No. 756,334. PATENTED APR. 5, 1904.

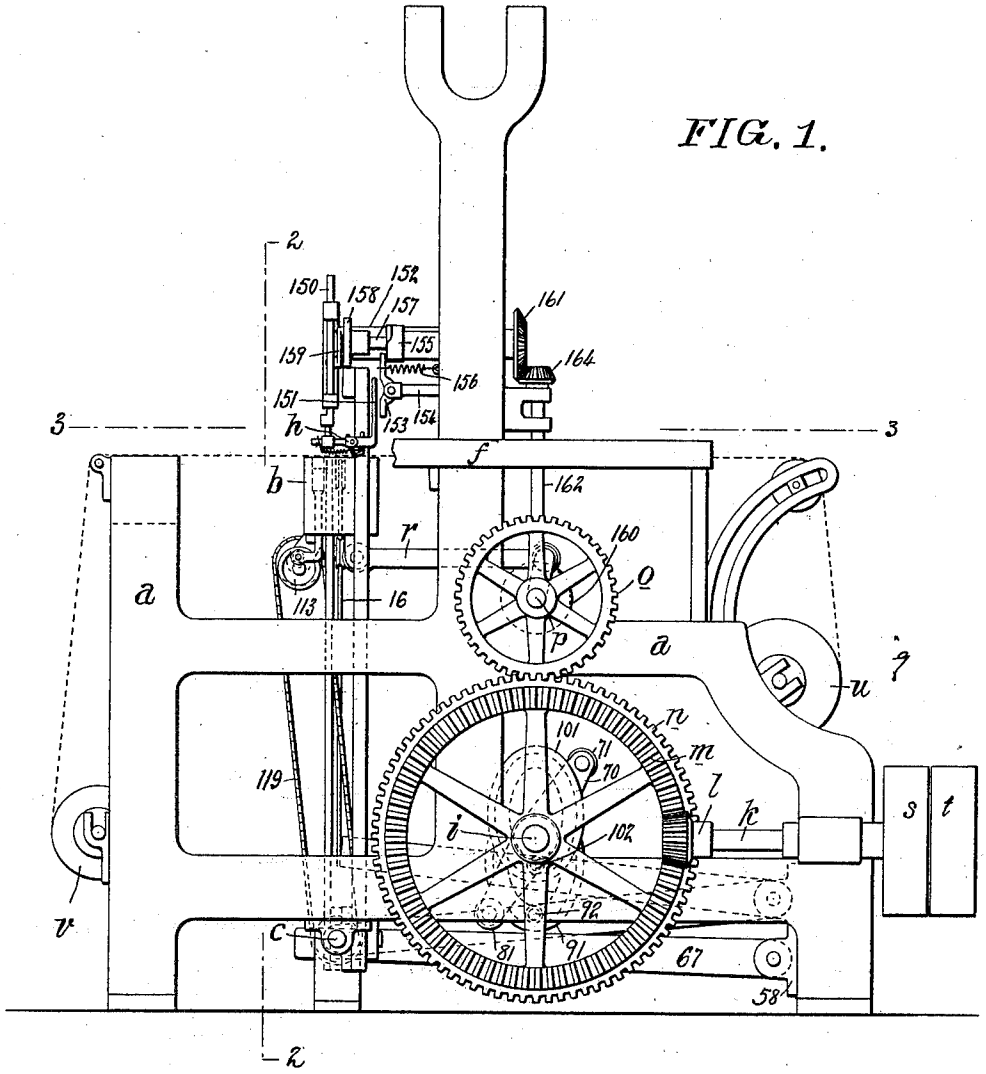
G. S. COX.

LOOM.

APPLICATION FILED JULY 10, 1903.

NO MODEL. 4 SHEETS—SHEET 1.

FIG. 1.



