

WEAVING.—No. XI.

DIAPER WEAVING.

THE second class of weaving, according to the order into which we have divided the subject, consists in using two or more "divisions," or sets of harness. These are so arranged that any of the sets or "divisions" when used govern and alter the action of the remaining sets. This system is known as diaper weaving, and by its means very extensive designs may be woven for the purpose of table-cloths, shawls, &c. Figs. 96 and 97 represent a plan and section of a diaper harness in two divisions only, with the warp and a simple diaper pattern woven. The same pattern or design is also shown in Fig. 98.

In order to weave the pattern, as shown in Figs. 96 and 98, the treadles must be worked in the consecutive order from 1 to 28, as shown at T, Fig. 101. It will be noticed that the treadles in division A are first used, then those in division B, and so on to the completion of the pattern. But it must be observed that although the headles must be raised in the consecutive order shown, still the weaver would deviate from that order to suit the alternate action of his feet, as before explained. Figs. 96 and 98 show the parts of the pattern effected by each of the divisions or sets of treadles A and B, and the numbers of each of the treadles are given as they are shown at Fig. 101.

In other words, the eight healds forming the harness are divided in two divisions, and are con-

sequently a plan has been devised whereby the use of one set of treadles only is required, the different divisions being thrown in and out of action by a separate contrivance, and it is here that we again find resort to complicated but ingenious arrangements to overcome difficulties. In the matter to which we are now referring the desired end is obtained by using one set of foot treadles only, and substituting for the other treadles auxiliary levers which can, each set, be thrown in or out of action by a separate contrivance. By so doing the weaver may have command over six or more divisions or series of levers, and still only use one set of treadles. In other words, he substitutes for the various divisions of treadles (excepting one set) a number of levers, or sets of levers, corresponding to the divisions of the treadles, and by throwing in or out of action, by means of connecting cords, any of these divisions or sets, he avoids the use of more treadles than are required for one set only. This plan is ingeniously carried out as follows: Fig. 105 is a front view of the mounting of a loom, C being the top castle, and H the headles, 20 in number in this instance, or four sets of a five-leaved twill. B is a set of coupers, one for each leaf connected to it by the cords *d*, which are rising cords to raise the leaves—it being simply a rising shed. The ends of the coupers are seen at C, Fig. 106. There is another set of coupers shown at D, Fig. 105, equal in number to the former, and to which they are connected for the purpose of raising the opposite ends of the leaves by the cords *t*. In this case the marches are not placed below the leaves but above them, as shown at A, 1, 2, 3, 4, 5, or one for each leaf of the twill, a side view of which is shown at A, Fig. 106. Each of these leaves is connected to a treadle below by means of the cords X, Fig. 105, which pass through the warp, and are

thread, as was explained in the case of Fig. 98, but rather any requisite number, according to the size and kind of pattern to be woven. Figs. 103 and 104 represent a common arrangement breaking up into smaller divisions the squares as shown in Fig. 102. The black squares in that figure would not, necessarily, represent a different colour, but a different kind of twill. Different colours are, however, often used in the warp and weft, and these can be varied at pleasure, independently of the form of the figure woven; but different colours have not to be considered at present, as they in no way affect the subject with which we are dealing. It will be evident that in the use of several divisions with four or five treadles in each would be almost impracticable for the weaver to work,

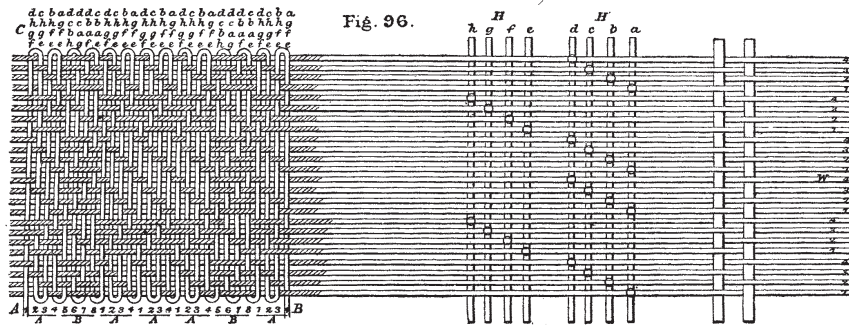


Fig. 96.

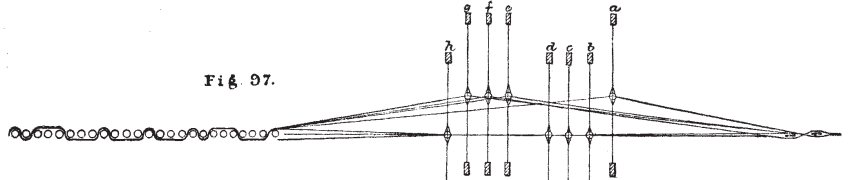


Fig. 97.

