May 5, 1925. 1,537,007

G. CROMPTON, JR

SHUTTLE CHANGING MECHANISM FOR LOOMS

Filed June 12, 1922 2 Sheets-Sheet 1

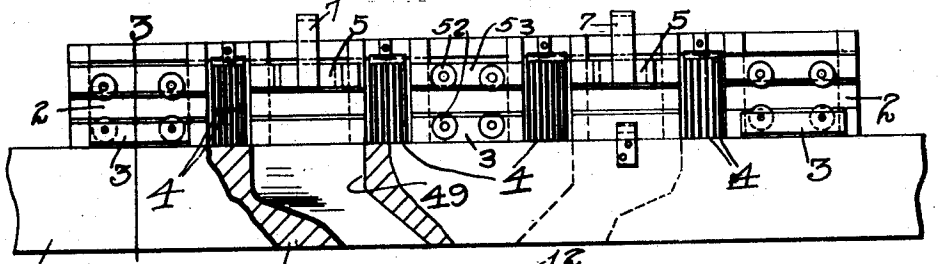


Fig. 2.

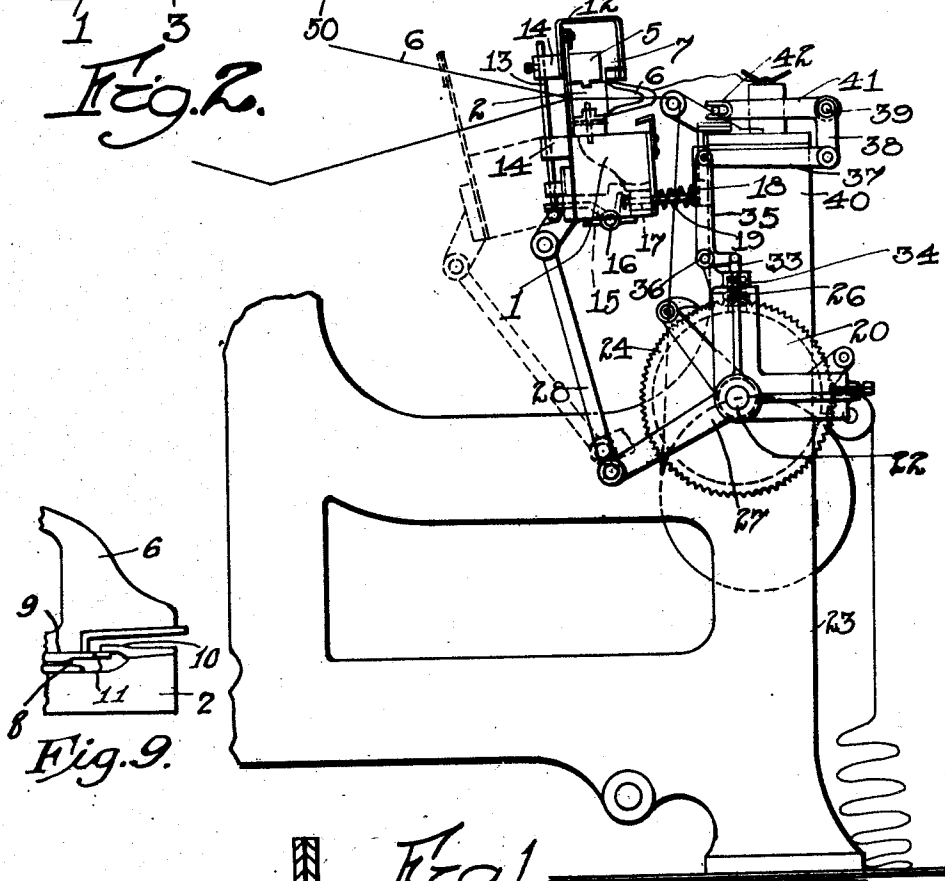


Fig. 1.

Fig. 9.

