(No Model.) 2 Sheets—Sheet 1.

J. C. BROOKS.

SHUTTLE CHANGING MECHANISM FOR LOOMS.

No. 390,339. Patented Oct. 2, 1888.

Fig. 1.

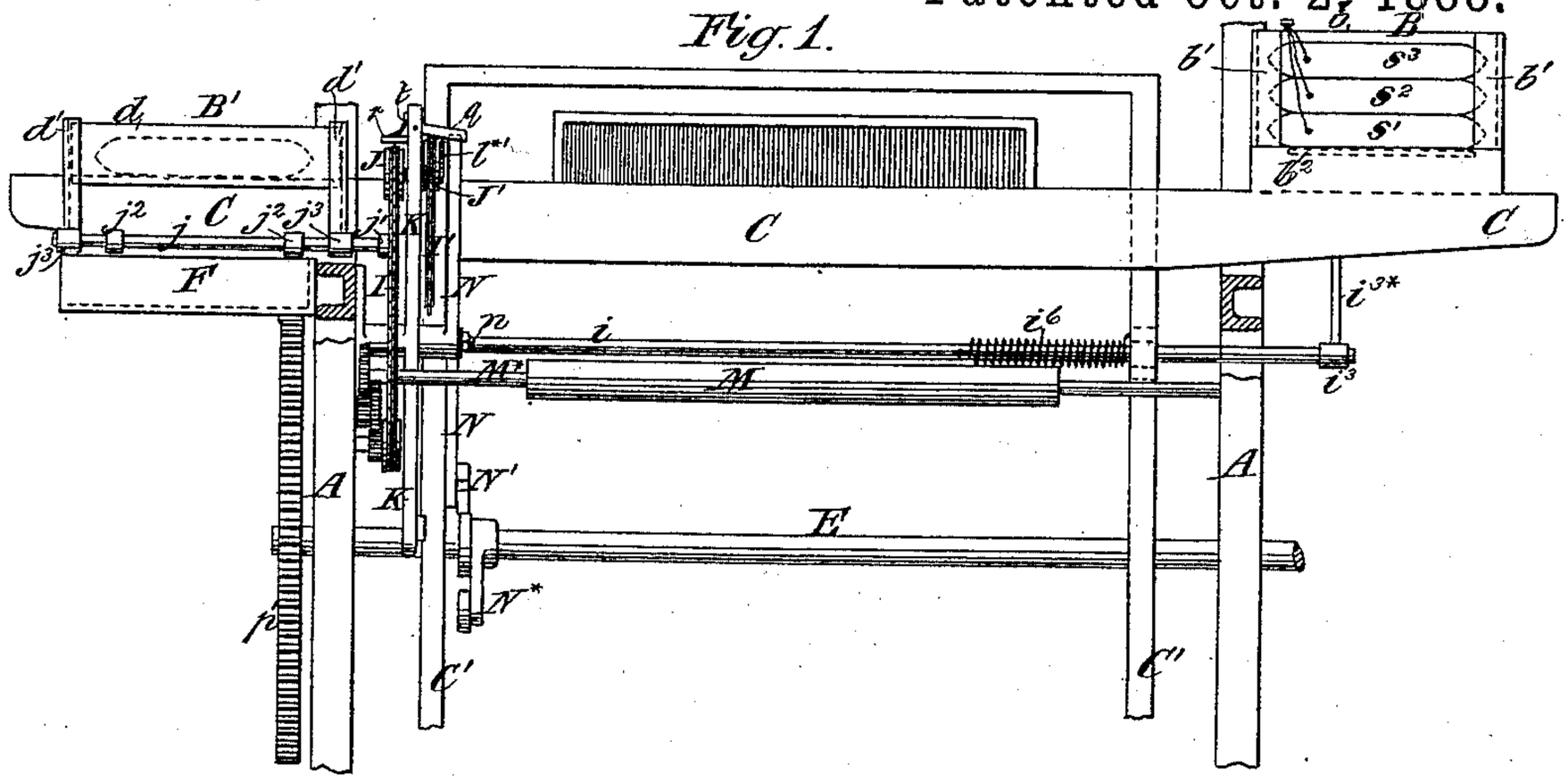


Fig. 2.

