(No Model.) 4 Sheets—Sheet 1.

# A. E. RHOADES.

## LOOM.

No. 454,791. Patented June 23, 1891.

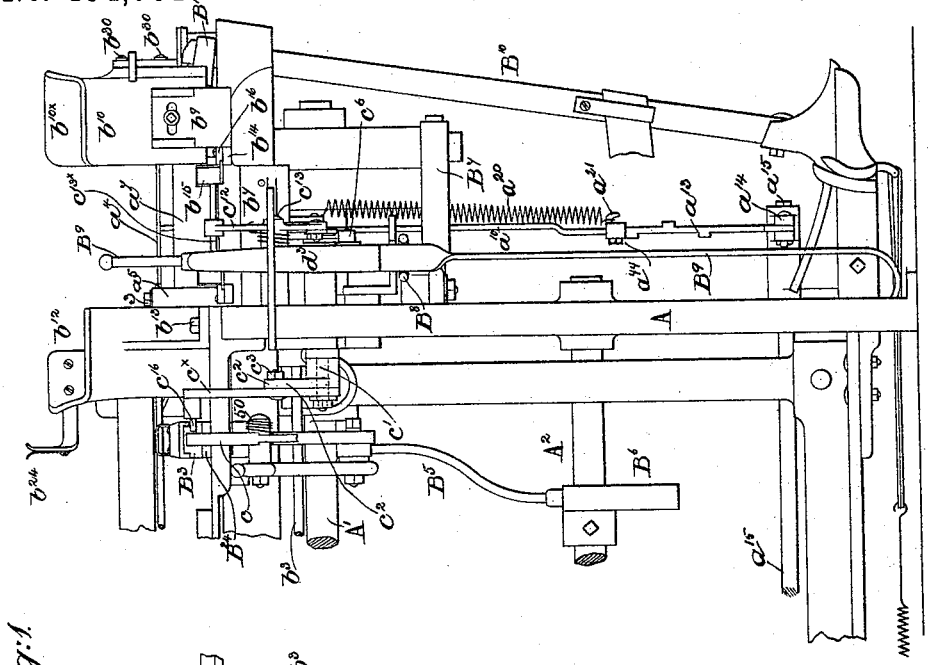
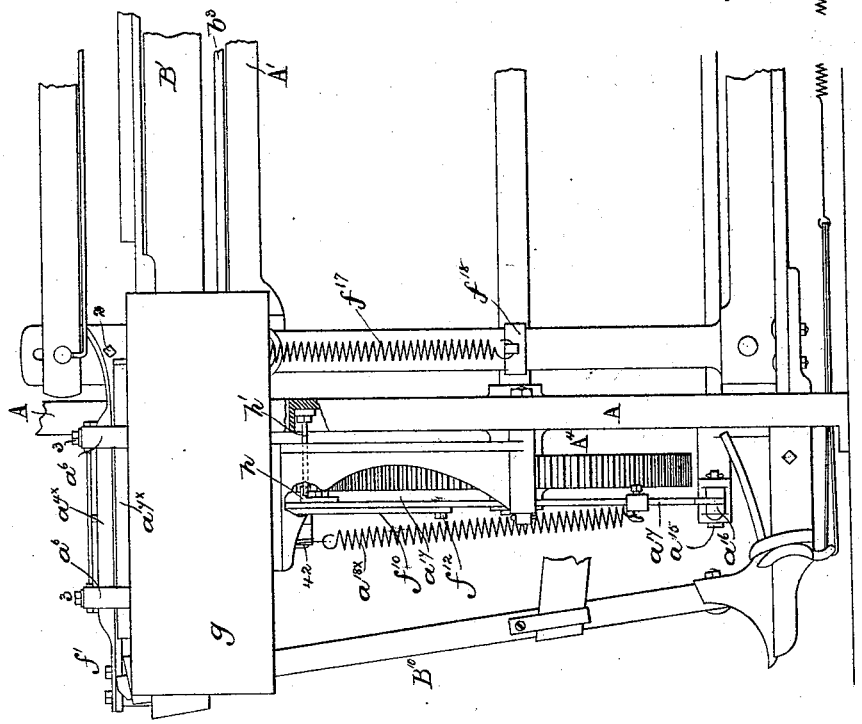


Fig. 1.



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(No Model.) 4 Sheets—Sheet 2.