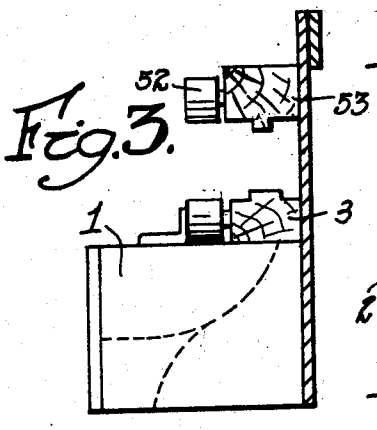


Fig. 3.

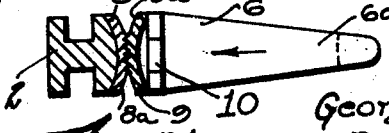


Fig. 7.

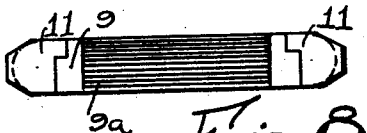


Fig. 8.

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SHUTTLE CHANGING MECHANISM FOR LOOMS

Filed June 12, 1922 2 Sheets-Sheet 2

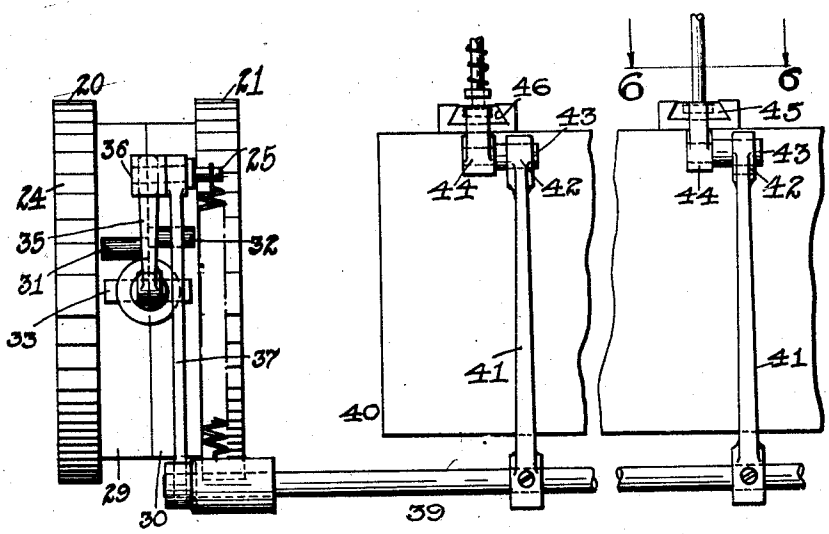


Fig. 5.

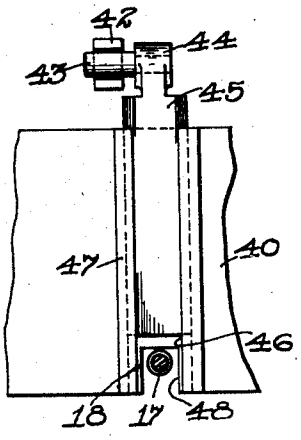


Fig. 6.

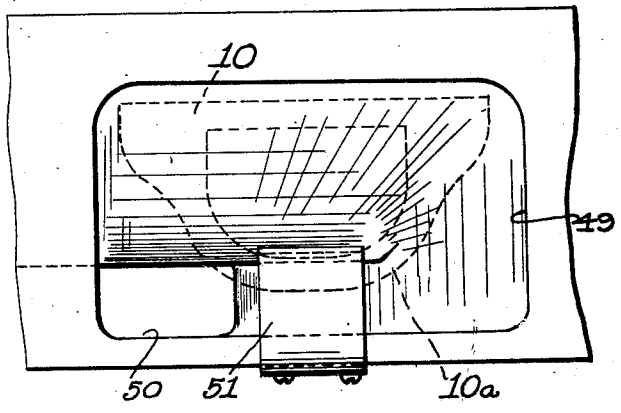


Fig. 4.

