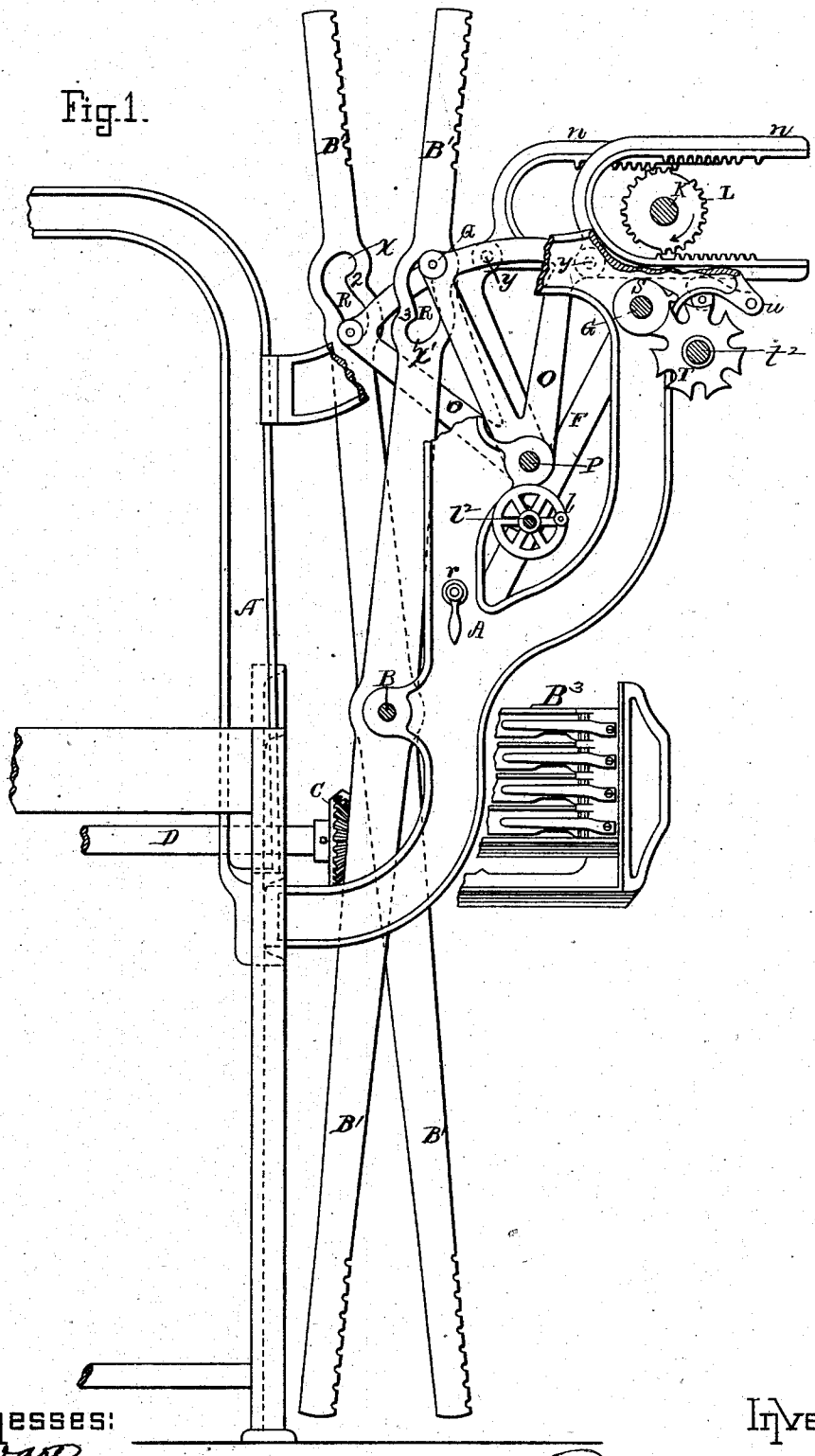
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G. CROMPTON.

Loom.

