S. TOYODA.

SHUTTLE CHANGING LOOM.

APPLICATION FILED JUNE 6, 1910.

1,018,089.

Patented Feb. 20, 1912.

3 SHEETS—SHEET 1.

Fig. 1.

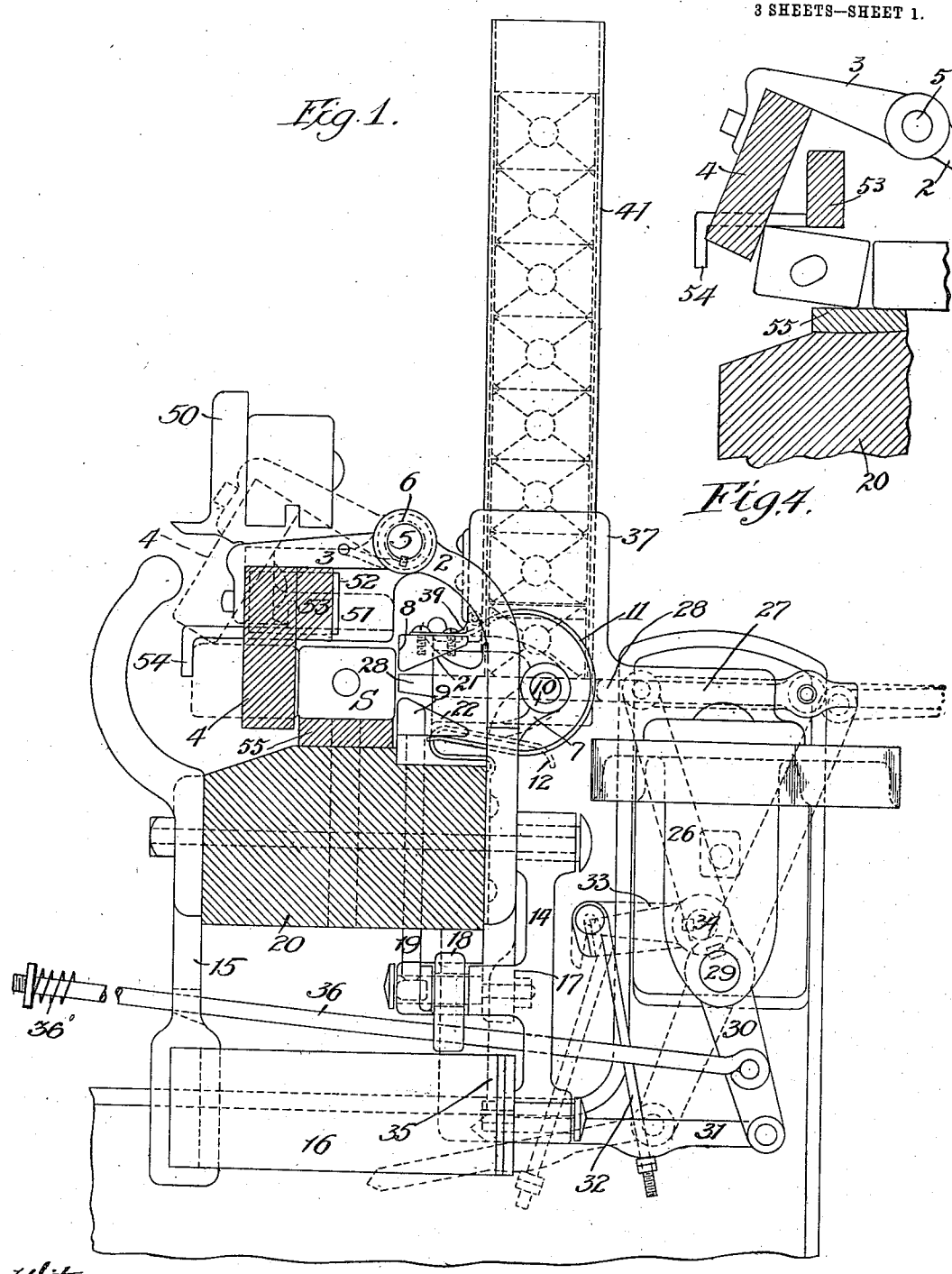

Fig. 4.

