HAND-LOOM WEAVING: DETAILS OF DROP-BOXES.

Fig. 40.

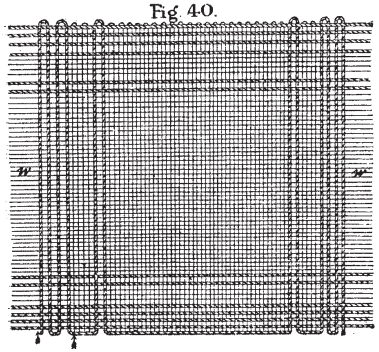


Fig. 41.

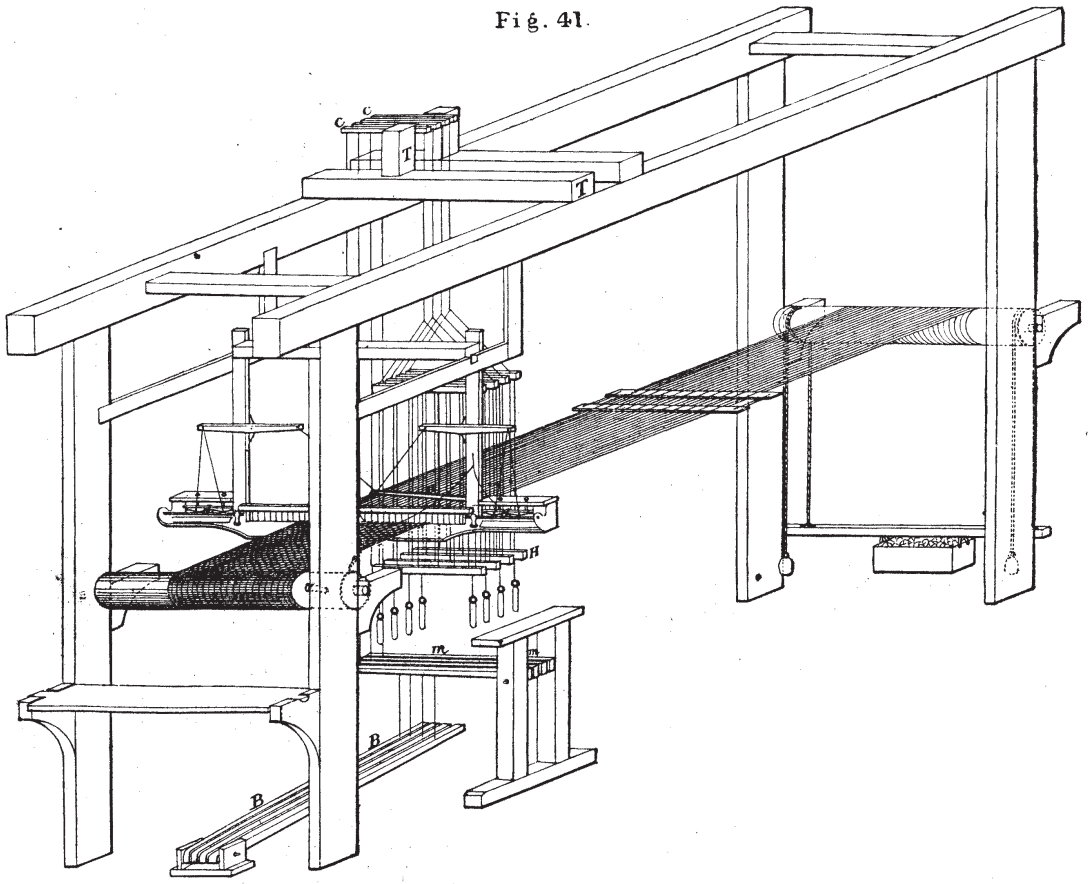


Fig. 42.

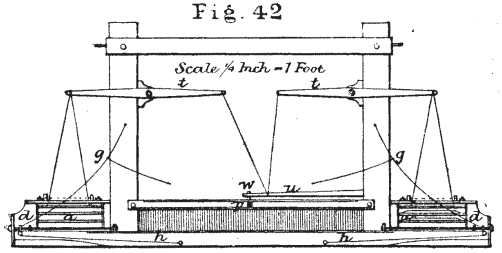


Fig. 44.

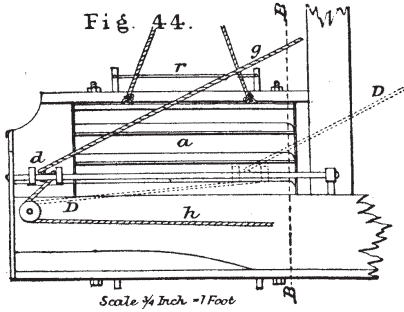


Fig. 45.

Fig. 46.

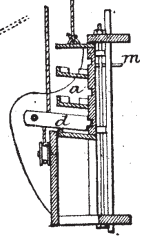


Fig. 48.