# A. E. RHOADES.

## LOOM.

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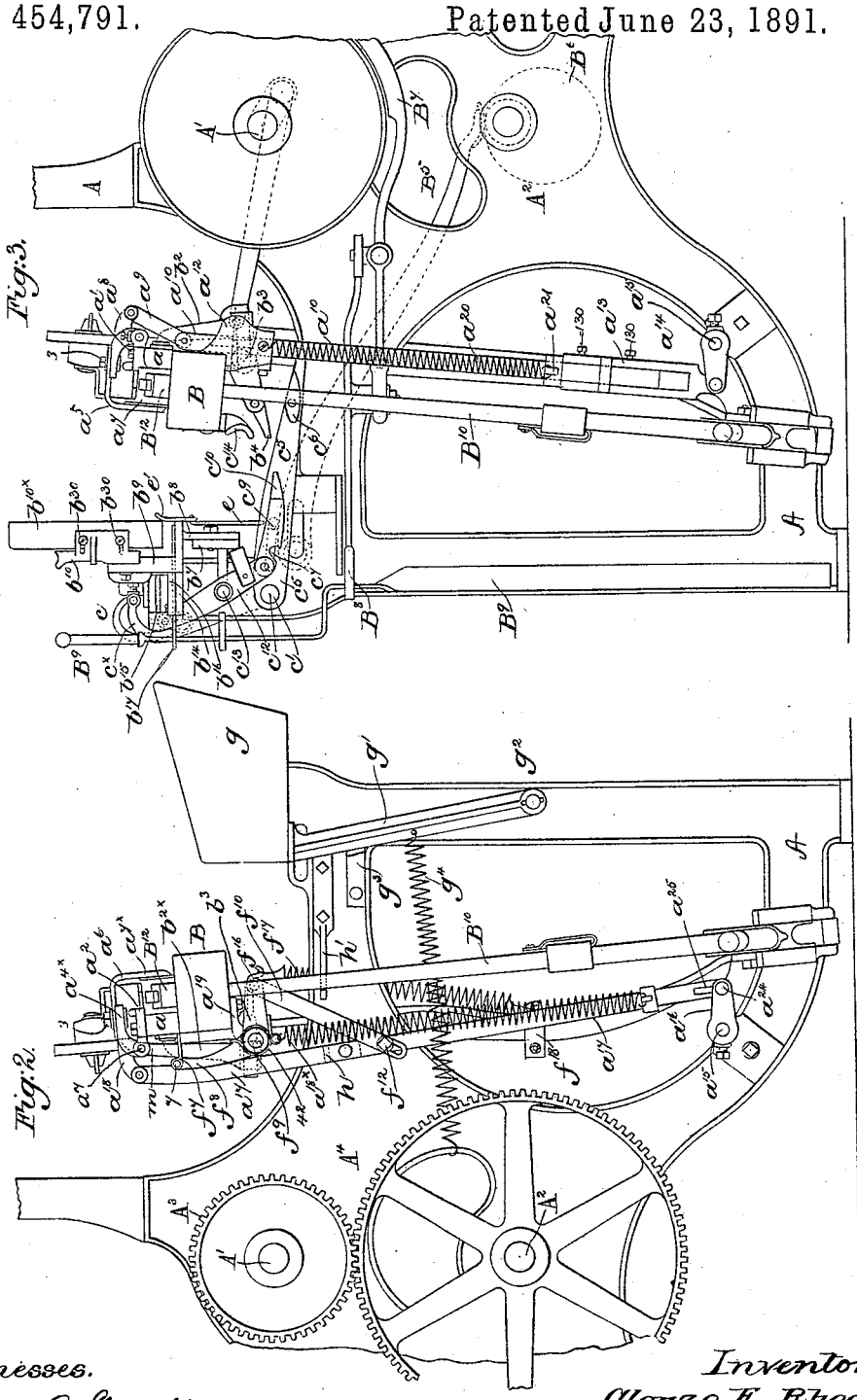

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(No Model.) 4 Sheets—Sheet 3.

# A. E. RHOADES.

## LOOM.

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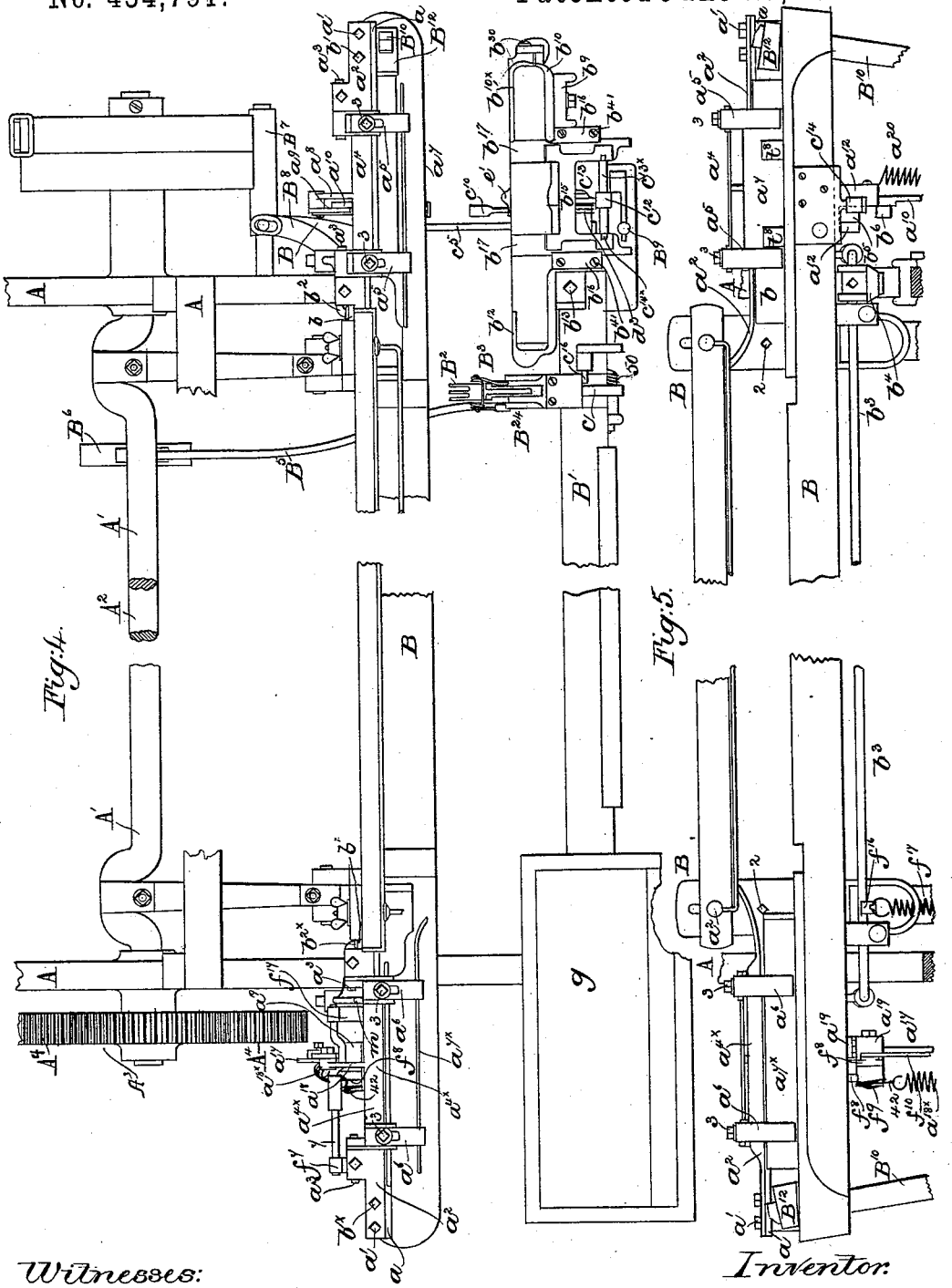