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UNITED STATES PATENT OFFICE.

GEORGE CROMPTON, JR., OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO ROBERT G. PRATT, OF WORCESTER, MASSACHUSETTS.

SHUTTLE-CHANGING MECHANISM FOR LOOMS.

Application filed June 12, 1922. Serial No. 567,719.

To all whom it may concern:

Be it known that I, GEORGE CROMPTON, Jr., a citizen of the United States, residing at Worcester, in the county of Worcester and Commonwealth of Massachusetts, have invented a new and useful Improvement in Shuttle-Changing Mechanism for Looms, of which the following, together with the accompanying drawings, is a specification.

My invention relates to shuttle changing mechanism for looms, particularly of the so-called "narrow ware type," in which a plurality of spaced shuttles are adapted to be driven back and forth in unison with respect to a plurality of spaced groups of warp threads, in order to simultaneously weave a number of separate strips of narrow fabric, such for example, as tape or ribbon.

In my copending application, Serial No. 504,869, filed October 3, 1921, there is shown and described an improved shuttle changing mechanism for looms of the above described type, by means of which the shuttles may be changed, either individually or collectively, on any desired pick of the loom, without interrupting the operation of the same, the power for operating the shuttle changing mechanism being derived entirely from the movement of the lay.

The object of the present invention is to provide a shuttle changing mechanism of the same general type as set forth in the above mentioned patent application, with means whereby the entire mechanism may be caused to operate automatically to bring about a transfer of the shuttles after the latter have made a predetermined number of picks. Other objects of my invention are to provide improved means for engaging shuttles with the carrier and for lining up the shuttles thereon, and an improved arrangement whereby spent shuttles may be ejected from the loom without any possibility of such spent shuttles jamming, smashing or interfering with the operation of the loom. The above, and other advantageous features of my invention will hereinafter more fully appear, reference being had to the accompanying drawings, in which—

Fig. 1 is a view in end elevation of a loom provided with a shuttle changing mechanism embodying my invention.

Fig. 2 is a view in front elevation of a portion of the lay of the loom shown in Fig. 1.

Fig. 3 is an enlarged transverse sectional view along the line 3—3 of Fig. 2, looking in the direction of the arrows.

Fig. 4 is a plan view of a portion of the lay shown in Fig. 2, on an enlarged scale.

Fig. 5 is a plan view illustrating, on an enlarged scale, the mechanism for automatically operating the shuttle changing mechanism shown in Fig. 1.

Fig. 6 is a vertical sectional view along the line 6—6 of Fig. 5, looking in the direction of the arrows.

Fig. 7 is an enlarged end view of a shuttle carrier and shuttle.

Fig. 8 is a rear view of a shuttle removed from its carrier.

Fig. 9 is a fragmentary plan view of a portion of the shuttle carrier and shuttle shown in Fig. 7.

Like reference characters refer to like parts in the different figures.

Referring first to Figs. 1 and 2, a portion of the lay of a loom is indicated at 1, and is provided with a slidably mounted toothed rack that is adapted to be reciprocated back and forth to drive in unison a plurality of toothed pinions, as is usual in looms of this type. A plurality of shuttle carriers 2 are arranged at intervals along the lay 1, and each carrier 2 is provided on its under side with teeth which are in mesh with the teeth on the pinions, so that when the rack is reciprocated, the shuttle carriers 2 will be moved back and forth in unison on suitable race blocks 3. The several spaces between the race blocks 3 are occupied by separate groups of warp threads which pass between the groups of reed wires 4 and are connected to the loom harnesses in the usual manner, and so constitute the sheds through which the shuttle carriers 2 are to be driven back and forth.