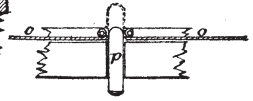


Fig. 47.

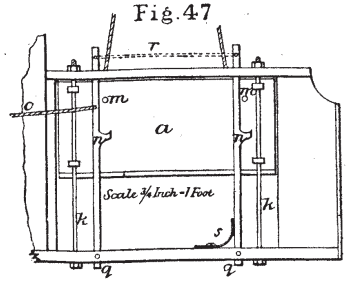
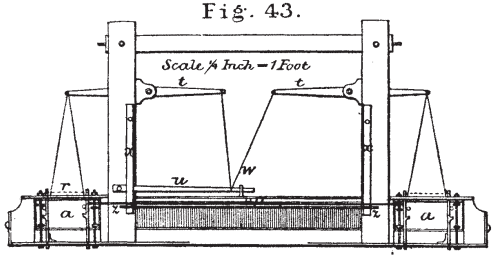


Fig. 43.



WEAVING.—No. VII.

Hand-Loom Weaving—(*Continued*).

In plain weaving it has been shown that the threads of the warp and weft intersect each other alternately, but in figured weaving the intersections are varied according to the pattern, for it is by this means that the figure is produced. Still, in plain weaving, the first step towards figured or pattern weaving is made by varying the thickness of the threads both in the warp and the weft, as may be observed in the borders of some cambric handkerchiefs. Different coloured warp and weft threads may also be used, so as to form stripes, checks, or plaids, or materials of different kinds, such as silk and wool, may also be used with more or less effect.

But whatever the difference of the threads may be, the actual mode of weaving them is simply plain, or tabby weaving. If various kinds of threads are required for the warp, they are arranged in the process of warping, and they are afterwards entered or placed in the loom accordingly. But the various kinds of weft threads are inserted by shuttles, each description of thread having a separate shuttle.

Fig. 40 represents a piece of cloth, or handkerchief,

which has two thicknesses of warp and weft. The warp W has been arranged, as before described, on the warping mill; but the weft threads have been inserted by two separate shuttles, and the thick and thin weft threads may be traced as they have been carried from side to side of the cloth.

In this instance the shuttles have been changed on one side of the cloth only, consequently, at least two threads, or picks, are used before the shuttle is changed, or they may be continued as many picks as may be desired, so long as the shuttle is returned to the side from which it commenced. In other words, single picks or threads require the shuttle to be changed at either side of the cloth, so that a single or any number of threads may be inserted as desired.

When the shuttles are thrown by hand the weaver can easily throw in one or more picks or threads at pleasure, for when two or three shuttles only are used they are laid on the cloth before him, and he selects them as required. But if he uses a larger number of shuttles—say five or upwards—he generally makes use of a small box, which is fixed near the edge of the cloth, and into which he drops the shuttles endways. By this means they are convenient to select, and the use of a number of shuttles is a simple matter.

When the fly shuttle was first introduced it was intended for the use of one shuttle only, but it was afterwards found that if two or more shuttles could be used on the same principle it would be of great advantage. This was effected about the year 1760, by Robert Kay, who invented the "drop-box" for that purpose. We have already related that the fly shuttle itself was invented by John Kay, the father of Robert, and was patented in 1733.

The drop-box is usually made for two shuttles only; although by an ingenious contrivance three shuttles can be used, or several more, by an extension of the same principle. It will be advisable to describe a three-shuttle drop-box, for it comprises the principles of both the others.

Fig. 41 represents a hand loom fitted with a two-shuttle drop-box, or rather a pair of such boxes, for there is one at each side of the loom, as shown at *a a*, and Figs. 42 to 48 represent in detail a pair of three-shuttle drop-boxes.

Fig 42 shows a front view of a batten fitted with boxes *a a*, and Fig. 43 represents the back of same. Fig. 44 is an elevation of one box on a large scale, Fig. 45 a plan, and Fig. 46 is section of it, at the line B B. The same letters refer to the same parts in all the figures.

The drop-box consists simply of a small board upon which are fixed three or more shelves, according to the number of shuttles, and as these shelves are lowered to the level of the shuttle race, or board upon which the shuttle slides, so is the shuttle upon that shelf brought in line with the picker, and may be driven to the corresponding box on the opposite side of the batten.