No. 240,009. Patented April 12, 1881.

Fig. 1.



Witnesses:
J. Lowe
J. B. Syme.

Inventor:
Geo. Crompton.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

(No Model.)

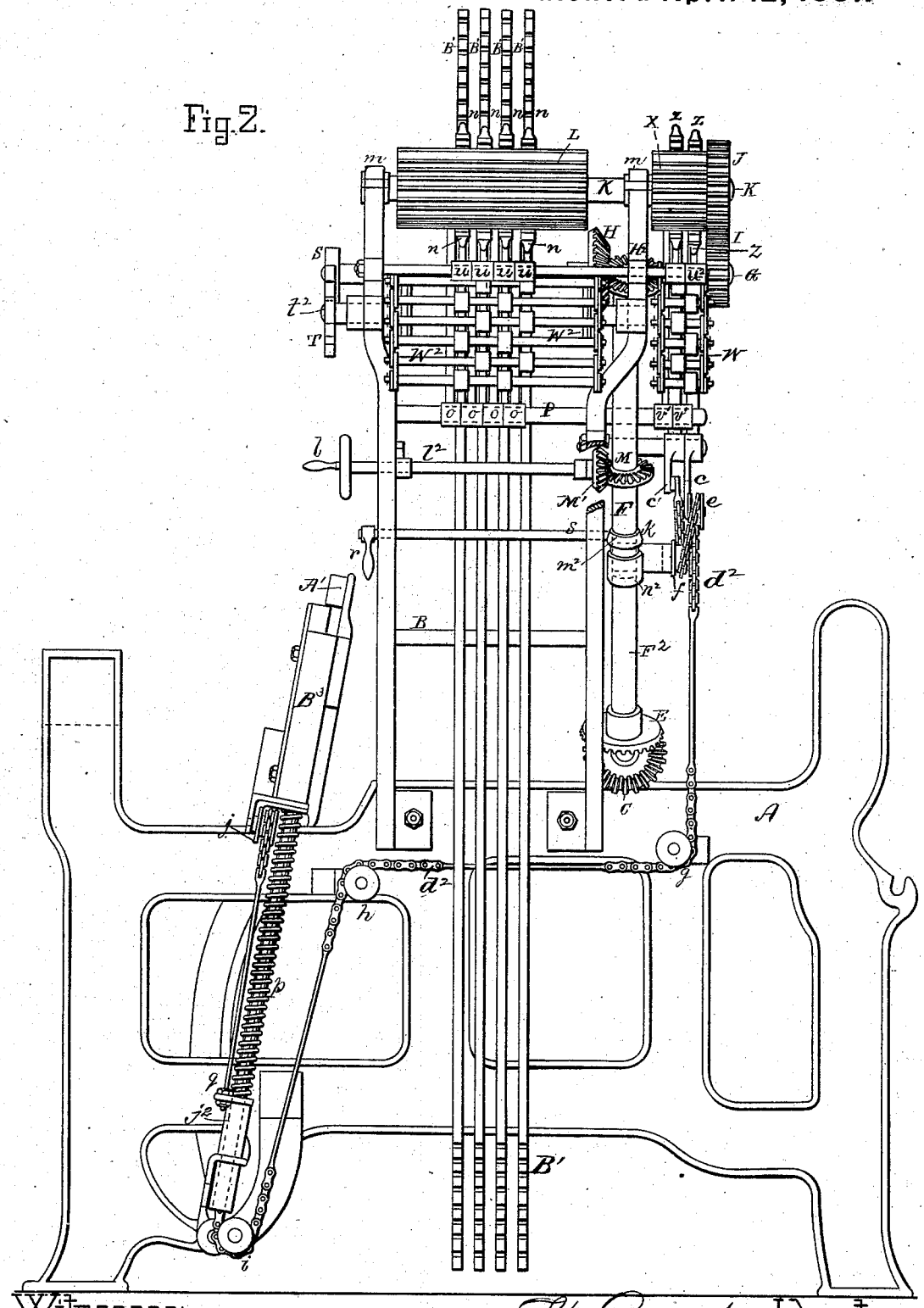
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Loom.

