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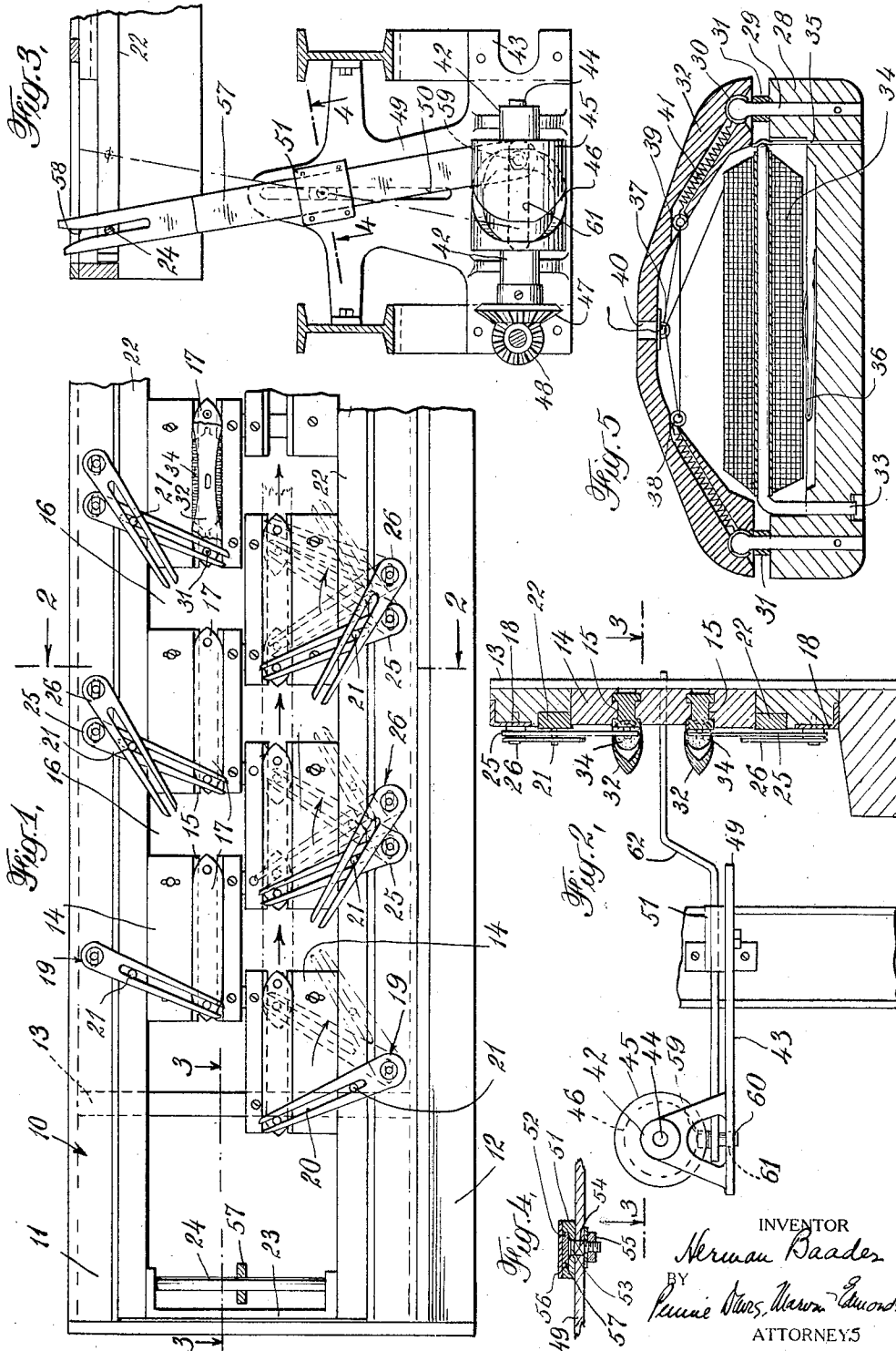
H. BAADER

1,737,138

NARROW FABRIC LOOM

Filed June 24, 1927

3 Sheets-Sheet 1



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ATTORNEYS

Nov. 26, 1929.