In the various figures, *a a a* represent the drop-box, the shelves upon which are more clearly shown in section, Fig. 46, and in plan, Fig. 45. The shelves are inclined in the same way as the shuttle race, but when the batten is pushed backwards for the throwing of the shuttle they become less inclined, although sufficiently so as to keep the shuttle in its proper course. The far end of each box is contracted, as shown at *b*, Fig. 45, which is to prevent the shuttle from going beyond its bounds. Shuttles are shown upon the shelves at *c*, Fig. 42, where the bottom shuttle is in line with the picker *d*. There are two pickers only, as in the ordinary fly loom, but they slide horizontally, as shown at *d d*, Figs. 45 and 46, upon the spindles *e e*, and not vertically as in the single shuttle fly. This arrangement is to allow the picker to slide over any of the shelves that may be brought opposite to it. The pickers are driven by means of a stick and cords *g g*, as before described in the fly shuttle, but in this case there is an additional cord *h h*, which is elastic, and is for the purpose of withdrawing the picker out of the drop-box after the shuttle has been driven, otherwise it would prevent the box from being raised or lowered when required. The picker is provided with a "nib" to slide into a groove, to lessen the friction, as in the ordinary fly, and as shown in Fig. 46. In Fig. 44 the dotted lines D D show the position of the picker after it has thrown the shuttle out of the box, when the elastic cord *h* withdraws it clear of the drop-box. The drop-box is made to slide on two small bolts shown at *k k*, Fig. 47, which represents the back of the box. In the same figure two pins *m m* are shown, also at *m*, Fig. 46, fixed in the back of the box. These pins, when the box is lowered, rest upon the hooks *n n*, Fig. 47, and prevent the box from being lowered to its full extent. But by drawing the hooks aside, the box can then descend to the full extent. The hooks are drawn aside by means of the cords *o o*, which are connected to a peg *p*, Fig. 42, placed in the middle of the batten, and shown in sectional plan, Fig. 48. When the peg is pushed inwards, as shown by the dotted lines, it draws the cords *o o* round the small pulleys as shown, and, consequently, pulls back the hooks. It will be noticed that each hook works on its fulcrum as shown at *q q*, and they are connected together by a cord at *r r*. The hooks, after they have been drawn backwards, recover their position by means of a small spring shown at *s*, Fig. 47.

The boxes are suspended from the levers *t t*, the opposite ends of which are connected with the lever *u*, Figs. 42 and 43. The boxes being heavier than the lever *u*, their tendency is to drop and lift the lever. The weaver counteracts this by holding the lever down when working the batten with his left hand, or he sometimes fixes a small catch at *w*, which can be easily thrown in and out of contact with the lever without moving the hand off the batten.

In working the loom the boxes are raised, as shown in the Figs. 42 to 47, and the lever *u* is pressed or held down. Consequently the bottom shuttle box is placed opposite the picker on both sides of the loom. If the weaver releases the catch *w*, or takes his hand off the lever *u*, the boxes fall and rest upon the hooks *n n*, Figs. 46 and 47, by means of the pins *m m*, and the middle shuttle boxes are then lowered to the level of the race board. It is in this manner that a two-shuttle drop-box is used, namely, by simply pressing upon the lever *u*. But if the weaver requires the uppermost box to be lowered to the level of the shuttle race, he presses with his thumb the peg shown at *p*, Figs. 42 and 48, which causes the catcher *n n* to be drawn backwards clear of the pins *m m*, and allows the box to fall to its lowest level, or the level of the third box. This method may be extended so as to employ several more boxes, if required, as before stated.

In Fig. 41 the drop-boxes are shown for the use of two shuttles only. The lever *u* being released, the top shuttle is lowered to the level of the race-board, and opposite to the picker.

It is by this simple and effectual means that two or more shuttles can be used without difficulty. Each shuttle can be thrown either once, or any number of times, and they may be thrown in any order that may be desired.

In applying the use of several shuttles to the power loom, the difficulty to be overcome is far greater than would at first sight appear. So long as the speed of the loom is but slow, the task can be accomplished in many ways, and with success. But to drive such looms at the speed exacted from the modern power loom would destroy them in a very short time. As the speed of the loom has been increased, the more simply its parts are contrived, and the more capable it becomes of working at that speed; but to apply several shuttles to a power loom, so that each shuttle can be used any desired number of picks, and be immediately changed for another shuttle, necessarily gives rise to a considerable amount of complicated motions. To simplify these as much as possible, the box containing the shuttles is applied only to one side of the loom, consequently if any of the shuttles are thrown through the shed, it is received into a stationary box at the opposite side, and it must be returned before another shuttle can be thrown. To throw the shuttles, one pick only, cannot be accomplished in such looms. To show the value of a loom capable of throwing "single picks" of weft, let it be supposed that the manufacturer desires to face his cloth with an occasional pick of silk weft. Now it is possible that a single pick, under certain circumstances, may be made quite as effectual in appearance as two picks would be. In this case he would be throwing a valuable material away, comparatively speaking, unless his looms were adapted to work single picks of weft. We may revert to this subject when describing the power loom.

In Fig. 43 are shown the flat springs *x x*, which are connected together by the flat bar *z z*, shown on edge. The bar and springs are for the purpose of pressing against the reed in such a manner that when the blow is given to drive the weft threads, they may be struck with nearly equal force each time the weft is beaten together, as has been previously described, but shown in end view only in Fig. 27.