Witnesses:

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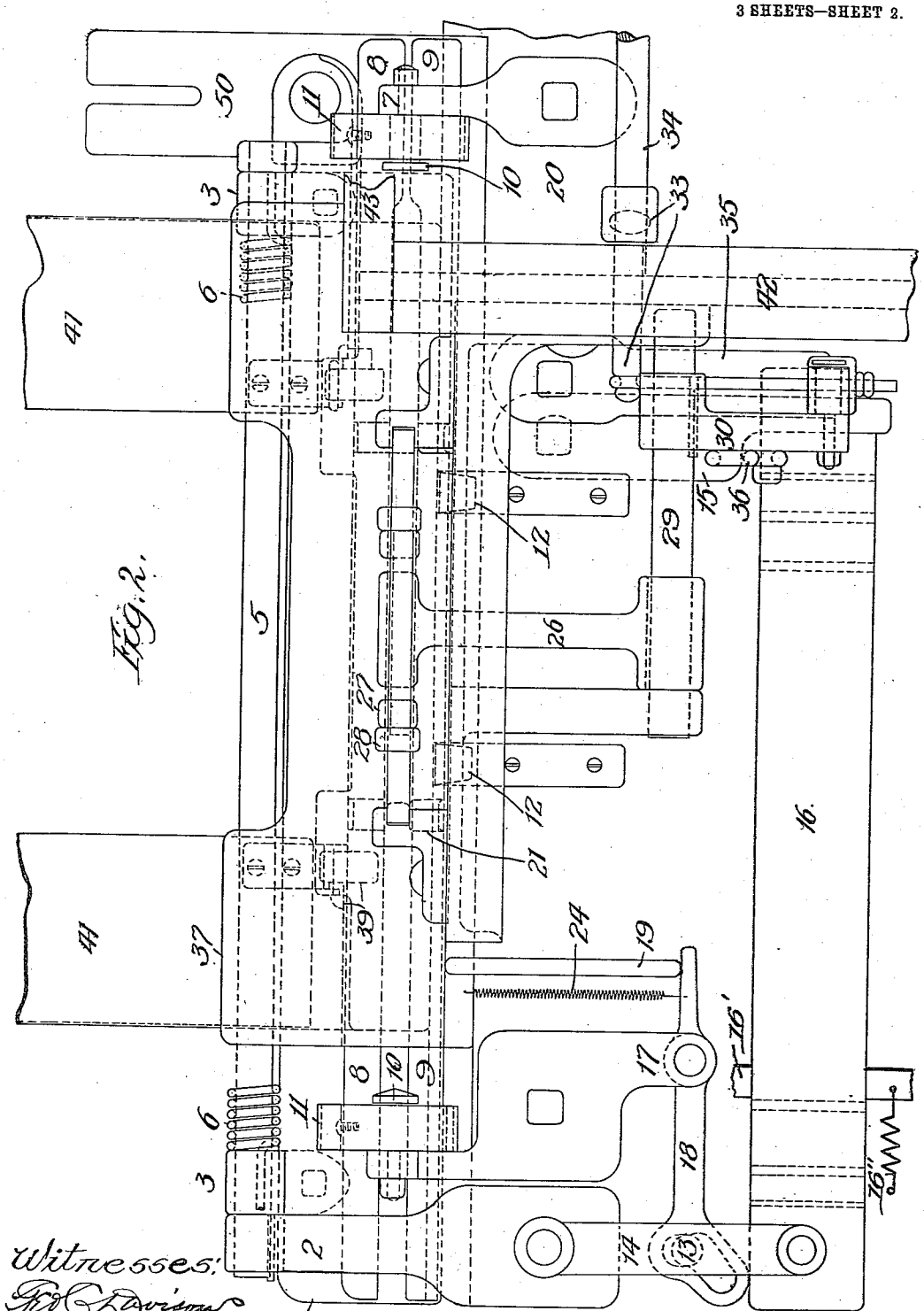

Fig. 2.