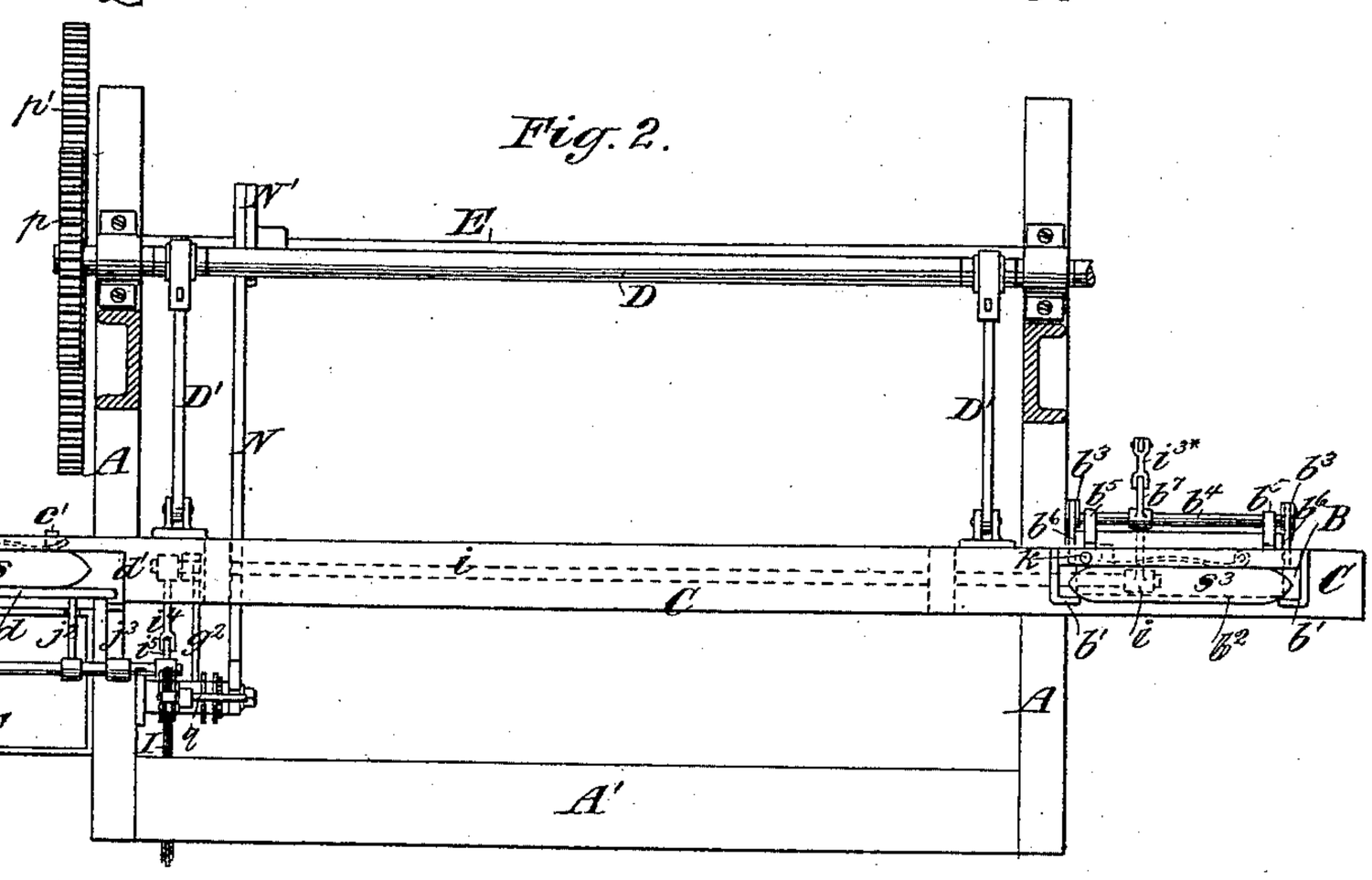
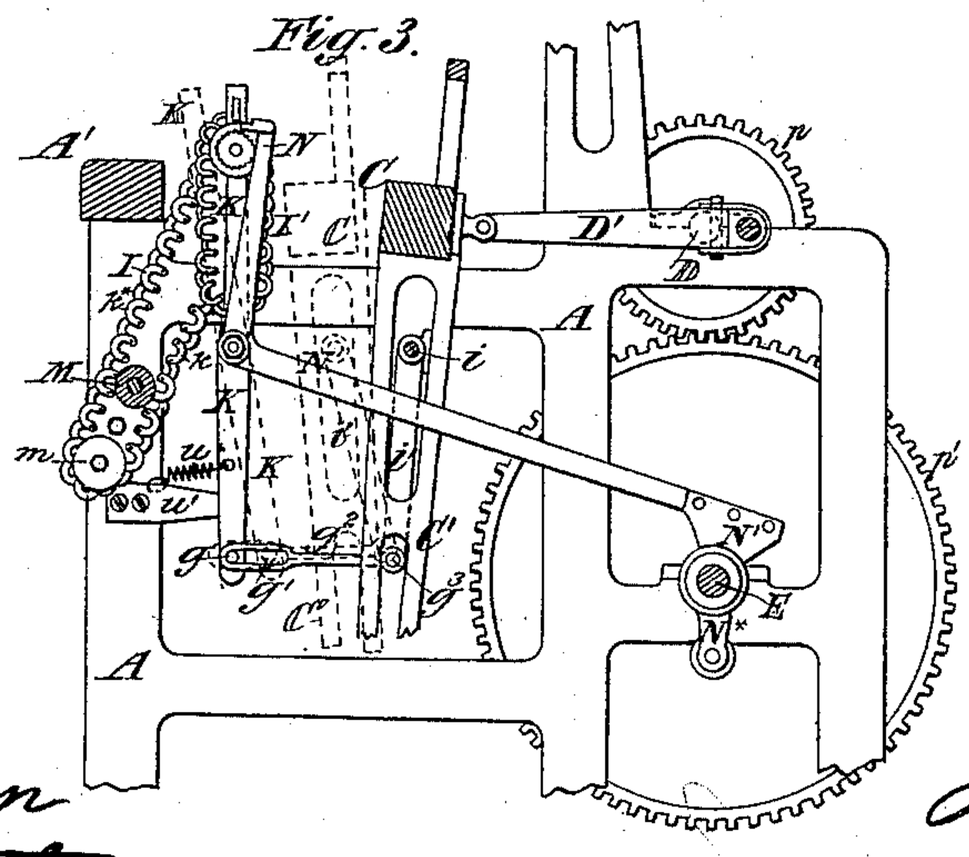


