(No Model.) 2 Sheets—Sheet 1.

E. H. RYON.

SHUTTLE CHANGING MECHANISM FOR LOOMS.

No. 557,519. Patented Mar. 31, 1896.

Fig. 1.

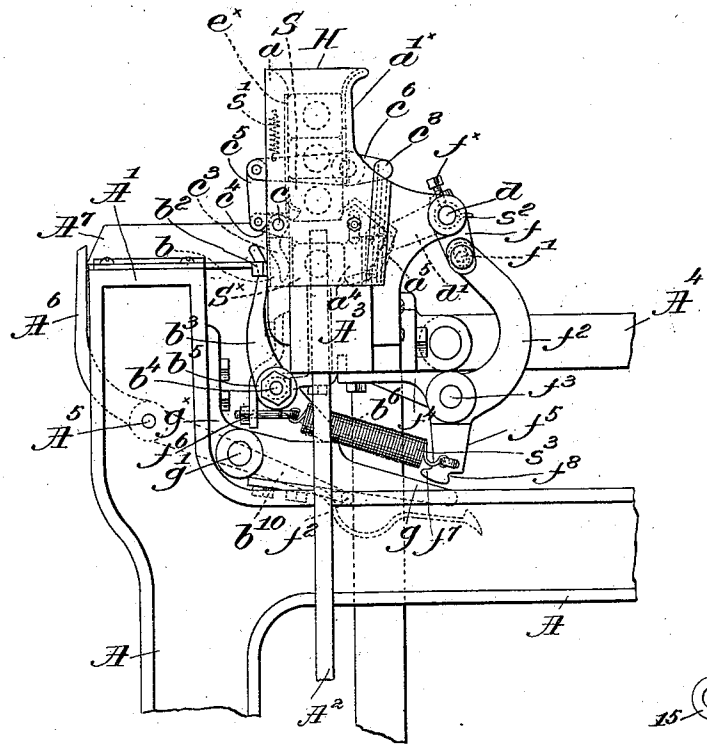


Fig. 5.

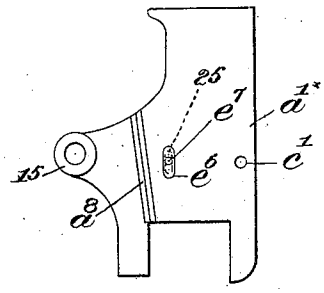
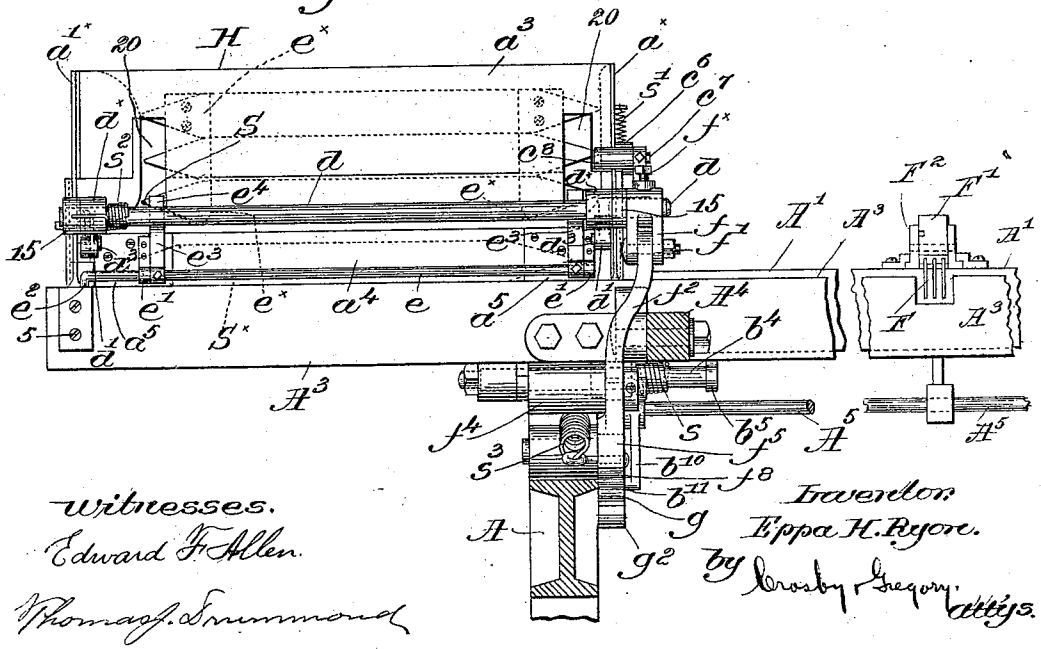


Fig. 2.



