

WEAVING. The various processes for weaving with the common loom have been fully discussed in those departments of our work dedicated to the manufacture of CLOTH and COTTON; and it will now only be necessary to furnish our readers with a description of the improved power loom as manufactured by Mr. Roberts of Manchester.

The patentee's improvements are divided into several heads, the first of which consists in an improved manner of constructing and applying the tappets which are employed for raising and depressing the different shafts or heddles in those looms where more than two shafts or heddles are used. This part of the improvement is applicable both to hand looms and those which are worked by power. Plate I of WEAVING contains several views of a power loom, having six shafts or heddles, adapted to weave twilled cloths or fustians, and such other fabrics as have the threads crossed in weaving, in that peculiar manner called twill. Fig. 1 is a front view of the loom (the cloth-roller and breast-beam being removed, in order to exhibit the parts behind). Fig. 2 represents the left hand end of the loom; fig. 3 the right hand end; and fig. 4 is a horizontal view, that is, looking down upon the top.

The framing is of cast iron, bolted or screwed together, so as to render the whole firm; *a* is the yarn roller, upon which the warps are wound, and this is made to turn with considerable friction, by means of cords passing over pulleys, with weights suspended in order to keep the warp tight. The warp is drawn from this roller over a small roller *b*, and thence is conducted to the lease-rods *c*, and through the loops of the several heddles *d*. These heddles are made to move up and down (in the manner hereafter to be described) for the purpose of separating the warp into two sheds, between which the shuttle is to pass, for the purpose of bringing the weft threads between those of the warp, and thereby weaving the fabric; *e* is the lay in which the reed is placed, consisting of a series of fine wires; between these wires the warp passes, and by it the threads are separated. This lay is supported by two arms *f, f*, and vibrates upon a shaft with pivots below.

The lay is moved backward to enable the shuttle to pass along its race between the divided parts of the warp, and it is brought forward to beat up the weft after the shuttle has passed; *g* is the place of the breast beam, over which the cloth or other fabric passes when it is woven, and descends from the breast-beam to the roller *h*, where it is wound up. On the end of the axle of this roller, *h*, there is a toothed wheel *i* (seen in fig. 3) which takes into a pinion upon the axle of the ratchet wheel *k*. A click or pall at the end of the cross-lever falls into this ratchet, and the lower end of the cross-lever being connected to the leg of the lay, moves with it, turning upon a pivot in the centre of the cross, and, every time that the lay goes backward, the click pulls the ratchet wheel one tooth, thereby causing the pinion to move the roller *i* round with a very slow motion, by which the cloth is progressively drawn on to the roller as it accumulates in the loom.

The machinery is put in motion by means of the band *m*, seen in fig. 2, which proceeds from the steam-engine, or any other first mover, and passes over the rigger *n*, which is fixed to a small fly-wheel upon the end of the main shaft of the loom

WEAVE, *v. a. & v. n.* } *Part. wove, weaved;*  
WEAVER, *n. s.* } *participle pass. woven,*  
weaved. Sax. *wepan*; Belg. *weven*; Teut. *weben*.  
To form by texture, or by inserting one part of the materials within another; insert; unite; to work with a loom: one who weaves.

The women *wove* hangings for the grove.  
*2 Kings xxiii. 7.*  
My days are swifter than a *weaver's* shuttle.  
*Job vii. 6.*

Here in her hairs  
The painter plays the spider, and hath *woven*  
A golden mesh to intrap the hearts of men  
Faster than gnats in cobwebs. *Shakspeare.*

Upon these taxations,  
The clothiers all, not able to maintain  
The many to them 'longing, have put off  
The spinsters, carders, fullers, *weavers.* *Id.*

There our secret thoughts unseen  
Like nets be *waved* and intertwined,  
Wherewith we catch each other's mind. *Carew.*

White seemed her robes, yet *woven* so they were,  
As snow and gold together had been wrought.  
*Dryden*

When religion was *woven* into the civil government,  
and flourished under the protection of the emperors,  
men's thoughts and discourses were full of secular af-  
fairs. *Addison.*

Dan Pope, for thy misfortune grieved,  
With kind concern and skill has *waved*  
A silken web, and ne'er shall fade  
Its colours. *Prior.*

WEAVING.

