(No Model.) 3 Sheets—Sheet 1.

C. A. LITTLEFIELD.

SHUTTLE CHANGING MECHANISM FOR LOOMS.

No. 601,836. Patented Apr. 5, 1898.

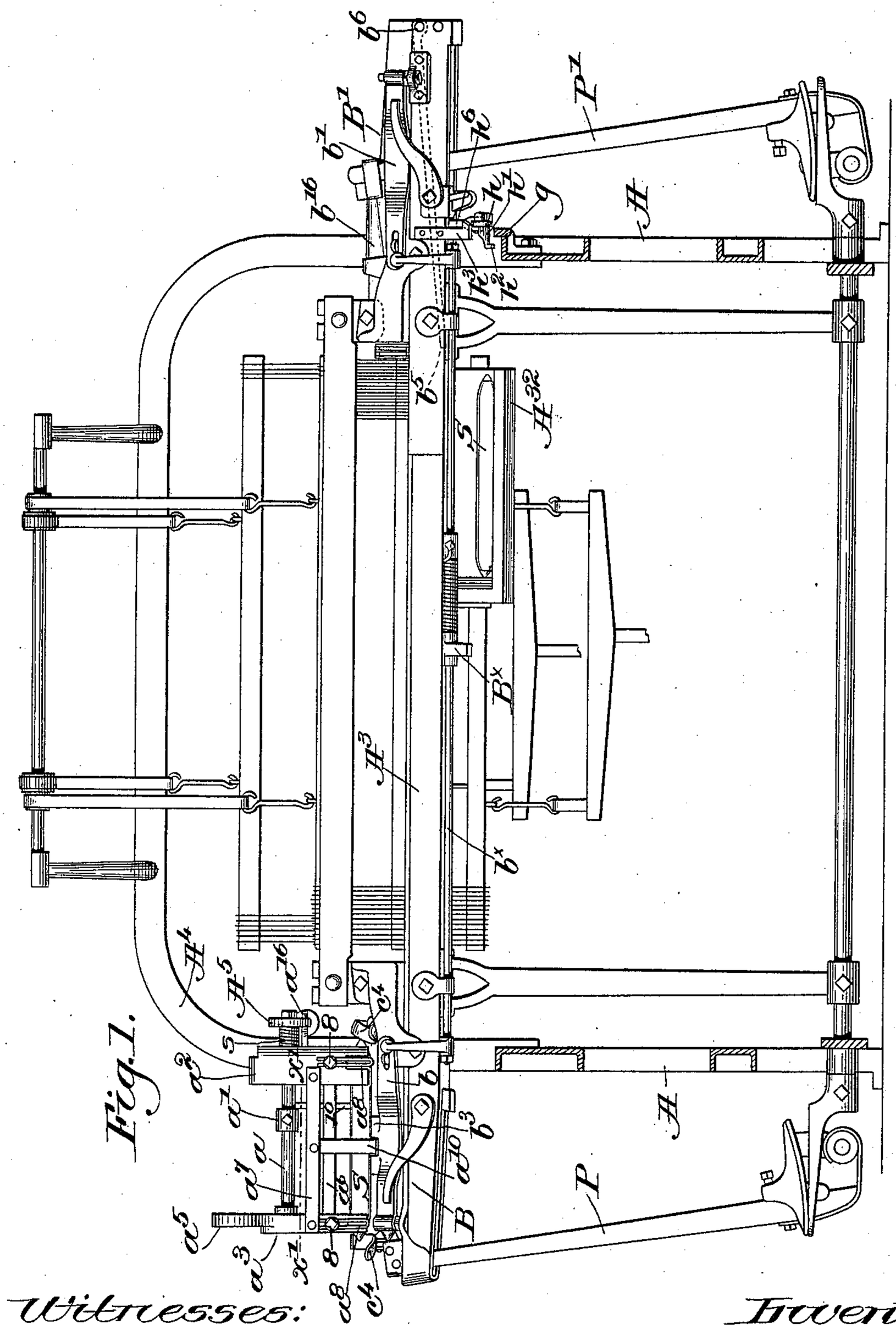

Fig. 1.

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(No Model.) 3 Sheets—Sheet 2.

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SHUTTLE CHANGING MECHANISM FOR LOOMS.

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Fig. 2.