No. 240,009. Patented April 12, 1881.

Fig. 2.



Witnesses:
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(No Model.) 4 Sheets—Sheet 3.

G. CROMPTON.

Loom.

No. 240,009. Patented April 12, 1881.

Fig. 3.

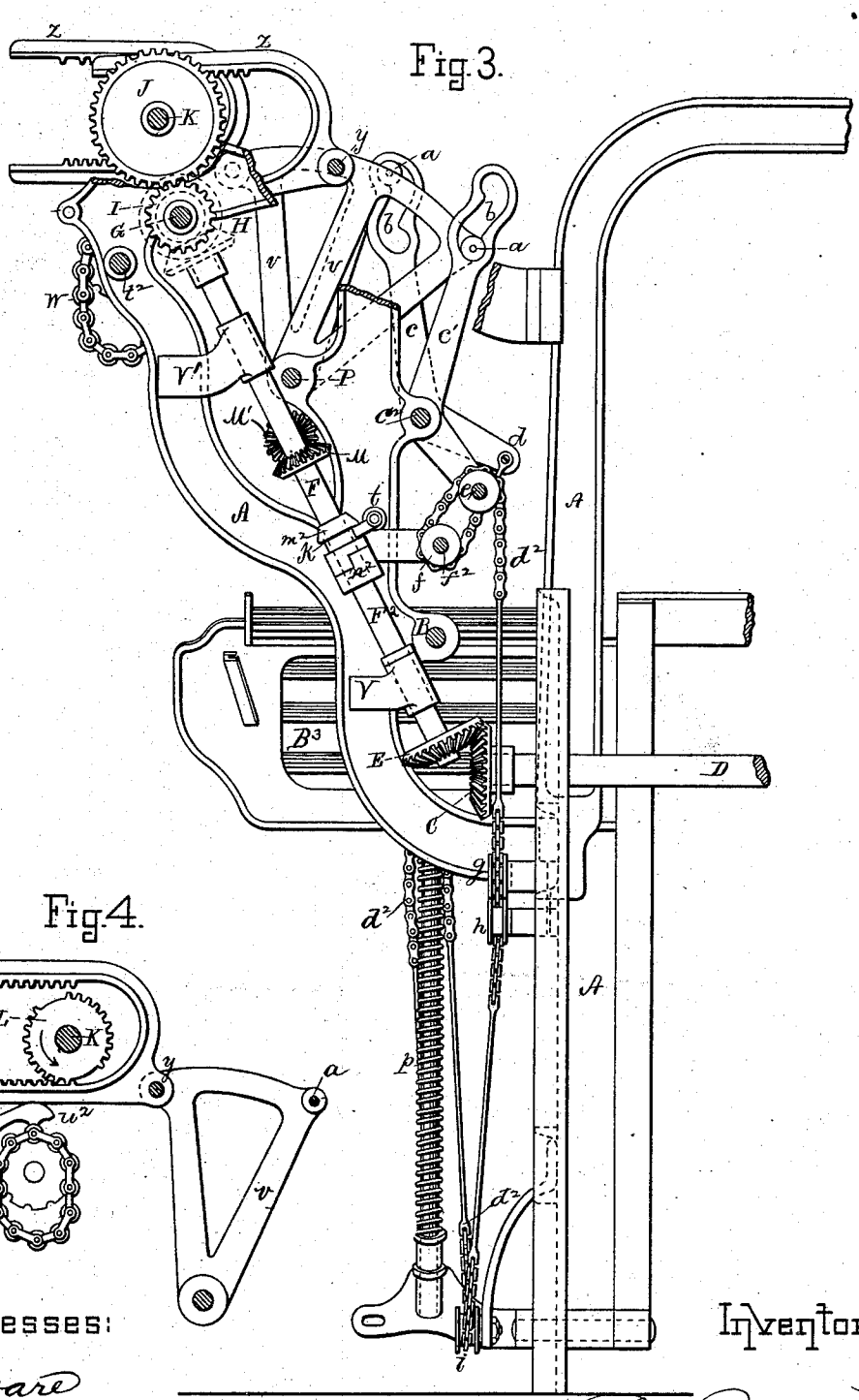


Fig. 4.