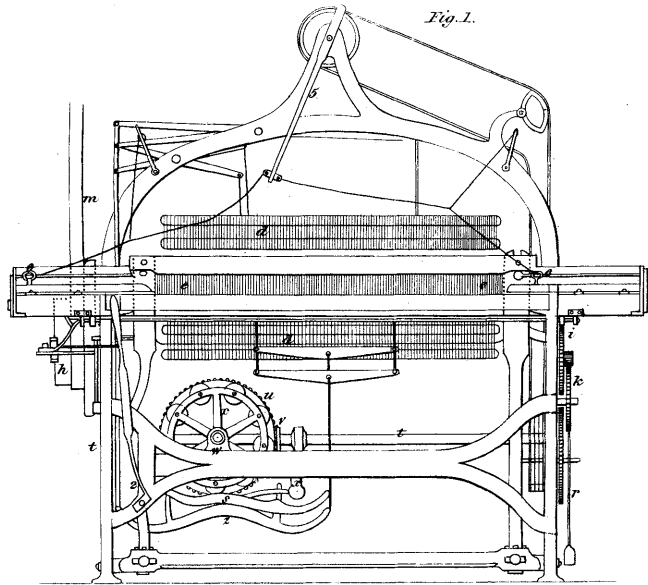


Fig. 1.

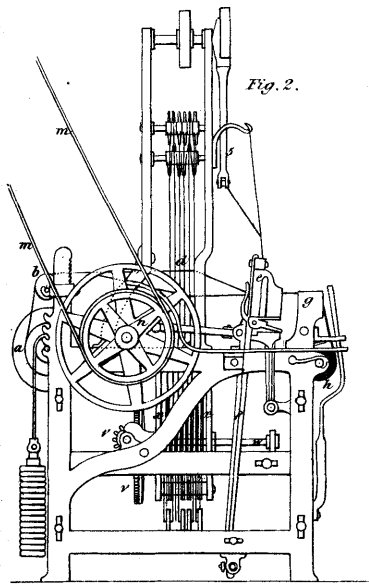


Fig. 2.

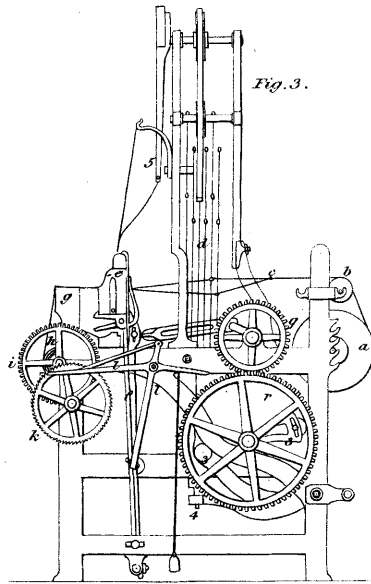


Fig. 3.

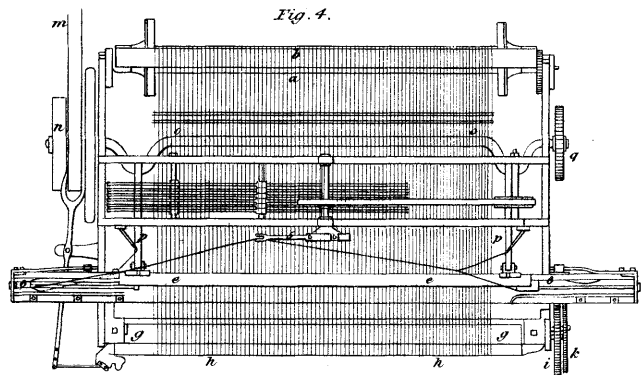


Fig. 4.

WEAVING.

PLATE II.

Fig. 1.

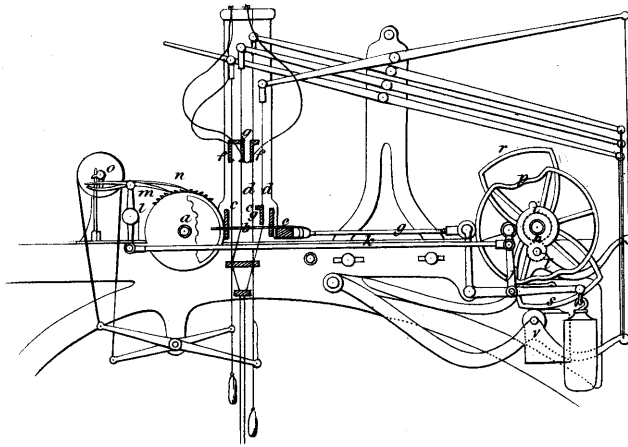


Fig. 2.

