M. O. STEERE.

SHUTTLE MOTION FOR LOOMS.

APPLICATION FILED JUNE 30, 1909.

991,385.

Patented May 2, 1911.

3 SHEETS—SHEET 1.

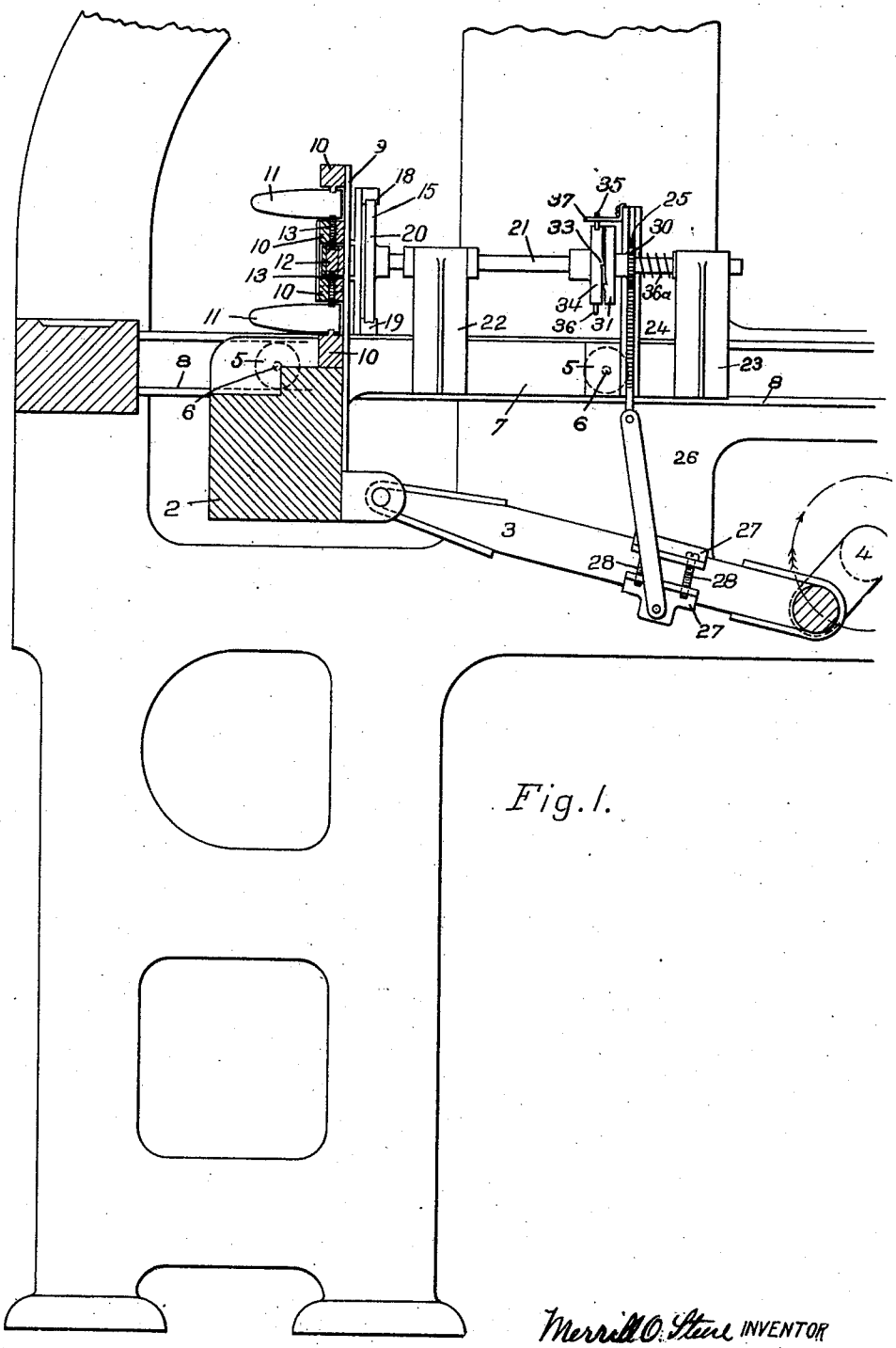

Fig. 1.