Fig. 3.



Witnesses:
C. L. Sundgren
Emy. Herter

Inventor:
John C. Brooks
by his attorneys
Brown & Ball

(No Model.) 2 Sheets—Sheet 2.

J. C. BROOKS.

SHUTTLE CHANGING MECHANISM FOR LOOMS.

No. 390,339. Patented Oct. 2, 1888.

Fig. 4.

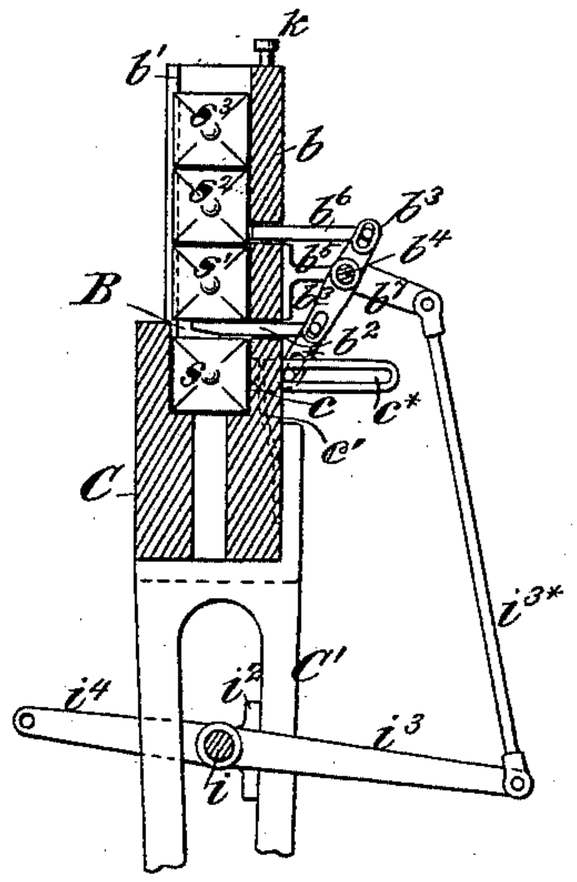


Fig. 6.