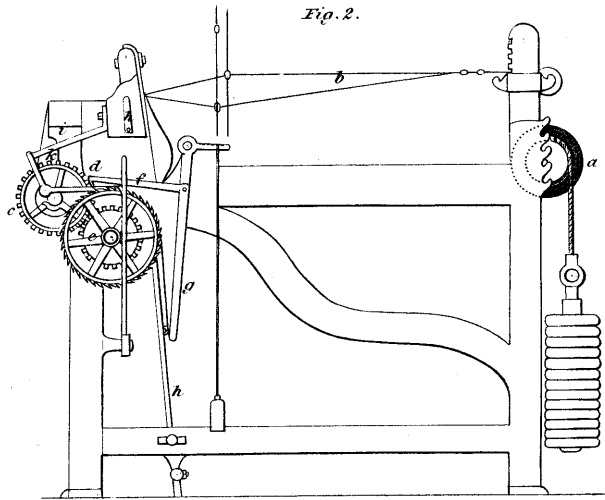
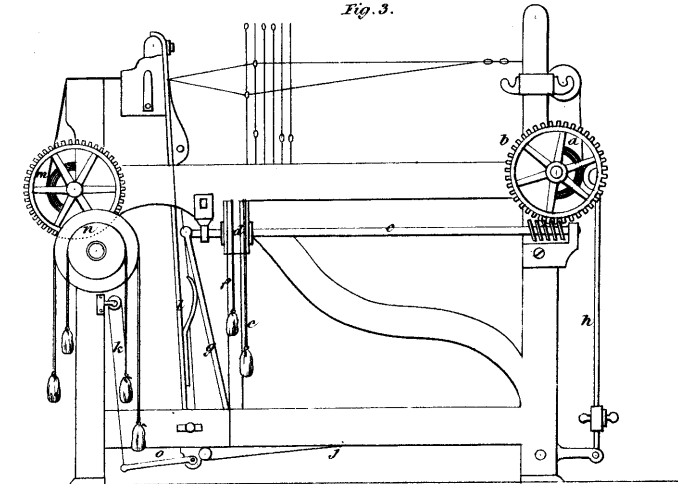


Fig. 3.



shown at *oo*, fig. 4. This shaft *o* has two cranks upon it, which, by means of the connecting links *p, p*, gives motion to the lay. The other end of this shaft has a small toothed-wheel *q*, seen at fig. 3, which takes into another toothed-wheel *r*, of twice the diameter, which last is fixed upon the end of an horizontal axle *t t*, extending the whole width of the loom, as shown at fig. 1. This axle has a small bevel pinion *v* fixed upon it, which actuates a bevel-wheel *u* upon the cross axle *w*. The tappet wheel *x* is also fixed upon this axle, and the gear is so regulated that the tappet wheel makes one revolution to every nine revolutions of the crank shaft.

The tappet wheel *x* is formed by two wheels which carry nine small axles, on each of these axles are six small friction rollers, making in the whole fifty-four friction rollers. These rollers are intended to act upon twelve curved levers *y, z*, fig. 1. The curved levers move upon fixed centres supported in small bearings; six of these curved levers are supported at 1, and the other six at 2, crossing each other, as shown in fig. 1, the extremities of the levers alternately rising and falling. The ends of these levers, towards the middle of the loom, are attached by cords to the lower rails of the heddles, and their other extremities by cords to the top levers, from which are suspended the upper rails of the heddles.

The operation of the tappet wheel upon the heddles is this:—Having been actuated by means of the shaft and gear, as before described, the wheel in its revolution causes the friction rollers to strike alternately upon one or other of the levers *y* or *z*, and force them down, by which means the respective heddles are depressed or raised at certain parts of the operation, and these drawing the sheds of the warp up or down to permit the shuttle to pass, as before described, dispose the warp according to that particular arrangement which is calculated to produce a twilled fabric. In order to vary the twill, the friction rollers are capable of being shifted, and, by so disposing the collets between the rollers, certain of them may be situated so as not to act upon any particular one or more of the curved levers.

The operation of pecking, or throwing the shuttle, is effected by means of a double arm or tappet 3 on the axis of the shaft *t t*, which acts upon the levers 4, seen in fig. 3, whence rods and bands pass to a vibrating lever 5, upon the axle of a wheel at the top of the loom in front, as seen in fig. 1. Thus the revolution of the tappets 3, causing the alteration of the levers 4, produce the vibratory action of the lever 5; and cords being passed from this lever to the peckers 6, 6, cause the peckers alternately to strike the shuttle out of its box, and send it across the lay *e*.

There is a provision in case the shuttle should by any accident stop in the race to prevent the lay from coming forward, which would otherwise break the reed; this is by means of small springs in the shuttle boxes, which, when the shuttle has not reached its destination, stand out and catch against small projections, and by that means stop the advance of the lay. Whenever this happens, the main strap *m* is, by the sudden action of a spring, pushed off the rigger of the main shaft, and the machinery is altogether stopped until the accidental interruption is removed.