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3 SHEETS—SHEET 3.

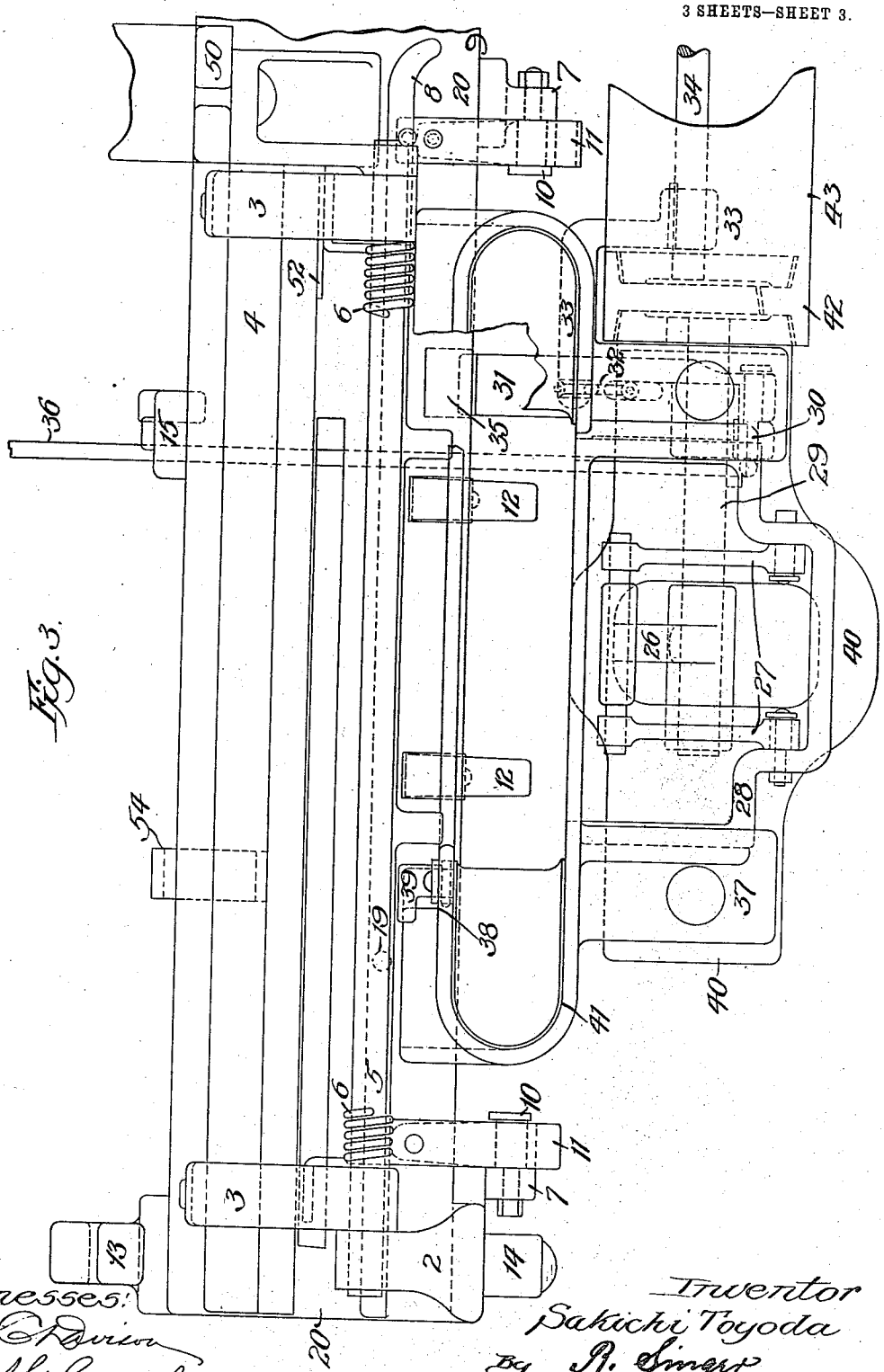

Fig. 3.