Fig. 4.



Fig. 5.

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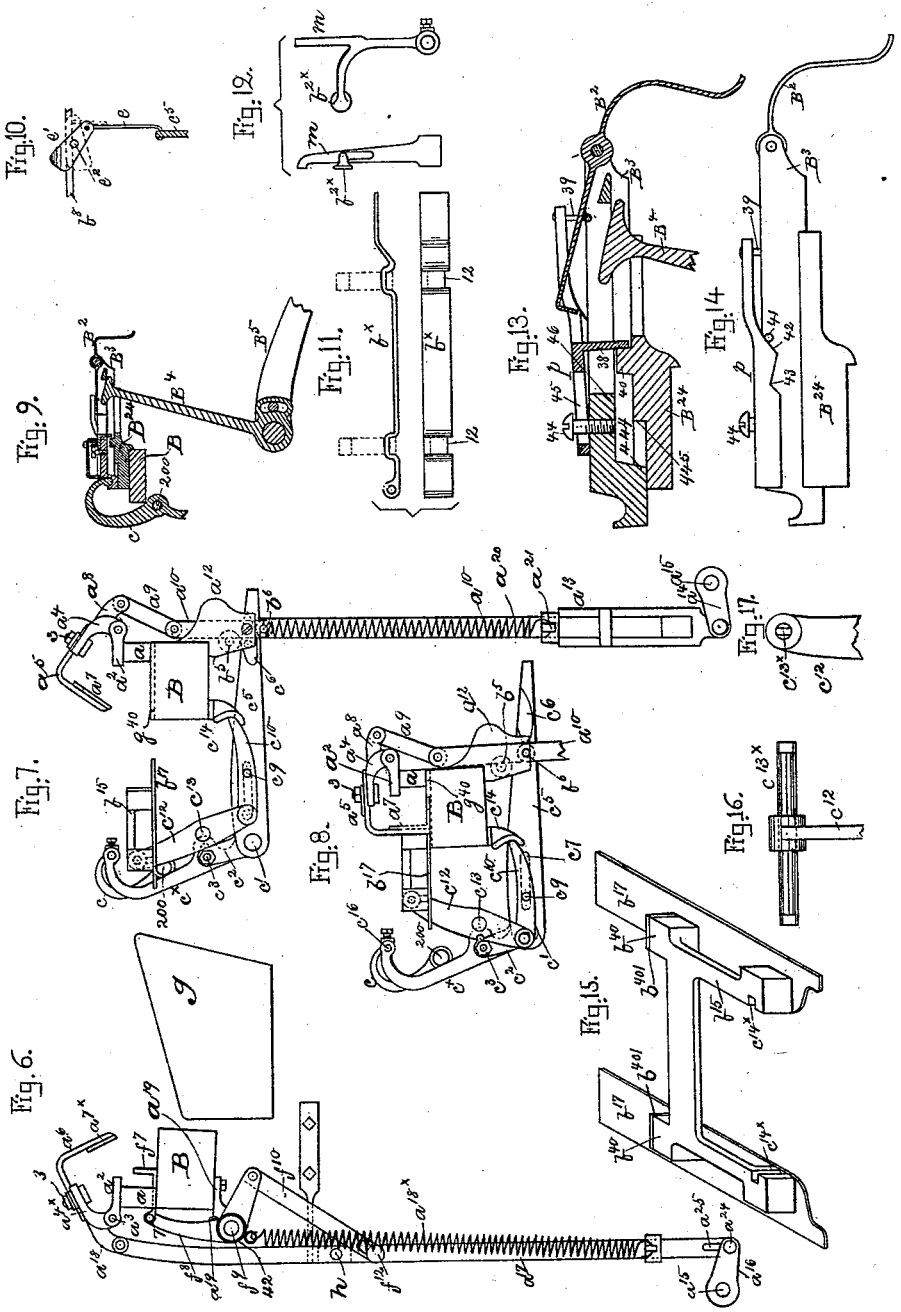
(No Model.) 4 Sheets—Sheet 4.

# A. E. RHOADES.

## LOOM.

No. 454,791. Patented June 23, 1891.



Witnesses.
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# UNITED STATES PATENT OFFICE.