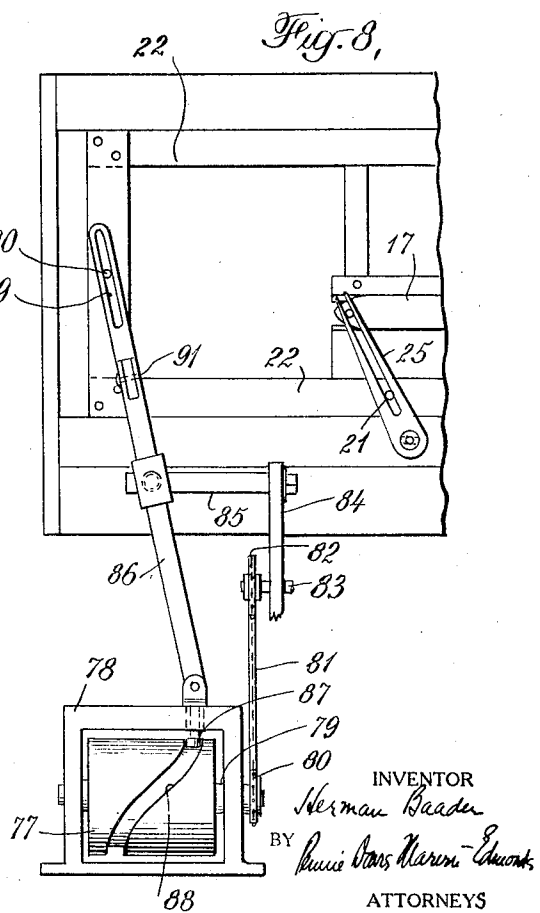
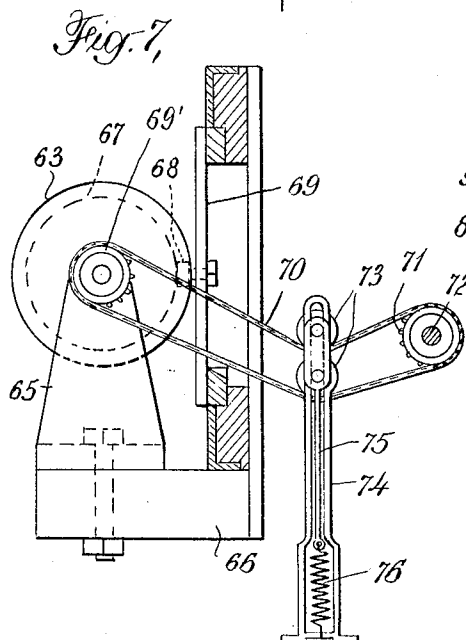
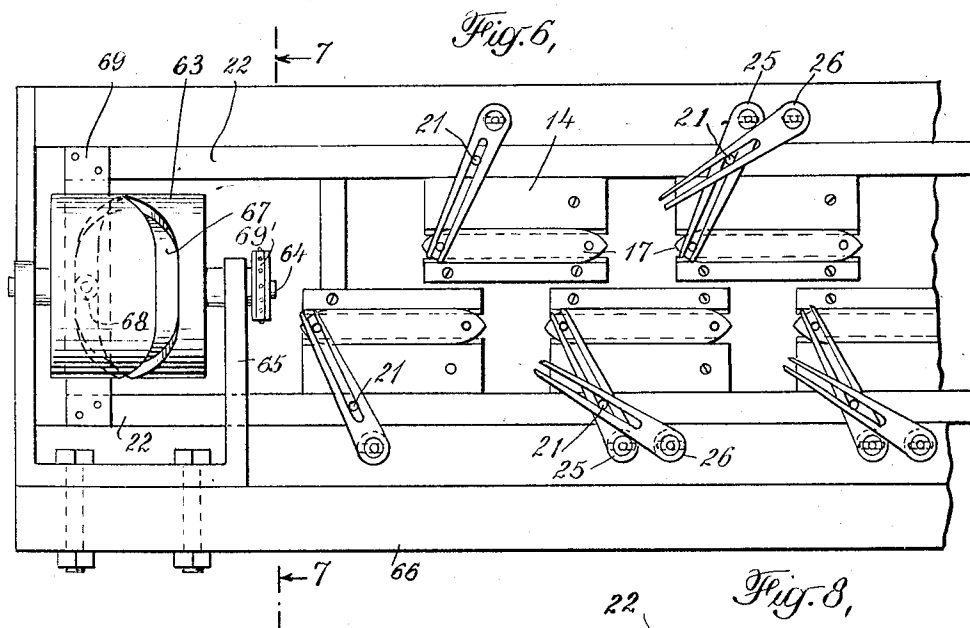
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NARROW FABRIC LOOM