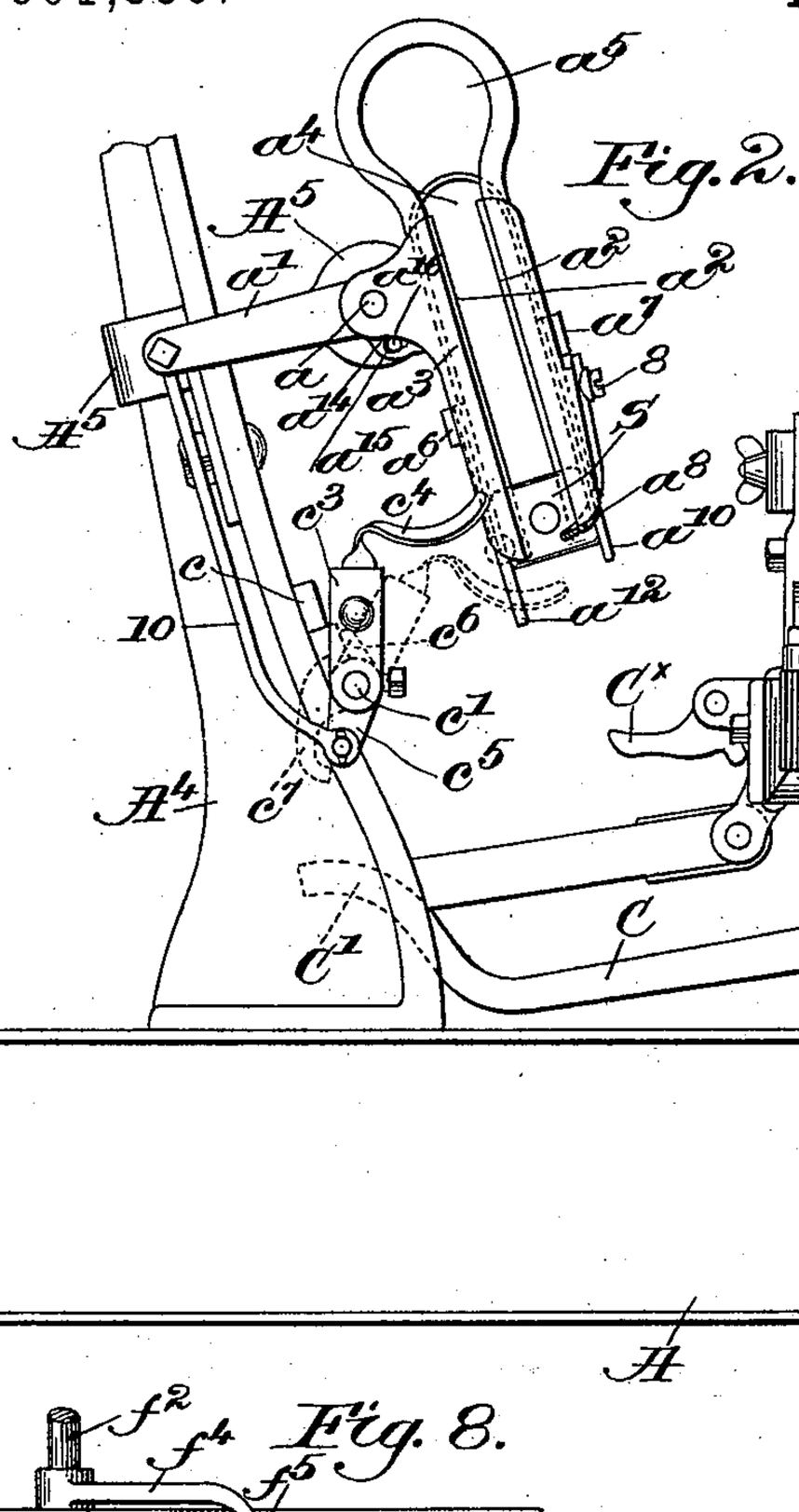


Fig. 9.

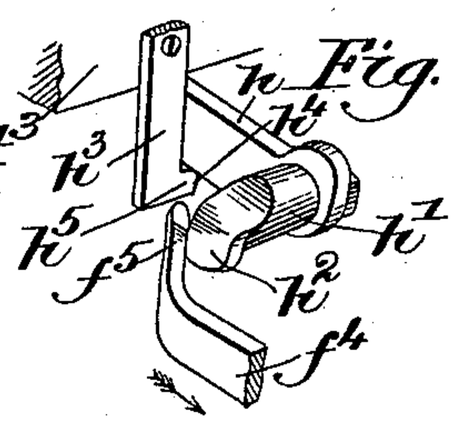


Fig. 8.

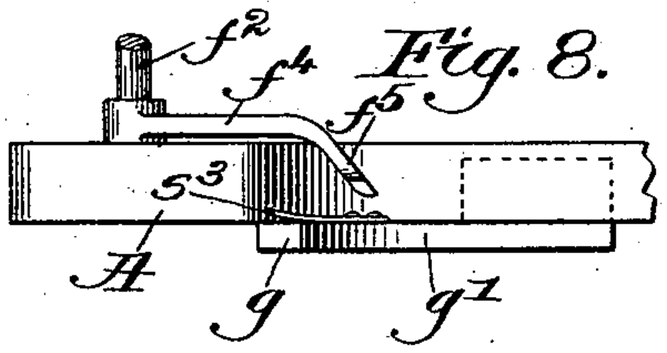


Fig. 6.

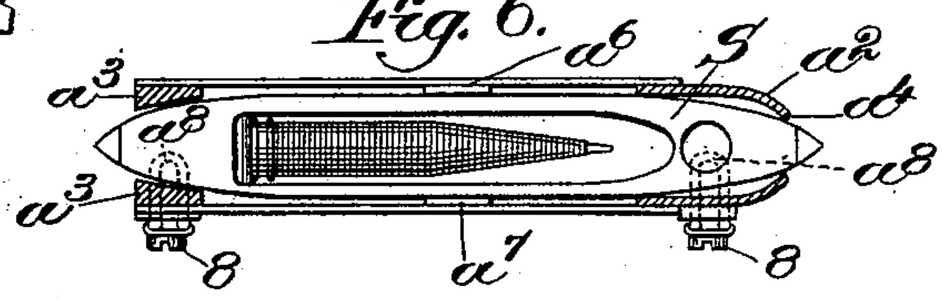


Fig. 10.