ALONZO E. RHOADES, OF HOPEDALE, MASSACHUSETTS, ASSIGNOR TO GEORGE DRAPER & SONS, OF SAME PLACE.

## LOOM.

SPECIFICATION forming part of Letters Patent No. 454,791, dated June 23, 1891.

Application filed February 11, 1890. Serial No. 340,011. (No model.)

*To all whom it may concern:*

Be it known that I, ALONZO E. RHOADES, of Hopedale, Massachusetts, have invented an Improvement in Looms, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention has for its object to improve that class of looms in which the shuttle-box on the lay is supplied with a shuttle while the lay is in rapid motion.

In the invention herein to be described the shuttle is introduced into a shuttle-box at one end of the moving lay and a spent shuttle is discharged from the other end of the said lay. The shuttles to be supplied to the lay are contained in a hopper located at or near one end of the breast-beam, and hence disconnected from the lay instead of being attached to and carried by the lay, as has been done. Each shuttle-box of the lay has as a part of it a front plate connected to arms secured to a rocker, the elevation of the front plates above the raceway of the lay being effected whenever a shuttle is to be inserted into or to be removed from a shuttle-box, each front plate when standing in vertical position substantially at right angles to the raceway of the lay affording a wall for the shuttle-box toward the breast-beam, the said plate remaining in such position so long as the weft is being properly laid.

I have provided the hopper with a carrier consisting of a carriage having a horizontal movement, the feeding movement of the carriage being started and completed by devices set in motion by the lay during its forward movement toward the breast-beam. The front plates of the shuttle-boxes are closed by springs. I have also provided the loom with means to prevent the stopping of the loom at the dead-pick.

Figure 1 in front elevation represents a loom embodying my invention, the central part of the loom being broken out to save space on the drawing. Fig. 2 is a partial left-hand end elevation of the loom shown in Fig. 1. Fig. 3 is a partial right-hand end elevation thereof. Fig. 4 is a partial top or plan view. Fig. 5 is a partial front elevation of the lay and some of the connected parts. Fig. 6 is a detail taken from the left-hand end of the loom where the spent shuttle is discharged. Figs. 7 and 8 are details taken from the right-hand end of the loom, showing the devices employed for putting the shuttle into the shuttle-box of the lay. Fig. 9 is a detail referring to the stop-motion. Fig. 10 is a detail illustrating the device employed to retain the lowermost shuttle in the hopper until it is to be carried into the shuttle-box on the lay. Fig. 11 shows two views of the binder at the left-hand end of the lay. Fig. 12 shows the binder-finger employed at the left-hand end of the loom. Figs. 13 and 14 are details showing the weft-fork and devices employed with it to prevent the stopping of the loom at the dead or false pick. Fig. 15 shows the shuttle-carrier detached. Figs. 16 and 17 show part of the upper end of the lever $c^{12}$ and its attached stud or pin.

The loom-frame A, the crank-shaft A′, the pick or cross-shaft $A^2$, the gear $A^3$ on the crank-shaft, the gear $A^4$, engaged by it and fixed on the shaft $A^2$, the lay B, breast-beam B′, and weft-fork $B^2$, pivoted to the slide-bar $B^3$ in the stand $B^{24}$, the weft-hammer $B^4$, the lever $B^5$, with which it is connected, the cam $B^6$ on the shaft $A^2$ to operate the lever $B^5$, the belt-shipper $B^7$, its actuating-lever $B^8$, the shipper-handle $B^9$, the picker-sticks $B^{10}$, pickers $B^{12}$ thereon, and the means for actuating them are and may be all as usual in ordinary looms for weaving cotton cloth. The lay, at or near each end, has a projection *a*, upon which by a bolt *a′* is screwed a cap $a^2$, the inner ends of the said caps being attached by suitable bolts, as 2, (see Fig. 5,) to the lay-swords above the race of the lay, the said caps $a^2$ forming part of the back and top of the shuttle-boxes of the lay. Each of these caps $a^2$ has ears to receive like studs $a^3$, which constitute pivots for the rockers $a^4$ $a^{4\times}$, to which by suitable bolts 3 are connected in an adjustable manner the arms $a^5$ $a^6$, to the depending ends of which are connected the front plates $a^7$ $a^{7\times}$. The arms have slots therein, (see Fig. 4,) through which pass the bolts 3. The front plates $a^7$ $a^{7\times}$ constitute the fronts of the shuttle-boxes at opposite ends of the lay. The rocker $a^4$ has a backwardly-

extended arm $a^8$, which has joined to it the link $a^9$, in turn joined to a vertical slide-bar $a^{10}$, extended through a slot in the stand $a^{12}$, attached to the rear side of the lay, the lower end of the said slide-bar entering the guide $a^{13}$, where it is held by suitable set-screws 130, the said guide being pivoted at its lower end to an arm $a^{14}$ of a rock-shaft $a^{15}$, extended across the loom-frame, the opposite end of the said rock-shaft having an arm $a^{16}$, to which is joined a slide-bar $a^{17}$, the upper end of which is jointed to the arm $a^{18}$ of the rocker $a^{4\times}$ at the left-hand end of the lay. The slide-bar $a^{10}$ is normally kept elevated, so as to keep the front plate $a^7$ of the right-hand shuttle-box down in the position shown in Figs. 1, 2, 3, 4, 5, and 8 by a suitable spring, as $a^{20}$, attached as herein shown to the guide-block $a^{12}$ and to a lug $a^{21}$ on the slide-bar. The collar $a^{21}$ is adjustably connected by set-screw $a^{44}$ (see Fig. 1) to the bar $a^{10}$, adjustment of the collar on the bar adjusting the effective strength of the said spring to thus normally keep the front plate of the shuttle-box down. The slide-bar $a^{17}$ is normally kept elevated in like manner by a spring $a^{18\times}$, so as to keep the front plate $a^7$ of the left-hand shuttle-box down, as in Fig. 2.

