

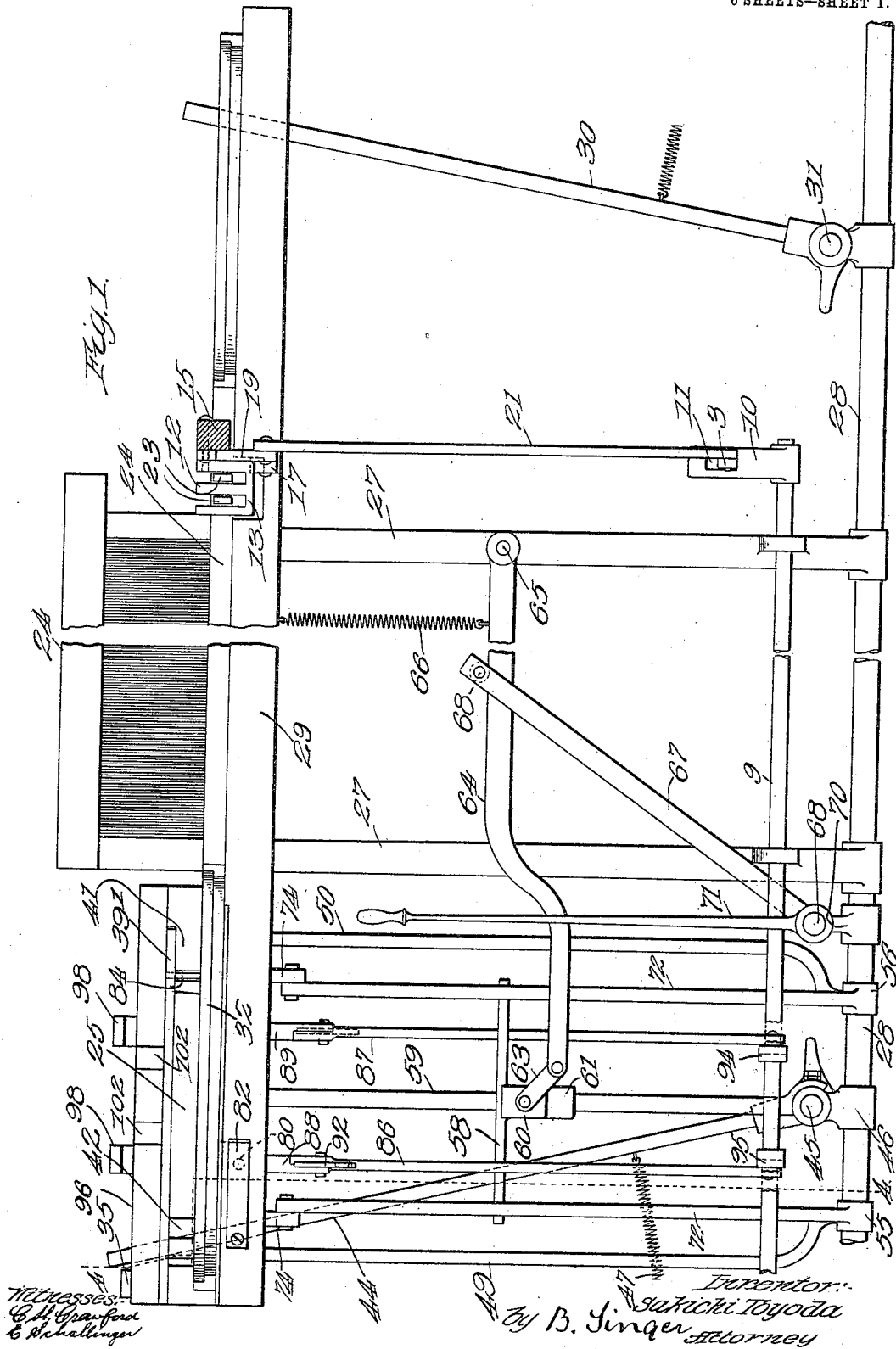
S. TOYODA.
AUTOMATIC SHUTTLE CHANGING MECHANISM.

APPLICATION FILED APR. 20, 1908.

Patented Mar. 22, 1910.

6 SHEETS—SHEET 1.

952,652.



S. TOYODA.

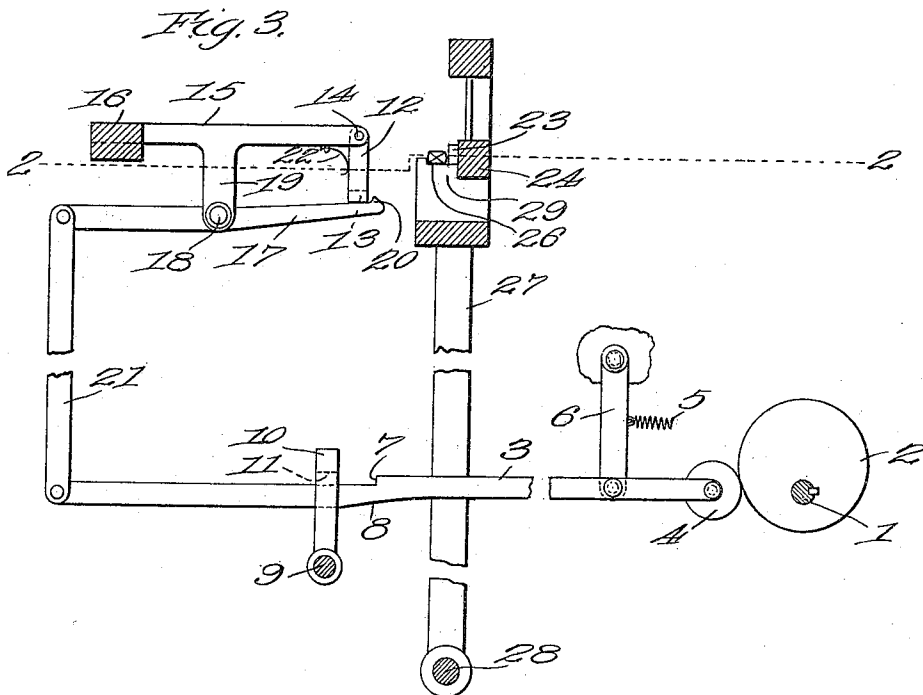
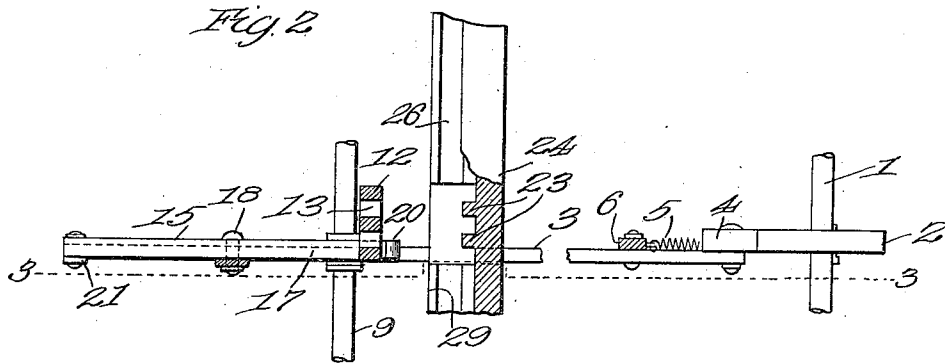
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6 SHEETS—SHEET 2.