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atty's

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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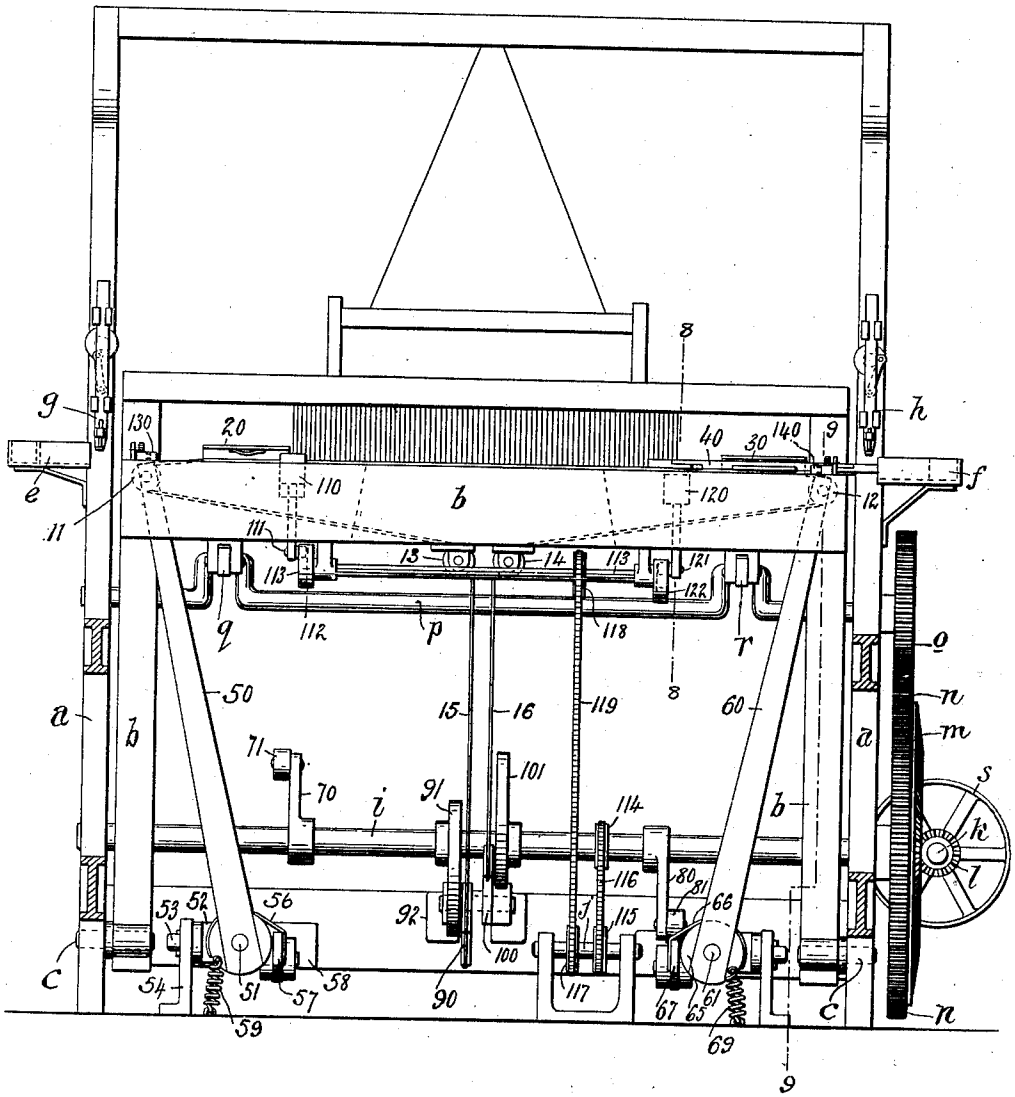
NO MODEL. 4 SHEETS—SHEET 2.

FIG. 2.



