

H. D. DAVIS.
LOOM.

No. 110,904.

Patented Jan. 10. 1871.

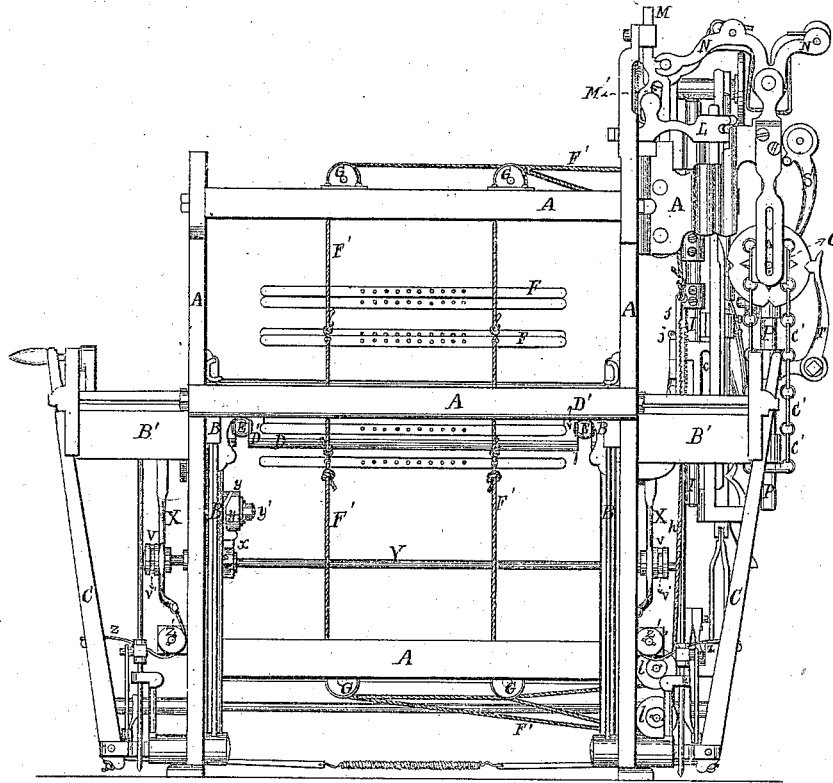


FIG. 1.

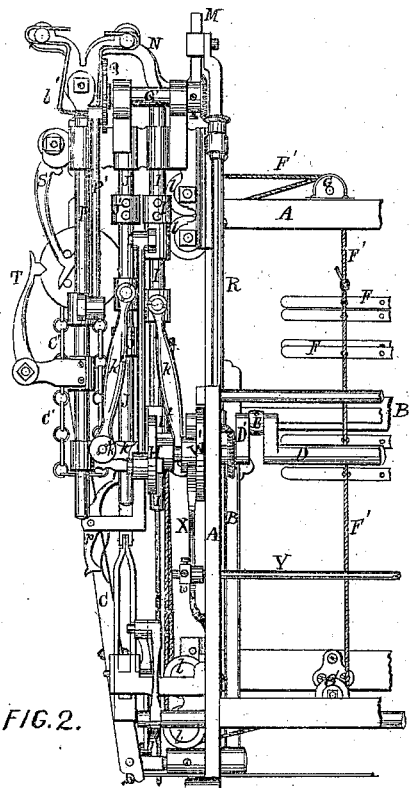


FIG. 2.

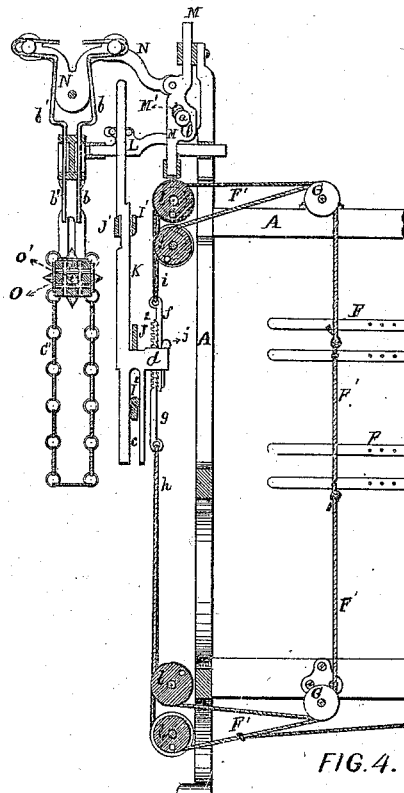


FIG. 4.