A plurality of shuttle holder blocks 5 are mounted on the lay directly above alternate race blocks 3, and each holder block 5 is provided with a shuttle holder, the details of which form no part of the present invention, but are fully shown and described in the above mentioned copending application. Each holder is adapted to coact with a shuttle 6 to hold the same in position against movement in the plane at right

angles to the lay, and at the same time to permit the shuttle to be moved downwardly in the direction of a shuttle carrier 2 by means of a transferrer 7.

Each carrier 2 is provided with means for engaging a shuttle 6 as it is moved downwardly by the transferrer 7, whereby the shuttle is firmly held in position on the moving carrier. As fully set forth in the above mentioned copending application, the shuttle is held in position by coacting rigid and resilient portions carried by the shuttle and carrier respectively, and the present invention contemplates an improvement over the above mentioned shuttle positioning means which is shown in Figs. 7, 8 and 9. The carrier 2 is provided with a plate 8 having serrations 8^a extending longitudinally thereof, and the shuttle 6 is provided with a plate 9 also having serrations 9^a, also extending longitudinally thereof. The ends of the plate 9 are adapted to be engaged by resilient members 10 mounted on the carrier as the shuttle is moved downwardly, and thereby hold the serrations 8^a and 9^a in locking engagement. The plate 9 is provided with notches 11 at its ends, the purpose of which is to free the plate 9 of the members 10 and thereby allow a spent shuttle to fall freely from the carrier 2 before a fresh shuttle is completely engaged therewith.

As best shown in Fig. 1, each transferrer 7 is carried on a bracket 12 overhanging a shuttle holder block 5, and secured to the upper end of a vertically movable operating rod 13. The rod 13 is slidably mounted in bearings 14 carried by the lay and is connected at its lower end to one arm of a bell crank lever 15, pivotally mounted on a shaft 16. The other arm of the lever 15 is engaged by one end of a plunger 17, slidably mounted on the lay 1 and terminating in an operating head 18. Each plunger 17 is surrounded by a spring 19, which engages the head 18 and tends to hold the plunger 17 in the position shown in Fig. 1.

The exact arrangement of parts for operating the transferrers 7 forms no part of the present invention and is more fully shown and described in the above mentioned copending application, which further describes an arrangement whereby the transferrers 7 can be caused to operate either individually or collectively by interposing an obstruction in the path of movement of any one or all of the plungers 17 as the latter move back and forth with the lay. It is obvious that if an obstruction is interposed in the path of movement of any one of the plungers 17, as the lay moves forward, the resulting inward movement of the plunger will be communicated to the bell crank lever 15 and cause the transferrer 7 to move downwardly and transfer a shuttle 6 from a holder 5 to a shuttle carrier 2. The arrangement for actuating a transferrer by means operated by movement of the lay is broadly claimed in the above mentioned copending application, and forms no part of the present invention.

As previously set forth, it is one of the objects of the present invention to provide an arrangement whereby shuttle changing mechanism of the above described type may be caused to automatically bring about a transfer of shuttles after a given set of shuttles have made a predetermined number of picks. To this end, I have provided an automatic measuring device of the type shown in United States Letters Patent No. 600,121, which is adapted to cooperate with the shuttle transferring mechanism, as will now be described with reference to Figs. 1, 5 and 6.

A pair of ratchet wheels 20 and 21 are mounted to turn on a stud 22 projecting from the frame 23 of the loom at one end, the number of teeth 24 on the wheel 20 being less than the number of teeth 25 on the wheel 21. The teeth 24 and 25 are adapted to be engaged by pawls 26 carried on bell crank levers 27, pivotally mounted on the stud 22 adjacent to the wheels 20 and 21. Each lever 27 is connected at its other end to a link 28 that is pivotally connected at its upper end to the back of the lay 1. At each oscillation of the lay 1, the pawls 26 are adapted to advance the wheels 20 and 21 through the space of one tooth, and it is apparent that the wheel 20 will gain, in angular movement, on the wheel 21 each time that the wheels make one complete revolution, the distance gained by the wheel 20 being dependent upon the difference in the number of teeth on the wheels.