Witnesses:-

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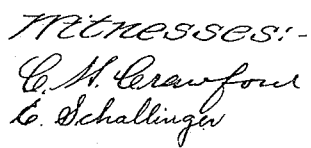
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AUTOMATIC SHUTTLE CHANGING MECHANISM.

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6 SHEETS—SHEET 4.

Fig. 5.

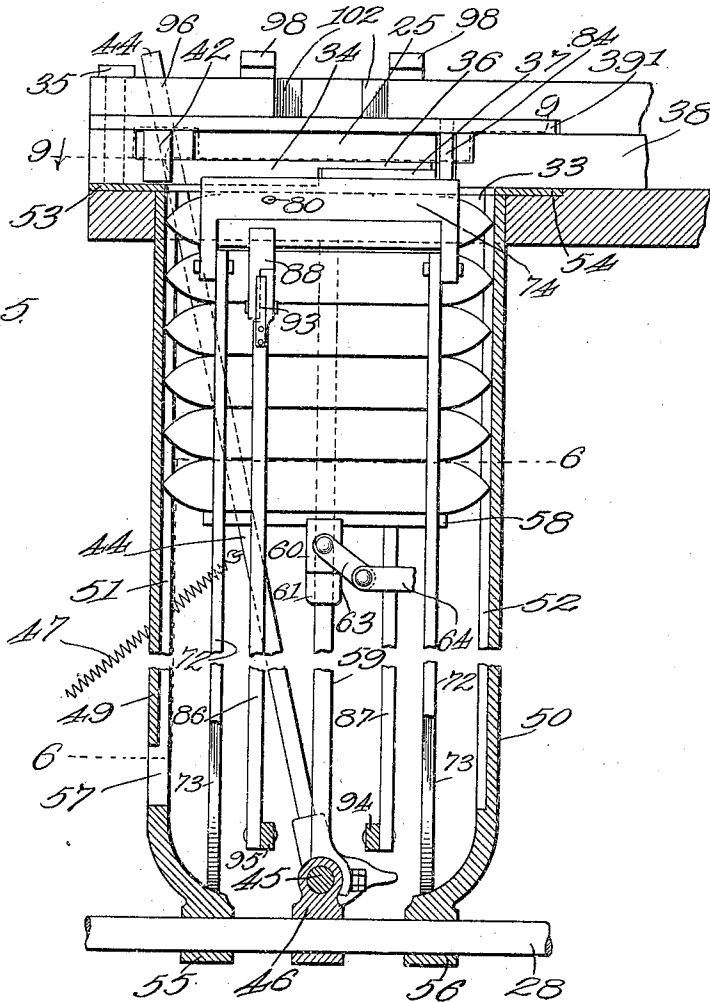
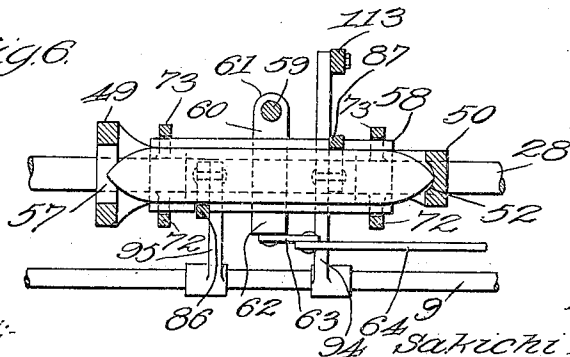


Fig. 6.