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3 Sheets-Sheet 2



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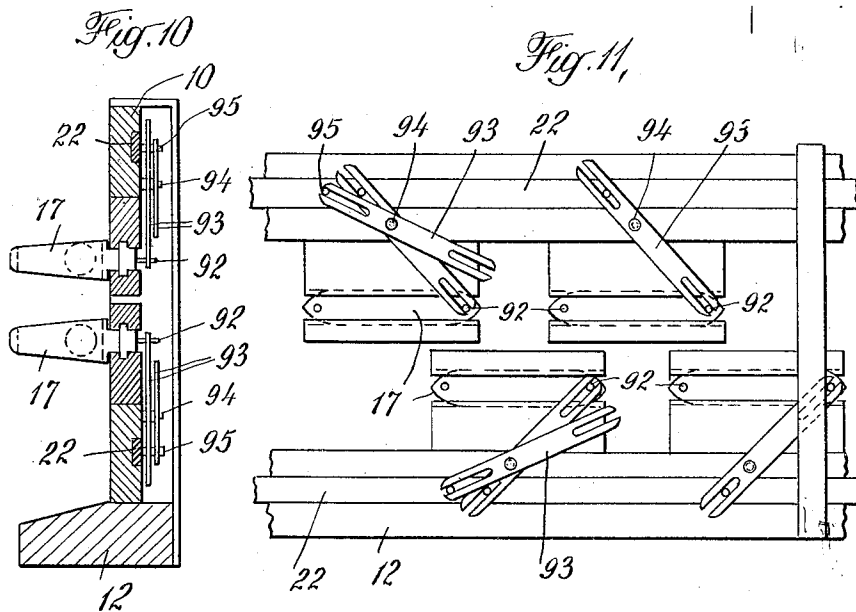
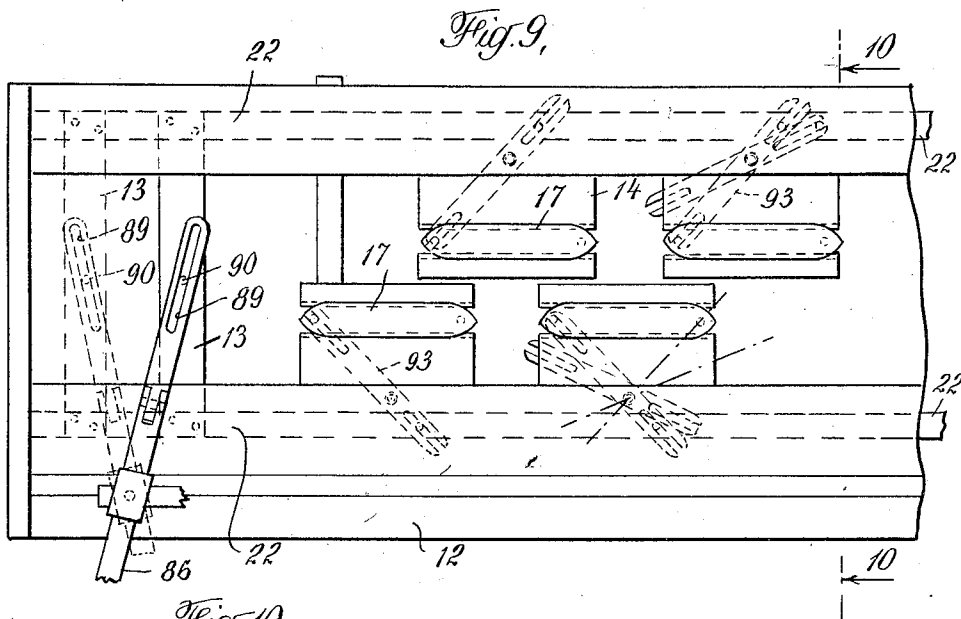
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1,737,138

NARROW FABRIC LOOM

Filed June 24, 1927

3 Sheets-Sheet 3



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NARROW FABRIC LOOM

Application filed June 24, 1927. Serial No. 201,092.