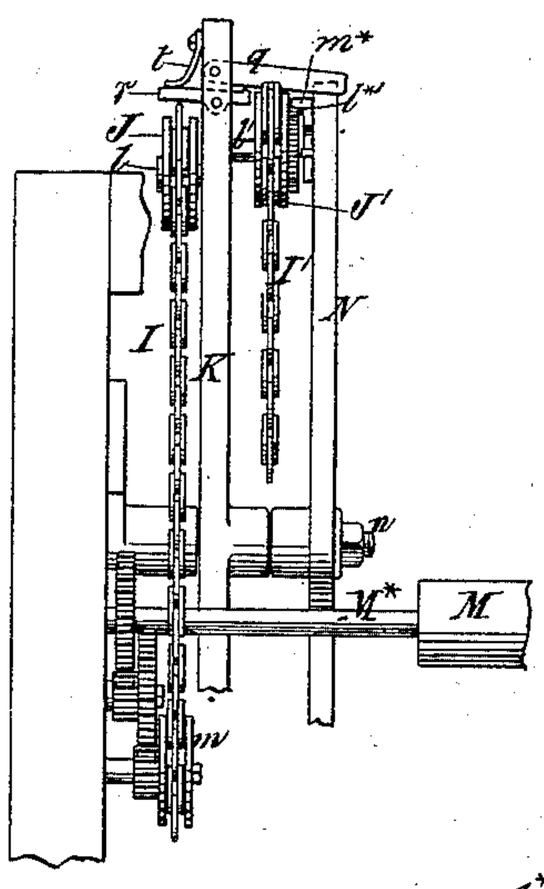


Fig. 5.

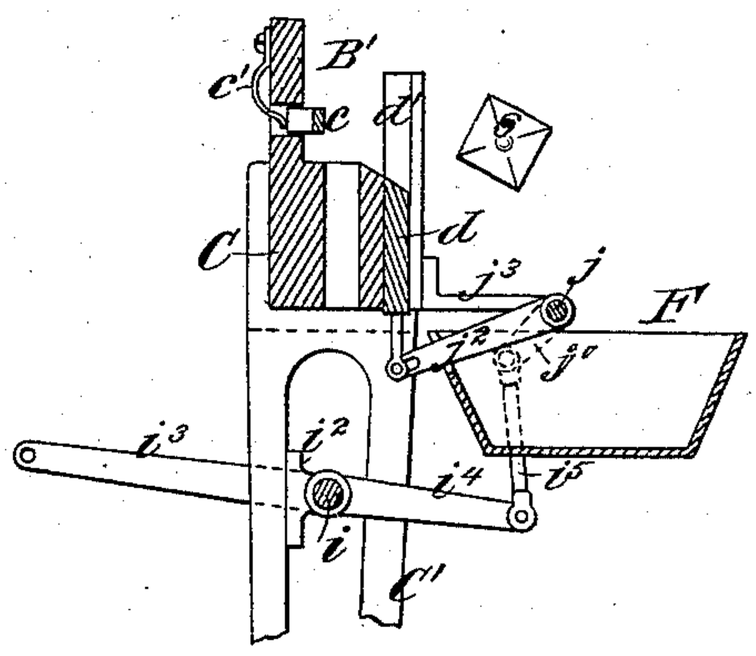


Fig. 7.