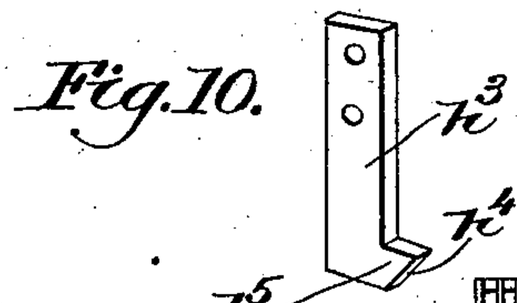
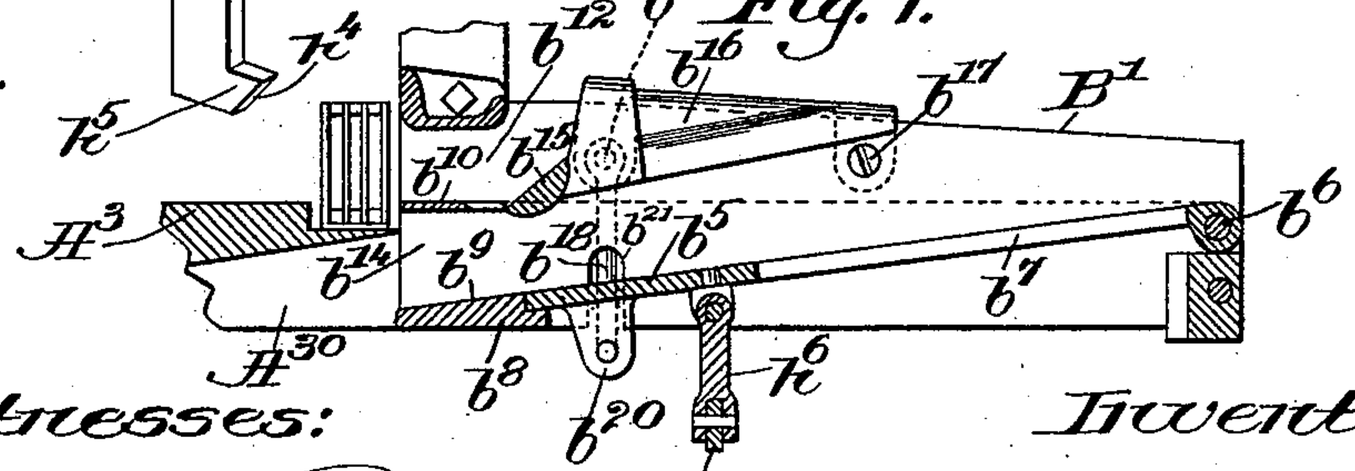


Fig. 7.



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(No Model.) 3 Sheets—Sheet 3.

C. A. LITTLEFIELD.

SHUTTLE CHANGING MECHANISM FOR LOOMS.

No. 601,836. Patented Apr. 5, 1898.

Fig. 5.

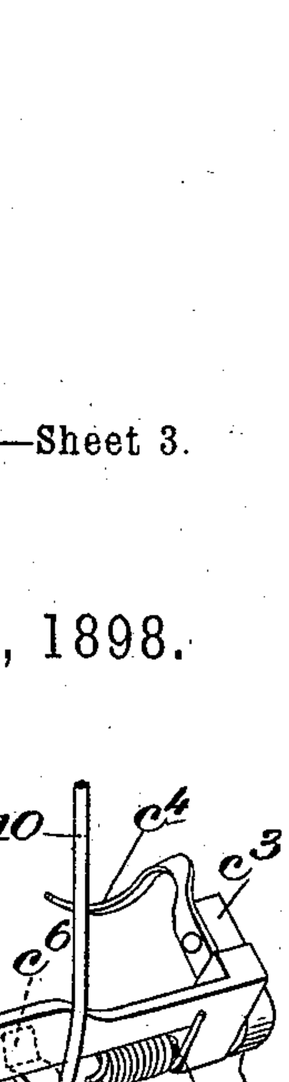


Fig. 3.