This invention relates to narrow fabric looms of the type commonly used in weaving ribbon, tape, and the like and having a plurality of shuttles movable in unison. More particularly, the invention is concerned with a novel form of drive mechanism for reciprocating the shuttles, which affords numerous advantages over those heretofore used, in that the shuttles are driven positively and under exact control at all times and the mechanism is simple in construction, of great durability, capable of easy adjustment when occasion arises, and includes only a few working parts none of which is subject to rapid wear or breakage.

In narrow fabric looms as now ordinarily constructed, the shuttles which are of wood are mounted in one or more rows in guides on a batten, each shuttle being guided between pairs of blocks, one pair of which is on either side of the reed through which the warp threads pass. Various devices are used for driving the shuttles in unison, and in one form of drive mechanism in wide use, the batten carries a rack bar for each row of shuttles, the teeth of this bar engaging a pair of pinions, one in a block at each side of the reed. These pinions project into the shuttle raceway and mesh with rack teeth formed in the rear faces of the shuttles. For reciprocating the rack bar, the means provided includes a pair of straps which are connected to the rack bar at spaced points near one end of the bar, these straps leading around guide wheels to a pair of crank arms on a driven shaft. In order to give the rack bars, and consequently the shuttles, the desired reciprocating motion with a period of rest at either end of the shuttle movement, the drive shaft for the shuttle motion is driven from a main drive shaft through an elliptic and an eccentric gear, the straps being alternately taken up and let out in the operation of the device.

This type of shuttle drive is open to nu-

merous objections, among which may be mentioned the frequent adjustment required because of variation in the lengths of the leather straps, due to weather conditions and normal tendency to stretch. Likewise, the shuttles and the rack bar are made of box wood for lightness and the wood is affected by climatic conditions to an extent such that the parts get out of adjustment as the humidity varies. The teeth of the bar and the shuttle rack become worn after a period of use, and these teeth frequently break, necessitating a complete shut-down of the loom and a considerable loss in ends. Furthermore, due to variation in the lengths of the straps and wear in the teeth, the shuttles are not under exact and positive control at all times in their movement and the momentum of the shuttles causes them to overrun and to rebound. Their rest period is therefore not of exact duration and damage to the parts, as well as to the warp, frequently results.

The present invention is directed to the provision of a shuttle drive for narrow fabric looms which overcomes the objections above pointed out and affords important advantages, due to its longer life resulting from the elimination of working parts, and more satisfactory performance, resulting from the positive control of the shuttles at all times. In addition, the new drive mechanism, due to its simplicity and durable construction, permits the loom to be operated at much higher speeds than is practically possible in looms as heretofore constructed, so that it represents a saving in installation and maintenance cost and permits a much higher output rate than has heretofore been common practice.

The shuttle drive of the present invention may be embodied in different forms of mechanism, but it preferably includes a pair of elements for driving each shuttle which may take the form of forks, levers, hooks, etc., the pair of elements for each shuttle being

placed on opposite sides of the reed with which the shuttle works. The elements for a row of shuttles are pivotally mounted on the batten at one side of the row, and an operating rod is provided which extends lengthwise of the batten and carries pins which engage the elements and cause them to swing in the plane of shuttle movement as the rod is reciprocated. The rod is driven positively to and fro by means of a grooved cam rotated in any convenient manner but preferably by bevel gears from the vertical drive shaft for the pattern control mechanism with which these looms are commonly provided.

The elements which for convenience will be referred to as forks, are so disposed with reference to the shuttle which they are to drive, that as the rod begins to move in one direction, one fork will positively engage and move the shuttle in a direction across the shed, effecting only a part of the movement, which is then continued by the second fork coming into action to complete the shuttle movement before the first fork has cleared the shuttle. In the return movement of the shuttle, the sequence of operations is reversed so that each fork accomplishes a portion of the reciprocation of the shuttle in each direction but releases the shuttle in sufficient time so that the fork cannot contact with the warp through which the shuttle is moved.

With this arrangement, it will be apparent that as the operating rod is positively driven and the forks have a positive engagement with the shuttles, the shuttle movement is under exact control at all times. The shuttles are not only positively driven, but since they are in positive engagement with one fork as they approach the ends of their reciprocatory movement, the rest periods of the shuttles are positively and exactly determined, so that overrun with resultant shock and breakage of the parts or of the ends is prevented.