Witnesses:

Jaware

J. D. Lyons

Inventor:

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(No Model.)

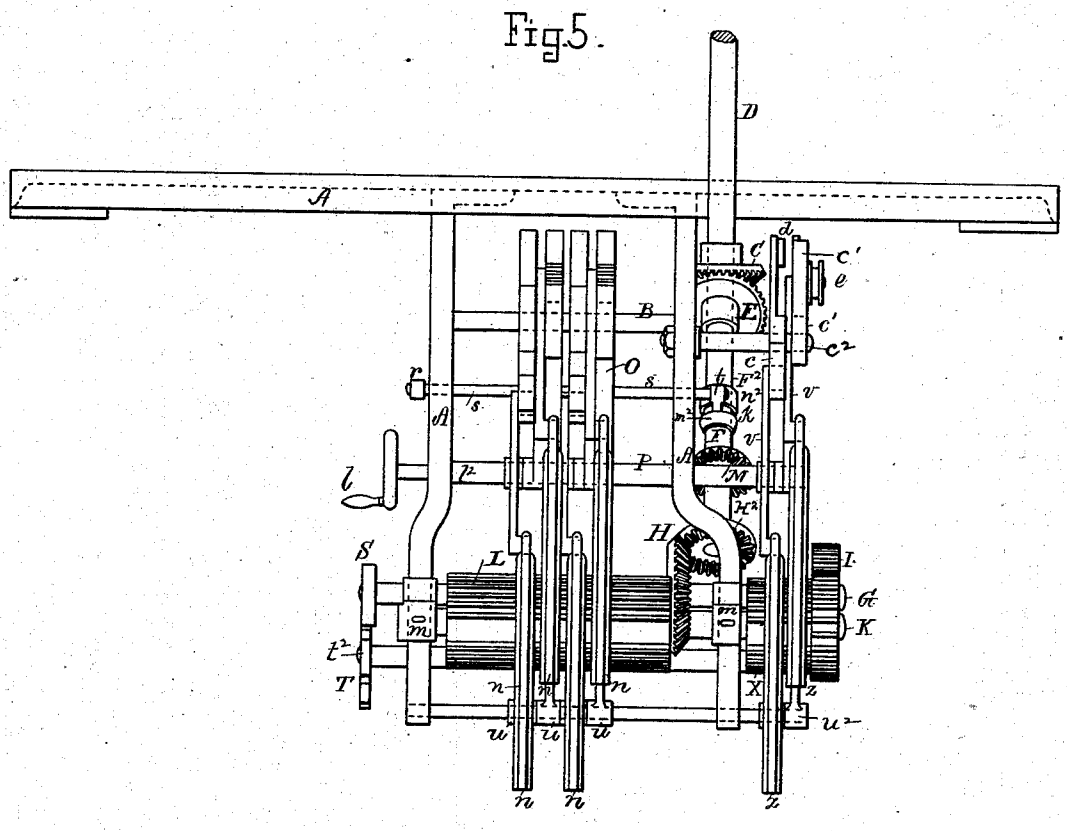
4 Sheets—Sheet 4.

G. CROMPTON.

Loom.

No. 240,009. Patented April 12, 1881.

Fig. 5.



Witnesses:

J. Ward

J. B. Sym

Inventor:

Geo. Crompton.

UNITED STATES PATENT OFFICE.

GEORGE CROMPTON, OF WORCESTER, MASSACHUSETTS.

LOOM.

SPECIFICATION forming part of Letters Patent No. 240,009, dated April 12, 1881.

Application filed July 10, 1880. (No model.)

To all whom it may concern:

Be it known that I, GEORGE CROMPTON, of Worcester, county of Worcester, State of Massachusetts, have invented an Improvement in Looms, of which the following description, in connection with the accompanying drawings, forming a part thereof, is a specification.