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UNITED STATES PATENT OFFICE.

SAKICHI TOYODA, OF NAGOYA, JAPAN.

SHUTTLE-CHANGING LOOM.

1,018,089. Specification of Letters Patent. Patented Feb. 20, 1912.

Application filed June 6, 1910. Serial No. 565,349.

To all whom it may concern:

Be it known that I, SAKICHI TOYODA, a subject of the Emperor of Japan, residing at Shimasaki-cho, Nagoya, in the Empire of Japan, have invented a certain new and useful Improvement in Shuttle-Changing Looms; and I do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement.

One of the objects of this invention is to provide a shuttle box wherein one wall portion thereof is movable for the purpose of permitting the discharge therethrough of a spent shuttle.

A further object of the invention is to provide a reserve shuttle holder or magazine, in the construction of which, there are included movable doors or flaps where through a shuttle may be projected into the shuttle box and whereby the projection of the reserve shuttle serves to eject the spent shuttle, from the shuttle box. In this connection a feature of novelty consists in so arranging the doors or flaps that the same may act to form one wall or closure for the shuttle box.

A further feature of novelty resides in the arrangement whereby on the forward movement or beat of the lay, the complete operation of ejecting a spent shuttle and inserting a reserve shuttle, is effected thereby avoiding any inaccuracy that might otherwise result should this operation be performed during or in the course of movement of the lay in two directions.

A further feature of novelty resides in an improved means for shifting the picker check strap so that the picker stick is permitted to move the picker out of engagement with the spent shuttle to permit ejection thereof from the shuttle box.

Other features of novelty will be more fully described in connection with the accompanying drawings and will be more particularly pointed out in and by the appended claims.

In the drawings—Figure 1 is a cross sectional view, with parts in elevation, of a form of loom embodying my invention. Fig. 2 is an elevation thereof looking from the right of Fig. 1, with the lay omitted. Fig. 3 is a plan view thereof. Fig. 4 is a detail view showing the discharge of an exhausted shuttle.

Like numerals of reference designate similar parts throughout the different figures of the drawings.

The lay, which may be arranged to be swung to and fro in the usual manner, is indicated at 20 and is provided with a shuttle race 55. The shuttle box is formed in part by an upper wall portion 53, which may be rigidly mounted in any desirable manner, and a back wall 4, which is mounted to be swung or opened to permit ejection of a spent shuttle. As illustrated, mounting arms 2 are rigidly secured to the lay 20 and form bearings at their upper ends for a shaft 5, which is rigidly secured therein. Loosely mounted on the shaft 5 are arms 3, to which the back wall 4 is rigidly secured. Springs 6, secured to said shaft 5 and arm 3, normally hold the back wall 4 in the position shown in full lines in Fig. 1, to hold the working shuttle in position in the shuttle-box and permit the back wall 4 to be swung into the position shown in dotted lines in said figure. Guards 54 are rigidly secured to the upper wall portion 53 and may extend outwardly therefrom past the wall 4 where their outer ends are bent downwardly to intercept the rearward travel of an ejected shuttle in a manner to be hereinafter more fully described.

A magazine 41, which is supported on frame 42, is provided, for holding the reserve shuttles in superposed relation and is arranged to permit the superposed reserve shuttles to descend by gravity as the lowermost shuttle thereof is ejected or fed into the shuttle-box. At the lower end of the magazine, a base portion 37, is provided and the front wall thereof, or that wall facing the lay, is opened to permit of the transfer of the shuttles from the magazine to the shuttle-box. A retainer or spring hinged flap 39 is pivotally mounted on the front wall of the base 37 and projects into the opening in said front wall and into the path of transfer of the shuttles toward the shuttle-box. Preferably the shuttle retainer 39 is normally held by its own weight, or a spring, in an obstructing position and is permitted to allow of passage of a reserve shuttle out of the magazine. It will be seen by reference to Fig. 1, that the spring

hinged flap or retainer 39 lies in the path of the lowermost shuttle and must be turned or swung upwardly thereby when the lowermost reserve shuttle is fed into the shuttle box. It will thus be seen that this spring hinged flap 39 forms a stop for the upper side of the shuttle during the feeding movement thereof into the shuttle box.