WITNESSES

Charles E. Hood

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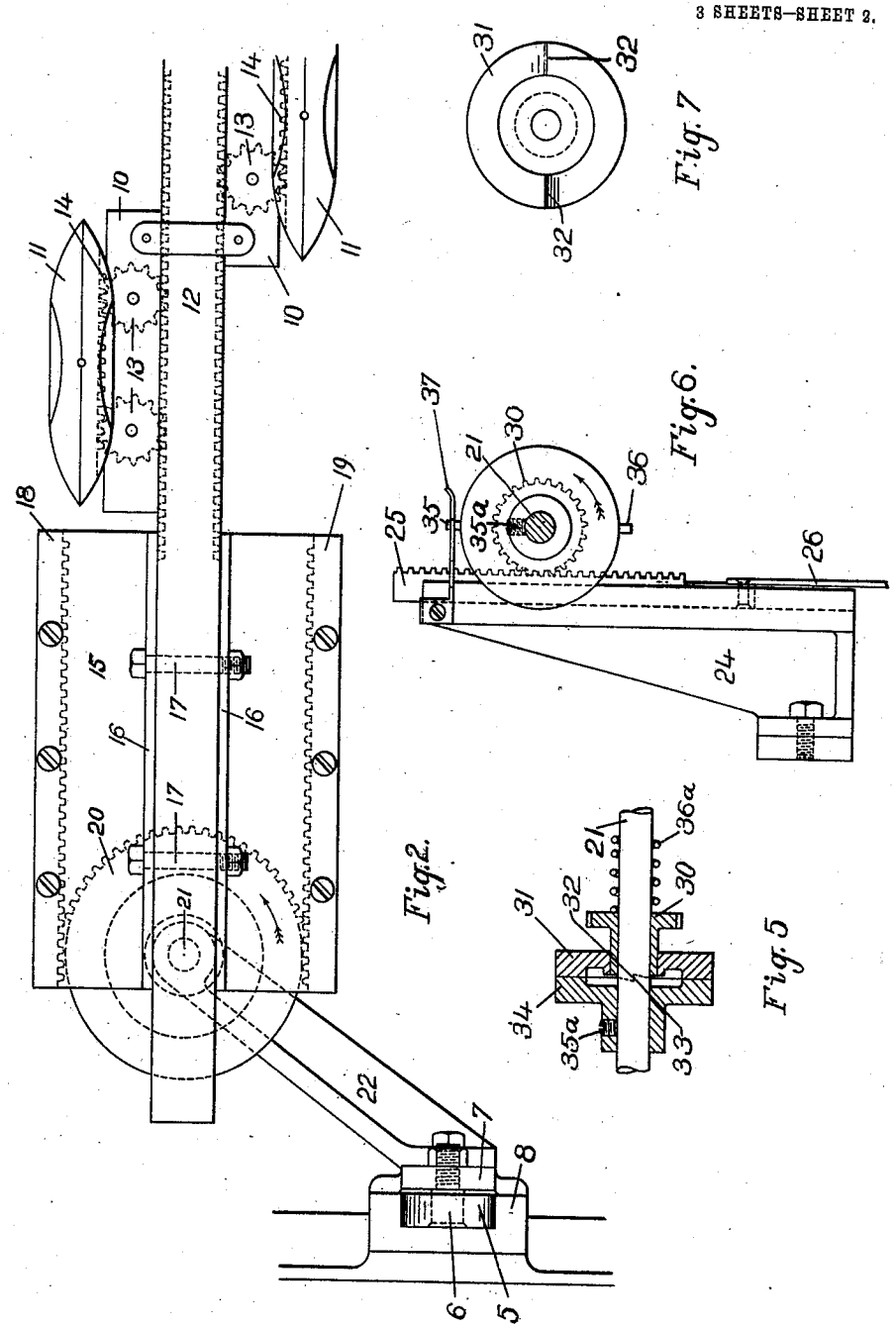

Fig. 2.

Fig. 7

Fig. 6.