The invention has various advantages in addition to those pointed out which will be apparent in the detailed description to follow and includes not only the new drive mechanism for the shuttles, but also the new shuttle which is to be used in conjunction with such mechanism.

For a better understanding of the invention, reference may be had to the accompanying drawings, showing the new driving mechanism in a form suitable for use in a loom in which two banks of shuttles are employed. In these drawings

Fig. 1 is a view in front elevation of a portion of a batten showing a part of the new drive mechanism in use for driving shuttles in two banks,

Fig. 2 is a sectional view on the line 2—2 of Fig. 1,

Fig. 3 is a sectional view on the line 3—3 of Fig. 1,

Fig. 4 is a sectional view on the line 4—4 of Fig. 3,

Fig. 5 is a view partially in cross-section, showing the new shuttle used with this drive mechanism,

Fig. 6 is a view corresponding to Fig. 1, but showing a modified form of drive mechanism,

Fig. 7 is a sectional view on the line 7—7 of Fig. 6,

Fig. 8 is a view similar to Fig. 6, showing another modified form of the drive mechanism,

Fig. 9 is a view similar to Fig. 1 showing a modified drive mechanism, Fig. 10 is a sectional view on the line 10—10 of Fig. 9, and Fig. 11 is a rear view of a portion of the mechanism shown in Fig. 9.

Referring to the drawings, the loom includes a batten 10 of the usual or any standard construction, including upper and lower members 11 and 12 connected by straps 13. As illustrated, the batten is provided with two rows of shuttle raceways defined by guide blocks 14 mounted on the straps 13 in any convenient manner, preferably by an adjustable mounting which permits the upper and lower guide blocks of each pair to be adjusted toward and away from each other. The guide blocks are under-cut to provide tongues as shown at 15 which are received in suitable channels in the opposite faces of the shuttles, this arrangement insuring that the shuttles will move freely but in a straight line in the blocks.

Each pair of blocks forms a part of the shuttle raceway and as the shuttle has a movement through the shed, a pair of blocks consisting of an upper and lower block is placed at each side of the reed through which the warp passes through the batten. The space for the reed, which is not illustrated, is indicated at 16 and in Fig. 1 the shuttles 17 are shown at the left-hand end of their movement. In the operation of the loom, each shuttle 17 moves from the pair of blocks in which it is shown in the drawings, across a space 16 and into the raceway between the pair of blocks at the right-hand side of the reed.

For driving the shuttles the batten is provided with angle bars 18 on its front face at its upper and lower edges, and pivotally mounted in each angle bar are driving elements 19 which may take the form of forks, levers, hooks, or the like. These elements are illustrated in Fig. 1 in the form of forks, each element having a longitudinal slot 20 extending inwardly from its free end. The forks of the upper row extend downward from their pivots and the forks of the lower row extend upward, and each fork is engaged by a pin 21 projecting into its slot, these

pins being carried on actuating rods 22 disposed movably in guide-ways in the face of the batten and connected by bars 23 at their ends. One bar 23 carries a long pin 24 for a purpose presently to be described.

The pairs of blocks at the ends of each row of shuttles serve as guides only for one shuttle, while the intermediate pairs of blocks are effective to guide a pair of adjacent shuttles. As each shuttle is driven by a pair of forks, there is one fork associated with each end pair of blocks and a pair of forks designated 25 and 26 mounted pivotally adjacent each intermediate pair of blocks. The forks 25 and 26 are pivotally mounted close together and are arranged so as to be actuated by a common pin 21 on the rod 22. In order to clear each other, one of the forks is mounted on the pin above a washer, while the other fork is mounted on its pin beneath a washer, this arrangement permitting the forks to operate while clearing each other.