Witnesses.
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Thomas J. Drummond

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(No Model.) 2 Sheets—Sheet 2.

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SHUTTLE CHANGING MECHANISM FOR LOOMS.

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Fig. 3.

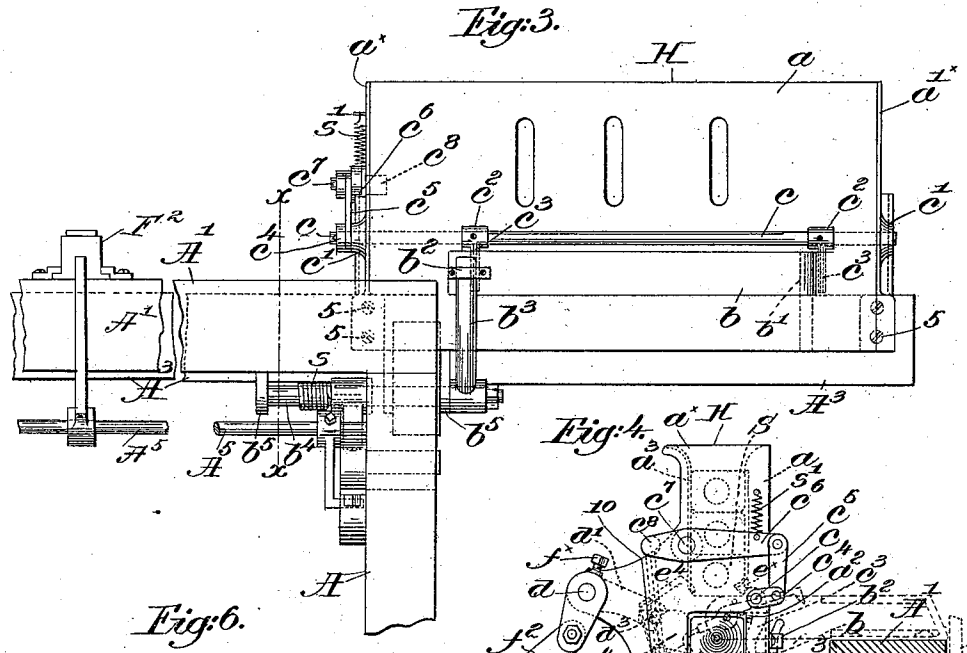


Fig. 4.

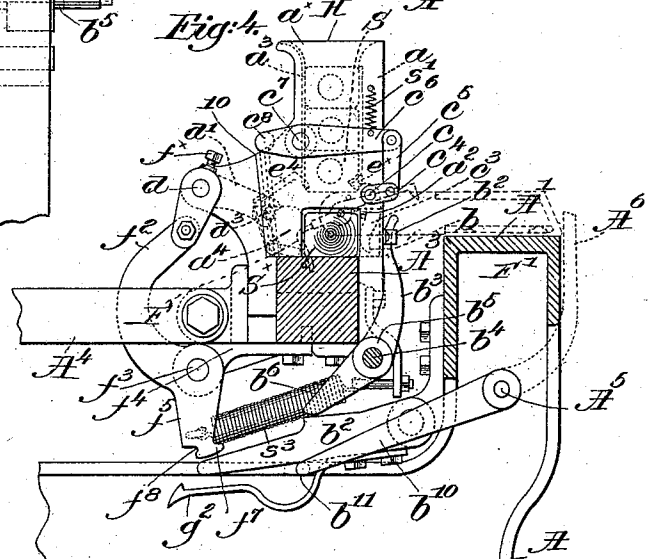


Fig. 6.