Fig. 5

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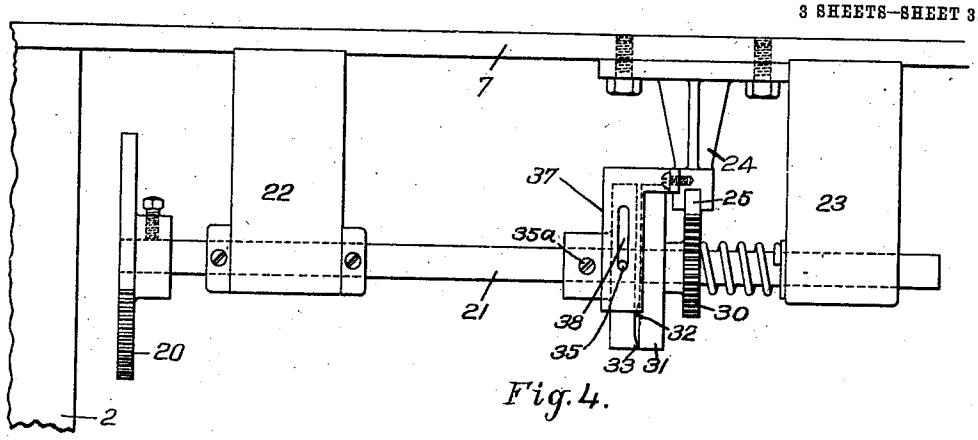

Fig. 4.

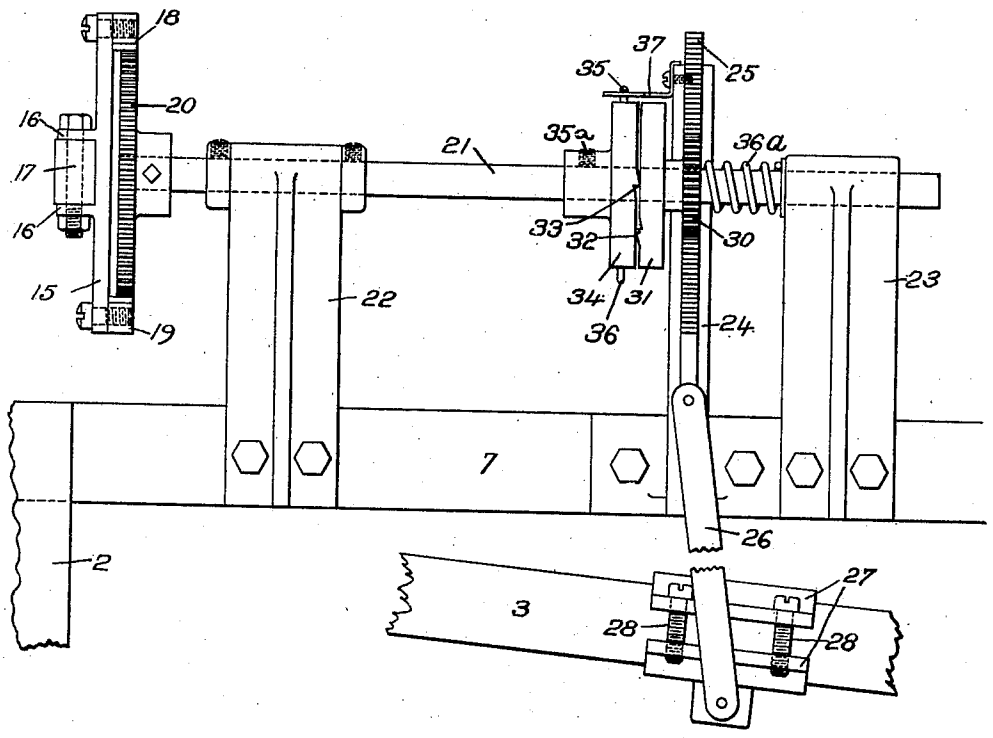

Fig. 3.

WITNESSES

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UNITED STATES PATENT OFFICE.

MERRILL O. STEERE, OF PAWTUCKET, RHODE ISLAND.

SHUTTLE-MOTION FOR LOOMS.

991,385. Specification of Letters Patent. Patented May 2, 1911.

Application filed June 30, 1909. Serial No. 505,151.

To all whom it may concern:

Be it known that I, MERRILL O. STEERE, a citizen of the United States, residing at Pawtucket, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Shuttle-Motions for Looms, of which the following is a specification.