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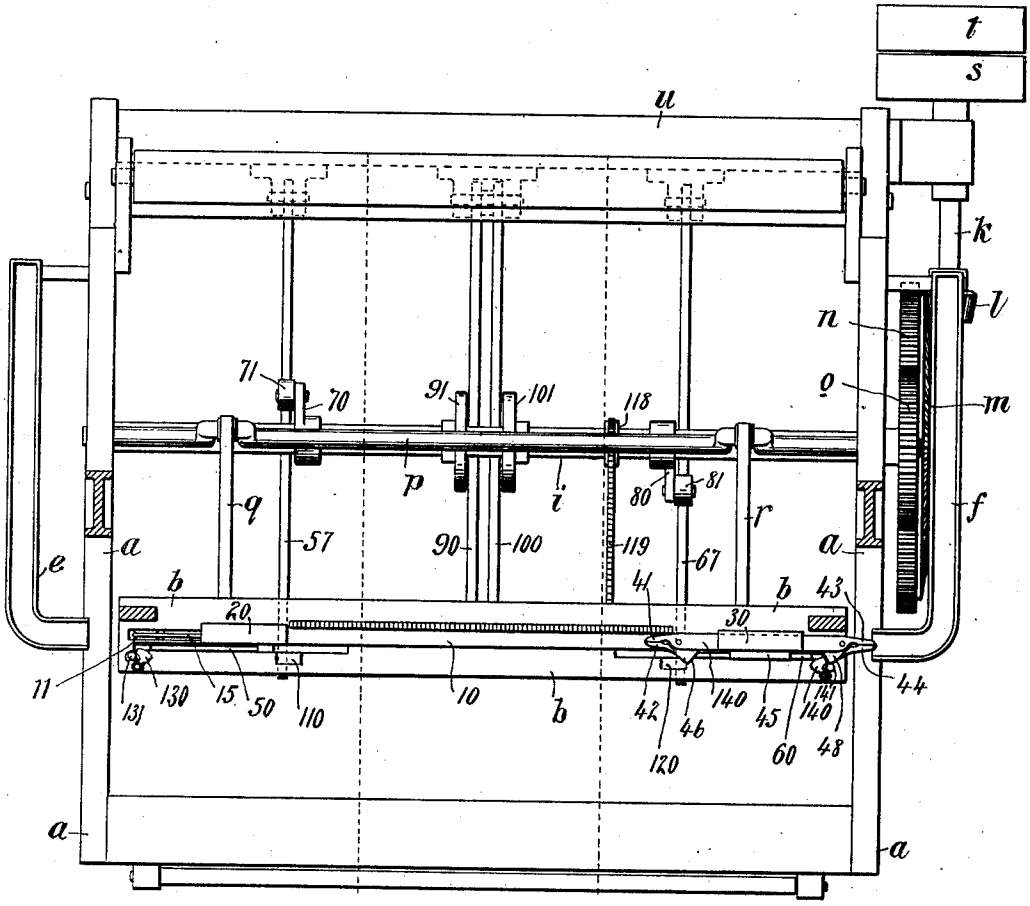
NO MODEL. 4 SHEETS—SHEET 3.

FIG. 3.



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NO MODEL. 4 SHEETS—SHEET 4.

FIG. 4.

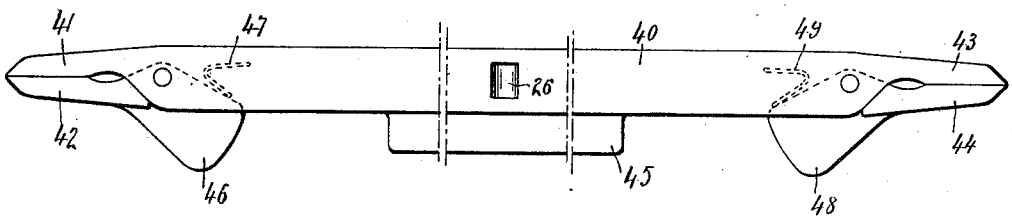


FIG. 5.

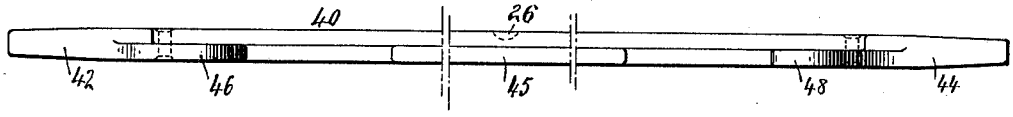


FIG. 6.