The wheels 20 and 21 are provided with flanges 29 and 30 respectively, extending in the direction of each other, the flanges 29 and 30 being provided with transverse slots 31 and 32, as best shown in Fig. 5. A vertically movable plunger or gag 33 is mounted above the ratchet wheels 20 and 21 with its lower end normally pressed in engagement with the peripheries of the flanges 29 and 30 by means of a spring 34, best shown in Fig. 1. As the gag 33 is wide enough to engage both flanges 29 and 30, it will continue to ride on the peripheries of same so long as the slots 31 and 32 remain out of register with each other. It is apparent that continued turning of the wheels 20 and 21 by the pawls 26 will finally bring the slots 31 and 32 into register with each other, whereupon the gag 33 will be forced downwardly into the alined slots 31 and 32 by the spring 34.

The upper end of the gag 33 is connected to one arm of a bell crank lever 35 pivotally mounted at 36, the other arm of which is connected by means of a link 37 to an arm

38 carried on a shaft 39. The shaft 39 extends across the front of the breast beam 40 of the loom and has mounted thereon a number of arms 41 extending in the direction of the lay 1. The arms 41 are spaced apart the same distance as the plungers 17 of the transferrer operating mechanisms, and each arm 41 terminates in a yoke 42 which embraces a pin 43 carried on a lug 44 projecting rearwardly from the top of a vertically movable actuator slide 45. As best shown in Fig. 6, each slide 45 is adapted to move within a dovetailed groove 46 provided in a block 47 mounted on the front of the breast beam 40. The lower end of each block 47 is provided with a notch 48 that is large enough to permit the operating head 18 of a plunger 17 to enter therein on each forward movement of the lay without encountering any obstruction, so long as the slide 45 remains in the position shown in Fig. 6, or in other words, so long as the gag 33 remains in engagement with the peripheries of the flanges 29 and 30.

When, however, the slots 31 and 32 come into alinement, the resulting downward movement of the gag 33 causes the cross shaft 39 to be turned in a counterclockwise direction, thereby simultaneously moving all of the slides 45 downward to cover the notches 48. Therefore, on the next forward movement of the lay, the several plungers 17 will engage the slides 45 and cause the several transferrers 7 to move a series of shuttles 6 from the holder blocks 5 to the shuttle carriers 2.

The change in the shuttles can be brought about after a given set of shuttles has made a predetermined number of picks, by properly proportioning the number of teeth 24 and 25 provided on the ratchet wheels 20 and 21. For example, if the wheel 21 is provided with 71 teeth, while the wheel 20 is provided with only 69 teeth, the slots 31 and 32 will come into alinement only after the pawls 26 have moved the wheels 20 and 21 a number of times equal to 71 multiplied by 69, or 4899 times. With the above described apportionment of teeth on the ratchet wheels 20 and 21, it is therefore apparent that the transferrers 7 will be operated only after the loom has made 4899 picks for a given set of shuttles. Obviously, the transferrers 7 can be caused to operate after the loom has made any other desired number of picks, by employing different ratchet wheels 20 and 21 provided with the proper number of teeth thereon. With my improved arrangement, the changing of the shuttles is rendered entirely automatic, so that all the operator has to do is to place fresh shuttles in the holder blocks 5 following a change of shuttles. As fully set forth in my above mentioned copending application, the holders are of such form as to permit the ready insertion of a fresh shuttle therein as the lay moves toward the breast beam 40.

It will be noted that there are transferrers 7 only on every alternate block 5, this being the same arrangement as above mentioned in my copending application, which shows mechanism whereby any shuttle can be changed at will, or any set of shuttles, (i. e., the even numbered ones or the odd numbered ones). Therefore, in order to make this loom continuously automatic, it is necessary to change both sets of shuttles, e. g., odds first, then even, then odd, etc., and by the present invention I accomplish this by having the measuring device measure an odd number of picks. As above stated, the number of picks measured off is equal to the product of the number of teeth in each ratchet gear; consequently, to measure an odd number, each gear must have an odd number of teeth, whereby the loom is rendered automatically selective.