My invention relates to shuttle-motions for narrow ware looms and the object of my improvement is to provide a simple shuttle actuating device operated from the same means which operates the batten or lay of the loom without the introduction of cams, cranks or other special actuators.

Another important improvement of my device is the arrangement which provides for an entirely separate and distinct shuttle-motion for each side of a double loom so that when one of the lays is disconnected from the crank shaft the shuttle-motion for this lay shall be rendered inoperative without affecting in any way the operation of the shuttle-motion for the opposite lay.

The following is a complete description of the invention, illustrated by the accompanying drawings, in which:

Figure 1 is a side elevation of a portion of a narrow-ware loom showing the breast-beam and lay in section; Fig. 2, a front elevation of a portion of the rack-bar and shuttles which are supported on the lay, showing the means for engaging the rack-bar to reciprocate the latter to actuate the shuttles; Fig. 3, an enlarged side view showing the shuttle-motion proper in elevation; Fig. 4, a plan view of the same; Figs. 5, 6 and 7, details of construction.

My invention is shown as applied to a loom in which the shuttles are positively shifted and positively controlled throughout their travel. The device is particularly adapted for use on a double loom such as is disclosed in Patent No. 634,681 to Thomas Brindle and Merrill O. Steere, granted October 10, 1899, in which there are two oppositely moving lays reciprocated from a single crank-shaft arranged between the lays and connected to the latter by pitmen. In operating this style of loom occasions arise when it is essential or desirable to draw in or repair the warp on one side of the loom only, and in order that one side of the loom may be kept in operation while the opposite side is inoperative this is accomplished by actually disconnecting the pitmen of the lay which is to remain at rest.

In the drawings I have shown one side of the loom only, with the shuttle-motion applied to one lay, but it will be obvious that the same arrangement may be applied to the opposite side of the loom by providing a similar mechanism on the other lay. It will also be observed that the shuttle-motion is controlled and operated by the movement of the lay to which it is attached, so that when used in a double loom each shuttle-motion is entirely independent of the other.

In Fig. 1, 2 is the lay which is connected by two or more pitmen 3 to be reciprocated from the crank shaft 4. The lay 2 is preferably supported on roller bearings 5—5 pivotally mounted on studs 6—6, see Fig. 2, projecting from an arm or frame 7 fastened to the end of the lay. Only one of these frames is shown in the drawings, but it will be understood that there are two, one on each end of the lay. The rollers 5—5 are adapted to a horizontal track 8, a track being secured to the inside of each end frame of the loom, so that the lay is supported between the two frames to slide on the tracks with very little resistance to its reciprocation.

Carried on the lay 2 is the usual framework 9 having blocks 10, 10, etc., which serve as guides in which the shuttles 11—11 slide. The rack-bar 12, see Fig. 2, slides between the blocks 10, 10, etc., and its edges are formed with teeth which engage the toothed wheels 13, 13, etc., pivoted in slots in the blocks 10. The teeth on the wheels 13 engage toothed racks 14 in the grooves of the shuttles 11, so that when the rack-bar is reciprocated the shuttles are moved in an opposite direction to pass through the shed in the usual manner employed in looms of this character.

The rack-bar 12 is operated by the following described novel arrangement of mechanism: Secured to the end of the bar is a plate 15 having flanges 16—16 overlapping the edges of the bar and bored to receive the bolts 17—17 which extend through the bar. Secured to the top and bottom edges of the plate 15 are horizontal, toothed racks 18 and 19. Adapted to alternately engage the racks 18 and 19 is a segmental gear 20 having teeth extending around its periphery less than half a circumference. The number of teeth in