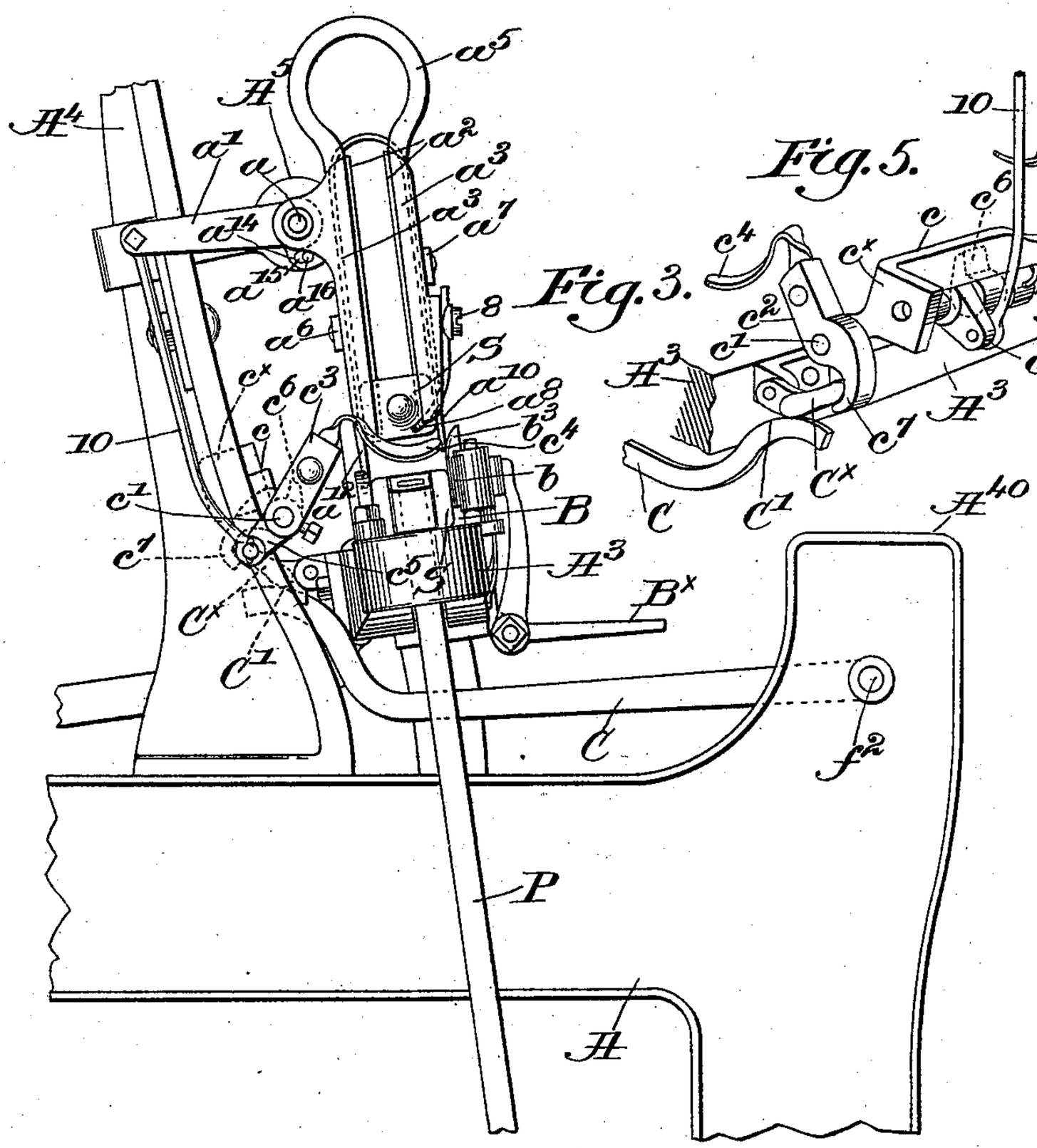
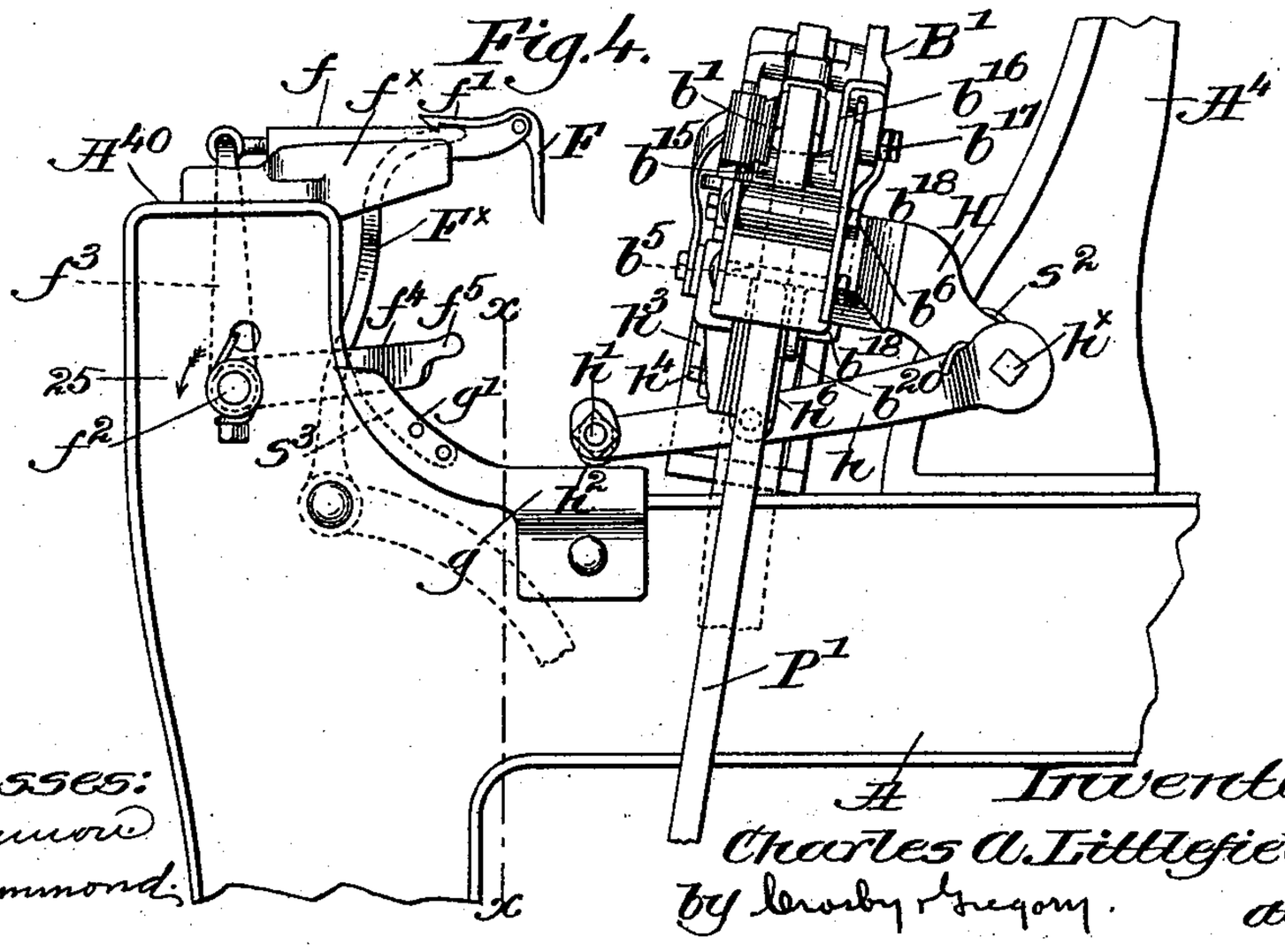


Fig. 4.