The binder $b$ for the shuttle-box at the right-hand end of the lay, into which box the shuttles are inserted, as required, has for its pivot a bolt $b'$, the opposite end of the binder being acted upon by a binder-finger $b^2$, attached to a rod $b^3$, forming part of the usual shaft, (shown by dotted lines in Fig. 3,) which carries the usual dagger $b^4$, which dagger in case the shuttles are not properly boxed drops to effect the stopping of the loom in the usual manner. The binder $b^\times$ for the shuttle-box at the left-hand end of the lay (shown separately, as in Fig. 11) is pivoted at $b'^\times$, and the inner end of the said binder is acted upon by the binder-finger $b^{5\times}$, (see Fig. 2,) which is connected to the rock-shaft $b^3$. The connection between the slide bar $a^{17}$ and the arm $a^{16}$ is effected by a pin $a^{24}$ on the arm $a^{16}$, working in a slot $a^{25}$ in the slide-bar $a^{17}$, the said slot and pin enabling the rock-shaft $a^{15}$ to be turned in a direction to lower the front plate $a^7$ at the right end of the lay without correspondingly lowering the front plate $a^{7\times}$ at the left-hand end of the lay.

The block $a^{12}$ (see Figs. 7 and 8) is provided with a roller or other stud $b^5$, and the inner side of the bar $a^{10}$ is provided with a roller or other stud $b^6$.

The loom herein shown is provided at the right-hand end of the breast-beam with a stand $b^7$, (see Fig. 3,) to which is bolted in suitable manner a bottom plate $b^8$, having an upturned lug $b^9$, upon which are bolted the castings $b^{10}$ $b^{10\times}$, forming one end of the hopper for the reception of the shuttles, the end part $b^{12}$ for the other end of the hopper being connected as herein shown, by bolt $b^{13}$ to the end of the loom-frame. The bottom plate $b^8$ and the castings $b^{10}$, $b^{10\times}$, and $b^{12}$, referred, to constitute the essential parts of the hopper, it being of sufficient depth to in practice receive and contain, preferably, three or four shuttles, all provided with weft and threaded in usual manner, the ends of the weft-threads being connected to the weft-catch $b^{24}$. (Shown only on Fig. 1, it being omitted from Fig. 4 to avoid confusion with parts which it is desired to show below it.) The part $b^{10\times}$ of the shuttle-holder is attached by screws $b^{20}$ in an adjustable manner to the part $b^{10}$, the screws being extended through slots in the casting $b^{10}$ and screwed into the casting $b^{10\times}$, such provision enabling the width of the space for the reception of the shuttles to be varied in accordance with the shuttle being used. The bottom plate $b^8$ has forwardly-extended arms or supports $b^{14}$, (shown in Figs. 1 and 3,) on which rest and slide the carrier shown as composed of a frame $b^{15}$ and plates $b^{17}$, the carrier being kept down on the arms by lips $b^{16}$, (see Fig. 4,) held in place by suitable screws $b^{41}$. The carrier is shown notched at $c^{14\times}$ for the reception of the ends of the stud or pin $c^{13\times}$ of a lever $c^{12}$, to be described. The front end of the body of the carrier has shoulders $b^{40}$ to engage the rear side of the lowermost shuttle in the hopper, the said shuttle lying on the plates $b^{17}$, and to avoid injury to the shuttle I have provided the said shoulders with leather or other pads $b^{401}$. The plates $b^{17}$ support the shuttle while it is being taken from the hopper by the carrier, and the ends of the plates toward the lay at such time enter grooves $g^{40}$ (see Figs. 7 and 8) in the top of the lay, and, as herein shown, the shuttle is picked off the carrier $b^{15}$ by the interposition of a plate or device between the shoulders and the shuttle, that device being shown as the front plate $b^7$ of the shuttle-box at the receiving end of the lay.

The slide $B^3$, on which is pivoted the usual weft-fork or feeler $B^2$, is engaged by the upper end of a lever $c$, pivoted at 200, said lever being common in usual cotton-looms, the lower end of the lever (shown broken off in Fig. 9) being in practice extended down for a short distance and provided with a pin, which is extended under the usual pawl employed to actuate the ratchet-wheel of the take-up mechanism, (not shown,) so that the take-up is suspended when the weft-fork is pushed back. I have surrounded the hub of the lever $c$ (see Figs. 1 and 4) with a strong expanding spring 50 of wire, one end of the spring resting against the inner side of the lever $c$ below its fulcrum 200, while the other end of the spring rests against the breast-beam or some fixed part of the loom, the said spring always acting to move the weft-fork slide $B^3$ rearward in the loom as soon as the weft-hammer $B^4$ retires from its engagement with the weft-fork.