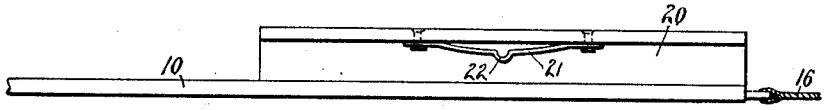


FIG. 7.

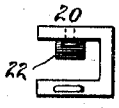


FIG. 8.

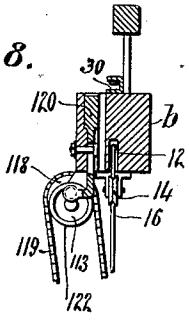


FIG. 9.

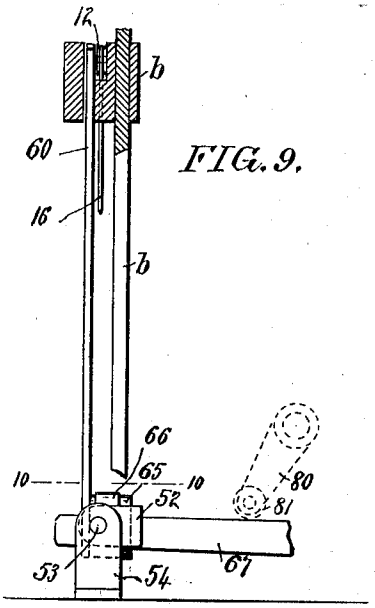
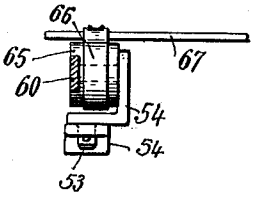


FIG. 10.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 756,334. Patented April 5, 1904.

UNITED STATES PATENT OFFICE.

GEORGE S. COX, OF FITZWATERTOWN, PENNSYLVANIA, ASSIGNOR TO HIMSELF, AND WALTER S. COX, TRADING AS GEORGE S. COX AND BROTHER, OF PHILADELPHIA, PENNSYLVANIA.

LOOM.

SPECIFICATION forming part of Letters Patent No. 756,334, dated April 5, 1904.

Application filed July 10, 1903. Serial No. 164,966. (No model.)

To all whom it may concern:

Be it known that I, GEORGE S. COX, a citizen of the United States, residing at Fitzwatertown, county of Montgomery, and State of Pennsylvania, have invented a new and useful Improvement in Looms, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to looms, and particularly to that type of loom adapted to the manufacture of hair-cloth and similar goods, wherein the weft is prepared in separate strands or picks, substantially equal in length or slightly longer than the width of the goods to be woven.

The objects of my invention are to increase the production of the loom by causing the nipper or shuttle to throw a pick of weft on both its forward and return movement, to regulate with accuracy the extent of the throw of the shuttle and at the same time dispense with a positive connection to the shuttle during its travel across the loom, to automatically operate the shuttle at the end of its throw, to release a thrown pick and engage a new pick, and generally to perfect the construction and operation of the loom.

In the drawings, Figure 1 is a side view of the loom. Fig. 2 is a section on the line 2 2 of Fig. 1. Fig. 3 is a section on the line 3 3 of Fig. 1. Fig. 4 is a plan view of the shuttle. Fig. 5 is a front or edge view of the shuttle. Fig. 6 is a front view of one of the shuttle-boxes. Fig. 7 is an edge view of one of the shuttle-boxes. Fig. 8 is a section on the line 8 8 of Fig. 2. Fig. 9 is a section on the line 9 9 of Fig. 2. Fig. 10 is a section on the line 10 10 of Fig. 9.

a is the frame of the loom.

b is the lay, pivoted on the studs *c* on the frame. Extending along the shuttle traverse of the lay *b*, but not connected thereto, is a plate 10, having secured thereto the movable shuttle-boxes 20 and 30.