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UNITED STATES PATENT OFFICE.

CHARLES A. LITTLEFIELD, OF LOWELL, MASSACHUSETTS, ASSIGNOR TO THE NORTHROP LOOM COMPANY, OF SACO, MAINE, AND HOPEDALE, MASSACHUSETTS.

SHUTTLE-CHANGING MECHANISM FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 601,836, dated April 5, 1898.

Application filed December 4, 1896. Serial No. 614,428. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. LITTLEFIELD, of Lowell, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Shuttle-Changing Mechanism for 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 the production of means for maintaining the supply of weft or filling in a loom by automatically substituting a fresh shuttle having a full quota of filling for a shuttle the filling whereof has become broken or exhausted without stopping the running of the loom. A shuttle feeder or hopper is located at one side of the loom, and upon failure of the filling a fresh shuttle is transferred from said feeder or hopper to the adjacent empty shuttle-box on the lay, while on the same beat the spent shuttle is ejected from the opposite shuttle-box preferably into a receptacle beneath the lay, the regular motion of the picker-stick being utilized to effect the ejection of such spent shuttle. The shuttle whose filling has failed, either by breakage or exhaustion, passes the filling-fork or detector on its way to the shuttle-box from which it is to be ejected, and the absence of the filling acts through suitable devices, to be described, to operate the shuttle-transferring mechanism and also to cause the ejection of the spent shuttle, so that at the next pick but one the filling from the freshly-transferred shuttle will be laid in the shed. By such construction the shuttle-box to which a fresh shuttle is to be transferred is empty and better adapted to properly and accurately receive it, and there is no danger of possible interference of the fresh and spent shuttles.

Various details of my invention will be hereinafter described, and particularly pointed out in the claims.

Figure 1, in partial front elevation, represents a loom having my invention embodied therein, the view being taken back of the line $x\ x$, Fig. 4, thereby omitting portions of the loom which are of well-known construction and which if illustrated would obscure the details of my invention. Fig. 2, in elevation and on a larger scale, represents a portion of the left-hand side of the loom, showing the shuttle feeder or hopper in normal position with the lay forward. Fig. 3 is a similar view, the lay being shown as back, however, and having just received in its shuttle-box a fresh shuttle from the shuttle-feeder. Fig. 4 is an enlarged detail in elevation of the right-hand side of the loom, viewing Fig. 1, a spent shuttle having been ejected and the lay about to move on its forward stroke. Fig. 5 is a perspective detail of the shuttle-transferring mechanism in the position shown in Fig. 3 viewed from the rear. Fig. 6 is an enlarged horizontal sectional view of the shuttle-feeder, taken on the line $x'\ x'$, Fig. 1, looking down and with a shuttle therein. Fig. 7 is a longitudinal sectional view of the shuttle-box from which a shuttle is ejected, the parts being shown ready to eject a shuttle. Fig. 8 is an enlarged plan view, and Figs. 9 and 10 perspective views of details of the devices for controlling the movable portions of the ejecting shuttle-box.

The loom-frame A, of suitable shape to support the operative parts, the lay A^3, breast-beam A^{40}, the picker-sticks P P′ and their actuating mechanism, the shuttle-boxes B B′ at opposite ends of the lay, their binders $b\ b'$, respectively, and the shaft $b^\times$, mounted on the lay and provided with a dagger $B^\times$ to effect stoppage of the loom if a shuttle is improperly positioned in the shuttle-box, are and may be of usual and well-known construction.

A bracket A^5 is erected on the arch A^4 back of and at the left-hand end of the lay A^3, as herein shown, to provide a bearing for a rock-shaft a, having fast thereon an arm a' and the shuttle feeder or hopper.

The feeder or hopper comprises upright ends or guards $a^2\ a^3$, the inner end being vertically slotted at a^4 and bent or rounded at the corners, as best shown in Fig. 6, while the outer end a^3 is shown as a casting having a bow-shaped top a^5 and open to its lower end.

The shuttles S are inserted one at a time through the entrance a^5, the point of the

shuttle, as it is tipped, passing into the slot a^4 of the end piece a^2 of the feeder, the heel of the shuttle passing down between the sides of the open end a^3, as best shown in Fig. 6, the inner faces of the end pieces being shaped to guide the shuttles into position, and the heels and points of the shuttles projecting beyond the ends of the feeder.

Side bars a^6 and a^7, rigidly connected to the ends, serve to stiffen and strengthen the feeder or hopper, which is of sufficient depth to receive and hold a plurality of superposed shuttles.

The end pieces a^2 a^3 of the feeder are cut away to permit the passage therethrough of the inturned lower ends of yielding detents a^8, suitably secured, as by screws 8, to the end pieces, the detents passing beneath the lowermost shuttle in the feeder and normally acting to hold the shuttles therein.