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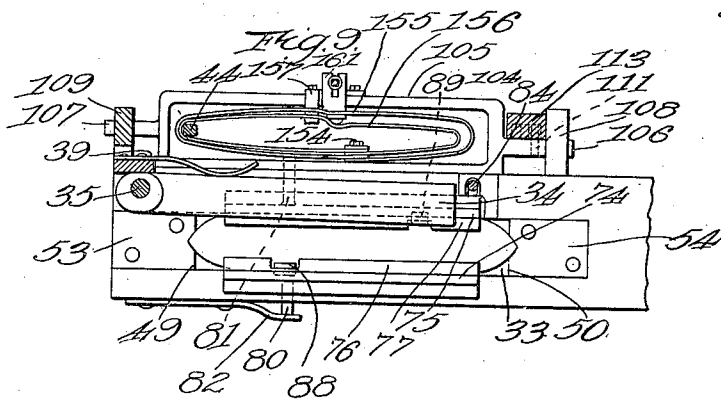
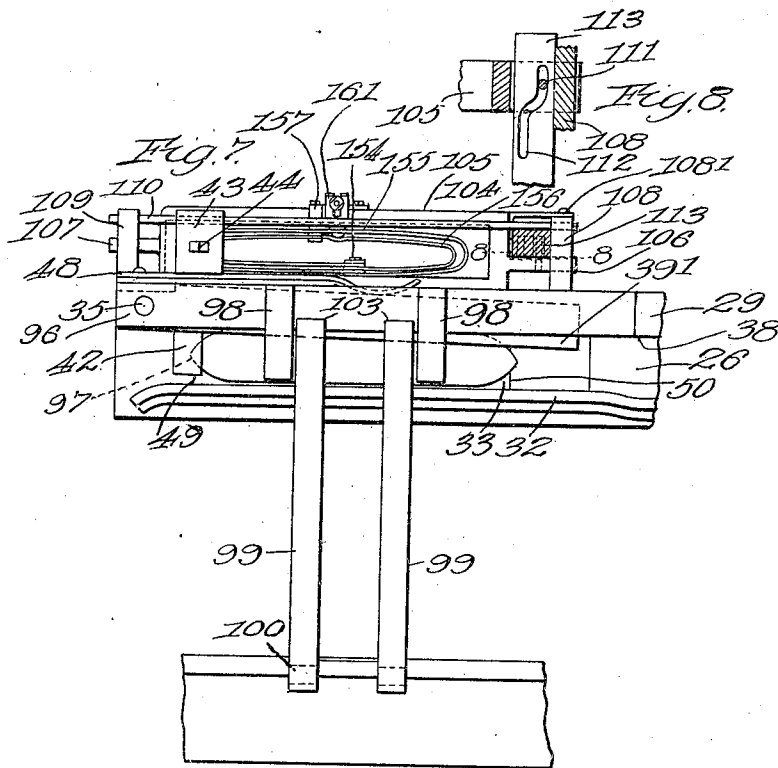
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APPLICATION FILED APR. 20, 1908.

952,652.

Patented Mar. 22, 1910.

6 SHEETS—SHEET 5.



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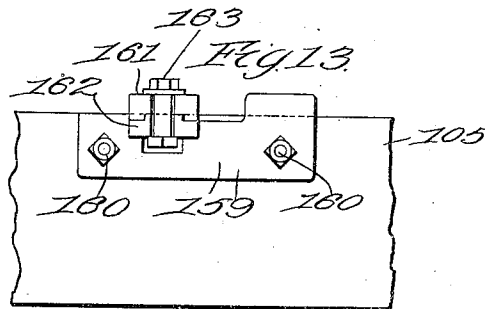
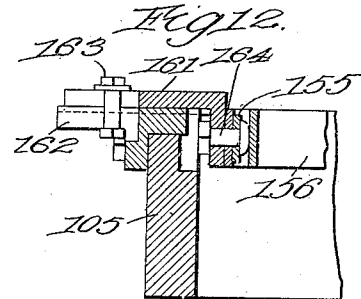
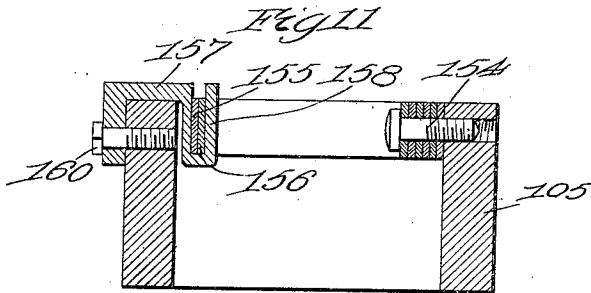
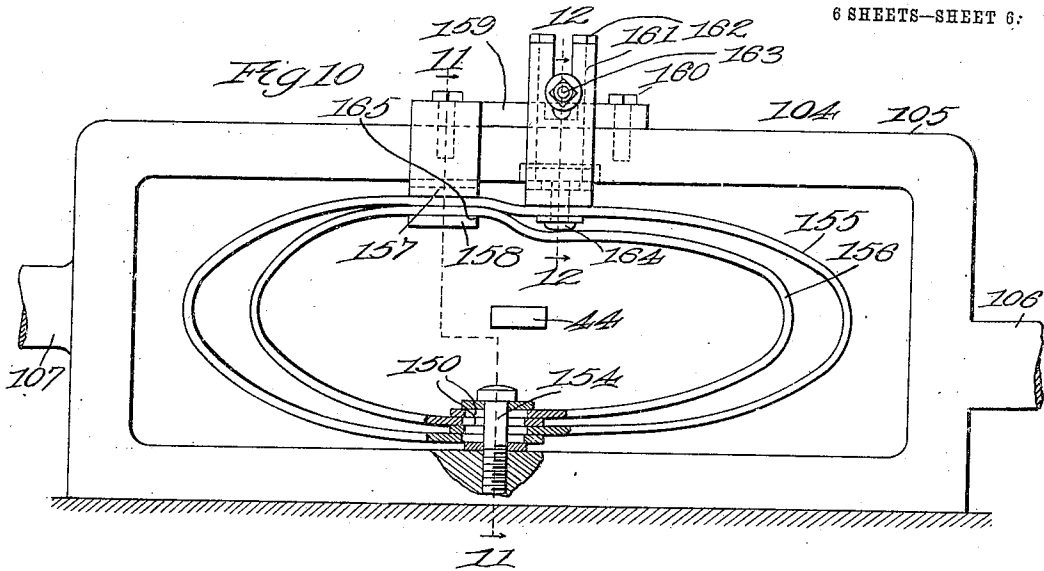
Attorney

S. TOYODA.
 AUTOMATIC SHUTTLE CHANGING MECHANISM.
 APPLICATION FILED APR. 20, 1908.

952,652.

Patented Mar. 22, 1910.

6 SHEETS—SHEET 6.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC SHUTTLE-CHANGING MECHANISM.

952,652.

Specification of Letters Patent. Patented Mar. 22, 1910.

Application filed April 20, 1908. Serial No. 428,218.

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 certain new and useful Improvements in an Automatic Shuttle-Changing Mechanism, of which the following is a specification.