the toothed segment is such that the leading tooth engages one rack just as the last tooth leaves the other rack. The gear 20 is fast on a shaft 21 which rotates in bearings in the brackets 22 and 23 fastened to the frame 7 on the lay 2. The shaft 21 is given an intermittent, progressive rotation by means of the following instrumentalities actuated from the pitman 3 which connects the lay with the crank shaft 4. Between the brackets 22 and 23 is a third bracket 24, likewise bolted to the arm 7, and formed with a vertical guideway in which a rack 25 slides. The rack 25 is connected at its lower end by a link 26 to the pitman 3. Preferably, the means for connecting the link 26 with the pitman 3 consists of a two-part clamp 27 secured to the pitman by means of bolts 28—28 and adjustable along the pitman toward or away from the crank shaft 4. By adjusting the point of connection of the link 26 on the pitman 3 in relation to the crank shaft 4 the range of movement of the link 26 may be varied to regulate the extent of reciprocation of the rack 25. The teeth of the rack 25 engage with the teeth of a pinion 30, see Fig. 6, which is free to rotate on the shaft 21 and is either formed with, or has attached thereto, a clutch member 31. The clutch member 31 has its face formed with shoulders 32, see Fig. 7, which are preferably diametrically opposed and adapted to engage the corresponding shoulders 33 on a clutch member 34 secured to the shaft 21 by any suitable means such, for instance, as the set screw 35[a]. A coiled spring 36[a] surrounding this shaft 21 between the hub of the pinion 30 and the bearing of the bracket 23 serves to press the member 31 into engagement with the member 34. As the pitman 3 moves up and down with the rotation of the crank shaft 4 the rack 25 is reciprocated thereby, through its connection therewith by the link 26, and to the pinion 30 is imparted an oscillating movement. The pinion 30 is so proportioned that the action of the rack 25 is to cause it to oscillate in half rotations of alternately opposite direction. Each time the rack 25 rises it turns the clutch member 31 backward until its clutch shoulders are engaged with the corresponding shoulders on the coacting clutch member 34; and each time the rack 25 is carried downward it turns the clutch member in the opposite direction, and, through the engagement of the shoulders on the two clutch members, a half rotation is imparted to the shaft 21 in the direction indicated by the arrow, Figs. 2 and 6.

To prevent the clutch member 34 from turning backward under the influence of the frictional contact of the clutch faces, I provide a detent arrangement shown most clearly in Figs. 4 and 6. Secured in the periphery of the member 34 are two diametrically opposed pins 35 and 36 which are adapted to engage the yielding detent 37. This latter consists of a spring plate secured to the bracket 24 and formed with a slot 38 with which the pins 35 and 36 engage. When the shaft 21 is being rotated ahead in the direction indicated by the arrow, Fig. 6, the pins 35 and 36, each in turn, will ride up under the end of the detent 37 and the latter will yield sufficiently to allow the end of the pin to enter the slot 38. The slot 38 is so proportioned that when the clutch member 34 is rotated in the direction indicated, as desired, the pins will pass out of the inner end of the slot without resistance; but any tendency of the member 34 to rotate backward is prevented by the engagement of the pins with the outer end of the slot, as shown in Fig. 6.

The operation of the whole mechanism is as follows: The lay 2 is reciprocated by means of the pitmen 3 connected with the crank shaft 4, and slides in the loom frame on the roller bearings 5, 5. As the pitman 3 rises and falls with the rotation of the crank, a reciprocatory motion is imparted through the link 26 to the rack 25 which, in turn, oscillates the pinion 30 through half rotations in alternately opposite directions. The clutch member 31 engages the coacting member 34 at each half rotation and turns it in the direction indicated by the arrows, Figs. 2 and 6. The member 34 being fast on the shaft 21, the latter is thus given a progressive movement with a half rotation at a time, backward movement of the member 34 being prevented by the pins 35 and 36 which alternately snap into the slot 38 in the detent 37 as previously explained. The gear 20 being fast on the shaft 21 has a progressive turning movement, a half rotation at a time, always in one direction as indicated by the arrow, Fig. 2. The teeth on the gear 20 engage alternately with the racks 18 and 19 so that the rack-bar 12 is caused to move first in one direction and then in the other to slide the shuttles 11 back and forth through the shed. In Fig. 1 the pitman 3 is shown with the crank near the bottom of its stroke and as the crank shaft 4 turns in the direction indicated by the arrow the rack 25 is carried upward. This upward movement of the rack 25 rotates the pinion 30 to turn the clutch member 31 backward and the shoulder 32 on said member is shown as just starting to recede from the shoulder 33 on the member 34. When the rack 25 has been raised to the limit of its upward stroke the pinion 30 will have been turned through one half a rotation and the opposite shoulder on the clutch 31 will then come into engagement with the shoulder 33 on the clutch member 34. At this point the gear 20 is in the position shown in Fig. 2 with its teeth just free from engagement