40 is the shuttle, having one pair of jaws 41 and 42 at one end and another pair of jaws 43 and 44 at the other end.

e f are the receptacles for the strands of horse-hair weft.

g h are the selectors.

Generally speaking, the operation of the foregoing parts is as follows: The selector *h* selects a single pick of weft from the receptacle *f*. The jaws 43 and 44 of the shuttle 40 clamp the end of the selected pick, which at the same time is released from the selector, pull the pick from right to left, Figs. 2 and 3, between the sheds of warp, and then release the same. The selector *g* selects a single pick of weft from the receptacle *e*, and the jaws 41 and 42 of the shuttle 40 clamp the end of the last-selected pick, pull the same from left to right, Figs. 2 and 3, between the sheds of warp, and then release the same, and so on alternately and continuously, the sheds of warp being changed, preferably, after each pick.

The above-described operation is effected by means of the mechanism to be hereinafter described.

The shuttle 40 is provided with a flange 45, extending laterally therefrom.

50 60 are picker-sticks. The picker-stick 50 is pivoted on a stud 51, secured to a bracket 52, having a stud 53, turning in a bearing 54 on the machine-frame. The picker-stick 60 is pivoted on a stud 61, which is supported similarly to stud 51. The upper part of each picker-stick extends through a slot in the lay. Each picker-stick therefore moves with the lay, and also is capable of swinging crosswise of the loom on the studs 51 or 61. When the shuttle is at one side of the loom—say to the extreme right, Figs. 2 and 3—the picker-stick 60 swings inwardly, engages the flange 45 of the shuttle, and throws the shuttle, initially by direct engagement and thence by momentum, nearly across the loom, as will hereinafter be more fully described. In the same way the shuttle 60 returns the shuttle from left to right.

Inasmuch as the weft is in separate strands of a length but little greater than the width of the fabric to be woven, it is important that the shuttle shall move to but not beyond a

point that will insure the forward end of the weft being drawn just beyond the edge of the warp. To effect this, I cause the shuttle to first make slightly less than its complete throw by throwing it into the shuttle-box 20 or 30 and then complete the throw of the shuttle by moving the shuttle-box itself with its contained shuttle the slight distance necessary to complete the throw of the shuttle. To enable the shuttle-box 20 to receive and hold the shuttle, a leaf-spring 21, having a projecting portion 22 midway of its length, is secured to the upper wall of the box, while the shuttle is provided on its upper face with a slot or recess 26. The shuttle-box 30 is a duplicate of the shuttle-box 20. When the shuttle is thrown into the box, the spring engages the recess in the shuttle and stops and holds the shuttle. Thereafter the plate 10 is moved in the direction in which the shuttle has been thrown, moving both shuttle-boxes and completing the throw of the shuttle.

The means for actuating the picker-sticks 50 and 60 will now be described. On the stud 51, secured to the picker-stick 50, is a drum 55, to which is secured a strap 56, which extends partially around the periphery of the drum and is secured to the free end of a treadle 57. The other end of the treadle 57 is pivoted to the bracket 58 on the machine-frame. Depression of the treadle 57 through the strap 56 turns the drum 55 and swings the picker-stick 50 in the direction necessary to throw the shuttle.

To depress the treadle 57, the cam-shaft *i* is provided with an arm 70, having a roller 71, which as the shaft rotates engages and depresses the treadle 57. A spring 59 is secured at one end to the drum 55 and at the other end to the machine-frame, which spring acts to return the picker-stick 50 to its normal position when the arm 70 recedes from the treadle 57.

To actuate the picker-stick 60, the drum 65, strap 66, treadle 67, and spring 69 are provided, and an arm 80, having a roller 81, is secured to the shaft *i* and engages and depresses the treadle 67. The arm 80 is set opposite to the arm 70, so that the picker-sticks will be operated alternately at each revolution of the shaft *i*.