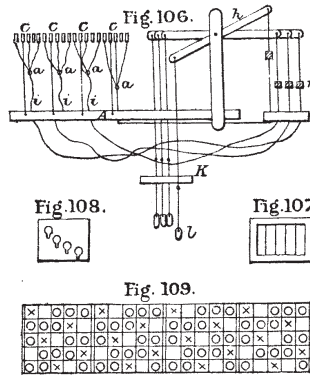


Fig. 98.

Fig. 99.

Fig. 100.

Fig. 103.

Fig. 104.

Fig. 109.

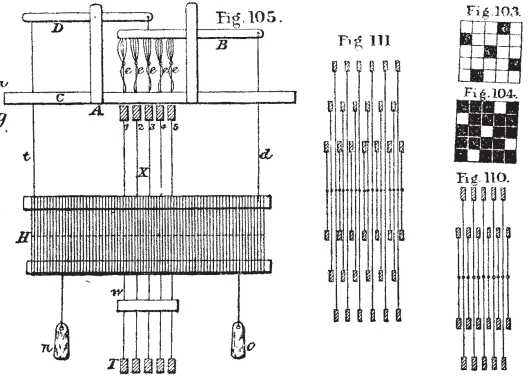


Fig. 101.

Fig. 102.

Fig. 101.

Now, on comparing the design in Fig. 96 with Fig. 98 it will be seen that each of the small squares of the latter figure represents sixteen intersections of the warp and weft, or rather the space for that number of intersections, for the intersections are not shown. The white spaces may be filled up by weaving a twill, as shown in Fig. 99, which corresponds to one of the small white squares in Fig. 98, and Fig. 100 is the same twill, but on the reverse side, and corresponds with the small black squares of Fig. 98. Upon comparing the designs Figs. 96 and 98 there is not necessary to show the secondary intersections in detail, as in Figs. 96, 99, and 100.

In the plan, Fig. 96, the headles are shown divided into two divisions, H and H'. The headles are also marked with letters as in the former plans, and these letters correspond to the letters at C in the same figure. The entering of the warp threads through the headles is also shown, and the threads are numbered at W, corresponding to the entering.

Fig. 101 represents, as the weaver would show it and as before explained, the connexions of the healds with the treadles at the intersections marked with circles. In this plan the healds H and H' represent the two divisions, and the treadles T are likewise divided in two divisions, as shown at A and B.

nected to two divisions of treadles. If the division A of the treadles only be used, it will weave the cloth in two stripes formed by two different twills or satins, as may be desired, and all the healds would be employed. On the other hand, if the treadles B are used, they—being connected to the same healds, but in a different order—can be used to weave a reverse satin twill, &c., as may be desired, by using the same healds as the treadles A. The chequer or diaper pattern, therefore, is produced by changing or working at intervals each set of treadles in any order desired, or extent of interval between each change. If in regular and equivalent intervals a plain check would be woven, or plaid, or stripes may be woven instead.

When this method is clearly understood it will be seen that it affords very extensive means for the production of large patterns. The example above given comprises the use of two divisions only; but the healds may be made in six or seven divisions, and their efficiency is thereby increased in far greater proportion than to the number of divisions used. Thus the efficiency of a harness with seven divisions would be vastly greater in effect than two divisions only.

It will therefore not be difficult to imagine that this system may be extended to the production of patterns such as shown at Fig. 102. In this figure also, each square does not represent a separate

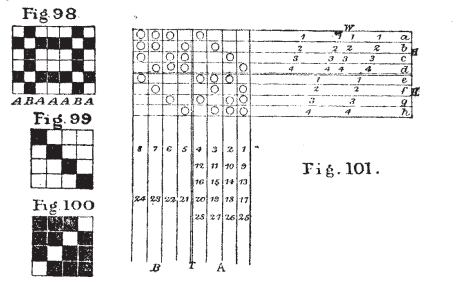


Fig. 98.

Fig. 99.

Fig. 100.

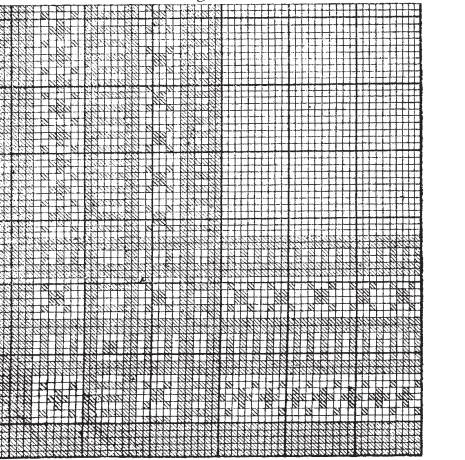


Fig. 102.