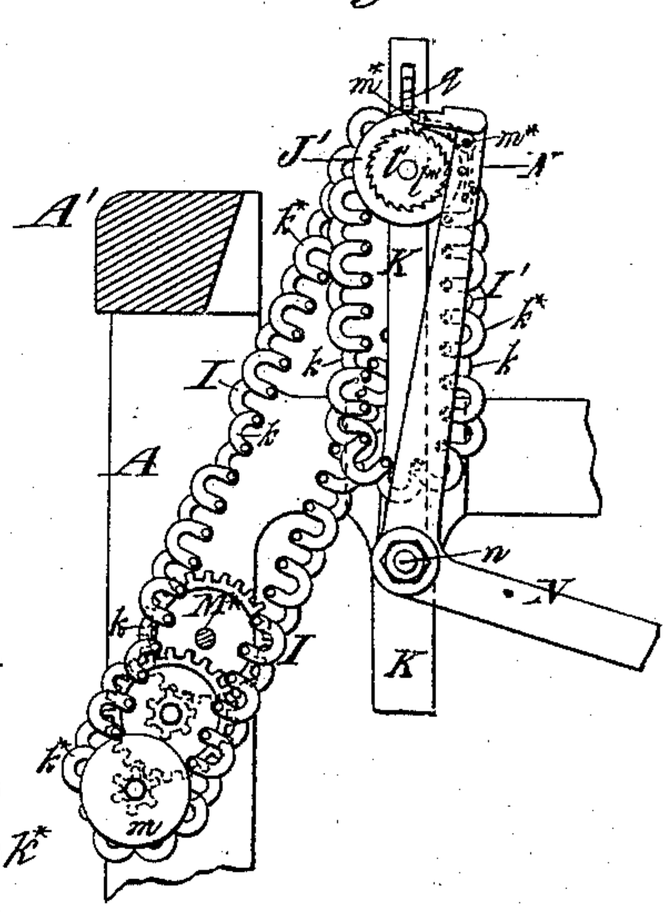
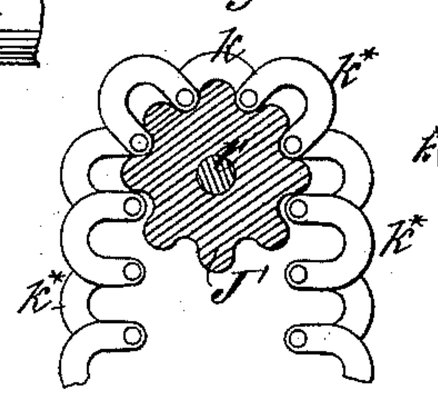


Fig. 8.



Witnesses:
C. L. Sundgren
Emil L. Certo

Inventor:
John C. Brooks
by attorneys
Brown & Hall

UNITED STATES PATENT OFFICE

JOHN C. BROOKS, OF PATERSON, NEW JERSEY, ASSIGNOR OF ONE-HALF TO ROBERT BLACKBURN, OF SAME PLACE.

SHUTTLE-CHANGING MECHANISM FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 390,339, dated October 2, 1888.

Application filed May 11, 1887. Serial No. 237,795. (No model.)

To all whom it may concern:

Be it known that I, JOHN C. BROOKS, of Paterson, in the county of Passaic and State of New Jersey, have invented a new and useful Improvement in Shuttle-Changing Mechanism for Looms, of which the following is a specification, reference being had to the accompanying drawings.

The object of this invention is to provide, in a very simple way and without any movement of the shuttle-boxes relatively to the lay, for the changing of the shuttles under the control of pattern mechanism; and to this end the improvement consists in certain novel means, hereinafter described and claimed, whereby the shuttles are displaced or thrown from the raceway of the loom and replaced by others, as required for the production of a pattern.

Figure 1 in the accompanying drawings is a front view of the lay, the shuttle-boxes, and the pattern mechanism of a loom and of all the other parts thereof necessary to illustrate the improvement, the framing being in section. Fig. 2 is a plan view of the parts of the loom shown in Fig. 1, showing also the breast-beam. Fig. 3 is a vertical sectional view corresponding with and at right angles to Figs. 1 and 2. Fig. 4 is a transverse sectional view of the right-hand shuttle-box and of that part of the shuttle-changing mechanism attached to said box. Fig. 5 is a transverse sectional view of the left-hand shuttle-box and of that part of the shuttle changing mechanism which is attached to said box. Fig. 6 is a front view of the pattern mechanism and part of the loom-framing. Fig. 7 is a side view, partly in section, corresponding with Fig. 6. Fig. 8 is a side view of one of the chains which are represented in some of the previously-mentioned figures as part of the pattern mechanism. Figs. 4, 5, 6, and 7 are on a scale double that of Figs. 1, 2, and 3, and Fig. 8 is on a still larger scale.

Similar letters of reference designate corresponding parts in all the figures.

A is the side framing of the loom, and A′ the breast-beam. C is the lay. B B′ are the shuttle-boxes, and C′ C′ the lay-swords. D is the crank-shaft; D′ D′, the rods connecting the cranks with the lay, and E is the cam shaft. All these parts, except the shuttle-boxes, are or may be like the corresponding parts of looms in common use for plain weaving. The shuttle-boxes differ from those of common looms, in that one of them—viz., B in the example shown—is constructed to contain several shuttles—one above another in reserve—and is furnished with means of letting the reserve shuttles down to the raceway, as required, and the other one—viz., B′ in the example shown—is constructed to let out the shuttle which had been in use previously to the bringing of a new shuttle from the box B down to the raceway.