This invention relates to improvements in looms and has for its object the provision of means for automatically discharging a shuttle upon breakage of a weft thread and inserting another shuttle in its place without the necessity of stopping the loom. According to this invention the means for inserting the shuttle is operated by cooperating devices which operate in a given manner in connection with the weft thread when the same is intact and prevent operation of the shuttle supplying means, said devices serving, when the weft thread breaks, to operate in a manner to actuate the shuttle supplying means.

The invention will be more fully described in connection with the accompanying drawings and will be more particularly pointed out and ascertained in and by the appended claims.

In the drawings:—Figure 1 is a front elevation of a loom embodying the main features of my invention. Fig. 2, is a sectional view on line 2—2 of Fig. 3, showing the stop motion mechanism which operates in conjunction with the weft thread. Fig. 3, is a sectional view taken on line 3—3 of Fig. 2. Fig. 4, is a sectional view taken on line 4—4 of Fig. 1. Fig. 5, is a sectional view taken on line 5—5 of Fig. 4. Fig. 6, is a sectional view taken on line 6—6 of Fig. 5. Fig. 7, is a plan view of one end of the loom. Fig. 8, is a detail sectional view on line 8—8 of Fig. 7. Fig. 9, is a sectional view taken on line 9—9 of Fig. 5. Fig. 10 is a plan view with parts in section of an improved mechanism for supporting the picker leather. Fig. 11, is a sectional view on line 11—11 of Fig. 10. Fig. 12, is a sectional view on line 12—12 of Fig. 10. Fig. 13, is a rear view of a portion of the apparatus shown in Fig. 10. Like numerals of reference designate similar parts throughout the different figures of the drawings.

The invention will now be described in connection with the specific embodiment shown but it will be understood that the invention is not to be limited by such specific

showing except for such limitations as the claims import.

Considering the invention generally it consists in a swinging lay structure provided with a reed and a shuttle race and provided at one end of the shuttle race with means, mounted to swing with the lay, for holding a plurality of reserve shuttles and adapted upon breakage of a weft thread to discharge the operating shuttle from the shuttle race and insert therein one of the reserve shuttles whose thread is intact, this operation being effected without stopping the loom. The said means cooperate with the picker mechanism operating the shuttle in such a manner that the discharge of the operating shuttle having a broken weft may be effected and the insertion of a reserve shuttle brought about without interfering with the operation of said picker mechanism. The means for inserting reserve shuttles is at all times in readiness for operating and is actuated by or through the medium of devices which are so constructed that when they engage an intact weft thread the said means will be prevented from operating and when they engage a broken weft thread they will serve to operate the means for discharging the operating shuttle and insert in its place one of the reserve shuttles.

Considering the invention more specifically and with special reference to the actuating devices cooperating with the weft thread as shown in Figs. 1, 2 and 3, 1 designates the main shaft to which is secured a cam 2. A reciprocating bar 3 is desirably provided with a roller 4 which is normally held in engagement with the cam 2 desirably by means of a spring 5 acting through a swinging supporting link 6 pivotally secured to said bar 3 and supporting the same at one end in prescribed relation with respect to the cam 2. Said bar 3 is provided with a stop 7, which as shown is in the form of a shoulder, and also with a releasing portion which as shown is in the form of a recessed or curved part 8 formed in the bar 3. An actuating member for the shuttle supply means is shown in the form of a shaft 9 provided with a lever 10 having an aperture or slot 11 through which the bar 3 passes. Said bar 3 and arm 10 constitutes cooperating stop motion members the operation of which is controlled and varied by the weft operating devices. The slot 11, shoulder 7 and curved portion 8 are so dis-

posed and proportioned with respect to each other that when the bar 3 is held in the substantially horizontal position shown and reciprocated by the cam 2 the shoulder 7 will engage the arm 10 and rock the shaft 9 but when the bar 3 is lowered slightly from a horizontal position and reciprocated by the cam the curved portion 8 will permit the shoulder 7 to pass freely through the slot 11 without operating the arm 10 and rocking the shaft 9.

I will next describe in detail the weft operating device with which the bar 3 is operatively associated and controlled to perform the functions stated.

A comb 12, having its teeth connected preferably at their lower ends at 13 to form a rigid structure, is pivotally mounted at 14 to a supporting bar 15 which latter is secured to any suitable stationary part such as 16.

As shown in Fig. 1 the comb 12 is located slightly beyond one end of the reed and in the path of the movement thereof. A retaining lever 17 is pivotally mounted preferably at 18 on a depending arm 19 of the support 15 and is provided at one end with a latch shaped portion 20 adapted for engagement with the lower portion of the comb 12. The opposite end of said lever 17 is connected with the bar 3 by a link 21. In the position shown in Figs. 2 and 3 the retaining lever 17 is in the normal or retaining position and grips the lower portion of the comb 12 thereby holding the bar 3 in such a position that the shoulder 7 will not pass through the slot 11 but will engage and rock the arm 10. A spring 22 normally holds the comb 12 in the position shown. When the comb 12 is swung rearwardly on its pivot the latch end 20 of the lever 17 is permitted to rise and the bar 3 falls by gravity so that it rides upon the lower end of the slot 11 in which position the recessed portion 8 permits the stop 7 to pass through the slot 11 freely thereby imparting no movement to the arm 10.

I will now describe the cooperating member of the comb 12 and the manner in which the parts cooperate to perform the function just described. A comb member 23, mounted on the reed 24, consists of projections adapted to register with the openings of the comb 12. The comb member 23 is located abreast of the shuttle race 26 (which together with the reed will be hereinafter described in detail) and the weft thread, paid out by the shuttle, extends transversely across the face of said projections. Assuming that the weft thread is intact the rearward or non-filling swinging movement of the lay and reed will bring the comb member adjacent the comb 12 and the thread intervening the comb 12 and projections will prevent the same from entering the comb recesses or

openings thus the comb will be swung rearwardly on its pivot, against the action of the spring 22, permitting the latch end 20 to raise and allowing the bar 3 to descend by gravity so that it will rest on the curved portion 8 and the stop 7 will pass freely through the slot 11. If however the weft thread should break, the forward movement of the reed would merely cause the projections to enter the comb recesses and the comb 12 will not be displaced from the position shown in Fig. 3 and the bar 3 will be held or supported by the retaining lever 17 so as to prevent the stop 7 from passing through the slot 11 which will result in engagement between the stop 7 and arm 10 and consequent rocking of the shaft 9.