The new shuttle to be used with this drive mechanism includes a body portion 28 having longitudinal channels to receive the tongues 15 of the guide blocks. At each end the body portion has upstanding posts 29, each of which has a slotted knob 30 on its upper end. Each post carries a roller 31 and the shuttle frame is completed by a cover member 32 having recesses which may receive the knobs 30 on the ends of the posts, the cover member then being spaced from the body portion by the rollers 31 which are free to rotate. In the body portion there is provided the usual spindle 33 on which the quill 34 may be mounted, a spring finger 35 being provided to engage the free end of the spindle to hold it in place with the quill in position. A spring tension finger 36 of the usual form is provided on the body member to bear against the face of the quill to prevent its overrunning and the yarn is drawn from the quill, passed through a central guide eye 37 on the cover member, then successively through lateral guide eyes 38 and 39, and finally through a central opening 40. The guide eyes 38 and 39 are attached to springs 41 mounted in recesses in the cover member of the shuttle in the usual manner. These shuttles are placed in position in the guide blocks in the usual way and the shuttles are positioned so that one roller 31 enters the slot in a fork 19. When the shuttles are properly mounted and at the end of their traverse each shuttle is engaged by one fork, and, as shown in Fig. 1, each shuttle is at the left end of its movement and engaged by a fork which is swung with its free end toward the left. As the actuating rod for a row of shuttles is now reciprocated toward the right, the fork 19 is swung toward the right and causes the shuttle to move across the space 16, the shuttle then passing through the shed. As this movement continues, the right-hand end of the shuttle

enters the raceway between the next adjacent pair of blocks to the right and at this time the fork 26 has swung downwardly to a position in which its prongs straddle the roller 31 in the right-hand end of the shuttle. At this period in the movement, the shuttle is being moved by both forks and the period of overlap in the action of the forks is sufficient to insure their positive engagement with the shuttle and a continuous movement thereof. The further movement of the shuttle to the right effected by the two forks results in the fork 19 swinging upwardly in a counterclockwise direction to clear the roller at the left end of the shuttle, whereupon the shuttle movement is completed by the fork 26 which swings to an extent determined by the reciprocation of the actuating rod. At the end of its movement, the shuttle remains at rest for a period necessary to permit the harness to form the new shed, whereupon the actuating rod moves toward the left and each shuttle in the row is driven toward the left by its fork 26. The fork 19 begins to swing downwardly as the shuttle movement commences and at the proper instant the prongs of the fork straddle the left-hand roller in the shuttle, picking up the shuttle and continuing its movement as the fork 26 clears the shuttle. The length of each fork and its position with reference to the reed are such that the fork may swing, as far as may be necessary without coming in contact with the warp threads.

It will be seen that with this arrangement each shuttle is moved by a pair of members which swing in a plane and comes successively into action, the first member initiating the shuttle movement and partially completing it, and the second member coming into action before the first has gone out of action, after which the second member alone completes the shuttle movement. Owing to the direct and positive engagement of each shuttle with its driving forks, the extent of shuttle movement is exactly determined and the duration of the periods of rest of the shuttle is likewise controlled with the possibility of overrunning of the shuttles prevented. These desirable results are in part accomplished by the type of driving elements for the shuttles and in part by the means by which these elements are actuated. For this purpose, the following drive mechanism is used.

Mounted in bearings 42 in a base plate 43 placed at one end of the loom is a shaft 44 carrying a cam drum 45 having a cam slot 46. The shaft 44 may be driven in any convenient manner, but is preferably rotated through bevel gears 47 and 48 one of which is fast on the vertical drive shaft for the pattern control mechanism commonly employed in these looms. The base plate is provided with an extension 49 having a slot 50 and on the extension is adjustably mounted a clamp member 51 having a channel 52 in its upper

face. This clamp member has a bore through its bottom wall in which lies the head 53 of a bolt 54 which passes through the slot 50 and is held in place in adjusted position by means of a nut 55. The clamp member is free to oscillate on the head of the bolt and the channel is closed by a cover plate 56. Secured in the channel is a drive lever 57 which has a forked end 58, the prongs of which straddle the drive pin 24 connected to the upper and lower actuating bars for the shuttle motion. At its other end the drive lever 57 carries a roller 59 which runs in the cam slot 46 in the drum 45 and on its lower face the lever carries a roller 60 running in a slot 61 in the base plate which extends parallel to the axis of the drum 45. The lever 57 may be a straight lever, or may be bent as indicated at 62 in any manner which may be required by the location of the base plate and of the batten with reference thereto. The slot 58 in the driving lever is of considerable depth so that the lever will be engaged with the driving pin 24 throughout the oscillation of the batten in the operation of the loom.