To actuate the plate 10 the following means are provided: Rollers 11 and 12 are secured to the lay, one at each side of the loom, and rollers 13 and 14 are secured to the central part of the lay. 90 and 100 are treadles, each being pivoted at one end to the bracket 92. A belt or cord 15 is secured to the free end of treadle 90 and thence passes up and around rollers 13 and 11 and is secured to one end of the plate 10. A belt or cord 16 is secured to the free end of treadle 100 and thence passes up and around rollers 14 and 12 and is secured to the other end of plate 10. The treadles 90 and 100 are caused to be alternately depressed and elevated by means of oppositely-set grooved cams 91 and 101 on the shaft *i*, said cams being engaged by pins 92 and 102 on the treadles 90 and 100. As the treadle 90 is depressed it pulls the plate 10 from right to left, (see Fig. 2,) at the same time elevating treadle 100. As the treadle 100 is depressed it pulls the plate 10 in the opposite direction, at the same time elevating treadle 90.

The following means are provided to actuate the jaws of the shuttle: The jaws 41 and 43 are fixed and the jaws 42 and 44 are movable, being normally closed by means of the springs 47 49, respectively. Integral with the jaws 42 and 44 are the cams 46 and 48, respectively. 120 110 are jaw-opening arms adapted to be projected into the path of the cams 46 and 48, respectively, for the purpose of opening the jaws to release the pick of weft after it has been thrown. 130 140 are jaw-opening levers adapted to engage the cams 46 and 48, respectively, for the purpose of opening the jaws just before the shuttle reaches its forward movement to enable it to clamp the pick of weft that has been selected by the selector.

The operation of the shuttle is as follows: Assume the shuttle to be in the position shown in Figs. 2 and 3 and that the jaws 43 and 44 are clamping a selected pick of weft. The shuttle is now thrown from right to left, as before described, from the box 30 into the box 20. The jaw-opening arm 110 is now projected into the path of the cam 48, and the plate 10, with the boxes 20 and 30 and the shuttle contained in the box 20, are moved to the left, causing the jaw-opening arm 110 to engage the cam 48 and open the jaw 44, thereby releasing the pick of weft, the jaw 40 immediately closing after it has overridden the arm 110. At or about the same time the jaw-opening lever 130 engages the cam 46. and opens the jaw 42, the jaw 42 immediately closing after the cam 46 has overridden the lever 130 and clamping a pick of weft selected by the selector *g*. The shuttle is now thrown from left to right from the box 20 into the box 30. The jaw-opening arm 120 is then projected into the path of the cam 46, and the plate 10, with the boxes 20 and 30 and the shuttle contained in the box 30, are moved to the right or into the position shown in Fig. 3, causing the jaw-opening arm 120 to engage the cam 46 and open the jaw 42, thereby releasing the pick of weft. At or about the same time the jaw-opening lever 140 engages the cam 48 and opens the jaw 44, the jaw 44 immediately closing after the cam 48 has overridden the lever 140 and clamping a pick of weft selected by the selector *h*. To enable the levers 130 and 140 to act only when the shuttle is completing its movement, stops 131 and 141 are provided. When the shuttle is returned, the cam 46 or 48 strikes the lever 130 or 140 and moves it away from the stop 131 or 141.

In order to prevent the jaw clamping the pick of weft from being operated by the first jaw-opening arm 110 or 120 that it passes during its movement across the loom, the jaw-opening arms are alternately retracted and advanced into operative position. This is accomplished by the following means: The jaw-opening arms are vertically slidable in grooves in the lay and are secured at their lower ends by means of the pins 111 and 121 engaging grooves 113 and 123 in the disks 112 and 122, said disks being secured to a shaft 213. The shaft 213 is driven from the cam-shaft *i* by means of a pulley 114 on the shaft *i*, a pulley 115 on a counter-shaft *j*, a belt 116, connecting pulleys 114 and 115, a pulley 117 on the counter-shaft *j*, a pulley 118 on the shaft 213, and a belt 119, connecting pulleys 117 and 118.