I will next describe the shuttle feeding means and the operation thereof which results from rocking the shaft 9.

As shown the lay consists of supporting members 27 mounted upon a rod 28. The reed 24 together with the shuttle race member 29, in which latter the shuttle race 26 is formed, are mounted on the supporting members 27. Any suitable means for imparting the usual swinging movement to the lay may be provided but as such means constitute no feature of the present invention it is not herein shown. The shuttle race extends some distance to the right of the reed at Fig. 1 for the purpose of accommodating suitable picker mechanism which is indicated merely by a picker 30 pivoted at 31 to a suitable mounting anchored upon the rod 28. As the invention does not apply to this portion of the loom a detailed showing and description will not be made.

Referring to that portion of the shuttle race extending from the left hand side of the reed 24 and the parts associated therewith, 32 designates the front wall of the shuttle race the base of which is provided with an opening or passage 33 approximately the length of a shuttle and located at approximately the limit of travel of the shuttle toward the left, said opening serving to permit insertion of the reserve shuttles in the manner now to be described. The rear wall of the race way adjacent the shuttle opening or passage 33 is provided with a shuttle retarding member whose function is to engage the shuttle and retard its movement toward the left of the race prior to stoppage of the shuttle by the picker and to prevent rebounding of the shuttle as a result of its impact. As shown said retaining member consists of a bar or lever 34 pivoted at one end upon a stud 35 extending upwardly from the extreme end of the shuttle race member 29. At its forward or free end 36 said member is reduced and overlaps a reduced portion 37 of the rear wall 38 of the race shuttle. A spring 39 engaging said member 34 acts upon the same yieldingly to

maintain the free end projecting a slight extent into the path of the shuttle. Means are provided which preferably overhangs the shuttle race, for preventing the shuttle from rising vertically out of the shuttle race, while the weft thread is intact and the shuttle is operating under normal conditions said means being capable of being retracted when the operating shuttle is removed and a reserve shuttle fed into position. As shown said means consists of a plate 39' desirably provided with a chamfered margin 40 adapted to overhang the race way. At one end said plate 39' is pivotally mounted on the stud 35 and rests upon an upwardly extending portion 41. A space 25 between the plate 39' and said member 34 is provided in which an extension 42 of the picker 43 operates. A spring 48 mounted at one end to any suitable stationary part engages with its free end the free end of said plate 39' and normally holds the latter in the position shown in Fig. 3 with its chamfered margin overhanging the shuttle race. The manner in which the plate 39' is retracted to permit discharge of an operating or exhausted shuttle and the insertion of a reserve shuttle will be hereinafter described. Said extension 42 is connected with and actuated by a picker bar 44 mounted at its lower end on a picker spindle 45 which, as shown, is transversely disposed with respect to the rod 28. A mounting 48 carried by the rod 28 forms a support in which the spindle 45 is rigidly secured. A spring 47, secured at one end to the picker bar 44 and at its other end to any suitable stationary part, normally holds the bar 44 in a retracted position as shown in Fig. 5. The means for actuating said picker bar forms no part of the present invention and is not herein shown.

The means for retaining the reverse shuttles and feeding them through the shuttle passage into the race will next be described in detail.

As shown guides 49 and 50 are provided for guiding the reserve shuttles and desirably each of said guides is provided with ways 51 and 52 into which the ends of the shuttle project as will be clearly seen by reference to Fig. 5. The upper ends of said guides 49 and 50 project up through the shuttle passage 33 and are bent at right angles at 53 and 54 which bent portions are seated in recesses formed in the bottom wall of the shuttle race. The lower ends of said guides are provided with bosses 55 and 56 mounted on the supporting rod 28. An opening 57 formed in the guide 49 affords means for inserting the reserve shuttles. This structure which may be termed storage means for the reserve includes an elevator adapted to normally support the shuttles and elevate them automatically into a position whereby they

may be singly inserted in the shuttle race. As shown said means consist of an elevator in the form of a plate 58 on which the reserve shuttles are mounted which plate is guided by a rod 59 mounted at its upper end in the member 29 and at its lower end on the spindle 45. Preferably a mounting 60 is provided for said plate 58 and is equipped with a boss 61 engaging said rod 59 and a forwardly extending part 62. A link 63 is secured to said extension 62 at one end and to an elevating lever 64 at its other end and said lever 64 is pivotally mounted at 65 to one of the supports 27. A spring 66, secured to said lever 64 at one end and to the member 29 at its other end, exerts an upward pull on the lever 64 and normally tends to raise the plate 58 and the shuttles thereon upwardly which upward movement is limited by means hereinafter described. A lowering device is provided for depressing the elevator of plate 58 for the purpose of loading the same with reserve shuttles and as shown said device consists of a lever 67 mounted upon a shaft 68 and provided at its upper end with a pin 69 adapted to bear upon the lever 64 to depress the same. The shaft 68 is mounted in the bearing 70 carried by the rod 28 and carries a hand lever 71 adapted to be grasped by the operator for the purpose of lowering the elevator. When the lever 71 is swung to the right a sufficient distance the plate 58 will be depressed to a point below the opening 57 whereupon reserve shuttles may be inserted one at a time.

I will next describe the movable supporting means which serve to support the operating shuttle while the same is located above the shuttle passage said means constituting in effect a bottom wall for the shuttle race.