The second improvement applies to that descrip-

tion of loom employed for the weaving of figured goods, and consists in certain machinery to be placed above the loom for the purpose of effecting the raising and depressing of such parts of the warp as are usually operated upon by the draw boy. Very considerable difficulty and labor are attendant upon the old mode of setting in any particular pattern, figure, or design to be woven, but this labor and consequent expense are, in a great measure, overcome by the plan proposed under the present patent.

A section of the improved piece of mechanism is shown in plate II., fig. 1, which is to be placed immediately over the heddles or leases of the loom; *a* is a cylinder mounted upon an axle, and supported upon bearings in the frame. The periphery of this cylinder is perforated with a vast number of holes at equal distances apart, so as to render the appearance of its entire surface like a colander. Previous to placing the cylinder in the loom, it is to be covered with stout drawing paper, and, when set in such a situation that the light may shine through the perforations, a small punch is to be employed for the purpose of pricking through the paper, and through the cylinder, certain holes corresponding to the required pattern.

The cylinder thus pierced is then placed in the frame as shown at *a*, so as to revolve upon its pivots, resting in bearings, capable of accurate adjustment. A series of needles *b* are ranged in a horizontal position, so that their end may come in contact with the periphery of the cylinder.—Cords *c c* and *d d*, fastened to the frame above, pass through eyes in the needles, and proceed down to the heddles or leases below. These needles work in guide pieces, and are supported by a straight bar *e*, which passes through their bent parts behind, and by that means they are enabled to slide accurately in a line with the axis of the cylinder. When the ends of the needles come against the blank or unpierced parts of the paper upon the periphery of the cylinder, they are pressed back, and the cords are drawn out of the perpendicular, as *d, d*, by which means the needles acquire a tendency to advance when any of the apertures come opposite them, so as to permit their ends to slide forward. When any of the needles have slid forward through any of the apertures of the cylinder, the cords attached to those needles become straight as *c, c*. There are four bars *f, g, f, g*, from each of which a row of forks, like a wide toothed comb, extend. Between the forks or teeth of these bars the cords pass; and as the bars are drawn up or let down, by the action of the top levers, a knot in each of the cords causes them and the heddles to which they are attached below to be drawn up or let down also: it will hence be seen that those needles which have been allowed to advance by passing into the apertures of the cylinder, draw the bent cords *d, d*, into the straight position of *c c*, and by that means those cords are withdrawn from the teeth of the forked bars *g, g*, and are placed between the teeth of *f f*, which, in rising, take hold of the knots and lift the heddles attached to the cords so operated upon; while those needles which are forced back by the blanks of the cylinder keep their cords bent in the position of *d, d*, and the heddles connected to these cords are lifted by the rising of the bars *g, g*; thus the different parts of the warp required to be raised, to produce any particular pattern or damask figure, are so raised

by the shifting of the cords connected to the respective heddles from the fork bars *f* to *g*, or from *g* to *f*, as may be required, which is effected by the sliding of the needles as above described.

The manner in which the different parts of this piece of mechanism are put in action is as follows:—*h* is a main shaft turned by a connexion with the lay of the loom, so as to move half round every time that the shuttle has been passed across the warp. Upon this shaft there are several cams or tappets operating upon levers; *i* is one of these cams, which, as it revolves, strikes against the friction roller of a bent lever *j*, and drives the rod *k* forward. At the reverse end of this rod *k* there is a vibrating lever *l*, connected to which a pall *m* is attached, and this, taking into the ratchet teeth of the cylinder *a*, causes the cylinder to advance one tooth every time that the cam *i* strikes the lever *j*, and rod *k*. There is a hook *n*, by the side of the pall *m*, which is connected also to the action of the lever *l* and rod *k*, for the purpose of giving the cylinder a retrograde motion; which is requisite when the figure or pattern is designed to be worked backwards and forwards, as in what is called a point pattern; the means of putting either the pall or the hook out of action is a cam upon the shaft *o*.

In order to move the cylinder forward one tooth of a revolution, it is necessary to withdraw those needles that have passed into the apertures; this is done by the cam or tappet wheel *p* (also upon the main shaft) permitting the rod *q* to recede, and with it the guide bar *e*, which draws the whole of the needles *b* a short distance back every time that the shuttle has passed across the loom. The lifting of the fork bars is produced by two tappets *r* and *s*, likewise upon the main shaft, which, coming in contact with the friction rollers of the bent levers *t*, *v*, by the cords at their extremities, alternately pull down the longer arms of the top levers, and thereby cause the shorter arms of the same levers to lift the forked bars and the cords *c* or *d* as before described.