A spring s, Fig. 1, fast at one end to the bracket A^5 and attached at its other end to the rock-shaft a, normally acts to maintain the shuttle-feeder in the position shown in Fig. 2, when the loom is running properly, the feeder being so located with relation to the shuttle-box B, however, as to be directly over it and adjacent thereto when a shuttle is to be transferred, such position being shown in Fig. 3.

As best shown in Fig. 5, a bracket c, having an ear $c^\times$ by which it is bolted to the arch A^4, is provided with bearings for a transferrer-shaft c', having fast thereon arms c^2 c^3, provided each with like curved fingers c^4 at such a distance apart that the feeder may pass between them to permit the fingers to act upon the heel and point of the lowermost shuttle, projecting beyond the ends a^2 a^3 of the said feeder. A spring s' normally tends to elevate the fingers, as shown in Fig. 2, so that when the shuttle-feeder is moved into operative position the path of the lowermost shuttle therein will be below said fingers.

The rocker-arm a' is pivotally connected by a link 10 with a short arm c^5, fast on the transferrer-shaft c', and a stop-lug c^6, fast on the latter, is adapted to bear upon the bracket c when the parts are at rest.

One of the transferrer-arms, as c^2, is downturned to form a preferably hooked dog c^7, adapted at times to be engaged by a bunter $C^\times$, herein shown as pivotally mounted on the lay, the bunter being moved into operative position by engagement with an arm C, having a cam portion C', Figs. 2 and 3. Normally the bunter will not engage the dog c^7; but upon failure of the filling the arm C is moved to act upon the bunter $C^\times$, turning the latter into position to engage the dog and rock the transferrer-shaft c' as the lay completes its backward stroke. Such movement of the transferrer-shaft operates through the link 10 to swing the shuttle-feeder into operative position, Fig. 3, above the shuttle-box B in the plane of the lay, and the rotative movements of the rock-shafts a and c' are so timed that the shuttle to be transferred is moved beneath the transferring-fingers c^4 before they are completely depressed, the feeder moving in unison with the lay at the latter part of its stroke, while the shuttle is transferred. The final depression of the fingers into the position shown in Fig. 3 is effected at the time that the shuttle-feeder is in operative position, and the lowermost shuttle therein is rapidly and positively moved into the empty shuttle-box, the detents a^8 yielding to allow the transfer of the shuttle and immediately returning to operative position beneath the next shuttle in the feeder. As the lay moves forward the feeder and transferrer springs s and s' act to return their respective devices to normal inoperative position. (Shown in Fig. 2.)

Guides a^{10} a^{12} at the front and rear of the shuttle-feeder direct the shuttle as it is transferred, the back of the shuttle-box and the binder being recessed to accommodate the guides, the rear guide a^{12} being shown as the longer of the two.

A collar a^{14} on the rock-shaft a is slotted at a^{15} to receive a pin a^{16}, extended laterally from the bracket A^5 to limit the inward movement of the shuttle-feeder into operative position, the stop c^6 limiting its movement in the opposite direction.

As shown best in Figs. 1, 2, and 3, the binder b of the receiving shuttle-box B is provided with an upturned portion b^3, convexed on its inner face, to be engaged by a shuttle as it is transferred to the shuttle-box to open the binder and also to assist in guiding the shuttle into position.

Referring now to Fig. 4 the filling-fork F, pivoted on a stand f, adapted to slide in a guide $f^\times$, secured to the breast-beam at the right-hand end thereof, is of usual construction, the tail of the fork having a hooked end f' to be engaged by the weft-hammer $F^\times$ upon failure of the filling to thereby slide the stand f toward the front of the loom.

A rock-shaft f^2 is mounted in the loom-frame below the breast-beam, and it is connected by a rocker-arm f^3 with the filling-fork stand f, whereby the shaft f^2 will be rocked when the filling fails.

The controlling-arm C for the transferring mechanism is fast on said rock-shaft, and a second rocker-arm f^4 is secured thereto opposite the ejecting shuttle-box B', said arm being bent laterally at f^5, as best shown in Figs. 8 and 9.

A bracket H on the lay at the rear of the shuttle-box B' has loosely pivoted thereon at $h^\times$ a lever-arm h, normally depressed, as herein shown, by a spring s^2, the free end of said arm having secured thereto a laterally-extended stud h', the shank of which is rounded, while its inner end h^2 is downturned and beveled. (See Fig. 9.)

Secured to the loom side is a bracket g, hav-

ing a cam-surface g', on which the shank of the stud h' rides as the lay comes forward to lift the lever-arm h, and a leaf-spring s^3 on the inner side and at the upper end of the cam-bracket acts upon the downturned end h^2 of the stud, throwing the arm h laterally slightly toward the center of the loom. Such lateral movement of the arm h brings it into engagement with a detent h^3, depending from the lay, the face h^4 of the offset end h^5 of said detent being beveled (see Fig. 10) to assist the passage of the arm h thereover. When the said arm is engaged by the detent, it will be so held as long as the loom is running properly.

The ejecting shuttle-box B′ has a movable bottom b^5, Fig. 7, pivoted at its outer end at b^6 and slotted longitudinally at b^7 for the picker-stick P′, said movable bottom being pivotally connected by a link h^6 to the lever-arm h to be raised or lowered thereby. When in its lowered position, the bottom b^5 rests against a stop b^8, extended across the shuttle-box and inclined at its upper side, as at b^9, to form a continuation of the box-bottom.