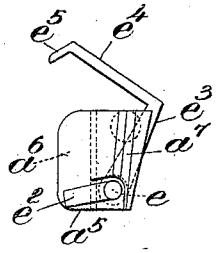
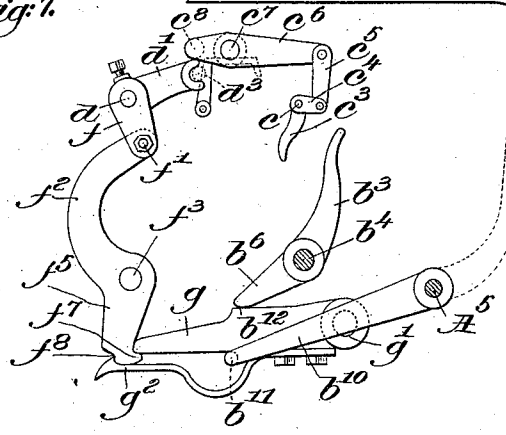


Fig. 7.



Witnesses.
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UNITED STATES PATENT OFFICE.

EPPA H. RYON, OF WALTHAM, MASSACHUSETTS, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE NORTHROP LOOM COMPANY, OF HOPEDALE, MASSACHUSETTS.

SHUTTLE-CHANGING MECHANISM FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 557,519, dated March 31, 1896.

Application filed June 11, 1895. Serial No. 552,375. (No model.)

ll whom it may concern:

it known that I, EPPA H. RYON, of Wal- county of Middlesex, State of Massa- s, have invented an Improvement in tle-Changing Mechanism for Looms, of h the following description, in connection the accompanying drawings, is a speci- tion, like letters and numerals on the draw- s representing like parts.

his invention has for its object the pro- on of means for automatically maintain- e supply of weft in a loom, which I ac- sh, as herein provided for, by substi- a new shuttle in the shuttle-box for nose filling-thread is broken or ex- ted while the loom is running, the latter tle being ejected as the new shuttle is ituted.

ave herein shown a shuttle receiver or er, into which are placed a number of tles which are to be fed when required he shuttle-box, mounted on and to move with the lay and directly above the shuttle-box. As the lay of the loom may make a large number of strokes a minute, the time for ejecting the shuttle whose filling-thread is broken or exhausted and substituting in its place a fresh shuttle must be necessarily very short, and I make the transferring mechanism, as well as the ejecting mechanism, direct and positive in its action and substantially simultaneous in operation, the shuttle-changing being effected on the forward stroke of the lay, so that the new shuttle is in the shuttle-box ready to be acted upon by the picker-stick as the lay goes back. The shuttle-changing mechanism is connected with the filling or weft fork of the loom, of usual construction, as a means of bringing said mechanism into action when a change of shuttle is required. The shuttle-transferrer is shown as a rock-shaft pivoted to the movable back or gate of the shuttle-box and having at each end a bent arm which swings inward and projects over the tip of the lowermost shuttle of the series in the hopper as the shuttle-gate begins to rise, and as the latter rises to its fullest extent the rock-shaft is given a quick sudden turn, which depresses said arms, carrying the engaged shuttle positively down into the shuttle-box as the gate is lowered. The shuttle-ejector is shown herein as a rock-shaft mounted at the front of the shuttle-box and provided at or near its ends with depending fingers which normally enter recesses in the inner side of the binder opposite to the shuttle-box gate, and just as the gate is lifted sufficiently high to permit a shuttle to pass thereunder the rock-shaft is partially turned with a sudden movement to throw the ejecting-fingers inward against the shuttle then in the shuttle-box, throwing it out at the back of the box and then returning into inoperative position as the new shuttle is moved into the shuttle-box by the transferrer.

My invention is readily adapted to looms now in use with but little change, the majority of the operating parts being mounted on the hopper, so that the close attention of the operator is not necessary, it only being required that the hopper be filled from time to time before it is completely exhausted, thus saving much labor to the attendant and increasing the output of the loom, as no stoppage thereof is necessary in changing shuttles.

Other features of my invention will hereinafter appear in the detailed description of the embodiment of my invention herein shown.