The shaft *i* is driven from the main driving-shaft *k* by means of a bevel-gear *l* on the shaft *k* engaging a bevel-gear *m* on the shaft *i*. Secured to the shaft *i* is a large spur-gear *n*, engaging a spur-gear *o* on the crank-shaft *p*.

q r are connecting-rods connecting the cranks of the crank-shaft with the lay.

s t are the driving and idle pulleys, respectively, on the main driving-shaft *k*.

u is the warp-beam, and *v* the cloth-roll.

The selector *g* or *h* consists of the part 150, vertically movable in guides on the bracket 152 and carrying the fixed jaw of the selector, and the part 151, hinged to the part 150 and carrying the removable jaw of the selector.

153 is a lever pivoted between its ends on the bracket 154.

157 is a shaft to which are secured the cam 155 and the crank-disk 158.

159 is a connecting-rod between the crank-disk 158 and the part 150 of the selector.

156 is a tension-spring secured to the upper end of lever 153.

As the shaft 157 rotates the selector is moved up and down. The upper end of lever 153 is brought opposite the low point of the cam 155, into which it is snapped by the spring 156, which causes the lower end of the lever 153 to engage the part 151 of the selector and move it on its hinge to open the jaws of the selector. As the upper end of lever 153 rides up to the high point of the cam 155 the lever 153 is retracted from the part 151 of the selector, permitting the latter to drop to close the jaws of the selector.

To drive the shaft 157, the usual parts are provided—namely, a gear 160 on the crank-shaft, a gear 161 on the shaft 157, a counter-shaft 162, and gears 163 and 164, meshing, respectively, with gears 160 and 161.

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

1. In a loom, the combination, with shuttle-boxes on each side of the loom and a shuttle, of a shuttle-driver on each side of the loom adapted to move said shuttle out of one box across the shed into the other box, and means to impart to each shuttle-box, with its contained shuttle, a movement in the direction in which the shuttle is thrown, substantially as described.

2. In a loom, the combination, with a shuttle having jaws at each end adapted to engage the weft and pull it across the loom, of a selector at each side of the loom adapted to pick a strand of weft and present it to the adjacent jaws, a shuttle-driver adapted to throw said shuttle across the loom, means to arrest the travel of the shuttle so thrown, and means independent of the shuttle-driver to impart to said shuttle a short additional movement in the direction in which it has been thrown by the shuttle-driver, substantially as described.

3. In a loom, the combination, with a shuttle, of a shuttle-driver at each side of the loom adapted to throw said shuttle across the loom a distance slightly less than its complete throw, and a device on each side of the loom adapted, after said incomplete throw of the shuttle, to complete its throw, substantially as described.

4. In a loom, the combination, with a shuttle adapted to be thrown crosswise of the loom, of a shuttle-driver at one side of the loom adapted to engage and move said shuttle positively for a portion only of its throw and thence by momentum across the shed to the other side of the loom, means to actuate said shuttle-driver, and means to impart to said shuttle an additional movement in the direction in which it has been thrown by the shuttle-driver, substantially as described.

5. In a loom, the combination with a shuttle adapted to be thrown crosswise of the loom, of a shuttle-driver at one side of the loom adapted to engage and move said shuttle positively for a portion only of its throw and thence by momentum across the shed to the other side of the loom, means to actuate said shuttle-driver, a shuttle-box into which said shuttle is adapted to be thrown, and means to impart to said shuttle-box, with its contained shuttle, a movement in the direction in which the shuttle has been thrown, substantially as described.

6. In a loom, the combination, with a shuttle having jaws at each end adapted to engage the weft and pull it across the loom, a receptacle for the strands of weft at each side of the loom, a selector adjacent to each receptacle, a shuttle-box at each side of the loom, means to throw the shuttle from one box to the other, means to move each box in the direction in which the shuttle has been thrown, means to open the inner jaws of the shuttle during the said movement of the shuttle-box, and means to close the outer jaws of said shuttle upon the weft selected by the selector.