with both racks 18 and 19. Now, as the rack 25 is carried downward by the downward throw of the pitman the pinion 30 is rotated in the opposite direction from that of its previous movement and through the engagement of the clutch members 31 and 34 the shaft 21 is turned in the same direction. This turns the gear 20 in the same direction, as indicated by the arrow in Fig. 2, and the teeth on said gear will come into mesh with the teeth on the rack 18 and cause the rack-bar 12 to be moved to the left to shift the shuttles to the right. As the shaft 21 completes its half rotation, under influence of the downward movement of the rack 25, the leading tooth of the gear 20 will come into close proximity with the rack 19 just as the last tooth leaves the rack 18. Then, when the shaft 21 starts to rotate at the next downward reciprocation of the rack 25 the teeth on the gear 20 will engage the rack 19 and the rack-bar 12 will be moved to the right to return the shuttles through the shed. In this way the intermittent, progressive rotation of the gear 20 imparts a reciprocatory movement of the rack-bar 12 to shift the shuttles in one direction at each beat of the lay. By varying the diameter of the gear 20 and adapting the rack plate 15 to the size of gear employed the extent of movement of the shuttles can be varied to suit the conditions of weaving as required, and the adjustment of the clamp 27 along the pitman 3 provides for regulating the throw of the rack 25 to give the proper extent of rotation of the shaft 21. It will be observed that the movement of the pitman 3 causes an accelerated speed of reciprocation of the rack 25 during the middle of the stroke of the latter. As the crank passes the vertical center the speed of the rack is retarded and this retardation occurs at the end of each stroke of the rack. This feature is important because it is desirable to have the shuttles move with greatest speed as they pass through the shed when the latter is opened by the shifting of the harness mechanism; and to retard their movement at each end of their reciprocations so as to avoid a quick pull on the weft thread as the latter is drawn tight across the warp. Further, this condition is of advantage as reducing the shock and jar incident to a rapid reciprocation of the shuttles and therefore provides for running the loom at a maximum speed.

My invention has the advantage of simplicity of construction in a directly actuated mechanism carried by the lay and operated by the movement of the latter so that the shifting of the shuttles is always correctly timed with the movement of the lay. Further, it provides that when the lay is disconnected to remain inoperative the shuttle motion is also rendered inoperative, irrespective and independent of the other going parts of the loom, thereby making it particularly adapted for double looms in which it is sometimes necessary to arrest the operation of one side of the loom while the opposite side continues to run.

Various modifications might be made in the form and arrangement of the parts shown and described without departing from the scope of the invention, therefore, I do not limit myself to the exact construction herein shown, but

What I claim is:—

1. In a shuttle-motion for looms, the combination with the lay, shuttles and rack-bar carried thereby and cranks to drive the lay, of racks on the rack-bar, a gear engageable with the racks alternately and means to actuate the gear from one of the cranks.

2. In a shuttle-motion for looms, the combination with the shuttles and rack-bar therefor, of a shaft, connections between the shaft and rack-bar by which the latter is reciprocated, and means to turn the shaft progressively by successive half rotations to reciprocate the rack-bar.

3. In a shuttle-motion for looms, the combination with the lay, shuttles and rack-bar carried by the lay and cranks to drive the lay, of a shaft, connections between the shaft and rack-bar by which the latter is reciprocated, and means to turn the shaft progressively by successive half rotations, actuated by one of the cranks.

4. In a shuttle-motion for looms, the combination with the shuttles and rack-bar, of two racks connected with the rack-bar, a gear engageable with the racks and means to engage the gear with the two racks, alternately, to reciprocate the rack-bar with variable rate of motion.

5. In a shuttle-motion for looms, the combination with the shuttles and rack-bar therefor, of two opposed racks connected with the rack-bar, a gear engageable with the two racks alternately, and means to actuate the gear to reciprocate the rack-bar with variable rate of motion.