Figure 1 is a right-hand end elevation of a sufficient portion of a loom to be understood with my invention embodied therein, the lay being shown at the end of its forward or beating-up stroke. Fig. 2 is a rear side view of the mechanism shown in Fig. 1. Fig. 3 is a front elevation thereof, showing the hopper, shuttle-binder, and the right-hand end of the lay and breast-beam. Fig. 4 is a sectional view taken on the line $x\,x$, Fig. 3, and looking toward the right. Fig. 5 is a detached inner side view of one of the brackets forming one end of the hopper. Fig. 6, on a larger scale, is an outer side view of one of the end supports for the shuttle-box gate with one of the transferrer-arms in normal position; and Fig. 7 is a view of the transferrer and ejector devices and their actuating mechanism at the instant that a shuttle has been ejected and a new one substituted, the other parts being omitted to avoid confusion.

The framework A, breast-beam A', picker-

sticks A^2, (only one being shown in Fig. 1,) the lay A^3, lay connecting-rods A^4, the weft-fork or filling-detector F, slide-bar F', stand F^2, and the weft-fork rock-shaft A^5 are and may be all as usual, being substantially such as are contained in looms for weaving cotton cloth, and form no part of my invention.

At one end of the lay A^3 (herein shown as the right-hand end) the front wall a of the shuttle-box is extended upward at some distance to form the front of an open-top shuttle-hopper H, the ends thereof being formed by preferably metallic castings $a^\times$ and $a'^\times$, one of which, as $a'^\times$, is shown separately in Fig. 5 securely bolted to the lay A^3 at 5 by suitable screws or bolts. These castings form the ends also of the shuttle-box, the inner one, $a^\times$, having an opening a^2 (see Fig. 4) for the passage of the shuttle as it is thrown through the shed.

The back of the hopper is formed by a plate a^3 rigidly secured to the castings $a^\times$ $a'^\times$ and terminating above the top of the lay A^3 a sufficient distance to permit the free passage thereunder of a shuttle at times. This open space at the back of the shuttle-box proper is normally closed by a gate a^4, adapted to be moved up and down, as will be described, to permit a shuttle to be ejected or to close the back of the shuttle-box. A binder b, of usual construction, is hinged at b' (see Fig. 3) to the front a of the shuttle-box, moving in a longitudinal slot therein for that purpose, and connected by a strap or loop b^2 to an arm b^3 fast on a rock-shaft b^4, mounted in suitable bearings b^5 on the lay and provided with a toe b^6 for a purpose to be described, the shaft and attached parts being normally retained in the position shown in Figs. 1 to 4, inclusive, by a spring s, Figs. 2 and 3.

I have herein shown an ejector rock-shaft c mounted in bearings c' in the ends and above the binder b, at the front of the shuttle-box, and collars c^2 are secured on the rock-shaft c, having ejector-fingers c^3 extended downwardly in recesses in the inner face of the binder b, said fingers being located near the ends of a shuttle when in the shuttle-box. Normally the ejectors c^3 are slightly within or flush with the inner face of the binder, to offer no obstruction to the movement of a shuttle in its throw. A short arm c^4 is fast on the ejector rock-shaft c, at its inner projecting end, connected by a link c^5 to one arm of a lever c^6 pivoted on a stud c^7 on the outer side of the end bracket $a^\times$, a spring s' normally elevating the front end of the lever and retaining the ejectors c^3 in inoperative position. The rear end of the lever c^6 has thereon an inturned lug or projection c^8, which normally projects over and rests upon the inclined edge 10 of the end bracket $a^\times$, with its inner end in the path of movement of one of a pair of like arms d', whose hubs $d^\times$ are secured to a lifter rock-shaft d, mounted in bearings 15 in the rearwardly-extended portions of the end brackets $a^\times$ $a'^\times$, said lifter-shaft d being normally held with the arms d' depressed by a spring s^2, Fig. 2. The ends of the arms d' are notched at d^2 (best shown in Fig. 7) to partially embrace journal-lugs d^3 secured to the outer side of the shuttle-box gate a^4, and shown in full lines only in Fig. 2, so that elevation or depression of the arms d' will positively raise or lower the said gate.