That portion of the wall of the shuttle-box nearest the magazine is, in the present construction, formed by an upper flap or door 8 and a lower flap or door 9, and the same are provided on their outer faces with vertical portions to form wall surfaces for the shuttle-box, to retain a shuttle therein, and on their lower and upper portions, respectively, said flaps are inclined at 21 and 22. The inclinations diverge from the vertical portions toward the magazine so that when a reserve shuttle is advanced toward and through said inclined portions the parts 8 and 9 will be forced upwardly and downwardly, respectively, to permit passage of the shuttle. Spring 11 holds the flaps 8 and 9 in the position shown and permit divergence for the purpose set forth. Said flaps 8 and 9 are pivotally mounted on shafts or rods 10 supported on the lay 20.

If desired, a yielding shuttle guide 12 may be secured to the lay as clearly as shown in Fig. 1.

An ejector is provided for transferring the reserve shuttles from the magazine base to the shuttle-box, and as shown, said ejector is in the form of a U-shaped yoke 28, which is longitudinally movable toward and from the lowermost shuttle in the magazine. Links 27 are connected with said ejector 28, as shown in Fig. 3, and also to a lever 26, which is mounted upon a shaft 29. To a lever 30, fixed on shaft 29, is pivotally mounted a dagger 31 adapted for engagement with a bunter 35 secured on the lay 20.

A device is provided for restoring the ejector to a normal position and, as shown, said device comprises a rod 36 pivotally mounted to the lower end of the lever 30 and projecting through a check strap support 15, mounted on the lay 20, as clearly shown in Fig. 1. On the outer end of the rod 36 a spring 36′ is adjustably mounted to cushion the restoring action imparted to the rod 36 by movement of the lay.

A shaft 34 is adapted for operative connection with the weft fork mechanism of the loom, in any desirable manner not shown, so that when the weft becomes exhausted or broken the weft fork mechanism will automatically rock the shaft 34. There are many ways in which this connection may be effected, and as this connection is a common mechanical expedient in looms, such connection in not shown and described in detail. On the shaft 34 is mounted an arm 33, from which a rod 32 depends and which rod 32 is adjustably connected with the dagger 31. When the weft is intact, the shaft 34 will be in a position such as to hold the dagger 31 out of the path of the bunter 35, but when the weft thread breaks the shaft 34 will raise the arm 33 to bring the free end of the dagger 31 into the path of the bunter, and thereby actuate the ejector. When the weft thread breaks or is exhausted the weft fork mechanism will partially rotate shaft 34 and raises dagger into the path of the bunter 35.

It is well known that the picker is usually in engagement with the shuttle in such a manner that engagement must be released before a spent shuttle can be ejected from the shuttle-box. It is also well known that the picker stick is spring tensioned for movement in a direction away from the shuttle. One of the objects of my invention is to permit the picker mechanism to yield rearwardly or away from the shuttle so as to readily permit the transference or feeding movement of a full shuttle into the shuttle box and the discharge of an exhausted shuttle therefrom. Although I do not wish to be limited to the construction shown, except for such limitations as the claims import it may be stated that it is also one of the objects of my invention to cause the full shuttle to operate means which is adapted to permit yielding movement of the picker mechanism, and it is especially advantageous to cause the full shuttle to operate said means prior to its entrance into the shuttle box, by reason of which, the picker mechanism is adapted to be moved out of engagement with the exhausted shuttle just prior to the transferring movement of the shuttles. Now, it is one of the objects of this invention to automatically shift the check strap of the picker stick so as to permit movement of the latter under the action of its spring a sufficient distance to disengage the picker from the shuttle and permit of ejection thereof. In describing this feature of the invention it will be sufficiently clear to show the mechanism for shifting the check strap of the picker stick.