In the fancy-loom herein represented, containing my improvements, I employ well-known upright heddle-levers, notched at bottom and top to permit adjustment of the harness-frame cording; but I provide the said levers with peculiar slots to receive rolls mounted on carriers, with which are jointed the jacks of the shed-forming mechanism, the said jacks being forked and having each of their arms provided with a series of rack-teeth, the teeth of either arm of the jack, the latter under the control of the pattern-chain, being made to engage either the upper or lower side of the rotating toothed or fluted cylinder, which co-operates with the rack-teeth of the jacks and serves the purpose of both an elevator and depressor. Two of the jacks of the series of jacks actuated by the said fluted cylinder have the rolls of their carriers entered within slots made at the ends of two shuttle-box-moving levers. One of these levers has attached to it a chain extended to the box-rod of a series of four shuttle-boxes, while the other lever has upon its end a sheave, over which the said chain is passed, the movement of the two levers in one or the other direction acting upon the said chain and enabling any one of the series of four shuttle-boxes to be brought by one movement into position at the level of the race of the lay. The slots in these heddle and shuttle-box levers are so shaped as to enable the said levers to be locked and held in both their extreme positions, while the racks of the jack are disengaged from the toothed cylinder and the shed is held open.

The devices operative to move the shuttle-boxes and form sheds and to move the pattern-chains for the shedding and shuttle-box mechanisms are operated from the crank or lay shaft of the looms through an independent shedding-shaft, which, when desired, may be unclutched from the lay or crank shaft, and be turned by hand to move the shedding and shuttle-box mechanisms and find a mispick or correct any faults in weaving without moving the lay.

Figure 1 is a partial front elevation of a sufficient portion of my improved loom to represent the harness operating or shedding mechanism, a part of the loom-frame being broken away. Fig. 2 is a right-hand-end view of my improved loom. Fig. 3 is a rear-side elevation of Fig. 2; Fig. 4, a detail in side elevation, representing a pattern chain or surface and one of the double-racked jacks and carriers to be moved by the jacks, such as I employ to operate both the upright heddle-levers and the drop-shuttle-box levers; and Fig. 5 is a partial top or plan view of Fig. 3, it showing the jacks and the carriers for moving the upright heddle-levers and the shuttle-box levers of Fig. 3.

The frame-work A of the loom, the lay A′, and series of shuttle-boxes B^3 are and may be of any usual construction.

The upright heddle-levers B′, having their fulcra on the rod B, are of usual construction, and will be connected by cording in the usual manner with harness-frames, such as illustrated in United States Letters Patent No. 177,323, May 16, 1876, granted to me. Each heddle-lever, near its upper end, is provided with an irregular slot, R, composed of an inclined central portion having reversed notches x x' at its end, the acting surfaces of the notches beyond the corners 2 3 being concentric with the pivots P of the carriers O, each carrier having a roll, Q, or stud to enter one of the slots in one of the heddle or shuttle-box levers.

The heddles of the harness-frames, when the shed is held open, greatly strain the warp-threads, and the latter, having always a tendency to return to the level from which they were moved, always exert on the heddle-levers a pull which tends to bring them all into the same central line with the warps in the same plane. Consequently, in an open-shed loom it is especially necessary to provide means to lock the heddle-levers in place when moved into each of their extreme positions, the shed being then fully open to thus prevent the strain of the warps in the heddle-eyes from moving the levers; and, further, locking the heddle-levers is

especially desirable and necessary in a loom of the class herein shown, where the toothed racks run out of gear with the fluted cylinder.