The shuttle-boxes and the mechanism applied thereto, which I will immediately proceed to describe, for effecting the changing of the shuttles, is like that described in the specification of my Letters Patent, No. 371,299, dated October 11, 1887; but its operation is differently controlled, the control in that case being by devices which cause its operation to take place only when a weft-thread breaks or gives out, and the control in this case being effected by means of a pattern-chain or equivalent rotary pattern mechanism.

The shuttle-box B has a high back, *b*, in front of which are secured two upright angle-pieces, *b′*, for the purpose of keeping in place the reserve shuttles s' s^2 s^3, which, except while the shuttles are being changed, are supported one upon another, as shown in Fig. 4, on a movable shelf or supporting-plate, b^2, which works through a slot provided for it in the back *b* of the box between the angle-pieces *b′*. These angle-pieces are set wide enough apart to just receive the shuttles lengthwise between them and lap over their ends. The ends of the weft from the reserve shuttles so supported are all secured to a fixed pin, *k*, in the top of the shuttle-box B. The said movable shelf or support b^2 is connected by pivots to the lower parts of two levers, b^3, which are fast on a small rock-shaft, b^4, which works in bearings in small brackets b^5, secured to the back *b*. To the upper end of each of the said levers b^3 is pivoted one of two fingers b^6, which work through holes in the back *b*, and which are projected into the shuttle-box to form a second support for supporting the upper reserve

shuttles whenever the shelf b^2 is drawn back to let the lowest one, s', of the said shuttles drop onto the raceway. One of the levers b^3 is prolonged downward below its connection with the shelf b^2, as shown in Fig. 4, to connect it with the swell or binder c of the shuttle-box B, for the purpose of drawing back the binder, to let the lowest reserve shuttle pass the latter in falling to the raceway when the shelf is withdrawn. The connection between the binder and the lever b is slotted, as shown at c^* in Fig. 4, in order to permit the ordinary operation of the swell produced by the boxing of the shuttle.

The binder c may be of ordinary construction and controlled by a spring, c', in the usual way, as illustrated in the representation of the shuttle-box B' in Fig. 5.

The shuttle-box B' may be like that of an ordinary loom for plain weaving, except that its front d is removable, as shown in Figs. 1 and 2, but better in Fig. 5, where it is represented as capable of sliding up and down in guides d', secured to the front of the lay, the object of its being removable being to allow a shuttle to be thrown out from the box in a forward direction by the corresponding binder, c, as illustrated in Fig. 5, where the shuttle s is represented in the act of passing out, the front or shutter d being shown in that view as depressed below the raceway.

To facilitate the ejection of the shuttle, the front of the raceway and the top of the shuttle or box front d are beveled, as shown in Fig. 5. To receive the ejected shuttle, a box, F, is attached to the framing of the loom.

Below the lay there is arranged in bearings i^2, secured to the lay-swords C', a rock-shaft, i, which extends all across the loom and has two arms, i^3 and i^4, of which i^3 is connected by a rod, i^{3*}, with an arm, b^7, on the rock shaft b^4 at the back of the shuttle-box b; and i^4 is connected by a rod, i^5, with the arm j' of a small rock-shaft, j, (see Figs. 1, 2, and 5,) which works in brackets j^3, secured to the lay under the shuttle-box B'. The said rock-shaft j has another arm, j^2, which is connected with the movable front or shutter d of the shuttle-box B'. The rock-shaft i gives all the movement necessary for ejecting the shuttles from the shuttle-box B' and for bringing new ones into operative positions in the shuttle-box B. The said rock-shaft is inoperative until the time comes for changing the shuttles.