A check strap is indicated at 16 and is slidably mounted at one end, or near one end, in a guide 15, Figs. 1 and 2. At its other end said strap is mounted upon a link 14, pivotally secured to one of the bearing arms 2, as clearly shown in Fig. 2. The link 14 is provided with a stud 13 and a lever 18 is provided with a cam portion, preferably in the form of a slot, for engagement with said stud. The lever 18 is pivotally mounted on a part 17, which is rigidly secured to the lay 20. The opposite end of said lever 18 is engaged by a rod 19 which extends through the lay 20 and is arranged to be actuated by downward movement of the flap or door 9. A

spring 24 serves to hold the lever 18 in the position shown in Fig. 2. The picker stick 16′ is indicated in Fig. 2 and is provided with a spring 16″ which normally tends to draw the picker stick to the left. The spring is diagrammatically indicated and may be connected to any suitable stationary part.

While the operation of the device of my invention may be obvious from the foregoing, it will be briefly recapitulated as follows: When the weft thread breaks, or is exhausted, the shaft 34 is operated and the dagger 31 is raised so that upon movement of the lay toward the magazine, the bunter 35 will engage the dagger 31 and, acting through levers 30 and 26 will operate the ejector 28 and cause the same to move to the left of Fig. 1. The ejector 28 will engage the right hand side of the lowermost shuttle, forcing the same against the retainer 39, thereby causing same to swing upwardly, and then spreading the flaps 8 and 9 to permit the reserve shuttle being fed into the shuttle-box and onto the shuttle race 55. The reserve shuttle will first engage the exhausted shuttle, thereby forcing the latter against the inner face of the rear wall 4, and forcing the latter outwardly and upwardly into the dotted line position shown in Fig. 1. When this has been accomplished the reserve shuttle will occupy the position in the shuttle-box previously occupied by the exhausted shuttle, and the latter will be forced outwardly until it is arrested by the guard 54. The movement of the ejector is so rapid and sudden that if it were not for the guard 54 and the spring held back wall 4, the exhausted shuttle would be projected rearwardly in a dangerous manner and so as not to be readily accessible for replenishing purposes. The guard 54 momentarily arrests outward movement of the exhausted shuttle and so holds the same between it and the reserve shuttle, which has been fed into the shuttle-box. As will be seen by reference to Fig. 4 the exhausted shuttle tends to follow the changing inclination of the back wall 4 as the latter opens but is limited by the guard 54 which limits the inclination of the exhausted shuttle during its discharging movement. As soon as the lower end of the wall 4 is raised above the left side face of the exhausted shuttle the latter will bear against the downturned end of the guard 54 and the back wall 4 will bear upon the top of the exhausted shuttle and immediately force the same downward upon the inclined portion of the lay 20. The back wall 4 will thereafter assume the position shown in full line in Fig. 1. From the foregoing description, and with special reference to Fig. 4, it will be seen that there is a very decided coaction between the discharge portion 4 and the guard 54. When the portion 4 moves upwardly and outwardly as the result of the transferring movement of the discharge shuttle thereagainst, the friction between the exhausted shuttle and the portion 4 lifts the exhausted shuttle toward the guard 54. Likewise the friction between the exhausted shuttle and the guard additionally increases the resistance against outward movement of the exhausted shuttle and the two coacting forces cause the exhausted shuttle to move outwardly in a substantially horizontal plane and not to descend until after the portion 4 has reached the top of the exhausted shuttle so as to forcibly depress the exhausted shuttle and get it out of the way so that the portion 4 can close down into the position shown in Fig. 1. It will be understood that as soon as the reserve shuttle has been fed into position, the flaps 8 and 9 will prevent any retraction of the reserve shuttle toward the right of Fig. 1 and it will also be obvious that the remaining shuttles in the magazine will descend onto the ejector 28. The ejector 28, however, will permit the parts 39, and 8 and 9, to assume a normal position just as soon as the reserve shuttle has reached the shuttle-box. Now, the exhausted shuttle, which is in the dotted line position, has forced the back wall 4 upwardly and outwardly against the action of springs 6 and the tension of the springs 6 will be exerted upon the wall 4 to cause the exhausted shuttle to descend from between the guard 54 and the reserve shuttle down onto an inclined portion of the lay and from thence into any suitable receptacle accessible. The dislodgment of the exhausted shuttle by the rear wall 4 permits the latter to again assume a normal position, as shown in full lines, in Fig. 1. Now, during the outward movement of the reserve shuttle from the magazine toward the shuttle-box, the flap 9 will have been depressed and such depression, acting on the rod 19, will lift the left hand end of the lever 18, Fig. 2, thereby causing the cam slot to shift the link 14 and the check strap 16 to the left of Fig. 2, for a slight distance. It will be obvious that this shifting movement will occur just prior to the engagement of the lowermost reserve shuttle with the exhausted shuttle in the shuttle-box, and that thereby this shifting movement will enable the spring of the picker stick to move the picker out of engagement with the exhausted shuttle, just prior to the ejection thereof from the shuttle-box. Immediately after the check strap has been shifted, the reserve shuttle will have passed into the shuttle-box, thereby releasing the flap 9 and allowing the spring 24 to return the lever 18 to the position shown, and thereby restoring the picker stick and its picker to a normal position with the picker in engagement with the reserve shuttle. It will thus be seen that I not only

