by sinking, keeps all the doups down to the bottom of the shed. This additional standard, F, is therefore corded so as to rise in the open shed, and to sink in the cross, and each of the spotting ones. It is further necessary to observe, that there must be two doup weights resting, occasionally, on the long march of the upper doup, one from the short march of each standard.

Although, in weaving gauze spots, one shot of the ground weft be sufficient to bind each preceding shot of spotting, yet patterns are frequently woven with two shots of fine between them, such as Nos. 19, 26, 27, 31, 32, 33, 34 and 42, of Plate 9. These have a pretty good effect when part of the spot is solid, so as the two parts may form a contrast, but when the whole spot is woven in this manner, although it may save a little of the spotting weft, yet the pattern loses

much of that richness of texture which is intended for these grounds.

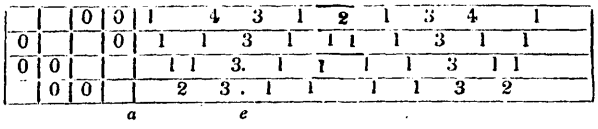
When the spotting leaves of a gauze mounting are numerous, it will be found an improvement to add a full back leaf for the upper doup warp, and raise it with each spotting treadle, which will make the open shed always clear and evenly.

ALLOVERS, ROBES, AND SCARFS.

The nature of allover spots has been fully explained in the first section of this chapter, and their application to gauze grounds will be easy, after the preceding details are well understood. As some of the diaper patterns in chapter 4, however, have lately been woven, with advantage, on gauze grounds for robes and the ends of scarfs, it may be of use to insert one example to show how this is effected.

If therefore the pattern No. 55, Chap. 4, be selected, and put on design paper, according to the instructions there given, it will be found to suit this style of work remarkably well, as it affords a great variety of figure with only four spotting leaves. The draught is here repeated for ease of reference.

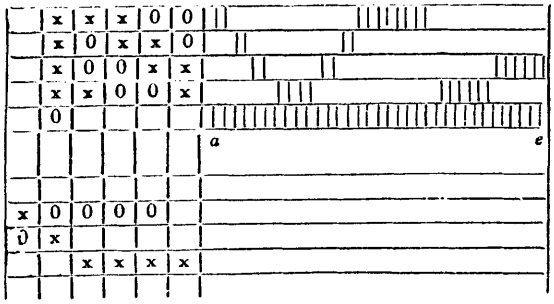
No. 60.



Here it will be observed, that in the single parts of the draught, there will be only two splits of plain between some of the spotted parts, which spaces are by far too small to admit the scissars for cutting. The draught must therefore be enlarged till the plains be sufficiently wide for this purpose. If the spaces be doubled, that is, by making every 1 in the

draught, 2, every 2, 4, every 3, 6, and every 4, 8, then the smallest of the plain spaces will consist of four splits, which will be sufficiently wide for any reed below a 10 or 11 hundred. That part of the draught from *a* to *e*, thus enlarged, with the plan of cording, will stand as under; the ground leaf being unnecessary, as all the upper doup warp is drawn on the spotting leaves.

No. 61.



As these diaper patterns are all adapted to 10 by 10 design paper, they must, when intended for gauze, be reduced to 8 by 12, which is the paper commonly employed for the patterns of this texture: for eight splits of warp ought to form a square with twelve shots of weft, and consequently of the spotting, when the cloth is of a medium thickness. The rule, therefore, for this purpose is very simple; for it is only necessary to observe, that for every two splits on the original design, there must be three spaces taken by the weft on the 8 by 12 to make the objects square: or, in the present example, as every space is to be doubled by the warp on the 8 by 12, so every space must be tripled for the weft, which will exactly preserve the pattern.