The mechanism so far described is precisely like that described in my aforesaid application, Serial No. 228,181, filed February 19, 1887, for changing shuttles when the weft breaks or gives out; but the means by which the rock-shaft i is caused to operate to change the shuttles for producing the pattern differs from what is shown in that application. According to this invention, the action of said rock-shaft i is controlled by two rotating pattern devices, which in the example represented consist of two endless chains, I and I', each composed of two kinds of links, k and k^*, which may be of any construction, provided the outer profiles of certain of the links k^* have a greater projection from the central line of the chain than other links, k, as shown in Figs. 7 and 8. These chains pass over two wheels or pulleys, J and J', carried by studs l l', secured in and projecting from opposite sides of the upper arm of a lever, K, which is capable of oscillation on a stationary fulcrum, n, secured in the left side of the loom-framing. The lower end of the chain I runs on a pulley, m, carried by one of the gears of the train which drives the shaft M* of the take-up roll M, and the said chain derives motion from the take up mechanism. The chain I is intended to be long enough for the whole length of a pattern and the chain I' long enough for some portion thereof—as, for instance, for weaving gingham patterns, such as those of handkerchiefs, the chain I would be long enough for the whole pattern, including the border, and the chain I' might be long enough for one or more of the repetitions of the check or pattern within the border.

The lower end of the chain I' hangs loose, and the said chain derives motion from a ratchet-wheel, $l^{*'}$, secured to its wheel or pulley J' from a pawl, m^*, carried by an elbow-lever, N, which oscillates on the same fulcrum-pin, n, with the lever K. This lever N resembles substantially the lever known as the "hammer-lever" of the "weft stop-motion" commonly employed in looms, and it is moved during every second beat of the lay by means of a cam, N*, on the shaft E, which is geared with the crank-shaft D of the loom by gears p p' in such manner as to make one revolution for every two of the crank-shaft. This cam N* consists of an arm secured on the shaft E and a roller carried by the said arm, and it acts upon a shoe, N', on the lower arm of the lever N, for the purpose of quickly throwing forward the upper end thereof and producing the operation of the pawl m^* on the ratchet-wheel $l^{*'}$, by which the chain I' is moved as the lay is completing its forward stroke.

The lever K, which carries the upper ends of the pattern-chains, carries at its lower end a pin, g, which works in a slot, g', in a rod, g^2, which is pivoted at g^3 to an arm, i', which is secured to and which projects downward from the rock-shaft i, before described, and at the upper end of the said lever K there is pivoted an arm, q, (see Fig. 6,) which projects transversely over the top of the pattern-chain I', above or near the head of the hammer-lever N, and just below this arm q there is pivoted to the same lever, K, a small lever, r, which may be called the "lifting lever," one arm of which projects over the pattern-chain I, and the other arm of which projects under the pivoted arm q. Above that part of the said lifting-lever r which projects over the pattern chain I there is secured to the lever K a spring, t, which presses upon that part of the said lever r in such manner as to tend to lift that end thereof which is under the arm q, and so to lift the said

arm above the chain I′. When the low links *k* of the chain I are presented under the short lever *r*, the spring *t* depresses the end of the said lever over the said chain and raises the other end, which is thus caused to lift the arm *q* out of reach of the chain I′ and out of range of the head of the hammer-lever; but when the high links *k′* of the said chain I are under the said lever *r* they lift up the spring-pressed end thereof, and so depress the other end that it will permit the arm *q* to come within range of the chain I′. While high links *k** of the latter chain are presented under the said arm the latter is still held up out of range of the head of the hammer-lever N; but when a low link, *k*, of the said chain I′ is presented under the said arm *q* the latter drops within range of the head of the hammer-lever, and so allows the said lever, the next time it is thrown forward by the cam N*, to carry forward the upper end of the lever K and throw back the lower end of the latter, which, by its action through the rod g^2 on the arm *i′* of the rock-shaft *i*, operates to turn the said rock-shaft in a direction to operate the shuttle-changing devices, as will be presently described.