automatically release the picker from the exhausted shuttle, prior to ejection thereof, but that I also automatically and immediately thereafter reëngage the picker with the newly positioned reserve shuttle.

One of the special advantages of this construction is that all of the foregoing operations are completed during the swinging movement of the lay in one direction, which in the present construction is toward the magazine, and it will thus be seen that the shuttle changing operation is quickly and effectively carried out and no inaccuracy of operation is made possible by reason of dependence upon movement of the lay in two directions, or reverse directions, in the performance of this function. When the lay swings toward the left of Fig. 1, the dagger 31 will be released from the bunter and will be permitted to swing downwardly out of contact therewith, it being understood that the weft fork mechanism has just previously permitted the arm 33 to descend. The part 15 will, on further movement of the lay, engage the spring of the rod 36, thereby restoring the ejector 28 to a starting position, through levers 30 and 26. The withdrawal of the ejector will permit the reserve shuttles, previously supported thereby, to descend in the magazine, so that the lowermost reserve shuttle will be in a position for ejection when the weft thread again breaks or is exhausted.

I claim:—

1. A shuttle changing loom comprising in combination, a swinging lay, a shuttle-box therefor, flaps or doors forming an entrance wall for said box on one vertical side thereof, a movable portion constituting an exit wall on the opposite vertical side of said box and adapted to be opened by an exhausted shuttle when discharged, means acting to restrain the opening movement of said portion, a magazine for reserve shuttles opening toward said flaps, and horizontally acting ejecting means actuated upon movement of the lay in one direction for feeding a reserve shuttle between said flaps into said box and causing said reserve shuttle to discharge the exhausted shuttle through said exit wall.

2. A shuttle changing loom comprising in combination, a swinging lay, a shuttle-box therefor, side flaps or doors forming a vertical entrance wall for said box, a magazine for reserve shuttles opening toward said flaps, and horizontally acting ejecting means actuated upon movement or beat of the lay in one direction and projecting between said flaps for feeding a reserve shuttle therebetween into said shuttle-box and causing discharge of the exhausted shuttle.

3. A shuttle changing loom comprising in combination, a swinging lay, a shuttle-box therefor, side flaps or doors forming a vertical entrance wall to said box, a bunter for said lay, a dagger for engagement with said bunter, means adapted for operation by a weft fork for moving said dagger into the path of said bunter, a magazine for reserve shuttles opening toward said door, and horizontally acting ejecting means operated by said dagger and projecting between said flaps to feed a reserve shuttle toward and against an exhausted shuttle to discharge the latter.