A transverse division-piece b^{10} across the inner end of the shuttle-box and at the level of the raceway of the lay divides the entrance into two parts or throats b^{12} b^{14}, the position of the movable bottom b^5 determining which throat shall be open to the shuttle when thrown out of the box.

A guard or director b^{15}, having a convexed under surface, projects from a guard-support b^{16} across the shuttle-box, above the bottom b^5 thereof, the support b^{16} being shown as a casting pivoted on the rear wall of the shuttle-box at b^{17} and bent over the said wall, a link b^{18}, pivoted to said support outside the shuttle-box at b^{19}, being jointed to an ear b^{20}, depending from the movable box-bottom, the link being bent, as shown in Fig. 4, to pass beneath the shuttle-box, the rear wall being cut away at b^{21} (see Fig. 7) to permit play of the bent end of the link. The guard b^{15} thus moves with the box-bottom and prevents the end of the shuttle from jumping up when it is thrown from the shuttle-box by the picker-stick, its position when a shuttle is to be ejected being shown in Fig. 7. Now when the filling fails the filling-fork F will detect such failure as the shuttle passes it on its way to the shuttle-box B′, and the weft-hammer will cause the rock-shaft f^2 to partially rotate in the direction of arrow 25, Fig. 4, thereby lifting the arm f^4 into operative position as the lay reaches the end of its forward stroke.

It will be remembered that normally the lever-arm h is engaged by the detent h^3, maintaining the bottom of the shuttle-box B′ level with the race of the lay, so that the shuttle will enter and leave the shuttle-box by the throat b^{12}, Fig. 7, and unless the arm f^4 is elevated it will be out of the path of movement of the stud h' on the lever-arm h. When, however, the rocker-arm f^4 is moved into operative position upon failure of the filling, its bent end f^5 will engage and wipe past the end h^2 of the stud h', as shown in Fig. 9, moving stud and lever-arm h laterally to disengage the latter from its detent h^3 when the lay goes back. The spring s^2 immediately depresses the lever-arm h, which causes the shuttle-box bottom b^5 to be lowered at its inner end, as shown in Fig. 7, by the time the picker-stick is ready to engage and throw the shuttle, the guard b^{15} depressing the end of the shuttle as the bottom is lowered. Such change of position of the box-bottom and guard opens the throat b^{14} for the passage of the shuttle as it is thrown from the box by the picker-stick P′, the ejected shuttle passing from the throat through a chute A^{30} in the under side of the lay, and thence to a suitable receptacle A^{32}, Fig. 1, shown as secured to the bottom of the lay, or the ejected shuttle may be permitted to drop from the chute A^{30} onto the floor, so that the operative can easily pick it up when desired. While the shuttle in which the filling has failed is thus being ejected from the shuttle-box at one end of the lay, the transferring mechanism is acting on the same stroke of the lay to transfer a fresh shuttle from the shuttle-feeder into the empty receiving shuttle-box B at the other end of the lay. As the lay beats up after the ejection of one shuttle and the transfer of a fresh one no filling will be laid in the shed at such pick, for the freshly-transferred shuttle will remain in the shuttle-box. At such forward beat of the lay, however, the movable bottom of the shuttle-box B′ will be lifted into normal position, as described, ready to receive the fresh shuttle as it is thrown from the receiving shuttle-box B at the next pick. The guard b^{15} has also the very important function of a director, as it serves to tip or direct the inner end of the shuttle to be ejected, so that the shuttle will be thrown through the ejecting-throat b^{14} of the shuttle-box B′ when the bottom of said shuttle-box is lowered, so that the shuttle will be positively moved against the pressure of the usual binder.

The rock-shaft f^2 will be designated in the claims as an "actuating-shaft," operative upon failure of the filling, said actuating-shaft through suitable mechanism effecting the transfer of a fresh shuttle from the shuttle-feeder and the ejection of the shuttle the filling whereof has failed.

My invention is not restricted to the precise construction, operation, and arrangement of parts as herein shown, as the same may be modified or rearranged without departing from the spirit and scope of my invention.

When the shuttles are placed in the feeder, the loose ends of filling carried thereby are made fast to any suitable portion of the feeder to retain the end of a filling when its shuttle is transferred to the shuttle-box and thrown through the shed.

As the filling is woven into the web the por-

tion between the selvage and the point to which the filling is attached breaks or is severed in any suitable manner.

Having fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A loom containing the following instrumentalities, viz: a lay having a shuttle-box; a filling-detector; a movable shuttle-feeder independent of the lay; a shuttle-transferrer operative upon failure of the filling to transfer a shuttle from the shuttle-feeder to the shuttle-box, and connections between the transferrer and shuttle-feeder to move the feeder into position for the transfer of a shuttle, substantially as described.

2. A loom containing the following instrumentalities, viz: a lay having a shuttle-box; a filling-detector; a movable shuttle-feeder independent of the lay; a shuttle-transferrer, and means independent of the lay and operative upon failure of the filling to move the shuttle-feeder in unison with the lay and to effect the transfer of a shuttle from the feeder to the shuttle-box, substantially as described.

3. A loom containing the following instrumentalities, viz: a lay having a shuttle-box; a filling-detector; means independent of the lay to support a fresh shuttle; a transferrer, including a rock-shaft, located at the rear of the lay-path, and mounted independently of the shuttle-supporting means, and fingers on said rock-shaft, adapted to engage and transfer a shuttle from its supporting means to the shuttle-box upon failure of the filling, substantially as described.