To lock the heddle-levers I have shaped the slots R as shown, and have so pivoted the carriers O between the jacks and heddle-levers, and with such relation thereto that when the tops of the levers B′ are moved into position nearest the loom-frame the rolls Q on the carriers will fall into the notches x' below the corners 3 and lock the heddle-levers, for the part of the slot then occupied by the roll and that part of the heddle-lever in contact with the roll is concentric with the axis of the carrier O. A heddle-lever in this position is subjected to the strain of the warp in the harness-frames then depressed. When the heddle-levers B′ have their tops moved fully away from the loom, as shown by the first lever of the series in Fig. 1, the roll Q in its slot R will rest in the notch x above and at the rear of the shoulder 2, and as that part of the lever against which the said roll then bears is concentric with the axis of the carrier O, upon which the said roll is mounted, strain on the lever B′ by the elevated portions of the warp will be counteracted by the said roll. In either of the two positions referred to, as soon as the carriers O are moved the rolls quickly leave the notches x or x' and commence to act against the inclined or long sides of the slots R, which are not concentric with the axes of the carriers, and move the said levers in one or the other direction.

Each double-racked jack n is connected with a carrier by a pivot, y, located substantially in the horizontal plane occupied by the teeth of its lowermost toothed arm. When the teeth of the jack-moving toothed cylinder L (to be referred to) engage the teeth of the upper arm of a forked jack, connected with its carrier at y, below the center line of the forked jack, as described, the teeth of the said upper arm, owing to the location of the said pivot y, as shown and described, are drawn down closely into mesh with the teeth of the toothed cylinder, the degree of the force holding the teeth of the said upper arm of the jack into mesh with the teeth of the said cylinder increasing or decreasing as the resistance offered by the heddle-lever and its connected carrier is more or less. As the cylinder L moves the jack engaged with it toward the right, the pressure between the rack and cylinder teeth is increased, for the pivot y is brought nearer and nearer to a point directly under the axis of the said cylinder. Were the pivot y located at or near the center line between the two racks of the jacks, and in a horizontal line drawn substantially through the axis of the toothed cylinder, as in the United States patent to Greenhalgh, No. 9,377, November 2, 1852, then this forcing together of the rack and cylinder would not take place.

The teeth of the lower arms of the jacks are held up firmly in contact with the toothed cylinder by means of the fingers u, (see Figs. 1 and 2, similar to finger u^2 in Fig. 4,) which are interposed between the said arms and the rolls or projections of the pattern-chain or cylinder W^2. The weight of the jacks is sufficient to insure the positive engagement with the teeth of the toothed cylinder of the teeth of the upper arms of the jacks when the latter are lowered into and kept in contact with the teeth of the toothed cylinder. One or more teeth are omitted from each series of rack-teeth. In the upper arm one or more teeth are omitted at the outer end of the row of teeth, but in the lower arm the teeth are omitted from the inner end of the row of teeth.

The toothed cylinder L has one or more of its teeth removed at points diametrically opposite, as shown in Fig. 1. By reason of these spaces or untoothed parts of the cylinder, and the untoothed portions of the racks of the jacks at the ends of their chase, I am enabled to insure accurate meshing of the teeth of the jacks with the teeth of the cylinder, and when the jacks arrive at either of their extreme positions the racks or the teeth of the arms of the jacks run out of gear with the fluted cylinder, and remain out of gear until the pattern-chain again indicates that a jack so held out of engagement should be put into engagement with the toothed cylinder. The solitary teeth at the ends of the racks of the jacks are not herein claimed, as they are described in my application filed June 7, 1880.

The rolls Q of the carriers lock and hold the levers after the racks of the jacks run out of mesh with the teeth of the cylinder L. As the double-racked jacks are moved horizontally in one or the other direction they move the carriers O and cause the rolls Q thereon, then in the slots R, to vibrate the heddle-levers B′ in one or the other direction, according to the direction of movement of the jacks and of the said rolls Q in said slots.