As previously stated, a further object of my invention is to provide means whereby spent shuttles, displaced from the shuttle carriers 2 by the transferrers 7, may be readily ejected from the lay without interfering with the operation of the loom. To this end I provide a series of passages 49 in the lay 1, each passage 49 extending through the lay from a point directly beneath a shuttle changing mechanism, as best shown in Figs. 2 and 4. Each passage 49 is inclined in the same direction on the lay, and the walls thereof converge downwardly to form a throat 50 at the bottom of the lay 1 of substantially the same width as the thickness of a shuttle 6. The dimensions of the passages 49 at the top of the lay are such as to permit a shuttle 6 to enter therein in a substantially horizontal position as it is ejected from a shuttle carrier 2, as indicated in dotted lines in Fig. 4, but as a shuttle falls into a passage 49, its handle portion 6^a engages a deflecting finger 51 extending over the passage 49. As the handle portion 6^a strikes the finger 51, it has been found that the shuttle 6 is directed, base downwardly, into the passage 49, so that it will readily pass through the throat without any possibility of jamming therein by lodging against the walls of the throat 50. As a shuttle passes through the throat 50, it is free to fall to the floor or into a suitable receptacle placed below the lay 1. It will be noted that the plate 9 on the back of the shuttle renders the back portion heavier than the front.

By the use of the deflecting finger 51, it is apparent that spent shuttles will be discharged from the loom without any possibility of their becoming jammed in the passages 49, and thereby interfering with the operation of the loom.

As previously set forth, a still further object of my invention is to provide improved means for lining up the shuttles vertically, as they are moved horizontally on the carriers 2, following the operation of the transferrers 7. To this end, a pair of rollers 52 are rotatably mounted on alternate race blocks 3 and blocks 53 immediately above the blocks 3. As a set of shuttles 6 are moved by the rack, they pass between the sets of rollers 52 which tend to properly aline the shuttles on the carriers 2 and, therefore, correct any misalinement which may have occurred, due to the vibration of the loom. The rollers 52, therefore, provide further assurance of the proper operation of the loom, at all times.

It will be understood these rollers constitute in effect a safety device, as normally the shuttles will be properly positioned in the carriers by the transferrers, but when in a machine where there is a plurality of duplicate mechanisms, small misadjustments will be liable to occur and vibration is liable to upset the adjustment of some mechanisms, so that the provision of these rollers is for the purpose of making my invention a highly practical machine. I have found, for example, that some shuttles are apt to come to rest in carriers at a position about one notch above the proper position, owing to the fact that the train of mechanism constituting the transferring motion may be made of steel, which is resilient under a blow. This may happen if the plates 9 and 11 are too close together from any cause. A variation of three thousandths of an inch may cause such an occurrence. The rollers 52 act to aline the shuttles in their carriers by a wedging action, for the carriers are held in a vertical direction by the race blocks and the rollers will press upon the top or bottom of the back portion of the shuttle proper if said shuttle is not properly lined up.

From the foregoing, it is apparent that by my invention I have provided an improved mechanism for automatically bringing about the changing of the shuttles in a loom of the type described in my above mentioned copending application. By my invention I have further provided means whereby spent shuttles are so guided, following their ejectment from the shuttle carriers, that they are discharged from the looms without any possibility of interrupting the operation thereof. Still further advantageous features of my invention reside in the provision of means whereby fresh shuttles are engaged with the shuttle carriers and are properly lined up thereon for loom operation at all times.

After the changing of the shuttles, it will be found that no pick is missing from the goods, and that no special means is required to insure the interlocking of the filling from the new shuttles in the goods, the leaving of a depending end of filling from the shuttle being sufficient for the proper operation of this mechanism. The depending end and the end left by the old shuttle can be cut off either by hand or by any suitable automatic cutter.