As the bottoms and tops of these patterns, from the great variety of the draught, will always appear broken and

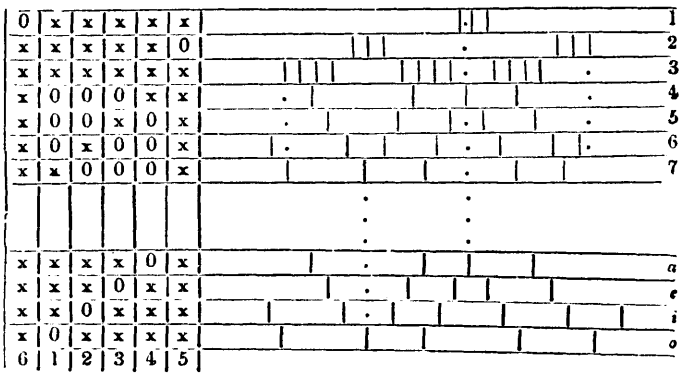
unfinished; this will be helped by throwing a few shots of the spotting weft into the plain and cross sheds; the former being opened, in allovers, by raising all the spotting leaves.

In like manner a trimming may be woven by varying the order of treading; and also, spots for the body or filling may be produced by selecting any two of the spotting leaves that may appear most suitable, for one spot, and the other two will produce another figure to embosom it.

TRAFALGARS.

It was formerly observed, that the patterns which have assumed this name, were merely the tweeled gauze turned into a bird-eye or lozenge figure, with a small barleycorn spot in the centre. The following plan will therefore be sufficient to explain the nature of these spots.

No. 62.



If this plan be compared with Fig. 8, Plate 6, the crossing of the warp between the back and front mountings will be easily understood. The leaves 1 and 2 are for the spots,

three shots on each, and are drawn opposite the alternate points of the figure, and embosomed. The leaf 3, represents the ground leaf of the common spot, or gauze; and these three leaves contain that half of the warp that would have been drawn through the upper doups, had they been employed. The other half of the warp is drawn on the leaves 4, 5, 6, 7, in the order of the double draught, which was explained under lined work. This part of the warp is again drawn through the doups of the standards *a*, *e*, *i*, *o*, in the very same order: but the other half of the warp is here omitted, as it has no heddles on these leaves.

The treadles numbered 1, 2, 3, 4, are for weaving the ground, as described under tweeled gauze, but the succession of treading is the same as that of the draught on the front leaves. The treadle 5 is for one spot, and 6 is the treadle for the other spot that embosoms it. Here it is to be observed, that when either of the spot leaves is raised for a spotting shed, all the others, both back and front, must be sunk. There is only one shot of weft, as in the common gauze, between the shots of spotting.

SPOTTED NETS.

As the spotting warp, in the common gauze, is taken from that half which passes through the upper doup; so in the whip net, the spotting warp is taken from that portion which passes through the upper bead lam; and therefore the processes of mounting and weaving these two spots are exactly the same, and can require no farther explanation.

The spotting sheds of the spider and mail nets, however, are generally formed on the gauze part, though it be evident that they may be also raised from the whip. Sometimes these nets are woven in stripes, a few splitfuls of spider net, and a few of the whip net being drawn alternately. In such cases the spot is generally on the gauze spaces, though