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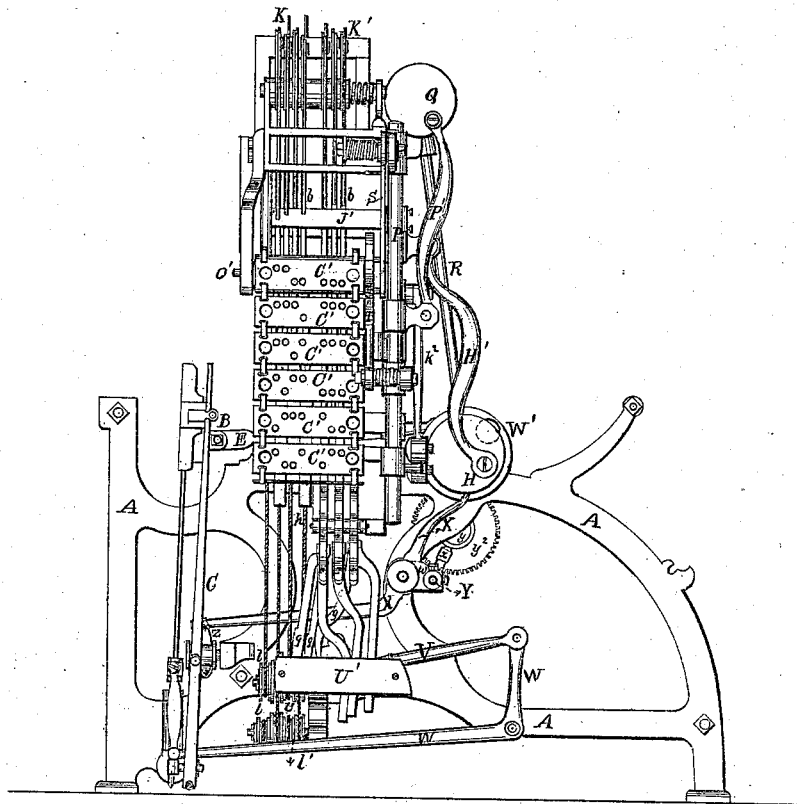


FIG. 3.

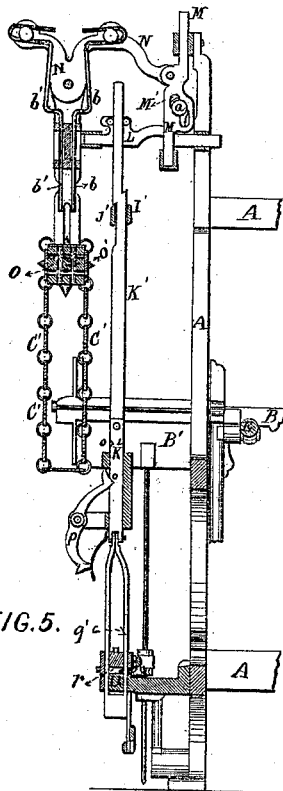


FIG. 5.

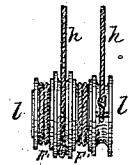


FIG. 6.

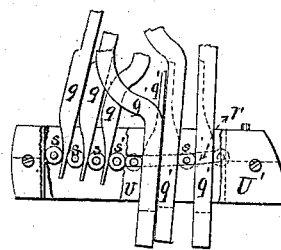


FIG. 7.

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Witnesses.

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HILAS D. DAVIS, OF NORTH ANDOVER, MASSACHUSETTS.

Letters Patent No. 110,904, dated January 10, 1871.

IMPROVEMENT IN LOOMS.

The Schedule referred to in these Letters Patent and making part of the same.

I, HILAS D. DAVIS, of North Andover, in the county of Essex and State of Massachusetts, have invented certain Improvements in Looms, of which the following is a specification.

My invention consists of several modifications in the construction of fancy looms, so called, by which the operations of those parts of the loom to which the modifications relate are much improved.

My improvements relate, in the first place, to the mechanism for working the heddles, and the kind of harness-mechanism to which they are applied, as herein shown and described, is that when the heddles are worked by jacks which slide lengthwise and are attached by cords or other connections to the several leaves of heddles, and are carried up or down by a lifter and depresser, which engage with notches or hooks on the jacks, and are all brought to a central position by eveners, in a manner well known to the trade.

The jacks that I use work in guides near their upper and lower ends, and the upper guide is made movable, so as to swing the upper end of the jack either toward the lifter or the depresser, to cause it to engage with one or the other, as the pattern-chain shall determine.