As shown rods 72 and 73 extend upwardly from the hubs or bosses 55 and 56 of the shuttle guides and carry on their upper ends pivotally mounted supporting members 74 and 75 having supporting portions 76 and 77 upon which the operating shuttle is adapted to rest and inclined walls 78 and 79 against which the uppermost reserved shuttle bears, said inclined walls serving to limit the feeding movement of the shuttle elevating means. Said members are provided with rods 80 and 81 adapted to be engaged by springs 82 and 83 which serve normally to maintain the members 74 and 75 in the position shown in Fig. 4. The shuttle race member 29 is recessed adjacent said members 74 and 75 to permit the latter to swing outwardly against the action of said springs when a reserve shuttle is being inserted in place. On member 75 a pin 84 is mounted which extends upwardly into the plate 39' and serves to retract the latter from its overhanging position shown in Fig. 3 to permit the operating shuttle to be elevated out of

the shuttle race by the next lowermost reserve shuttle as clearly shown in Fig. 4.

Inserting devices are provided for grasping the uppermost shuttle and inserting or forcing it through the shuttle passage 33 into the shuttle race and forcing the operating shuttle upwardly into the position shown in full lines, (Fig. 4). As shown said inserting devices consist of bars 86 and 87 provided on their upper ends with pivotally mounted inserting members 88 and 89. Said inserting members are provided with projections 90 and 91 adapted to normally engage the lower side portions of the uppermost shuttle as shown in Fig. 4. Said inserting members are normally held in the position shown by springs 92 and 93 mounted upon bars 86 and 87 and engaging said members 88 and 89 with their free ends. Said bar 87 is mounted at its lower end upon an arm 94 secured to the controlling rock-shaft 9 and said bar 86 is mounted upon an arm 95 which is also secured to the rock shaft 9. It will be seen from the foregoing that when shaft 9 is rocked in a clockwise direction the bars 86 and 87 will be raised and will act through the uppermost reserve shuttle to thrust the members 74 and 75 outwardly and through the latter retract the plate 39' and insert the uppermost shuttle into the shuttle race. The insertion of the uppermost reserve shuttle will act to raise the operating shuttle out of the shuttle race into the position shown in Fig. 4, as hereinbefore described whereupon upward pressure of the arms 94 and 95 will have been withdrawn and the latter will fall by gravity to the position shown in Fig. 4, whereupon the members 74 and 75 will be returned to their normal position by the springs 82 and 83 and the reserve shuttle will be in an operative position in the shuttle race. The immediate return of the plate 39' to the position shown in Fig. 3 with the member 75 not only supports the shuttle shown in full lines which has been removed from the race but also prevents upward movement of the positioned reserve shuttle after it has been elevated to the shuttle race.

Means are provided for receiving and withdrawing the discharged shuttle from the position shown in Fig. 4 which means as shown is of the following construction:— A discharge shuttle member 96 is secured at one end upon the stud 35 and is mounted at its other end to the rear wall 38. Said strip 96 carries two shuttle abutments in the form of arms 98 adapted to overhang the raceway and be engaged by the discharged shuttle shown in Fig. 4 and said shuttle when discharged is supported on the plate 39' and held thereby in engagement with said arms 98. Discharging members preferably in the form of levers 99 are pivotally mounted at 100 to any suitable stationary part and

are recessed at their free ends to provide jawed receiving portions 101 adapted to embrace the upper portion of the discharged shuttle. The strip 96 is recessed at 102 to receive the outer ends 103 of the levers 99 which latter as shown in Fig. 4 serves to retain the discharge shuttle in place when the lay occupies a vertical position. When however the lay swings toward a filling position the outer jawed portion of the lever 99 engaging the discharge shuttle will prevent it from following the lay and the said shuttle will be drawn off from its support 39' and permitted to fall upon the floor.

It will be seen by reference to Fig. 7 that the outer end of the shuttle engages a recessed portion 97 in the inner face of the picker 43 and therefore in this form of the invention it is necessary to move the picker 43 to the left when it is desired to discharge the operating shuttle or elevate it out of the shuttle and such displacement of the picker 43 is effected automatically according to my invention by means which as shown consists of the following construction. The leather for the picker bar 44 cushioning its movements in opposite directions is indicated generally at 104 and will be hereinafter described in detail. A frame 105 carries said leather and is provided with extensions 106 and 107 slidably mounted in guides 108 and 109 projecting rearwardly from the lay member 29. Said guides 108 and 109 also support a guide rod 110 on which the picker extension 42 slides. Extension 106 is provided with a pin 111 adapted to project into and be operated by a cam slot 112 formed in a bar 113 which latter is mounted at its lower end upon arm 94. Bar 113 at its upper end is guided by the frame 105 and the guide 108 and if desired an arm 108' may be provided to insure retention of the bar 113 in its working position when the frame 105 is moved to the left. When the controlling or rock-shaft 9 is rotated in a clockwise direction during the insertion of a reserve shuttle the arm 94 will raise the bar 113 and thereby cause the frame 105 to move to the left and when the arm 94 descends the bar 113 will restore the frame 105 to the normal position shown in Fig. 7. Owing to the spring 47 which normally exerts a pull on the picker bar 44, to the left of Fig. 5, said picker bar will normally occupy an extreme position to the left of the leather and therefore when the frame 105 is moved toward the left the spring 47 will impart a movement of like extent to the picker bar 44 and the latter being connected with the picker 43 will move the same to the left out of engagement with the shuttle to free the end thereof from the recess 97 and will permit the shuttle to be raised.

An improved and novel form of leather is provided for the picker bar 44 to arrest

movement thereof and the improved arrangement is designed to offer resistance to the picker bar prior to its limit of movement or prior to complete stoppage of the same.