The toothed cylinder L and its shaft is rotated in the following manner: The crank or lay operating shaft D has upon its end a bevel-pinion, C, which engages a bevel-pinion, E, at the lower end of an upwardly-inclined two-part shaft, F F^2, provided between its ends with a clutch, the said shaft and clutch and the parts for disconnecting the clutch being substantially as in United States Patent No. 176,113, April 11, 1876. At its upper end this shaft F has a bevel-wheel, H^2, that engages and rotates a bevel-wheel, H, on a horizontal shaft, G, having at one end a pinion, I, which engages a pinion, J, fixed upon the outer end of the shaft K, which has secured to it the toothed cylinder L. This toothed cylinder L is of sufficient length to be embraced by the forked parts of all the double-racked jacks which operate the heddle-levers. The shaft G, driven positively, as described, makes one revolution for each revolution of the crank-shaft D and beat of the lay. Each rotation of shaft G causes the wheel S thereon, having one tooth, (see Fig. 1,) to engage the star-wheel T and move it and the shaft t^2, which carries the pattern-chain W^2 one-seventh of a

revolution, each one-seventh revolution of the said star-wheel T bringing a new bar of the pattern-chain immediately under the series of fingers *u*, upon which the lower arms of the double-racked jacks rest. Those jacks the upper arms of which are in contact with the teeth of the toothed cylinder will be moved horizontally in one direction, while those jacks which have their toothed lower arms in contact with the said cylinder will be moved in the opposite direction.

The mechanism thus far described is for operating the heddle-levers. The shaft K, upon which is fixed the fluted cylinder L, has also secured upon it a shorter toothed cylinder, X, which receives above and below it the double-racked jacks Z of the shuttle-box mechanism, they being just like the jacks *n*. Each of these jacks Z is connected with one of two carriers, *v*, they having their fulcra at P, in line with the fulcra of the carriers O. Each carrier *v* has a roll or stud, *a*, like roll Q, which is entered within a slot, *b*, of one of the pair of shuttle-box-moving levers *c c'*. The slots *b* of the shuttle-box levers having their fulcra at c^2 are shaped just like the slots R *x x'* in the heddle-levers B', and for a like purpose. The short arm of the lever *c*, which I will call the "primary lever," has connected with it at *d* the end of the shuttle-box chain or connector d^2. The said chain is passed about a sheave, *f*, on a stationary stud, f^2, and thence about a sheave, *e*, carried by the short arm of the secondary shuttle-box lever *c'*, and from this sheave the said chain is passed under a sheave, *g*, over sheave *h* at the loom side, thence under a sheave, *i*, near the pivotal point of the lay A', thence up and over a sheave, *j*, supported at the under side of the race-beam of the lay, after which the said chain is connected, in the usual manner, with the sleeve j^2 on the shuttle-box rod *p*, the said chain moving the said shuttle-box rod and the series of four shuttle-boxes attached to it at its upper end, all in the usual manner.

Assuming the parts to be as represented in Fig. 3, if the secondary lever *c'* is moved into the position designated by the primary lever *c'*, it will lift the roll *e* and draw up the chain d^2 far enough to move the shuttle-boxes a distance of two cells. Simultaneously with this movement of the primary lever, if the secondary lever is moved toward the right the shuttle-boxes would be moved over a space equal to one cell. If both the shuttle-box levers *c c'* are in line and both be moved together in the same direction the shuttle-boxes will be moved for a distance equal to three cells.

With two levers, *c c'*, for actuating the shuttle-boxes, I am enabled to work them in unison in one or the other direction, or in opposition, and thus moved bring any one of four boxes in weaving position. I am aware that three shuttle-boxes have been moved by two cams of different lengths turned by racked jacks, each cam operating on the same shoe or plate; but with such cams and shoe it would be impossible to command any one of four boxes at will.

The pattern-chain W, for determining the movement of the shuttle-boxes, is carried upon a cylinder of usual construction attached to the same shaft which operates the pattern-chain of the shedding mechanism.

The fingers interposed between the forked jacks Z and the pattern-chain W for the shuttle-boxes are marked u^2.