At each end the gate a^4 is attached to a casting a^5, one of which is shown separately and enlarged in Fig. 6, in a recess a^6 in its inner face, the castings having on their outer faces inclined and preferably V-shaped guide-ribs a^7, to enter similarly-shaped and upwardly and inwardly inclined grooves a^8 in the inner faces of the end brackets $a^\times$ and $a'^\times$, whereby when the gate a^4 is raised it will be also moved rearward slightly, the better to clear the shuttle then to be moved into the shuttle-box.

As the arms d' are moved upward, lifting the gate a^4, one of them acts on the lug c^8 of the lever c^6, raising it quickly and depressing its front end, and by means of the link c^5 and arm c^4 the shaft c is sharply and rapidly rocked to throw the ejectors c^3 into the shuttle-box to impinge against and eject the shuttle then in front of the gate-opening out through the opening at the back of the lay, where it may be caught in any convenient receptacle provided therefor.

It is now proper to describe the shuttle-transferring devices for positively moving into the place of the ejected shuttle a new shuttle from the supply in the hopper H.

Bearings e' are secured to either the castings a^5 or to the gate a^4 for a rock-shaft e, one end of which is bent in at e^2 to rest upon the top or race of the lay A^3 when the gate a^4 is lowered, the said rock-shaft having thereon two transferrer-arms e^3, bent over at e^4 and slightly downturned at their extremities, as at e^5, (best shown in Figs. 6 and 7,) the arms being so placed on the rock-shaft as to play in slots 20 in the back plate a^3 of the shuttle-hopper and when thrown inward to project over the ends of the lowermost shuttle, as S, of the supply of shuttles in the hopper. This shuttle S is supported on the inturned ends of flat yielding metal plates $e^\times$, preferably secured in recesses in the inner face of the front a of the hopper, the inturned ends of the supports projecting under the shuttle near its ends and between the transferrers e^3. When the gate a^4 is raised, the rock-shaft e and transferrers e^3 are raised with it until the ends e^5 of the latter pass up over the ends of the lowermost shuttle S, and as the shuttle $S^\times$ is ejected, as has been described, the inturned end e^2 of the transferrer rock-shaft e impinges against a block e^6, preferably adjustably secured to the inner face of the end bracket $a'^\times$ by a bolt e^7 extended through a slot 25 into the block. (See Fig. 5.) As the gate continues to rise the block acts upon the end e^2 to partially rotate the rock-shaft e forward, quickly throwing the transferrers

e^3 forward and depressing the bent portions e^4 thereof, carrying the shuttle S down past the spring-supports $e^\times$. The gate a^4 is then lowered immediately by means to be described and the transferrers carry the shuttle into the shuttle-box in position to be thrown by the next forward movement of the picker-stick A^2, and as the gate almost reaches its normal position the depressed end e^2 of the transferrer-shaft e comes against the top of the lay and is lifted, turning the rock-shaft e back and moving the transferrers into normal position, Figs. 1 to 4, the next shuttle above in the shuttle-hopper H then resting on the yielding supports $e^\times$.

I have herein shown a forked or bifurcated arm f attached by a set-screw $f^\times$ to the inner projecting end of the gate-operating shaft d, to which is connected by a pin or stud f' the slotted extremity of a bent lever f^2, pivoted on a stud f^3 on a bracket f^4, secured to the lay A^3, as clearly shown in Figs. 1, 2, and 4. Said lever f^2 is extended below its fulcrum at f^5 and is normally drawn toward the front of the loom by a strong spring s^3, attached at one end to the lever and at its other end to a stand f^6 on the lay, said spring s^3 materially assisting the spring s^2 in retaining the gate a^4 and the shuttle-transferring devices normally in inoperative position and returning them to such position after a transfer of a shuttle to the shuttle-box.