PRINCIPLES OF SEEDING & FLUSHING

Fig 1

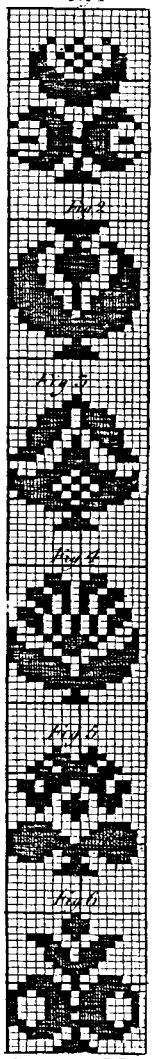


Fig 7

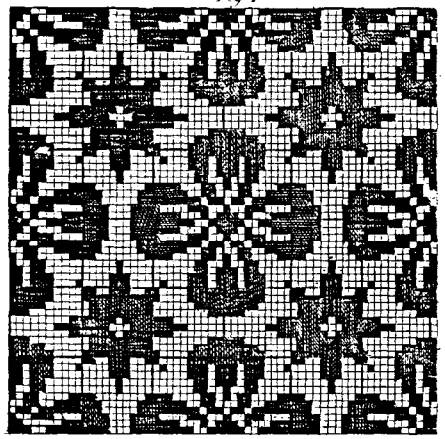


Fig 8

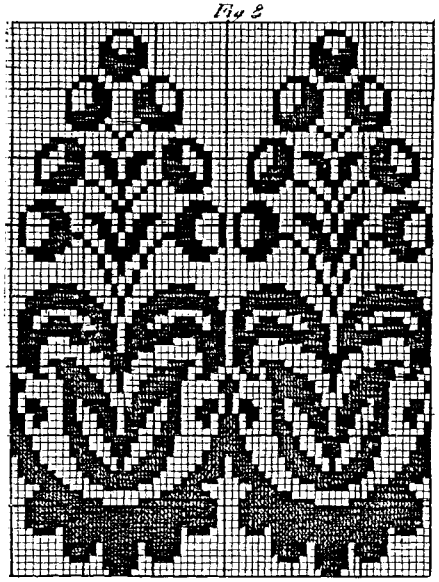


Fig 9 Fig 10

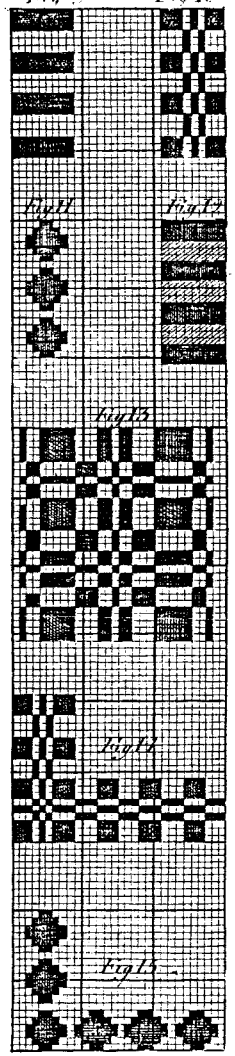


Fig 16

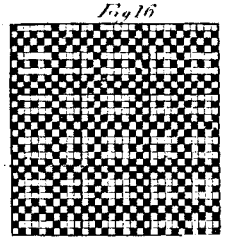


Fig 17

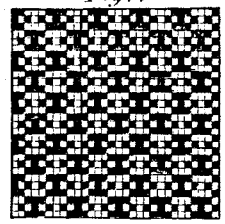


Fig 18

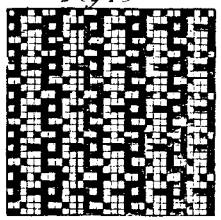


Fig 19

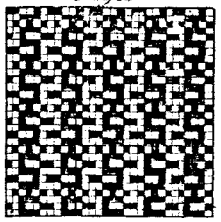


Fig 20

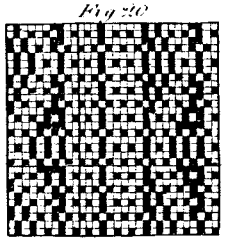


Fig 21

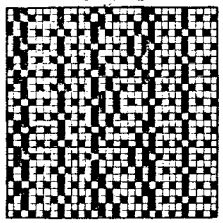


Fig 22

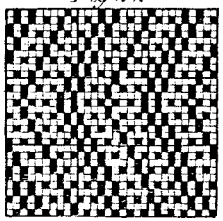


Fig 23

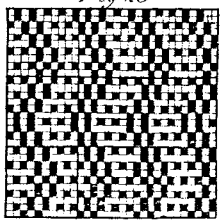


Fig 24

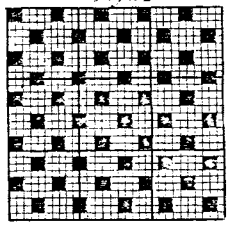


Fig 25

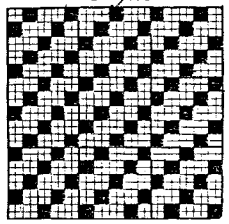


Fig 26

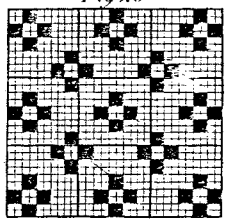
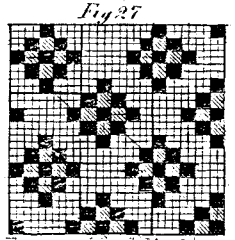


Fig 27



Drawn by J. Murphy

Published by Blackie & Son, Glasgow.