The first improvement in this part of my invention consists in working the movable guide for each jack by a cam, which has a rest, so called, at each limit of its movement, so that it thereby locks the guide and prevents any strain upon the jack from reacting upon the pattern-mechanism, which places the guide in position, and also insures the connection between the jack and the lifter or depresser until released by the pattern-chain; and it also consists in combining with the jack, the guide, and the cam, a pair of needles or pushers, and a double pattern-chain, and suitable connecting mechanism, so that the said cam will move the jack in both directions by a positive motion derived from the pattern-chain.

The second improvement consists in arranging the eveners near the lower ends of the jacks, and so forming both that one of the eveners shall serve as the guide for the lower ends of the jacks, as will be described.

The third improvement consists in forming upon the jack a projecting lug and combining therewith two adjustable eye-pieces, to which the cords or other connections are respectively attached, which raise and depress the heddles, so that the length of the connections and the positions of the several leaves of heddles may be readily adjusted.

The fourth improvement consists in the use, in combination with the heddles and jacks, of a series of duplex differential pulleys and cords between the hed-

dles and jacks, for the purpose of opening the shed evenly, by graduating the movement of the heddles to the inclination of the warps, while all the jacks have the same extent of motion.

My improvements relate, in the second place, to the construction of the mechanism for working a series of shuttle-boxes at one or both ends of the loom.

The first improvement in this part of my invention consists in the use of a duplex series of wedges or inclines for moving the boxes, each of which wedges has an incline adapted to move the boxes one grade, which wedges are arranged in two reversed series, working in opposite directions, and operate upon suitable intervening mechanism, so as to move the shuttle-boxes in both directions by a positive motion.

The second improvement consists in combining the said wedges with jacks, which are worked by a lifter and depresser under the control of a pattern-chain.

The third improvement consists in combining with each series of wedges a series of guided rollers or blocks interposed between said wedges, so as to serve as movable abutments to said wedges and enable them to transmit their united effect to the parts which move the shuttle-boxes.

The fourth improvement consists in combining two series of the said wedges, and guided rollers or blocks, with the guided block which imparts the motion to the shuttle-boxes, and two fixed abutments, between which the said system of wedges and rollers or blocks act.

The fifth improvement consists in combining with each jack, which works the shuttle-boxes, a detent, which holds it at rest at its extremes of motion, until it is moved therefrom by a new engagement with the lifter or depresser, as determined by the pattern-chain.

The sixth improvement consists in combining the jacks that work the heddles and the jacks that work the shuttle-boxes with the lifter, depresser, and other accessory mechanism which actuates them, into one system, so that all the jacks can be worked by the same kind of subordinate parts from the same pattern-card, and by the same mechanism.

Description.

In the drawing—

Figure 1 is a front elevation of so much of a loom as will show the application of my improvements;

Figure 2 is an elevation of a part of the back side of the same;

Figure 3 is an end elevation of the same;

Figure 4 is a sectional elevation, showing the construction of the mechanism for working the heddles;

Figure 5 is a sectional elevation, showing the con-

struction of the mechanism for working the shuttle-boxes;

Figure 6 is a view of two of the differential shives used with the heddles; and

Figure 7 is a detailed view of the wedges and accessory mechanism by which the shuttle-boxes are moved.

A is the frame of the loom.

B, the lay.

B', the shuttle-boxes.

C C, the picker-staffs.

D, the lay-shaft.

E E, the connecting-rods, to work the lay from the cranks D' D'.

F, the heddles.

F', the cording for the same working upon the shives G, all constructed and operating in the usual manner, except so far as modified by my improvements.

H is a crank upon the end of the lay-shaft D, which, through the connecting-rod H', imparts a reciprocating motion to the sliding rod I, which carries the depresser I' and one of the eveners I²; and from this, by means of the connecting-rod k, balance-lever k', and connecting-rod k², a corresponding motion in the opposite direction is imparted to the sliding rod J, which carries the lifter J' and the evenner J².

K K, &c., are the jacks which work the heddles, and

K¹, &c., are the jacks which work the shuttle-boxes.

The jacks are all provided with hooks to work with the lifter and depresser, and the general mode of operation of these parts is similar to what has been before used.

The jacks are arranged vertically, and their upper ends work in guides L, which slide horizontally to engage the jacks with the lifter or depresser, and are moved by a vertical slide, M, which has a cam-groove, M', in which a roller or pin, *a*, on the guide L, works.