The two-part shaft F F^2, having the clutch m^2 n^2 and operative parts for it, as before referred to, has upon it a bevel-gear, M, which meshes with a bevel-gear, M', at the end of a short hand-shaft, l^2, provided with a hand-wheel, *l*. The clutch part m^2, feathered, as usual, to slide longitudinally on the upper part of the shaft F, having been lifted from its engagement with the part n^2 of the clutch fixed to the lower part, F^2, of the shedding-shaft by the handle *r*, shaft *s*, and finger or fork *t*, the upper end, F, of the shedding-shaft and its connected parts may be turned while the lay and crank-shaft are at rest. The lower end of the part F of the shedding-shaft is entered loosely in a hole made at the center of the part n^2 of the clutch m^2 n^2, in line with the part F^2 of the shedding-shaft, the said clutch part thus serving as a bearing for the lower end of the part F.

By rotating the upper portion, F, of the shedding-shaft and its connected shafts by the said hand-wheel I am enabled to turn the toothed cylinders L and X forward and turn in unison with them the two pattern-chains W W^2 and make-sheds and move the shuttle-boxes without moving the lay. This provision enables the operator to easily correct imperfections in the weaving or to take out a mispick. The shuttle-box levers *c c'* are herein shown as having short arms of the same length; but these arms may be of different lengths.

If desired, I might omit the chain d^2, and instead connect the levers *c c'* directly with links *e f*, such as shown in Figs. 5 and 6 of United States Patent No. 209,714, November 5, 1878, or I may join the said levers directly with the lower ends of connecting-rods, such as shown by the letter d^5 in Fig. 5 of the United States Patent No. 230,243, July 20, 1880.

I am aware that a series of three-armed heddle-levers have been vibrated about their fulcra by means of toothed segments provided with slots and flanges, and actuated by jacks provided at their rear ends with racks to engage the said segments, as in United States Patent No. 134,572.

I am aware that it has been proposed to employ a belt to drive the shaft of a toothed cylinder to engage and slide double-racked jacks and cause them to rotate pinions and eccentrics to turn heddle-levers; but in this, my loom, the heddle-levers, slotted as described, are moved by rollers connected with carriers jointed to the jacks, and the movement of the toothed cylinder is made positive by gearing on the shedding-shaft.

I claim—

1. In combination, a series of heddle-levers, slotted as described, a series of pivoted carriers provided with rollers or studs to enter the said slots, a series of double-racked jacks connected therewith, a toothed cylinder to move the said double-racked jacks in one and then in an opposite direction, and a pattern chain or surface, and means to move both the toothed cylinder and pattern chain or surface, co-operating to determine the formation of sheds in the warp, substantially as described.

2. A series of double-racked forked jacks, means to move them, and a series of heddle-levers, combined with a series of intermediate carriers connected directly with and to move the heddle-levers, and a pattern chain or surface, and means to move it, the said jacks being pivoted directly to the said carriers below the horizontal center line of the toothed cylinder, as described, and substantially in the horizontal plane occupied by the lower arms of the double-racked jacks, whereby the upper arms of the double-racked jacks are drawn down into engagement with the teeth of the toothed cylinder, moving them, substantially as described.

3. In combination, a rotating toothed cylinder and shuttle-box pattern chain or surface, means to operate them, two double-racked jacks, two shuttle-box levers provided with angular slots, as described, two carriers actuated by said jacks and provided with rolls to enter the angular slots in and move the shuttle-box levers and hold them in their extreme positions of movement, and a series of four shuttle-boxes and intermediate connections, substantially as described, between the shuttle-boxes and the two shuttle-box levers, whereby any one of a series of four shuttle-boxes may be instantly brought opposite the lay, as set forth.

4. As a means for operating a series of at least four shuttle-boxes, a rotating toothed cylinder, and shuttle-box pattern chain or surface, and means to operate them, two double-racked jacks directly engaged by the said cylinder, two shuttle-box levers, and means to place them in operative connection with the jacks, and a series of four shuttle-boxes, and intermediate connections, substantially as described, between the shuttle-boxes and the two shuttle-box levers, whereby any one of the series of four shuttle-boxes may be instantly brought opposite the lay, as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEORGE CROMPTON.

Witnesses:

J. B. SYME,

J. A. WARE.