Engraved by J. Maclure

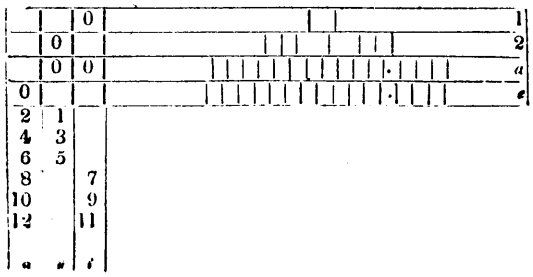
it would appear, that by spotting the whip parts, the contrast would be more striking.

SECT. V. CUT STRIPES.

In the several varieties of spots which have been hitherto explained, the figures are all formed by throwing the spotting weft into the sheds with the shuttle. In this species ot ornament, however, the figures are produced by supernumerary warp, or striping, which is interwoven with the ground at such intervals as form the pattern; and those parts which are not incorporated with the ground, are afterwards cut away, as in the other kinds of spots.

The mounting of a cut stripe consists of a set of plain leaves for the ground, and a set of spotting leaves for the figured parts, which are disposed in the very same manner as those of a common spot: and hence, all the variety of figures which are produced on the latter, as well as some of those adapted to flushed stripes, may be woven on this principle. A few examples, however, will be sufficient to explain this species of fancy weaving. The following plan is adapted to weave the flushed stripe pattern, Fig. 10, Plate 10, as a cut stripe.

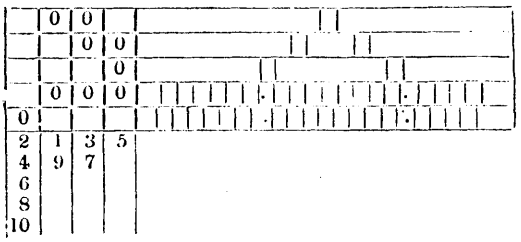
No. 63. Fig. 10. Plate 10.



In this plan, the two leaves *a*, *e*, are for the ground, although, as formerly noticed, it is customary to employ four for this purpose. The leaves 1, 2, are for the spotting warp, which is commonly two threads in the heddle, and one heddleful is taken into the reed along with a splitful of the ground.

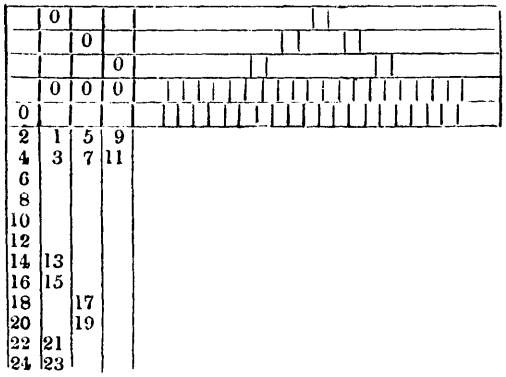
In weaving this pattern, six shots of weft are thrown in with the treadles *a* and *e;* during which time the spotting leaf 2 is raised and sunk alternately, while the leaf 1 is constantly sunk. The leaf 2, therefore, forms the first part of the pattern. The following six shots are thrown in with the treadles *a* and *i;* and this produces the second part of the pattern, the leaf 2 being now constantly sunk, and on this easy principle all the varieties of cut stripes are produced. The following plans will show how to diversify this species of fancy weaving.

No. 61. Fig. 8. Plate 9.