The groove M' has its ends parallel with the line of its motion, so that, when it is thrown up or down, the pin *a* rests in this part and locks the guide, and prevents any strain upon the guide from moving it or reacting upon the mechanisms beyond it, and holds the jack in connection with the lifter or depresser, as the case may be.

The slides M are moved up and down by the rocking-levers N, which are oscillated in one direction or the other by the needles or pushers *b b'*, which are connected with the lever N on either side of its axis, as shown, and are raised in the required order by the cards O' O', &c., of the pattern-chain.

The needle *b* raises the slide M, and the needle *b'* depresses it, so that all the movements of the parts between the jack and pattern-chain are positive and under control of the chain in a manner similar to what is described in another application for Letters Patent now pending.

The pattern-prism O is mounted upon an axis, O', fixed in the vertical sliding rod P, which receives a reciprocating motion, through the connecting-rod P', from the crank Q upon the shaft Q'.

This shaft receives its motion from the lay-shaft D by means of the inclined shaft R and the bevel-gears at the top and bottom thereof, which give the shaft Q' a coincident rotation with the lay-shaft.

The prism O is rotated and held by the hook-pawl S and detent T in the usual manner.

The pattern-cards O are made of sufficient length to provide pattern surface for the jacks that work the heddles, and also those which work the shuttle-boxes. The jacks that work the heddles are more clearly represented in fig. 4.

They are guided at the top by the guides L, already described, and their lower ends are made forked or with a long slot, *c*, which embraces the lower evenner J², and works thereon as the lower guide.

The evener also carries collars upon the outsides of the series of jacks, which keep them in their proper positions in that direction, so that the evener forms the sole guide for the lower ends of the jacks.

Just above this slot *c* there is a projection or arm, *d*, which is provided with a vertical mortise, in which two eye-pieces, *f* and *g*, are secured, to which the harness cords *h* and *i* are attached.

These eye-pieces are provided with graduated notches upon the edges which come together, so that the eyes may be brought nearer together or further apart; and the eye-piece *g* is also provided with notches on the edge next the jack, which engage with a pin or projection in the mortise in the projection *d*. The eye-pieces are secured in the mortise by the key *j*. By this arrangement the harness-cords may be adjusted both as to length and position.

The cords *h* and *i* lead to the differential pulleys *l* *l*, &c., which are made double or with two grooves for the cords, one of them of smaller diameter than the other. In one of the grooves (the larger) the cord *h* or *i*, leading from the jack, works, and in the other the cord F', which leads to one leaf of the heddles in the usual manner. Two of these pulleys are shown separately in fig. 6.

The diameter of the smaller scores of the shives are graduated to the extent of movement that its leaf of the heddles should have to open the shed evenly, so that while all the jacks have the same extent of motion the motion of each leaf of heddles is graduated to the position it occupies in the set. The shive Z, which is connected with the back leaf of the heddles, may be made single in the usual way, so that that leaf will have the full extent of motion that is given to the jack, and the other shives would be graduated to it.

As the shives or pulleys *l* are of twice the thickness of the usual single shive, they are arranged in two series, one over the other, to get them into a space equal in breadth to that occupied by the heddles.

The lower ends of the shuttle-box jacks K' are each jointed to a slide, K², which works in suitable guides attached to the frame, as seen in fig. 5. Each of said slides has two inclined notches, *o o*, in which the spring-detent *p* works to hold the jack in its upper or lower position, as the case may be, until it is moved therefrom by the lifter or depresser, when a change in the engagements of the jacks is produced by the pattern-chain. The lifter and depresser each move the shuttle-box jacks in one direction only, and do not bring the jack back to the central position with their return movement.

To the lower end of each slide K² are jointed two cam-wedges, *q q'*, the construction of the lower ends of which is seen more clearly in fig. 7. These wedges all work in a long vertical mortise, U, in the guide-block U'. This mortise is intersected by a horizontal slot, *r*, in which the bearings of a series of rollers, *s*, work, upon which the wedges *q* operate.

The roller *s* is mounted upon a pin which extends through the slot *r*, and is fixed in the end of the connecting-rod V, which connects with the bent lever W, the opposite end of which is connected with the shuttle-box standard, as is shown, and by means of which the shuttle-boxes are placed in position. The lower ends of the wedges *q* are of the form shown in fig. 7, and the spaces between them are filled by the rollers *s*. The rods of the wedges *q'* extend downward at one side of the mortise U below the block U', and an offset is formed upon them upon which the wedges *q* are secured, and extend upward into the mortise U upon the opposite side of the roller *s*. There may be a roller, *s*, between each two wedges, or by placing the wedges back to back and otherwise properly forming them they may have a roller only between every other two.