6. In a shuttle-motion for looms, the combination with the shuttles and rack-bar therefor, of opposed racks connected with the rack-bar, a segmental gear alternately engaging the two racks with each complete rotation, and means to advance the gear through successive half rotations to drive the rack-bar in alternately opposite directions.

7. In a shuttle-motion for looms, the combination with the shuttles and rack-bar therefor, of two opposed racks on the rack-bar, a segmental gear to reciprocate the rack-bar by engagement of its teeth with the two racks alternately, of means to turn the gear through successive half rotations, including a clutch member rotatively fixed

with relation to the gear, a second clutch member rotatively independent of said gear in one direction of rotation, and means to oscillate the second clutch member through successive half rotations to advance the first clutch member with the gear, through successive half rotations of constant direction to reciprocate the rack-bar.

8. In a shuttle-motion for looms, the combination with a shuttle and reciprocating rack-bar, a shaft intermittently rotating by progressive half rotations constantly in one direction, and connections that reciprocate the rack-bar from the shaft, of a clutch member rotatively secured to the shaft, a second, coacting clutch member oscillatable on the shaft, and means to oscillate the second clutch member through successive half rotations to drive the first clutch member and its connected shaft progressively by half rotations of constant direction to reciprocate the rack-bar.

9. In a shuttle-motion for looms, the combination with the lay, shuttles and rack-bar carried on the lay, and means to move the lay, of a device to reciprocate the rack-bar mounted and moved with the lay comprising a shaft rotated progressively by half rotations of constant direction, a clutch to drive the shaft and means to oscillate the clutch to drive the shaft, actuated from the lay moving means.

10. In a shuttle-motion for looms, the combination with the lay and actuating means therefor, and shuttles and rack-bar on the lay, of a shaft connecting with the rack-bar to reciprocate the latter, and itself reciprocating longitudinally with the lay, a clutch member on the shaft oscillated through successive half rotations, connections to oscillate the clutch member from the lay actuating means, and a second clutch member secured to the shaft, turned progressively by successive half rotations to reciprocate the rack-bar, by oscillation of the first clutch member.

11. In a shuttle-motion for looms, the combination with the lay and reciprocating means therefor, including pitmen, shuttles and rack-bar carried with the lay, of a shuttle actuating device carried bodily with the lay in its reciprocation, and a connection from one of the pitmen to the shuttle-actuating device to transmit motion thereto from the pitman, variable in position on the pitman to vary the extent of motion transmitted.

12. In a shuttle-motion for looms, the combination with the lay, shuttles and rack-bar carried thereon, arms to support, and means to reciprocate the lay, of bearings on one of said supporting arms, a shaft in said bearings connected with the rack-bar, a gear oscillatable on the shaft and driving connections between the gear and the lay reciprocating means, and a clutch to transform the gear oscillation into progressive rotation of the shaft to reciprocate the rack-bar and shuttles.

13. In a shuttle-motion for looms, the combination with the shuttles and rack-bar, of a shaft and operative connections between the same and the rack-bar, a gear free to turn upon the shaft, a rack to engage the gear, means to reciprocate the rack thereby oscillating the gear, and a clutch connecting the gear with the shaft to rotate the latter progressively, with successive oscillations of the gear, to reciprocate the shuttles.

14. In a shuttle-motion for looms, the combination with the shuttles, rack-bar, lay and means to reciprocate the lay, of a shaft connected with the rack-bar, a gear free to turn on the shaft, a rack to engage the gear, a connection from the lay reciprocating means to the rack to reciprocate the latter thereby oscillating the gear, and a clutch connecting the gear with the shaft to rotate the latter progressively, with successive oscillations of the gear, to reciprocate the shuttles.

15. In a shuttle-motion for looms, the combination with the shuttles, rack-bar, lay and means to reciprocate the lay including pitmen, of a shaft connected with the rack-bar, a gear free to turn on the shaft, a rack engaging the gear to oscillate the latter driven by a pitman, a link connecting the rack with the pitman and variable as to its point of connection with the latter to vary the movement of the rack, and a clutch connecting the gear with the shaft to rotate the latter progressively, with successive oscillations of the gear, to reciprocate the shuttles.

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

MERRILL O. STEERE.

Witnesses:
RICHARD BLOMSTOCK,
JOHN M. WELCH.