consequently a plan has been devised whereby the use of one set of treadles only is required, the different divisions being thrown in and out of action by a separate contrivance, and it is here that we again find resort to complicated but ingenious arrangements to overcome difficulties. In the matter to which we are now referring the desired end is obtained by using one set of foot treadles only, and substituting for the other treadles auxiliary levers which can, each set, be thrown in or out of action by a separate contrivance. By so doing the weaver may have command over six or more divisions or series of levers, and still only use one set of treadles. In other words, he substitutes for the various divisions of treadles (excepting one set) a number of levers, or sets of levers, corresponding to the divisions of the treadles, and by throwing in or out of action, by means of connecting cords, any of these divisions or sets, he avoids the use of more treadles than are required for one set only. This plan is ingeniously carried out as follows: Fig. 105 is a front view of the mounting of a loom, C being the top castle, and H the headles, 20 in number in this instance, or four sets of a five-leaved twill. B is a set of coupers, one for each leaf connected to it by the cords *d*, which are rising cords to raise the leaves—it being simply a rising shed. The ends of the coupers are seen at C, Fig. 106. There is another set of coupers shown at D, Fig. 105, equal in number to the former, and to which they are connected for the purpose of raising the opposite ends of the leaves by the cords *t*. In this case the marches are not placed below the leaves but above them, as shown at A, 1, 2, 3, 4, 5, or one for each leaf of the twill, a side view of which is shown at A, Fig. 106. Each of these leaves is connected to a treadle below by means of the cords X, Fig. 105, which pass through the warp, and are

held in position by being passed through holes in the board *w*. The weights *n* and *o* are the ordinary weights for sinking the leaves after they have been raised.

The plan Fig. 109 shows the connexion between the coupers *c c* and the masches or levers A. The crosses \times in the plan represent where the tight cords *i i i* are tied to the levers A, Fig. 106, and the circles denote the slack ends which are tied to the rings *a a*. Where the squares are blank there is no necessity for any cords.

Now it will be seen that there is one couper in each set connected to each lever A by a tight cord, while one couper of each set has no connexion whatever with the levers, also there are three coupers of each set that are tied to the rings *a a a*.

From these rings cords pass down through the levers A and up through the box *g*, where they are tied to another set of levers, the ends of which appear at *m*. These levers are again connected to another set at *h*, to which the handles *l* are appended. Fig. 107 is a plan of the box *g*. On the cords by which the handles are suspended are knots, and these cords pass down through the board K, Fig. 106; when the handles are drawn they are prevented from returning by their being placed in a narrow cut in the board through which the knots cannot pass, as shown in Fig. 108.

If all the handles are disengaged from the board K, and any of the treadles T be pressed, a twill will be produced of one thread raised and four sunk, for the coupers which are connected by the slack cords and those which have no cords will not be affected by the levers A.

Also, if all the handles were drawn down, and the knots held in the slots of the box K, it is evident that all the connecting cords would become tight, and when the treadles T were worked over all the coupers in the mounting would be sunk, and their corresponding levers raised, excepting those that have no connexion with the levers A, and in this case a twill would be woven with four threads raised and one sunk, which is the reverse of the other, as shown in Fig. 104 as compared with Fig. 103.

It will, therefore, be evident that if any one or two of the handles be lowered the sets of leaves to which they are connected will produce a twill the reverse of those which are left up, and by this means a great variety of patterns can be woven by using one set of treadles only, these treadles governing the twenty leaves by the means of throwing in and out of connexion the separate divisions of the harness as described.

In the plan shown by Fig. 109 the use of spaces instead of lines shows the advantage of being able to use with clearness crosses, circles, or other figures, as may be desired by the designer and weaver, and by this means little difficulty is encountered in representing the arrangements required.

In the construction of all the healds we have hitherto shown, they are formed by stretching the leashes between two laths. This system does not admit of a large number being used in a loom, although by placing them in two or three tiers, as shown in section by Figs. 110 and 111, as many as 80 or 90 may be used, for the laths need not be more than $\frac{1}{8}$ in. thick. But this number is quite inadequate to the quantity required in figure weaving, where the numbers usually amount to 300, 400, 600, or 900, and upwards. Therefore, in forming the healds the laths are entirely dispensed with, and single leashes, or several tied together forming a heald, are used instead. Small weights, called "lingos," made of iron or lead wire, are attached to the end of each leash, and the leashes are held in position in the loom by being passed through holes in a board, sometimes, as in power looms, made in one piece, and in hand looms formed of thin slips inserted in a frame, similar to a school slate, excepting that there are a number of slips. This is called the comber board. These healds will be explained as we proceed, for it is upon the advantages they give of being placed in any desired order that a great deal of the power of the loom depends, as will be described in future articles.