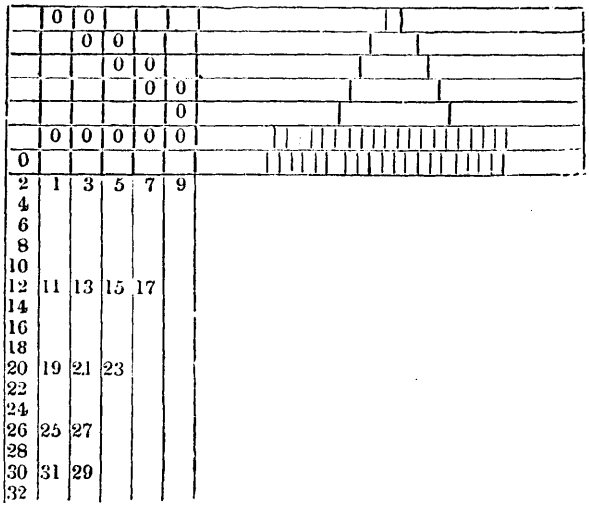


Four shots are thrown in on the treadles 1, 2; four on 3, 2, &c. to make the pattern square.

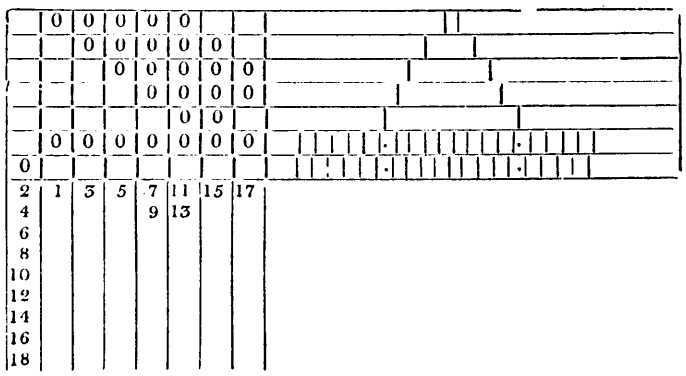
No. 65. Fig. 9. Plate 9.



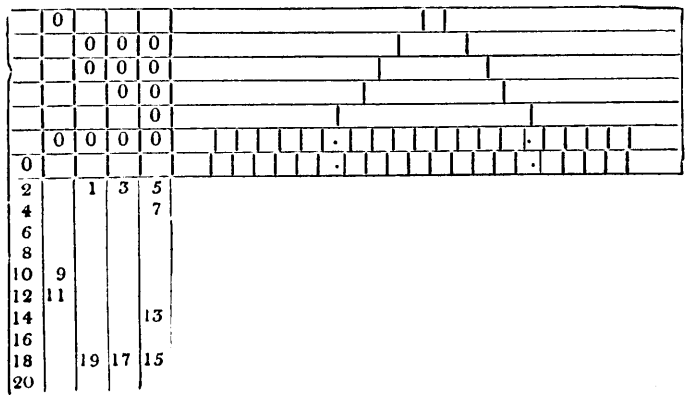
No. 66. Fig. 16. Plate 9.



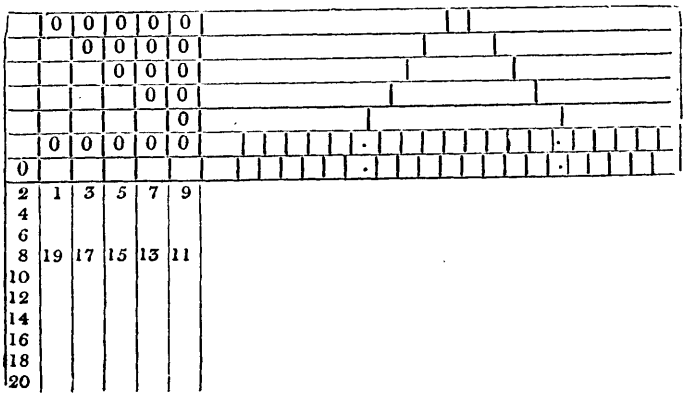
No. 67. Fig. 20. Plate 9.



No. 68. Fig. 23. Plate 9.



No. 69. Fig. 28. Plate 9.



No. 70. Fig. 39. Plate 9.