4. A shuttle changing loom comprising in combination, a swinging lay, a shuttle-box therefor, flaps or doors forming an entrance wall to said box, a magazine for reserve shuttles opening toward said doors, ejector mechanism operated upon movement of the lay in one direction for feeding a reserve shuttle between said flaps and into said box and discharging the exhausted shuttle therefrom, a picker check strap for said lay, and means operated upon movement of one of said flaps for shifting said check strap, allowing the picker stick to yield rearwardly, substantially as and for the purpose set forth.

5. A shuttle changing loom comprising in combination, a swinging lay, a shuttle-box therefor, an upwardly swinging portion constituting an exit wall from said box and adapted to be opened by an exhausted shuttle when discharged, a guard for arresting outward and upward movement of the discharging shuttle, and a spring for actuating said movable portion to restore the same to a normal position and discharge the shuttle from said guard.

6. A shuttle changing loom comprising in combination, a swinging lay, a shuttle-box therefor, a pivotally mounted discharge wall for said box, means for discharging an exhausted shuttle from said box and engaging the shuttle with said wall to force the wall to a point above said shuttle, a guard limiting movement of the shuttle upwardly with said wall and having a portion arresting outward movement of the shuttle and a spring acting through said wall to discharge the shuttle and restore the wall to a closed position.

7. A shuttle changing loom comprising in combination, a swinging lay, a shuttle-box therefor, a pivotally mounted discharge wall for said box, means for discharging an exhausted shuttle from said box and engaging the shuttle with said wall and force the wall to a point above said shuttle, a guard limiting movement of the shuttle upwardly with said wall, and means acting through said wall to discharge the shuttle and restore the wall to a closed position.

8. A shuttle changing loom comprising in combination, a swinging lay, a shuttle box therefor, a movable portion forming an exit wall for said box and mounted to move or

swing in an upward direction and be opened by engagement of a discharged shuttle therewith, and means preventing the shuttle from following the upward movement of said portion, substantially as described.

9. A shuttle changing loom comprising in combination, a swinging lay, a shuttle box therefor, a discharge wall for said box adapted to be opened by engagement therewith of a shuttle when being ejected, and means acting through said wall to discharge the ejected shuttle, substantially as described.

10. A shuttle changing loom comprising in combination, a swinging lay, a shuttle box therefor, a magazine for supplying shuttles to said box having its front portion spaced apart therefrom, swinging flaps forming an entrance wall to said box, and a spring hinged flap on said magazine projecting in front of the lowermost magazine shuttle and adapted to be raised and form an upper stop for such lower shuttle during its passage from the magazine to the shuttle box.

11. In a shuttle changing loom, in combination, a swinging lay and shuttle box, mechanism for feeding a full shuttle into said box and discharging the exhausted shuttle therefrom, a picker stick and check strap, and means operated upon transferring movement of the shuttles for shifting the check strap and allowing the picker stick to yield rearwardly.

12. In a shuttle changing loom, in combination, a swinging lay and shuttle box, mechanism for feeding a full shuttle into said box and discharging the exhausted shuttle therefrom, a picker stick and check strap, and means operated by the feeding movement of the full shuttle prior to its entrance to the shuttle box for shifting the check strap and allowing the picker stick to yield rearwardly.

13. In a shuttle changing loom, in combination, a swinging lay and shuttle box, picker mechanism, mechanism for feeding a full shuttle into and discharging an exhausted shuttle from said box, and means operated upon the transfer or feeding movement of the shuttles for allowing the picker mechanism to yield away from the shuttle upon the feeding or transfer movement thereof.

In testimony whereof I affix my signature in presence of two witnesses.

SAKICHI TOYODA.

Witnesses:
UHACHI ISHIMARA,
GENJI KURIBARA.