The loom-frame under the hopper has a short rock-shaft $c'$, having at its inner end an upwardly-extending arm $c^\times$, having a pin or projection $c^{16}$, which also contacts normally

with the end of the slide $B^3$. In order that this arm may be adjusted on this shaft as desired, the arm has been mounted thereon loosely and connected by bolt $c^3$ with an arm $c^2$, fast on the shaft $c'$, the bolt passing through a slot in the arm $c^\times$, the adjustment of the arm $c^\times$ enabling the arm $c^5$ at the other end of the rock-shaft $c'$ to be brought up to the desired level by the slide $B^3$ in its backward movement. The arm $c^5$ has a cam projection $c^6$, and the said arm between its ends is slotted at $c^7$, as shown mostly by dotted lines, (see Figs. 7 and 8,) to receive a stud $c^9$, extended therein from the inner end of a strut $c^{10}$, jointed to the lower end of the lever $c^{12}$, pivoted at $c^{13}$, the carrier $b^{15}$ being moved forward whenever the bunter $c^{14}$, attached to the lay, (see Figs. 7 and 8,) meets the strut $c^{10}$. The bunter, as it strikes the lifted strut, causes the lever $c^{12}$ to actuate the carrier $b^{15}$ to carry the lowermost shuttle out from the hopper into the shuttle-box at the right-hand or receiving end of the lay, the front plate $a^7$ of the said shuttle-box being at that time lifted. The forward movement of the slide $B^3$ of the weft-fork, which occurs when the weft breaks or is exhausted from a shuttle, effects the lifting of the arm $c^5$, so that the strut $c^{10}$ is put in position to be struck by the bunter $c^{14}$ as the lay moves forward, the forward movement of the lay causing the roll $b^6$ to first strike against the under side of the cam $c^6$ of the arm $c^5$, thus causing the slide-bar $a^{10}$ to be pushed down to turn the rockers $a^4$ $a^{4\times}$, thus lifting from the raceway the front plates or sides of the shuttle-boxes at both ends of the lay. The lay in its continued forward movement causes the bunter acting on the strut referred to to push the carrier $b^{15}$ forward with a shuttle, the roller $b^5$, attached to the block $a^{12}$, at such time traveling along the upper side of the arm $c^5$; but the latter arm drops as soon as the roller $b^6$ passes from under the cam $c^6$. The arm $c^5$ has connected to it a link $e$, (see Fig. 3,) which is attached to the gate $e'$, pivoted at $e^2$ (see Fig. 10) upon the bottom plate $b^8$, the said gate standing in the position indicated in Figs. 3 and 10, when the loom is operating regularly, but being turned into the dotted-line position, Fig. 10 when the arm $c^5$ is lifted, for at such times the gate has to be lowered in order to let the lowermost shuttle in the hopper be pushed laterally from the hopper into the shuttle-box of the lay. Without the gate this shuttle would be liable to be jarred out of position by the motion of the lay and other parts of the loom. The carrier is moved backward by a spring $d^3$, (shown in Fig. 1,) one end of the said spring acting against the arm $c^{12}$ above its fulcrum $c^{13}$, the other end of the said spring resting against a part of the casting $b^7$.

The binder $b^\times$ (see Fig. 11) for the shuttle-box at the left or discharging end of the lay, and acted upon by the finger $b^{2\times}$, is notched at its under edge, as 12, and recessed above the said notches to receive the ejector $f^7$, consisting, essentially, of two light fingers attached to a rod 7, the said rod being connected loosely to the upper end of an elbow-lever $f^8$, free to turn upon a stud $f^9$, attached to a block $a^{19}$, secured to the lay. (See Figs. 2 and 6.) The other arm of the lever $f^8$ has jointed to it a link $f^{10}$, longitudinally slotted at its lower end (see Fig. 6) to receive a bolt $f^{12}$, screwed into the slide-bar $a^{17}$. The bolt $f^{12}$ acts in the slot of the link $f^{10}$ when the slide-bar $a^{17}$ is depressed, as described, to lift the front plate $a^{7\times}$ to turn the lever-holder and cause the ejectors to discharge a shuttle from the left-hand end of the lay at its front side, the spent shuttle entering the receptacle $g$, mounted on the bar $g'$, pivoted at $g^2$, and normally held forward against the stop $g^3$ by a suitable spring $g^4$. The protector-shaft $b^3$ has projected forwardly from it an arm $f^{16}$, (see Fig. 2,) to the end of which is attached a spring $f^{17}$, the opposite end of the spring being attached to a suitable lug $f^{18}$, secured to one of the swords of the lay. The rod $a^{17}$ has at its inner side a stop $h$, and the loom-frame has attached to it a projection $h'$. When the rock-shaft $a^{15}$ is turned to actuate both of the rockers $a^4$ and $a^{4\times}$ to lift the front plates $a^7$ $a^{7\times}$ of the shuttle-boxes, the projection $h$, as the lay moves forward, passes under the projection $h'$, and thereby keeps the front plate $a^{7\times}$ of the shuttle-box raised or open at that end of the lay until after the front plate of the receiving shuttle-box has been closed and the lay has been moved back for a short distance. The upper end of the spring $a^{18\times}$ referred to is attached to the clock-spring 42, surrounding the hub of the elbow-lever $f^8$ in such a manner as to normally keep the ejectors $f^7$ back in contact with and in the spaces of the binders, the said spring keeping the ejectors out of the way of the picking-sticks and the shuttle.