7. In a loom, the combination, with a shuttle having a pair of jaws at each end adapted to

engage the weft and pull it across the loom, a shuttle-box at each side of the loom, means to throw said shuttle from one box to the other, means to move said shuttle-boxes, and means at each side of the loom to open each pair of jaws to release the thrown pick of weft and clamp a new pick, substantially as described.

8. In a loom, the combination, with the lay, of a shuttle, a picker-stick adapted to operate the shuttle, a stud upon which the picker-stick is pivoted, a drum on said stud secured to said picker-stick, a treadle, a strap connecting the treadle and drum, and means for operating said treadle, a device to stop said shuttle before it has completed its traverse across the loom, and means independent of the picker-stick to complete the traverse of the shuttle, substantially as described.

9. In a loom, the combination, with the lay, of a shuttle, a picker-stick on each side of the loom adapted to engage and throw said shuttle, a treadle to operate each picker-stick, and an arm to operate each treadle, said arms being arranged to actuate said treadle alternately, a device to stop said shuttle before it has completed its traverse across the loom, and means independent of the picker-stick to complete the traverse of the shuttle, substantially as described.

10. In a loom, the combination with movable shuttle-boxes at each side of the loom, said shuttle-boxes being secured together, two treadles, means for operating said treadles alternately, and a connection from each treadle to the shuttle-boxes, substantially as described.

11. In a loom, the combination, with a shuttle-box at each side of the loom and a connection between them, two treadles, cams adapted to actuate said treadles alternately, flexible connections from one treadle to one shuttle-box and from the other treadle to the other shuttle-box, and pulleys over which said flexible connections extend, substantially as described.

12. In a loom, the combination, with the pivoted lay, of a shuttle having jaws, a jaw-opener adapted, when in operative position, to open said jaws, a shaft turning in bearings in the lay, means on said shaft connected with said jaw-opener so as to move the same into and out of operative position, a counter-shaft whose axis is coincident with the axis on which the lay is pivoted, a driving-shaft, a driving connection from the driving-shaft to the counter-shaft, and a driving connection from the counter-shaft to the jaw-opener-operating shaft, substantially as described.

13. In a loom, the combination, with a shuttle-box, a spring in said shuttle-box, a shuttle adapted to be thrown into said box, means on the shuttle adapted, when the shuttle is thrown into said box, to engage said spring, thereby holding the shuttle in said box, and means to move said shuttle-box in the direction in which the shuttle has been thrown, substantially as described.

14. In a loom, the combination, with a shuttle-box open at one side, a shuttle having a fixed jaw and a movable jaw at each end adapted to be thrown into said shuttle-box, a cam on the movable jaw extending without the box, means to move said shuttle-box with its contained shuttle, and a jaw-opener in the path of movement of one of said cams during the movement of said shuttle-box, substantially as described.

15. In a loom, the combination, with a shuttle-box, a shuttle having jaws at each end, means to throw said shuttle into and out of said shuttle-box, means to move said shuttle-box, with its contained shuttle, in the direction in which the shuttle has been thrown, a jaw-opener adapted to open the inner pair of jaws to release the pick of weft carried thereby during the said movement of the shuttle-box, a second jaw-opener adapted to open the outer pair of jaws to permit them to clamp the next pick of weft, and means to withdraw the first-named jaw-opener out of operative position during the throw of the shuttle in the opposite direction, substantially as described.

16. In a loom, the combination, with shuttle-boxes, a connection between said shuttle-boxes, a shuttle having jaws at each end, means to throw said shuttle from one box to the other, means to move said shuttle-boxes, a jaw-opener adjacent to each box adapted to open the jaws holding the thrown pick of weft, means to cause said jaw-opener to be moved into operative position during the movement of the boxes in one direction and out of operative position during the movement of the jaws in the opposite direction, and a second jaw-opener adjacent to each box adapted to open the outer pair of jaws to permit them to clamp the next pick of weft, substantially as described.

In testimony of which invention I have hereunto set my hand, at Philadelphia, on this 1st day of July, 1903.

GEORGE S. COX.

Witnesses:
FRANK S. BUSSER,
M. F. ELLIS.