While I have shown my invention as being applied to a loom mechanism similar in many respects to that shown in my above mentioned copending application, it is not so limited, but is capable of various modifications, and of being applied to other loom structures such, for example, as a loom employing two or more complete shuttle changing mechanisms arranged one above the other, without departing from the spirit and scope of my invention. I desire therefore that only such limitations be imposed thereon as may come within the scope of the appended claims.

I claim,

1. In a shuttle changing mechanism for looms, the combination with a lay, a shuttle holder and a shuttle carrier mounted on said lay, a transferrer adapted to move a shuttle from said holder to said carrier, and an actuating member for said transferrer, adapted to move with the lay, of means for automatically interposing a stop in the path of movement of said actuating member to operate the latter.

2. In a shuttle changing mechanism for looms, the combination with a lay, a shuttle holder and a shuttle carrier mounted on said lay, a transferrer adapted to move a shuttle from said holder to said carrier and an actuating member for said transferrer, adapted to move with the lay, of means for automatically interposing a stop in the path of movement of said actuating member to operate the latter, after a shuttle in said carrier has made a predetermined number of picks.

3. In a shuttle changing mechanism for looms, a lay having a plurality of shuttle holders and shuttle carriers mounted thereon, and provided with passages extending therethrough for receiving shuttles from said carriers, the said passages being inclined toward each other.

4. In a shuttle changing mechanism for looms, the combination with a lay having a shuttle holder and a shuttle carrier mounted thereon, and provided with a passage extending therethrough, and a transferrer for ejecting a shuttle from said carrier into said passage, of means for deflecting said shuttle base downward into said passage.

5. In a shuttle changing mechanism for looms, the combination with a lay having a shuttle holder and a shuttle carrier mounted thereon and provided with a passage extending therethrough, and a transferrer for ejecting a shuttle from said carrier into said

passage, of a member overhanging said passage for deflecting the shuttle base downward, as it enters said passage.

6. In a loom, the combination with a lay having a shuttle carrier containing a shuttle mounted thereon, of means for moving said carrier back and forth on said lay, and means dependent upon the back and forth movement of said carrier for positioning said shuttle vertically thereon.

7. In a shuttle changing mechanism for looms, the combination with a lay having a shuttle carrier containing a shuttle mounted thereon for reciprocatory movement, of a pair of coacting rollers for lining up a shuttle on said carrier.

8. In a shuttle changing mechanism for looms, the combination with a lay having a shuttle carrier containing a shuttle mounted thereon for reciprocatory movement, of means dependent upon the movement of said carrier for positioning a shuttle thereon.

9. In a shuttle changing mechanism for looms, the combination with a lay having a shuttle carrier mounted thereon for reciprocatory movement, of means for inserting a shuttle in said carrier, and means dependent upon movement of said carrier for lining up said shuttle vertically in said carrier.

10. In a shuttle changing mechanism for looms, the combination with a lay having a shuttle carrier mounted thereon for reciprocatory movement, of means for inserting a shuttle in said carrier, and means dependent upon the reciprocatory movement of said carrier for alining the shuttle thereon.

11. In a shuttle changing mechanism for looms, the combination with a lay having a shuttle holder and a shuttle carrier mounted thereon, a passageway extending through said lay for the reception of a shuttle ejected from said carrier, said passage way having a wide opening at the top and a narrow opening at the bottom, and means for tipping said ejected shuttle so that it may pass through said narrow opening.

12. In a shuttle changing mechanism for looms, the combination with a lay, a plurality of shuttle carriers reciprocated between blocks on said lay, a plurality of shuttle holders and transferrers on alternate blocks adapted to move shuttles from said holders to said carriers, of members on the other blocks adapted to position said shuttles vertically in said carriers on every other beat of said lay.

Dated this sixth day of June, 1922.

GEORGE CROMPTON, JR.