I will now describe the manner of preventing the stopping of the loom at the dead or false pick. In operation in the loom shown, when a shuttle thrown from the left to the right does not lay a weft, the weft-fork is not tilted, as when the weft is present on the lay and the hook at the rear end of the weft-fork is struck by the weft-hammer $B^4$, which moves the slide $B^3$ forward in the loom. The slide starts forward at the moment that the lay starts back, and while the lay is retreating the arm $c^5$ is raised through the movements of the slide $B^3$ and the intermediate mechanism, as heretofore described. On this back movement of the lay the shuttle has been thrown to the left shuttle-box. As the lay comes forward the cam $c^6$ engages the roller $b^6$ and through the intermediate mechanism raises the shuttle-box front. Next the strut $c^{10}$ is met by the bunter $c^{14}$ and a new shuttle is carried into the box while the lay is still moving forward. At the same time the spent shuttle is being ejected at the other end of the lay. Now as the lay next goes back the picker-stick at the left-hand end of

the lay strikes; but, as there is not a shuttle in the box at the left-hand end of the lay, a weft is not laid, and as the lay comes forward, the weft being absent, the weft-fork cannot be tilted by the weft, and if not held up at its rear end the shuttle would be changed after weaving one or two picks. I have provided a weft-fork controller to hold up the rear end of the weft-fork at the dead-pick to obviate changing the shuttle at this "dead" or "false" pick, as it is called. This fork-controller is shown as a bar or plate $p$, having a finger 38 and a loop or projection 39, the plate having preferably side lips or flanges, which embrace the slide $B^3$, as in Fig. 14. This plate $p$ is prevented from rising too far on the slide $B^3$ by a screw 44, passed through a slot 45 in the plate. The rear end of the weft-fork rides over the loop 39. When the plate $p$ is forward on the stand, as in Fig. 14, the rear end of the weft-fork is permitted to descend low enough to be caught by the weft-hammer. When the plate $p$ is forward, as in Fig. 14, the incline 42 of the lip of the plate rests, as shown, against a pin 41 of the slide $B^3$. Fig. 14 shows the weft-fork and its devices as they appear when the device is working regularly and the weft is being properly laid, the slide $B^3$ resting on and being guided by the stand $B^{24}$, secured to the breast-beam in usual manner. When the weft falls, the weft-hammer strikes the lip at the rear end of the weft-fork and, acting thereon, pushes the slide $B^3$ back to actuate the arm $c^\times$, as described. As the slide $B^3$ is moved by the lay, as described, the plate $p$ travels with the slide until the finger 38 meets the projection 40 on the stand, when the movement of the plate is arrested, this happening before the slide $B^3$ stops, and as a result thereof the parts are left as in Fig. 13, the loop 39 under the rear end of the weft-fork acting to lift that end of the weft-fork, as in Fig. 13, by the time the slide $B^3$ completes its movement to the left. The weft-hammer having operated quickly retires, and the slide $B^3$ is moved to the right from the position shown in Fig. 13 by the spring 50, coiled about the hub of the lever $c$, as before described and shown in Figs. 1 and 4, until the shoulder 444 of the slide meets the shoulder 445, the plate $p$ at such time being moved forward with the slide $B^3$ and keeping the rear end of the weft-fork lifted, so that when the weft-hammer is moved to the left after the dead or false pick the rear end of the weft-fork is lifted, so that it cannot be caught by the hammer to again change a shuttle. During the stroke of the weft-hammer, as described, after the dead-pick the hammer strikes the finger 38, the pin 41 being then in the notch 43, and pushes the plate $p$ back until the finger 38 strikes the shoulder 46, and as the plate $p$ is so moved the loop 39 is moved toward the hooked end of the weft-fork and lets the latter drop into its normal position, Fig. 14, ready to operate in usual manner as soon as the picker-stick at the right-hand end of the lay has had a chance to strike the shuttle last supplied to the lay. I shall call the plate $p$ the "weft-fork suspender," as it suspends the operation of the weft-fork during the dead-pick. In operation, when the weft breaks or is exhausted and the weft-fork slide is pushed forward, as described, by the hammer $B^4$, the slide $B^3$ acts on the arm $c^\times$ to turn the rock-shaft $c'$ and lift the arm $c^5$ and strut $c^{10}$, so that as the lay comes forward for the second time the roller $b^6$ on the slide-bar $a^{10}$ strikes the cam $c^6$ on the said arm, which depresses the said slide-bar, turns the rocker $a^4$, and lifts the front plate $a^7$ of the shuttle-box at the receiving end of the lay, and at the same time, through the rocker-shaft $a^{15}$ and the slide-bar $a^{17}$, lifts the front plate $a^{7\times}$ of the shuttle-box at the opposite or shuttle-ejecting end of the lay. The front plates of both shuttle-boxes are lifted before the lay completes its forward stroke, and as the lay approaches the breast-beam the bunter $c^{14}$ hits the strut $c^{10}$ and throws the carrier $b^{15}$ quickly rearward, and the gate $e'$ having been depressed by the movement of the said arm $c^5$ the carrier carries the lowermost shuttle from the hopper into the shuttle-box, the front plate of which opposite it is then raised. The shuttle having been carried from the hopper into the shuttle-box, the roller $b^6$ on the slide $a^{10}$ passes from under the cam projection $c^6$ on the arm $c^5$, and the front plate $a^7$ of the receiving shuttle-box at the right-hand end of the loom immediately drops outside the shuttle just placed therein, this being done before the plates $b^{17}$ are withdrawn from the recesses on the lay. To give the longest possible time in which to eject the spent shuttle from the lay, the front plate $a^{7\times}$ of the shuttle-box at the left-hand end of the lay is not dropped until the lay has gone back far enough to carry the projection $h$ out from under the finger $h'$. The slot $a^{25}$ in the lower end of the bar $a^{17}$ permits the rock-shaft $a^{15}$ to be somewhat moved without actuating the said bar. The slot in the lower end of the link $f^{10}$ permits the slide-bar $a^{17}$ to be depressed far enough to turn the rocker and lift the front plate $a^{7\times}$ of the spent shuttle-box and uncover the shuttle therein to be ejected before the ejector $f^7$ starts to remove the spent shuttle. The binder-finger $b^{2\times}$ is provided with a projection $m$, which bears against the rocker $a^{4\times}$ at the left-hand end of the loom, so that when the said rocker is lifted it acts to turn the binder-shaft $b^3$ and remove both binder-fingers from both binders, leaving them without pressure on the shuttle. The arms $a^5$ $a^6$, to which the front plates are attached, form covers across the top of the shuttle-boxes to prevent the shuttles rising from the shuttle-boxes, and the front plate $a^7$ is preferably notched, as at $t^8$, Fig. 5, to embrace the plates $b^{17}$.