4. A loom containing the following instrumentalities, viz: a lay having a shuttle-box; a filling-detector; and a shuttle-feeder pivotally mounted above and independent of the lay, and adapted to be moved in unison therewith for a part of its stroke, in juxtaposition to the shuttle-box, combined with a transferrer mounted on a stationary part of the loom, means operative upon failure of the filling to actuate the transferrer and transfer a shuttle from the feeder to the shuttle-box while said feeder is moving in unison therewith and means to move the feeder by or through operation of the transferrer, substantially as described.

5. A shuttle-feeder for looms, comprising end guards having openings therein through which the extremities of a shuttle project, yielding detents to retain and also support the shuttle in the feeder, and side guides to direct the exit of a shuttle, substantially as described.

6. In a loom the following instrumentalities, viz: a lay having a shuttle-box; a movable shuttle-feeder independent of the lay and having an open bottom; yielding detents to engage the lowermost shuttle and retain it in the feeder; an independently-supported transferrer having fingers to engage the projecting ends of the lowermost shuttle and transfer it to the shuttle-box; and means operative upon failure of the filling to move the shuttle-feeder in unison with the lay and at the same time effect the transfer of a shuttle, substantially as described.

7. In a loom adapted to renew its supply of filling when necessary, the lay having a receiving shuttle-box at one end and an ejecting shuttle-box at the other end; a movable shuttle-feeder independent of the lay and adjacent the receiving shuttle-box, containing a supply of shuttles each with its filling; a filling-detector; means to effect the ejection of the spent shuttle; and means independent of the lay, to move the shuttle-feeder in unison with the lay and transfer a fresh shuttle from the feeder to the receiving shuttle-box, said means operating simultaneously upon failure of the filling, substantially as described.

8. In a loom provided with means to renew its supply of filling when necessary, the lay, a shuttle-box thereon provided with two throats, one above the other, means to direct the exit of a shuttle from the box through one of said throats, and across the lay, or through the other throat to be ejected, and a filling-detector, to control the operation of said shuttle-directing means, substantially as described.

9. In a loom provided with means to renew its supply of filling when necessary, the lay, a shuttle-box thereon provided with two throats, one above the other, and a movable bottom, means to move the bottom to direct the exit of a shuttle from the box through either of said throats and a filling-detector to control such means, whereby the shuttle when thrown from the said box either travels across the lay or is ejected, substantially as described.

10. In a loom provided with means to supply a fresh shuttle upon failure of the filling, the lay, a filling-detector; a shuttle-box having a shuttle-ejecting throat, and a throat in alinement with the raceway of the lay, a pivoted bottom for said shuttle-box, slotted for the picker-stick, a detent to retain said bottom in normal position, whereby the shuttle when thrown travels across the lay, and a releasing device, controlled by the filling-detector, to release the shuttle-box bottom from its detent upon failure of the filling, and after the entrance of the shuttle into the said box, whereby the shuttle will be shot through the ejecting-throat and ejected at the next stroke of the picker-stick, substantially as described.

11. In a loom provided with means to supply a fresh shuttle upon failure of the filling, the lay having a shuttle-box provided with an ejecting-throat, a box-bottom mounted to swing vertically, a shuttle-director movable with said bottom, and means operative upon failure of the filling to swing said bottom and move the director to direct the shuttle to said ejecting-throat, to be ejected from the shuttle-box by the picking mechanism at the next pick, substantially as described.

12. In a loom, the lay having a shuttle-box

provided with an ejecting-throat and a movable bottom, and a receptacle beneath the lay, combined with means operative upon failure of the filling to move said bottom to direct a shuttle to said throat as it is thrown from the shuttle-box, to be ejected therefrom, into said receptacle, substantially as described.

13. In a loom, filling-supplying mechanism, and mechanism operative upon failure of the filling to effect the delivery of a fresh supply of filling at one end of the loom and to eject the spent filling-carrier at the other end during the back stroke of the lay, substantially as described.

14. In a loom provided with means to furnish a fresh supply of filling, the lay, a shuttle-box thereon, a filling-detector, and means controlled thereby and operative upon failure of the filling, to eject a spent filling-carrier from the shuttle-box by effecting a change in the direction and location of its normal path of movement as it leaves said shuttle-box during the back stroke of the lay, substantially as described.

15. In a loom provided with means to furnish a fresh supply of filling, the lay, a shuttle-box thereon, a filling-detector, means controlled thereby and operative upon failure of the filling, to eject a spent filling-carrier in the shuttle-box by effecting a change in the direction and location of its normal path as it leaves the inner end of the said shuttle-box during the back stroke of the lay, and means to restore the shuttle-box to normal condition at the next beat of the lay, substantially as described.

16. A loom containing the following instrumentalities, viz: a lay having a shuttle-box; means independent of the lay to support one or more fresh shuttles, and movable adjacent to and in unison with the shuttle-box when a shuttle is to be transferred; means located at the rear of the lay-path and operative upon failure of the filling, to engage and transfer a shuttle from said supporting means to the shuttle-box, and devices independent of the lay to effect the movement of the supporting means, substantially as described.

17. In a loom provided with means to supply a fresh shuttle upon failure of the filling, the lay having an ejecting shuttle-box, coöperating picking mechanism, and means operative upon failure of the filling to effect a change in the direction of the normal path of movement of the spent shuttle, while the latter is in the ejecting shuttle-box, whereby it will be ejected as it is thrown from the said shuttle-box by said picking mechanism, substantially as described.

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

CHARLES A. LITTLEFIELD.

Witnesses:

CALVIN L. JAY,

HERBERT S. MANLEY.