The extremity of the arm f^5 is provided with a toe f^7 at its front side and a notch or shoulder f^8 at its rear side, the former to be engaged at times by the end of a dagger g, loosely pivoted at g' in a stand $g^\times$ on the frame A of the loom, a spring-latch g^2 being attached to the under side of the dagger g to engage the shoulder f^8 when the dagger engages the toe f^7, whereby the lever f^2 is swung positively in either direction. An arm b^{10} fast on the weft-fork shaft A^5 is offset at b^{11} to project beneath and support the dagger g and to raise it into the position shown in Fig. 7 when said shaft A^5 is rocked by the usual weft-fork or filling-detector F and intermediate devices on the failure of the weft or filling.

In Figs. 2 and 3 the weft-fork or filling-detector F is shown in full lines and in dotted lines, Fig. 4, of usual construction and of itself forming no part of this invention.

When the weft fails and the weft-fork shaft is so rocked, the dagger g is raised by the arm b^{10} into the path of movement of the lever-arm f^5 as the lay moves forward, and as the end of the dagger engages the toe f^7 the lever f^2 f^5 is turned on its fulcrum to swing its upper end forward. This movement in turn, by means of the pivotally-connected arm f, rocks the shaft d to lift the arms d', and the gate is thereby lifted, the shuttle $S^\times$ ejected, and the new shuttle S transferred to the shuttle-box. When the arm b^{10} is raised, a lump b^{12} thereon engages the depending toe b^6 on the binder-shaft b^4, rocking the latter to pull the binder b out sufficiently to permit the new shuttle to readily enter the box. As the lay moves back the spring s^3 tends to pull the lever-arm f^5 forward into normal position; but should the spring fail to do this properly the spring-latch g^2 remains in positive engagement with the notch f^8 until the return to normal position is effected, whereupon the latch slides over the end of and releases the lever-arm f^5. As the new shuttle is thrown through the shed the filling will act on the weft-fork in well-known manner, and as the lay moves forward to beat up, the shaft A^5 will not be rocked and the various parts of the shuttle transferring and ejecting devices will remain inoperative, and will so continue until another failure of the filling. The upper end of the lever-arm f^2 is connected to the arm f by a slot-and-pin connection in order to allow slight play between the parts and to prevent binding at the joint f'.

An arm A^6 (shown partly in full lines, Fig. 1, and in dotted lines, Fig. 4) is secured to the rock-shaft A^5 and is acted upon by the usual slide-bar (not shown) movable in the stand A^7, Fig. 1, the weft-fork being pivoted, as usual, to the slide-bar, and inasmuch as the weft-fork, slide-bar, and coöperating devices are old and well known in ordinary looms for weaving cotton cloth I have not deemed it necessary to illustrate them herein.

My invention can be readily applied to existing looms, to thereby render them automatic in the operation of supplying the filling continuously.

While I have shown the hopper H as adapted to hold three shuttles, it is obvious that by increasing the depth of the hopper the number of shuttles can be increased.

Inasmuch as a new shuttle is positively moved from the hopper into the shuttle-box, there is no chance for the shuttle to partially or improperly enter the box, and mispicks or smashes are thereby avoided.

The ejection of one shuttle and the transfer of a new shuttle is practically instantaneous and no time is lost in the running of the loom.

I claim—

1. A loom containing the following instrumentalities, viz: a lay, a filling-detector, a hopper mounted upon the lay, an ejector, a transferrer adjacent thereto, and actuating mechanism therefor, whereby when a filling-thread is broken or exhausted the faulty shuttle is ejected and a new shuttle is engaged and moved by the transferrer into operative position in the face of the ejected shuttle, substantially as described.

2. A loom containing the following instrumentalities, viz: a lay having a shuttle-box, a hopper mounted thereupon, a transferrer, and actuating mechanism therefor, whereby when a change of filling is necessary the transferrer is operated to positively engage and move a shuttle from the hopper into the shuttle-box, substantially as described.

3. A loom containing the following instru-

mentalities, viz: a lay having a shuttle-box, a hopper mounted thereupon, a rock-shaft having transferrer-arms attached thereto to enter the hopper and engage a shuttle and positively move the same into the shuttle-box, actuating mechanism for said rock-shaft, and a dagger mounted on the loom-frame, to operate said mechanism on the forward stroke of the lay, substantially as described.