I do not desire to limit my invention to the exact form of the several devices herein shown by which to actuate the front plates or by

which to reciprocate the carrier, or to the exact form of the weft-fork controller, so long as it is made to be acted upon by the weft-hammer and to act under the rear end of the weft-fork to hold it up while the lay comes forward at the dead-pick. The upper side of the carrier $b^{15}$ is of such length as to support in the hopper the shuttle next above the one to be taken from the hopper as the carrier is moved toward the lay, such construction enabling the shuttles in the hopper to be held up until the shoulders $b^{40}$ of the carrier in its next backward movement come to the rear side of the vertical plane in which the rear sides of the shuttles in the hopper stand when the lowermost shuttle drops into place on the carrier. If the top of the carrier $b^{15}$ on which the shuttle in the hopper next above that being carried from the hopper into the shuttle-box on the lay was not of sufficient length to support the next to the lowermost shuttle while the carrier completes its full forward stroke, then as the carrier is moved toward the lay the said shuttle would drop behind the part of the carrier which supported the next to the lower shuttle as the carrier started forward, and the said shuttle would be crushed on the return movement of the carrier or some part of the loom would be broken. Adjusting the arms $a^5$ $a^6$ on the rockers enables the width of the shuttle-box on the lay to be changed to the shuttle to be used.

I claim—

1. A loom containing the following instrumentalities, viz: a lay having a shuttle-box, a pivoted rocker mounted thereon having arms, a front plate attached to the said arms, a slide-bar $a^{10}$, connected to the rocker, a pivoted guide for the said slide-bar, and means to actuate the said slide-bar to lift the front plate at the proper time, substantially as described.

2. The lay having rockers $a^4$ $a^{4\times}$, one at each end thereof near the rear side of the lay, and attached front plates, combined with a cross-shaft, slide-bars connecting the said cross-shaft operatively with the said rockers, and with means to depress one of the said slide-bars, substantially as described, to turn the rock-shaft.

3. A loom containing the following instrumentalities, viz: a lay having shuttle-boxes, rockers $a^4$ $a^{4\times}$ at each end thereof and located near the rear side of the lay, front plates attached to the said rockers, slide-bars operatively connected to the said rockers, and springs acting upon the said slide-bars to normally move the rockers and front plates to keep the latter down and constitute one side of each shuttle-box, substantially as described.

4. The hopper and its co-operating movable gate $e'$, located at its lower end to prevent the lateral escape of the lowermost shuttle from the hopper until the said shuttle is to be carried positively into position upon the lay, substantially as described.

5. The lay, a rocker having arms provided with a front plate $a^7$, and a spring and devices between it and the said rocker to actuate the latter at the proper time to close the front plate at the front of the lay, substantially as described.

6. The weft-fork, its carrying-slide and stand to guide the slide, and a weft-fork controller having a finger and a projection 39 to engage and lift the rear end of the weft-fork and prevent the engagement of the weft-fork by the weft-hammer, substantially as described.

7. A loom containing the following instrumentalities, viz: a lay, a shuttle-box at the ejection end thereof, a movable front plate for the said shuttle-box, actuating devices for the said front plate, the said actuating devices containing a projection $h$, movable with the lay, and a stationary projection $h'$, adapted to be engaged by the said projection $h$, thus enabling the front plate at the ejection end of the lay to be kept open only after the lay has started on its backward movement, to operate substantially as described.

8. The lay having a shuttle-box at one end, a rocker located near the rear side of the shuttle-box, its arms and connected front plate, the slide-bar $a^{10}$, provided with the roll $b^6$, a guide for the slide-bar, and a spring to elevate the said slide-bar, combined with an arm $c^5$, having a cam, means to lift the said arm, the strut $c^{10}$, the carrier, devices intermediate the said carrier and strut, the bunter, and a hopper, to operate substantially as described.

9. In a loom, the following instrumentalities, viz: a lay, a shuttle-box at each end thereof having a rocker and an attached front plate, a rock-shaft, two spring-supported slide-bars connected to the said rock-shaft, and connections between the said rockers and slide-bars constructed substantially as described, a projection $h$ on the slide-bar $a^{17}$, and a co-operating stationary projection, whereby the shuttle-box front plate at the ejection end of the lay is not closed until after the shuttle-box at the receiving end of the lay has been closed, substantially as described.

10. The ejector, combined with a binder notched for its reception, substantially as described.

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

ALONZO E. RHOADES.

Witnesses:

HARRY BULLARD,

E. D. BANCROFT.