Referring in detail to Figs. 10 to 13 there is shown mounted in the frame 105 two picker bar leathers 155 and 156, one disposed within or inside of the other. Said leathers 155 and 156 are preferably in the form of loops and the same are shown as being anchored by a pin 154, or equivalent means to one side of the frame 105. Preferably the leathers 155 and 156 are adjustably anchored and therefore the said leathers are provided with slots through which the pin 154 passes and said slots are preferably formed in the ends of said leathers as indicated at 150. This adjustment not only permits of limiting the swing of the picker bar 44 but it also permits of adjustment of the leather 156 so that the resistance offered thereby to the picker bar may be increased or decreased as desired. By means of this adjustment the throw of the picker bar may also be varied by adjusting the leather 155. The leathers 155 and 156 are seated, at a point substantially opposite from the pin 154, in a support 157 which is mounted on the frame 105. Said support 157 is provided with a U-shaped arm 158 which is so proportioned with respect to the thickness of the leather loops 155 and 156 as to retain the same in relatively close proximity or in abutting relation and also permit of relative movement of said leathers. Said support 157 is provided with an extension 159 which is secured by screws 160 to the frame 105. Said support therefore constitutes means for loosely supporting said leathers in operative relation with respect to the picker bar 44 and for permitting relative movement of said leathers with respect to each other. Means is provided, which means is preferably adjustable, for anchoring one of said leathers and cooperating with said support to retard movement of the other leather. As shown said means consists of a slide 161 which is grooved to fit upon a guiding extension 162 of the support 157. Said extension 162 and said guide 161 are slotted to receive a bolt 163 whereby said slide may be anchored in its adjusted position. The inner end of said slide 161 is bent downwardly and is provided with a bolt 164 which passes through the leather 155 and secures the same rigidly to said slide. The head of said bolt 164 displaces the inner leather 156 inwardly and serves by separating said leathers to increase the friction of leather 156 in its movement in the support 158. By adjusting the slide 161 inwardly said leathers will impinge at 165 and the movement of the inner leather 156 will be retarded.

It will be seen from the foregoing that the swinging picker bar will first engage

the leather 156 and will move the same in the support 158 until the leather 156 is in engagement with the leather 155 at which point the picker bar 44 will be positively brought to a position of rest. The manner in which the leather 156 is supported will as hereinbefore described permit said leather to move only under a frictional resistance dependent upon adjustment of the parts and such frictional resistance will serve in a great measure to neutralize the force of the blow imparted by the picker bar on the leather 155 and will result in relieving the leather 155, in great measure, of the strain usually imposed thereon. This will result in greatly prolonging the life of the leather 155 and will prevent frequent breakage which has heretofore been a great defect in apparatus of this character. It will be seen that I have provided positively and yieldingly acting leathers for the picker bar.

I claim:—

1. A loom comprising in combination, a supporting rod a lay structure mounted to swing on said rod and provided with a reed and a race member in which a shuttle race is formed, said member having a passage for the admission of reserve shuttles to said race, shuttle guides mounted on said rod and member and delivering to said passage and adapted to receive a plurality of reserve shuttles, an elevator movable with said structure and adapted to support a plurality of reserve shuttles, means for normally raising said elevator to advance said shuttles toward said race, rods mounted on said supporting rod and provided with spring actuated shuttle supporting portions adapted to support the operating shuttle and form a bottom wall for the shuttle race within said passage, said supporting portions engaging and preventing admission of the uppermost reserve shuttle through said passage, bars provided with spring actuated reserve shuttle inserting members, an actuating shaft for operating said bars, and means cooperating with the weft thread and serving to actuate said shaft upon breakage of said thread.

2. A loom comprising in combination, a supporting rod, a lay structure mounted to swing on said rod and provided with a reed and a race member in which the shuttle race is formed, said member having a passage for the admission of reserve shuttles to said race, an elevator movable with said structure and adapted to support a plurality of reserve shuttles, means for normally raising said elevator to advance said shuttle toward said race, rods mounted on said supporting rod and provided with spring actuated shuttle supporting portions adapted to support the operating shuttle and form a bottom wall for the shuttle race within said passage, said supporting portions engaging and

preventing admission of the uppermost reserve shuttle through said passage, bars provided with spring actuated reserve shuttle inserting members, an actuating shaft for said bars, and means cooperating with the weft thread and serving to actuate said shaft upon breakage of said thread.

3. A loom comprising in combination, a supporting rod, a lay structure mounted to swing on said rod and provided with a reed and a race member in which a shuttle race is formed, said member having a passage for the admission of reserve shuttles to said race, an elevator movable with said structure and adapted to support a plurality of reserve shuttles and advance the same toward said passage, rods mounted on said supporting rod and provided with shuttle supporting portions adapted to support the operating shuttle in said passage and having parts engaging and preventing admission of the uppermost reserve shuttle through said passage, bars provided with reserve shuttle inserting members, an actuating shaft for said bars, and means cooperating with the weft thread and serving to actuate said shaft upon breakage of said thread.

4. A loom comprising in combination, a supporting rod, a lay structure mounted to swing on said rod and provided with a reed and a race member in which a shuttle race is formed, said member having a passage for the admission of reserve shuttles to said race, an elevator movable with said structure and adapted to support a plurality of reserve shuttles and advance the same toward said passage, shuttle supporting means adapted to support the operating shuttle over said passage and engaging and preventing admission of the uppermost reserve shuttle through said passage, reserve shuttle inserting means for inserting the reserve shuttles through said passage, and means cooperating with the weft thread and actuating said inserting means upon breakage of said thread.

5. A loom comprising in combination, a swinging lay structure provided with a reed and a race member in which a shuttle race is formed, said member having a passage for the admission of reserved shuttles, means mounted on said structure for advancing a plurality of reserve shuttles toward said passage, shuttle supporting means mounted on said structure for supporting an operating shuttle over said passage, reserve shuttle inserting means movable with said structure for inserting reserve shuttle through said passage, and means cooperating with the weft thread and actuating said inserting means upon breakage of said thread.

6. A loom comprising in combination, a swinging lay structure provided with a reed and a race member in which a shuttle race is formed, means for advancing a plurality

of reserve shuttles toward said shuttle race from below, shuttle supporting means supporting an operating shuttle in said race and normally preventing admission of said reserve shuttles to said race, reserve shuttle inserting means for inserting reserve shuttles into said race, and means cooperating with a weft thread and actuating said inserting means upon breakage of said thread.

7. A loom comprising in combination, a swinging lay structure provided with a reed and a race member in which a shuttle race is formed, means mounted on said lay structure for holding a plurality of reserve shuttles therein, shuttle supporting means supporting an operating shuttle in said race, reserve shuttle inserting means for inserting reserve shuttles into said race from below, and means cooperating with a weft thread and actuating said inserting means upon breakage of said thread.