4. A loom containing the following instrumentalities, viz: a lay having a shuttle-box, a hopper mounted thereupon, yielding supports to sustain the lowermost shuttle in the hopper, a rock-shaft having transferrer-arms attached thereto to engage and move the lowermost shuttle from said supports into the shuttle-box, mechanism to actuate the rock-shaft, and a dagger on the loom-frame to at times engage and operate said mechanism on the forward stroke of the lay, substantially as described.

5. A loom containing the following instrumentalities, viz: a lay having a shuttle-box, a sliding gate forming one side of said box, a rock-shaft located opposite the said gate and having attached depending fingers to act upon and eject a shuttle from the shuttle-box, means to open the gate, and connections between said gate and rock-shaft including a lever operatively connected to the latter and in the path of movement of the means for opening the gate, to partially rotate the rock-shaft and eject a shuttle when the gate is opened, substantially as described.

6. The lay and its shuttle-box, a gate for said box, a hopper mounted on and movable with the shuttle-box, and a binder, combined with a shuttle-transferrer and an ejector movable with the lay, means to open said gate, connections between the gate and the transferrer and ejector, to actuate them when the gate is opened, to eject a shuttle from the box and to transfer a new shuttle from the hopper into the box from which the shuttle has been ejected, and an arm to throw the binder out as the new shuttle is transferred, substantially as described.

7. The lay, a shuttle-box thereon having an open side, a sliding gate for said open side, guides to direct the movement of the gate, a rock-shaft mounted on the gate and having attached transferrer-arms, means to rock the shaft positively in opposite directions as the gate is raised and lowered, and operating mechanism for said gate, substantially as described.

8. The lay having a shuttle-box, a hopper mounted thereupon, a gate for the shuttle-box, a transferrer carried by the gate to positively move a new shuttle into the shuttle-box, actuating mechanism therefor controlled by breakage or failure of a filling-thread, an ejector, and connections between it and the gate, whereby when the latter is opened a faulty shuttle is ejected from the shuttle-box, substantially as described.

9. The lay having a shuttle-box, a hopper mounted thereupon a sliding gate for the shuttle-box, a rock-shaft mounted upon said gate and provided with an inturned end, devices to engage the end of and turn said rock-shaft when the gate is raised and lowered, and bent arms rigidly attached to said rock-shaft, to engage the ends of a shuttle as the gate is lifted and positively move it into the shuttle-box as the gate is lowered, substantially as described.

10. A loom containing the following instrumentalities, viz: a lay having a shuttle-box and a filling-supply hopper thereon, a transferrer and an ejector, a gate for the shuttle-box, connections between it and the transferrer and ejector, a lever to actuate the gate, a dagger pivoted on the frame, a spring-latch attached thereto, and a filling-detector to control the dagger, whereby when a filling-thread is broken or exhausted the dagger and spring-latch engage and positively move the lever into abnormal position, to remove the faulty filling and provide a fresh supply, and thereafter positively restore the lever and coöperating parts to normal position, substantially as described.

11. The combination with a lay having a shuttle-box provided with an open passage in its rear side, a gate for said passage, and feeding devices, including a superposed hopper having an open bottom and a transferrer, of a filling-detector, a dagger controlled thereby, an ejector, devices to operate it as the gate is raised, mechanism to open and close the gate and to operate the transferrer, and an actuating-lever therefor operated by the dagger when a filling-thread is broken or exhausted as the lay completes its forward stroke, substantially as described.

12. The lay having a shuttle-box thereon, a gate at one side of said shuttle-box, and a binder at the other side, and a rock-shaft having ejecting-fingers extended into the shuttle-box adjacent and normally within the plane of the binder, combined with devices to open the gate and actuate the ejectors upon failure or breakage of a filling-thread, substantially as described.

13. An organized loom containing the following instrumentalities, viz: a lay, having a shuttle-box thereon provided with a shuttle-binder, a hopper superposed upon said shuttle-box, devices adapted to be moved over into engagement with and to positively transfer a shuttle from the hopper to the shuttle-box, and means to open the binder as the shuttle is moved into the shuttle-box, substantially as described.

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

EPPA H. RYON.

Witnesses:
JOHN C. EDWARDS,
AUGUSTA E. DEAN.