Until the time comes for changing the shuttles the rock-shaft *i* does nothing but move back and forth with the lay, and the rod g^2 simply slides back and forth on the pin *g* in the lever K, the slot *g′* in said rod being long enough to permit this, and the upper end of the lever K is held back by a spring, *u*, which holds its lower arm in contact with a stop, *u′*, on the framing; but when the upper end of the said lever is moved forward by the action of the head of the hammer-lever N on its arm *q*, as hereinabove described, the lower end of said lever K is thrown back, as shown in dotted outline in Fig. 3, far enough to bring its pin *g* in contact with the rear end of the slot *g′* of the rod g^2, so that the said rod, and with it the lower end of the arm *i′* of the rock-shaft *i*, will be thrown back, thus throwing up the arm i^3 and throwing down the arm i^4 of said rock-shaft. The downward movement of the arm i^4, just mentioned, produces the turning of the rock-shaft *j* and downward movement of the arm j^2 thereof, and so produces the descent of the shutter *d*. The shuttle *s* in the shuttle-box B′ is then left uncovered in front, and the shuttle is left free to be pushed forward out of the box, as shown in Fig. 5, by the action of the binder *c*, produced by the ordinary pressure of the binder-spring *c′*. While this action is taking place at the shuttle-box B′ the upward movement of the arm i^3, which is under the other shuttle-box, B, produces, through the rod i^{3*}, an upward movement of the arm b^7 of the rock-shaft b^4, which turns the said rock-shaft to a position to withdraw the shelf b^2 or support from under the shuttle *s′*, which had been previously above it in the box B, as shown in Figs. 1 and 4, and also drawing back the binder so that the said shuttle is free to drop onto the raceway at the bottom of said box, whence it will be thrown through the shed by the next action of the picker belonging to that box. Simultaneously with the withdrawal of the shelf or support b^2 the fingers b^6 at the upper ends of the levers b^3 are projected forward into the shuttle-box B under the shuttle s^2, to hold up that shuttle and any other shuttle or shuttles which may be above it until the shelf or support b^2 enters the box again, which it will be caused to do by the return of the lever K by its spring *u* to its normal position, (shown in Fig. 3 in full outline,) and the pulling forward of the arm *i′* of the rock-shaft *i* by the rod g^2, the movement of the said rock-shaft so produced also causing the replacement of the front or shutter of the shuttle-box B′. This return movement of the rock-shaft is assisted, also, or might be produced altogether, by a spiral spring, i^6, which is coiled round the said rock-shaft, and one end of which is secured to the rock-shaft and the other end to the lay.

To give an example of the way in which the two pattern-chains operate to produce the changes of the shuttles at the proper time, I will suppose a pattern of the kind hereinbefore referred to—viz., a gingham handkerchief. During the weaving of the plain border of such pattern the low links of the chain I will be in operation on the small lever *r*, and the arm *q* will be lifted entirely above the chain I′ and out of range of the hammer-lever; but at the commencement of the weaving of the central pattern the high links of the said chain will be opposite said lever *r*, which will thus be lowered within range of the chain I′, which, by the presentation of one of its low links to the said arm, will let it drop within range of the head of the hammer-lever whenever the shuttles are to be changed.

The reserve shuttles will of course have to be placed by hand in the shuttle-box B in the proper order of sequence of color or quality of weft.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, with the lay and the mechanism carried thereby for changing the shuttles, of two rotating or endless pattern devices and a supporting-lever and support therefor common to both of said devices, means for rotating the said devices and connections between said supporting-lever and the shuttle-changing mechanism, a second lever arranged beside the first-named lever and a cam for operating said second lever, an arm attached to the first-named lever and overlying one of the said pattern devices and the second lever, and a lifting-lever and spring, both attached to the first-named lever, the said lifting-lever being controlled by the other of said pattern devices and said spring to permit the engagement of the said arm with the first-mentioned pattern device and the cam-actuated lever to produce through the latter the operation of the shuttle-changing mechanism, all substantially as herein described.

2. The combination, with the lay and the shuttle-changing mechanism carried thereby,

of the pattern-carrying lever K, and connections between it and said mechanism, and two endless pattern devices supported by said lever, the hammer-lever and the shaft and cam for operating it, the take-up mechanism and gearing, substantially as herein described, between it and one of the pattern devices, a pawl attached to the hammer-lever for operating the other pattern device, and a connection, substantially as herein described, permanently attached to one of said levers and capable of engaging with and being disengaged from the other and controlled by both pattern devices for controlling the operation of the pattern-carrying lever to effect the changing of the shuttles, substantially as herein set forth.

3. The combination, with the hammer-lever and the shaft and cam for operating the same, the pattern-carrying lever and the two connected pattern devices, and the means, substantially as herein described, for operating the same, of the arm *q*, overlying one pattern device and forming an intermittent connection between the two levers, the lifting-lever *r*, pivoted to the pattern-carrying lever and overlying one pattern device and underlying the lifting-lever, and the spring *t*, attached to the pattern-carrying lever for throwing the said arm *q* out of range of the hammer-lever, all substantially as and for the purpose herein described.

JOHN C. BROOKS.

Witnesses:
FREDK. HAYNES,
HENRY J. MCBRIDE.