The third improvement applicable to looms consists in a new mode of taking up or winding the cloth or fabric upon the beam, or cloth roller as it accumulates in the loom; this part of the invention is capable of adaptation to both power looms, and those worked by hand. It has been found extremely difficult in hand looms to produce an even cloth, owing to the unequal force by which the lay has beaten up the weft or shoot. This contrivance is shown at fig. 2, which exhibits an end view of a power loom, such parts only being shown as are necessary for the illustration of this contrivance.—*a* is the roller upon which the yarn is wound; this roller turns with considerable friction, owing to the weighted cord coiled round it, which distends the warp threads *b*. The roller upon which the cloth is wound is marked *c*, and has upon its axis a toothed wheel *d*, taking into a pinion upon the axle of the ratchet wheel *e*. This ratchet wheel is moved round by a hooked pall *f*, which is connected to the lever *g*; and this lever, being jointed to the leg of the lay *h*, causes the hook to pull the ratchet wheel one tooth at every vibration of the lay.

If the weft or shoot carried by the shuttle be of uniform substance, the cloth or other fabric woven by these means will be of an even texture; but, if some parts of the weft be thinner than other parts, then the lay will come forward a small distance and permit the tail rod *i* to strike against the short

lever *k*, which will cause the hook *f* to be lifted out of the teeth of the ratchet, and the beating up of the cloth will proceed without causing the roller *e* to draw it off until a second weft thread has been introduced, which by the increased thickness prevents the advance of the lay as before, and now allows the hook to take hold of the ratchet, and draw it one tooth forward. When this contrivance is adapted to a power loom, the lay must be worked by an arm which has a spring, in order to permit the lay to advance according to the thickness of the weft.

The fourth improvement applies to the working of the yarn roller and the cloth roller together, by means of certain machinery as will be explained. Fig. 3 shows the end of a loom with such parts as are necessary to explain this improvement; *a* is the yarn roller with a toothed wheel *b* upon its axis; *c* is a horizontal shaft having an endless screw upon it, taking into the toothed wheel; *d* is a friction pulley, over which two weighted cords pass, the one *e* fastened to the frame, the other *f* attached to an arm or lever *g*, extending from the leg of the lay. When the lay goes back, previous to throwing the shuttle, the lever *g* draws down the cord *f*, in which act the pulley *d* and its shaft *c* is turned a short distance round, and the endless screw upon this shaft taking into the toothed wheel *b* causes that wheel and the roller *a* to turn sufficiently to give out a portion of the warp. When the lay returns, for the purpose of beating up the weft, the lever *g* slackens the cord *f*, which now slides and is drawn tight by the weight at its extremity, the pulley *d* being prevented from returning by the friction of the weighted cord *e*.

In order to regulate the delivery of the warp, according to the larger or smaller diameter of the warp roller *a*, a lever *h* is placed at the back of the loom, carrying the friction roller *i*, which is pressed against the periphery of the warp roller by the tension of a cord *j* fastened to the lever *h*, and passing thence over a pulley to the arm or lever *g* before mentioned. This lever is pressed by a spring *l* in the side of the lay, and as the diameter of the warp roller diminishes; the lever *h* advances and relaxes the cord *j*, by which the spring *l* is enabled to force the arm *g* farther out, and hence the cord *f* is drawn further down in the receding of the lay above described, which draws the pulley also, and thereby causes the toothed wheel and the warp roller to advance more rapidly than would be required if the roller was full.

In opening the sheds of warp for passing the shuttle, the warp roller is not permitted to give way as in other looms: but the cloth roller is made to yield by the following means:—*m* is the cloth roller, having a toothed wheel upon its axis, taking into a pinion which is fixed upon the axis of the pulley *n*; this pulley has two grooves of different diameters, round which pass cords with balance weights. As the lay vibrates, its tail lever *o* draws the cord up and down, which by friction causes the pulley to move sufficiently to afford the required relaxation of the cloth.

The fifth improvement consists in disposing the warps and shuttles in several ranges, one above the other, which particularly applies to ribbon looms; in this improvement the shuttles are placed in the lay in several rows, and consequently several portions of reeds are adapted to correspond to the several rows of warp. The sixth improvement is in

the manner of working these shuttles for the weaving of narrow goods as ribbons ; by which arrangement, shuttles with different colors or shades of color may be worked at the same time. The lay is provided with an iron sliding frame, having beaters extending up and down, so as to reach the several shuttles in the upper and lower rows ; or, if more than two rows of shuttles be arranged, then the sliding beater is formed as a ladder.