8. A loom comprising in combination, a swinging lay structure provided with a reed and a race member in which latter a shuttle race is formed, shuttle supporting means mounted on said structure and supporting an operating shuttle in said race and permitting insertion of reserved shuttles, reserve shuttle inserting means mounted on said structure for inserting reserve shuttle past said supporting means, and means cooperating with a weft thread and serving upon breakage thereof to operate said inserting means.

9. A loom comprising in combination, a swinging lay structure provided with a reed and a race member in which latter a shuttle race is formed, guides for said structure for holding a plurality of reserve shuttles and provided with an opening whereby said shuttles may be inserted in said guides, an elevator normally advancing the reserve shuttles in said guides toward said shuttle race, means for lowering said elevator to permit insertion of reserve shuttles into said guides, means for singly advancing the reserve shuttles into said shuttle race, and means cooperating with a weft thread and serving when the same breaks to actuate said inserting means.

10. A loom comprising in combination, a swinging lay structure provided with a reed and a race member in which latter a shuttle race is formed, a spring actuated retarding member normally projecting into said race to engage and retard an operating shuttle, means for supporting an operating shuttle in said shuttle race and advancing reserve shuttles thereto, a movable retaining member operated by said means and normally overhanging the operating shuttle and being retracted by said means to permit discharge of an operating shuttle from said shuttle race and the insertion of a reserve shuttle thereinto, said retaining member

serving to support said discharged shuttle, and means engaging said discharged shuttle to hold the same in its discharged position when the lay is in one position and serving to discharge said shuttle from the lay structure when said lay is in another position.

11. A loom comprising in combination, a swinging lay structure provided with a reed and a race member in which latter a shuttle race is formed, said member being provided with a passage for the admission of reserved shuttles into said shuttle race, means for supporting an operating shuttle above said passage and advancing reserve shuttles therethrough into said shuttle race, a retaining member operated by said means and normally overhanging the operating shuttle and being retracted by said means to permit discharge of an operating shuttle from said shuttle race and insertion of a reserve shuttle therinto, said retaining member serving to support said discharged shuttle, and means engaging said discharged shuttle to hold the same on said retaining member when the lay is in one position and serving to withdraw the discharged shuttle when the lay is swung to another position.

12. A loom comprising in combination, a swinging lay structure provided with a reed and a race member in which latter a shuttle race is formed, said member being provided with a passage for the admission of reserve shuttles into said shuttle race from below, means for supporting an operating shuttle above said passage and raising a reserve shuttle therethrough into said shuttle race into engagement with an operating shuttle whereby the latter is elevated above said race, a retaining member operated by said means and normally overhanging said race and being retracted by said means to permit of elevating the shuttle being discharged and inserting a reserve shuttle and supporting the discharged shuttle above said race, and means engaging said discharged shuttle to hold the same on said retaining member when the lay is in one position and serving to withdraw the discharged shuttle when the lay is swung to another position.

13. A loom comprising in combination, a swinging lay structure provided with a reed and a race member in which latter a shuttle race is formed, said member being provided with a passage for the admission of reserve shuttles into said shuttle race from below, means for supporting an operating shuttle above said passage and raising a reserve shuttle therethrough into said shuttle race into engagement with an operating shuttle whereby the latter is elevated above said race, and a retaining member operated by said means and normally overhanging said race and being retracted by said means to

permit of elevating the shuttle being discharged and inserting a reserve shuttle and supporting the discharged shuttle above said race.

14. A loom comprising in combination, a swinging lay provided with reserve shuttle feeding means and a comb member, a pivotally mounted comb adapted to be operated by said member through an interposed weft thread when the same is intact and serving to pass through the openings of said comb when said weft thread breaks, a spring for restoring said comb to a normal position and preventing movement thereof when said weft thread breaks, a retaining lever co-operating with said comb, a reciprocating bar supported by said lever and provided with a stop and a releasing portion, means for reciprocating said bar, a shaft for operating said feeding means, and an arm for said shaft provided with a slot through which said bar is inserted, said slot and said stop and releasing portion being so disposed in proportion that when said comb is retracted said releasing portion will prevent engagement between said stop and arm and when said comb occupies a normal position said stop will engage said arm and operate said feeding means.

15. A loom comprising in combination, a swinging lay provided with reserve shuttle feeding means and a comb member, a movably mounted comb adapted to be operated by said member through an interposed weft thread when the same is intact, said member permitting said comb to remain in a position of rest when said thread is broken, a reciprocating bar provided with a stop and releasing portion operatively connected with said comb, a shaft for operating said feeding means, and an arm for said shaft provided with a slot through which said bar passes, said bar and said stop and releasing portion being so disposed and proportioned that when said comb is retracted by said member said releasing portion will prevent engagement between said stop and arm, and that when said comb occupies a normal position said stop will engage said arm and operate said feeding means.

16. A loom comprising in combination, a swinging lay provided with reserve shuttle feeding means and a comb member, a movably mounted comb adapted to be operated by said member through an interposed weft thread when the said thread is intact, said member permitting said comb to remain in a position of rest when said thread is broken, a reciprocating bar provided with a stop and a releasing portion and operatively connected with said comb, a device for operating said feeding means operatively associated with said bar and said stop and releasing portion, the arrangement being that when said comb is retracted by said member

said releasing portions will prevent operating of said device and when said comb is in a position of rest said stop will operate said device.

- 5 17. A loom comprising in combination, a swinging lay provided with reserve shuttle feeding means and a comb member, a movably mounted comb adapted to be operated by said member through an interposed weft
10 thread when the said thread is intact, said member permitting said comb to remain in a

position of rest when said thread is broken, and cooperating stop motion members operatively connected with said comb and means and serving when said thread is 15 broken to operate said means.

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

SAKICHI TOYODA.

Witnesses:

YASUNOSUKE FUKUKITE,
JAMES B. DAVIES.