Now, as one wedge of each kind is attached to ea c

jack, it follows that when one wedge is forced in between the rollers *s* its mate is drawn out, and *vice versa*, which moves the roller *s'* and its connection toward one end or the other of the mortise *U* a distance just sufficient to move the shuttle-boxes one grade; and if two wedges are forced in they will move the boxes two grades, and so on.

The order in which the wedges shall be worked is determined by the pattern-chain which determines which jack shall engage with the lifter or depresser, as has been described. If no change is made by the pattern-chain the jacks will remain at rest, being held by the detent *p*.

W' W' are the picker-cams. They are placed upon the lay-shaft *D* at each side of the loom, and have each one projection or operating incline, which are set to coincide with each other.

X X are the picker-levers. They are each mounted on an axis or stud, *u*, fixed in the side of the loom, and are made to slide laterally thereon sufficient to carry the lever to one side of the cam, so that the cam will not operate it. I prefer to make the cam of a circular plate, with a cylindrical pin or boss projecting from the side, as shown, which works upon the end of the picker-lever, which has a curved face of such form as will give the desired movement to the lever; but other forms of cam and lever may obviously be used in the same way. The hub *v* of each lever is made with a groove, *v'*, in which the forks of the shipper *w* work. The shippers *w* are fixed upon the rod *Y*, and at such distance apart that when one picker-lever is engaged with its cam the other will be carried beyond its cam, so as not to be operated.

Upon the rod *Y* is also fixed the guide-piece *x*, which works in the groove of the regulating pattern-cam *y*, which is mounted upon an axis, *y'*, and is attached to the gear *y''*, which engages with a pinion upon the lay-shaft, not shown. The cam *y* is, as shown, made with its helical groove so formed as to bring the picker-levers alternately to their cams *W W* and throw a shuttle alternately from opposite sides, and therefore makes one revolution to two of the lay-shaft; but if it is desired to throw a shuttle twice in succession from the same side of the loom, then the cam should have its groove made to correspond to that order of picking, and the ratio of the revolutions of the cam and lay-shaft should be one to four, and other modifications of the same character may obviously be used.

The picker-levers *X X* are connected with the picker-staffs *C* by straps *Z Z* working around the fixed pulleys *Z' Z'* in a well-known manner.

The several improvements which I have described are obviously susceptible of various modifications in

the devices employed, and would require such modifications in applying some or all of them to the kinds of looms already in use, but the mechanism described shows clearly their principles and modes of operation, and how they are to be used.

What I claim as my invention is—

1. The combination of the guide *L* with the cam-slide *M* or its equivalent, which will move the guide and lock the same, substantially as described.

2. In combination with the jack, the guide, and the cam-slide, a pair of needles or pushers and a double pattern-chain, substantially as described.

3. The eveners and jacks, constructed and combined so that one of the eveners will serve as a guide for the lower ends of the jacks, substantially as described.

4. In combination with the jack, the two adjustable eye-pieces attached to the central part of the jack, substantially as described.

5. The duplex differential pulleys and cords, in combination with the jack and leaf of heddles, substantially as described.

6. The duplex series of reversed wedges, with the parts subordinate thereto, for working the shuttle-boxes, substantially as described.

7. The combination, with said wedges, either singly or in pairs, of a jack or jacks, which are worked by a lifter or depresser under the control of a pattern-chain or its equivalent, substantially as described.

8. The combination of a series of wedges with a series of guided rollers or blocks interposed between said wedges, so as to transmit their united effect to the parts which move the shuttle-boxes, substantially as described.

9. The combination of the two series of wedges and guided rollers or blocks with the guided roller or block which moves the shuttle-boxes, and two fixed abutments, between which the system of wedges and rollers or blocks acts, substantially as described.

10. In combination with each jack which works the shuttle-boxes, a detent, which holds the jack at rest at its extremes of motion, substantially as described.

11. The combination and arrangement of the series of jacks that work the heddles and the series of jacks that work the shuttle-boxes, and the lifter and depresser, and pattern-chain, and the accessory mechanism that actuates them, all constructed substantially as described.

Executed July 7, 1870.

HILAS D. DAVIS.

Witnesses:

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