THE JACQUARD LOOM.—COMPOUND HARNESSES.

In the last article the method of applying the Jacquard apparatus in its most simple form was shown, and it was evident that each hook having but one thread to raise in each figure woven that the extent of the pattern or figure was confined to the number of hooks in the machine, except in using the point harness, where an apparent but not a real advantage was obtained.

In Fig. 112 (see page 337 of our last volume) the principle upon which a compound harness is formed is shown, as applied to the draw loom for the weaving of damasks. In that instance the effect produced was that five threads were raised by each leach or cord instead of one, consequently five times the width of pattern, or twenty-five times the area, was produced. But if eight-headed had been used instead of five, then sixty-four times the area could be woven. This system suited very well for the production of table cloths and curtains, and whenever large designs were required, but for smaller and more exact figures it was not so well adapted. The Jacquard machine is often used in exactly the same way as the draw loom, above alluded to, and instead of the draw boy (as shown in Fig. 156, page 374 of our last volume) holding the raised threads while the weaver worked the headings, the griffe is raised with the required hooks, and held in that position until the headings are worked over. In power looms this raising of the griffe at every fifth or eighth pick, or whatever number of hooks were in use, gave rise to many contrivances to effect the intermittent motion with as easy and quick a change as possible.

Soon after the introduction of the Jacquard, two very valuable contrivances were applied to the harness based upon the principle of the draw loom as before mentioned. But they have this difference in the draw loom the drawing of the cords was done every fifth, eighth, or whatever number of picks were desired, but in the new contrivances the cords are drawn at every pick, and from two to eight times the effect of the Jacquard machine may be produced. The first of these contrivances is for weaving rich silk damask, and known as damask harness, and the second is generally used in forming the richest silks now made, and is termed the split harness, or "split shaft" moiture.

These two plans are in consecutive order, the effect being a twill on the surface of the figure formed by the raising of the threads by the machine, and the minor intersections, forming the ground of the figure, are formed by the threads the heads of which have been raised to their full height in consecutive order as well as being lowered. Thus the principal effect of the figure is formed by the machine and the minor intersections, forming the ground of the figure, are formed by the threads, and whatever outlying intersections so formed will all have the same effect. In this manner, according to the number of threads, any kind of twist, satin, or other effect, may be woven with an endless variety of effect by simply altering the order or working of the heads to form the ground either on the surface of the figure or the plain portion of the ground.

The "split shaft" moiture is an ingenious modification of the damask harness and entirely dispenses with the headings. By its means a 400-thread Jacquard operates upon 500 leashes with almost the same effect as though 5000 needles were employed.

It appears to have been the invention of Mr. W. Rooke, of Hope Town, Bethnal Green, for which he received a reward of £30 from the Society of Arts in 1835 upon the occasion of his sending a model of the moiture to the society. It is very probable that at the time of the society's inspection of the invention, for the reward given was very inadequate for the services rendered to the silk manufacturer. Rooke received another reward of 5l. for an invention to apply "wirlives" to the broad loom, which being in common use was hereafter descrive; and on another occasion he appears to have sent to the society a model of an improvement in the process of weaving. The power loom upon which Rooke received contracts very curiously with the reward of 30 guineas given by the society in 1810 for unrolling the cap of the material with the open beater and timber and to give more light to the weaver! Such an invention needs no comment, for the stability of the loom was not only at a loss, but the only substantial means of support for the harness of the loom was taken away.

The split harness is an important modification upon Rooke's invention, and it is ascribed to Mr. James Gough, also of Bethnal Green. Fig. 158 represents the lowering of the warp in the Jacquard, and Fig. 159 shows a side elevation, and Fig. 160 is a plan of the same. In each figure the same letters and numbers are used to the same purpose.

The heads of the Jacquard are divided into two divisions in the same way as in the damask harness, as shown in Fig. 143. A and A' are the headings through the comben board e in the usual way, but it is at this point where the alteration takes place. Fig. 159 and 160 give a representation of the machine, and the leashes and the way the split is formed. It will be seen that the leashes a connected to the Jacquard are here attached to two separate leashes which pass through the comben board, and each of these leashes is looped through another leach x which has a mail and weight attached, as shown at w and l. It follows that whenever any of the leaches a are raised two warp threads are also raised, viz., the two adjoining threads through the loops of the leaches a a "shafit" or flatten enamelled hoop iron bar is placed, so that when the bar is raised it lifts with all the leashes a and the comber, and the corresponding leaches b. In Fig. 159 only four of these bars are represented, but in practice 24 are generally used. Each bar is connected to the strong cords T, shown also in Figs. 159 and 143.

In Fig. 160 the pairs of leashes are still more oleen at the leaches shown at l. 2, 3, 50, and the shafts a c d e to which they are looped.

Now whenever any of the hooks a are raised to form a figure the loop of the corresponding thread is formed at each intersection, and the figure can be varied to a distance of 1/2 in. at each step, i.e., when 400 threads are raised the figure is formed at the same time those threads which are not raised to form the figure by the hooks a can be raised by the shafts b by means of the hooks a. This allows the raising these shafts in any desired order so the ground of the cloth will be woven. In other words, the pattern can be woven a fineness of two warp threads at each intersection without being affected by the shafts, and the remainder of the cloth can...
be woven as plain cloth with every alternate thread intersected, or in twills, satins, or other required ground, according to the number of shafts that may be employed.

With four shafts and twenty pairs of leashes, as shown in Fig. 160, the effect that may be produced will be noticed at A B C D E and F. At A. "tabby" is woven by raising the shafts a c and b d as shown. At B a zig-zag is woven by raising the shafts in the order denoted by the letters. At E the pattern is formed by raising the leashes only. At D the leashes are raised and the shafts also, in this case the ground is woven as a single-thread four-leaf twill. At F the ground is a four-leaf satin or broken twill.

When the leashes are raised by the shafts the upper part of the split leash is slackened, as shown at a Fig. 161, but it in no way causes any inconvenience in working. In Fig. 158 one of the leashes is shown raised at c by the hook k, shown on the griffe bar G Fig. 159, and one of the shafts d is also shown raised in Figs. 158 and 159.

The various descriptions of harness shown in this and the last article, form the basis upon which all compound harness are constructed for figure weaving, and in endeavouring to show the principles clearly it was necessary to arrange the diagrams in the most simple form possible, for to attempt a description of full mounted looms would require a mass of complicated drawings in which the operations of weaving would be lost sight of, rather than explained in their general principles, which is the object we have at present in view.