As the cam drum 45 is continuously rotated, during the loom operation, the lever 57 is swung about the bolt 54 and the movement of the forked end of the lever causes a reciprocation of the actuating rods 22. The cam slot 46 is so arranged that the shuttles which are driven by their forks, the actuating rods, and the lever 57, remain positively at rest for a definite period at each end of their reciprocation. The shuttles then start slowly in their movement across the shed, thus permitting the shed to be completely opened, then the shuttles pass across the shed with a rapid movement and come slowly to rest at the end of their traverse. A definite rest period then ensues and the movement of the shuttles back across the new shed is repeated. Owing to the fact that the lever 57 is positively controlled by its pin which runs in the cam slot 46 and there is a direct and positive connection between the lever 57 and the actuating rods, between these rods and the drive forks, and also between these forks and the shuttles, it follows that the shuttles are under positive control at all times in their movement and the character of the movement and the length of the rest periods may be exactly determined. Also damage to the parts resulting from over-running and misadjustment is entirely prevented, so that the new drive mechanism has a long life and may be operated at a much higher speed than has heretofore been practicable.

It will be apparent that with this type of drive mechanism shuttles may be actuated under all conditions of batten movement and the extent of shuttle movement may be regulated by a simple adjustment of the position of the operating lever pivot. By a simple change in the bevel drive gears through which

the cam drum is driven, a change in the timing of the shuttle motion is easily accomplished. For all practical purposes the necessary adjustments may be accomplished by shifting the pivot of the operating lever 57 and consequently the operation of the loom with this new shuttle motion on it is greatly simplified because any change in adjustment may be accomplished by a change in the position of a single part, instead of from two to eight parts, as is necessary in looms having the strap and pinion shuttle drive.

The cam mechanism for driving the shuttles affords another important advantage in that this cam and the connections by which it is driven may be mounted on the outside of the loom frame at one end in a readily accessible position where all the parts can be inspected and given the necessary attention, as may be required. In the mechanism as heretofore used, a part of the drive has been placed beneath the loom and inside one of the end frames, making the parts inaccessible and their repair and adjustment difficult. Also the elimination of straps, elliptical gears, and floor stands or pulleys for the straps cut down the amount of space required by the loom and eliminates moving parts placed in a position where they are dangerous to the loom operator.

In the mechanism as illustrated in Fig. 6, the shuttles are mounted in guide blocks as before, and each shuttle is actuated by a swinging element such as a fork, lever, hook, or the like, these elements being oscillated on their pivots by actuating rods movable in guideways in the batten framework. These rods are driven by a cam 63 mounted on a shaft 64 in brackets 65 on an extension 66 from the batten frame, the cam having a channel 67 in which runs a roller 68 on the end bar 69 connecting the upper and lower actuating rods 22. On the end of the shaft 64 is a sprocket wheel 69' on which runs a chain 70 leading to a similar sprocket wheel 71 on a drive shaft 72 disposed at any convenient part of the loom and driven in any suitable manner. As the cam drum and its mounting are carried by the batten so as to swing therewith, the chain 70 has a considerable amount of slack which is taken up at one point in the batten movement by means of guide pulleys 73 mounted in a standard 74, the spindles of the pulleys lying in slots in the upper forked end of the standard and being connected in any convenient manner to a rod 75 connected at its lower end to a spring 76. As the batten oscillates away from the shaft 72, the slack in the chain 70 is let out by an upward movement of the pulley 73 against the force of the spring 76 and on the reverse movement of the batten, the slack is taken up by the contraction of the spring 76.

Another convenient means for driving the shuttle forks is illustrated in Fig. 8. Here

the cam drum 77 is mounted in a frame 78 at any convenient point, the shaft 79 of the drum carrying a sprocket wheel 80 driven by a chain 81 from a sprocket wheel 82 on a driven shaft 83. Carried in the end of a frame member 84 is a pin 85 in the end of which is pivotally mounted an operating lever 86 carrying a roller 87 at its lower end running in a slot 88 in the drum 77, the pin 87 passing through a slot in the upper part of the frame 78 to insure its reciprocation in a straight line. At its upper end the lever 86 has a slotted end portion 89 engaging a pin 90 in a cross bar connecting the ends of the actuating rods 22. The end portion 89 of the rod 86 is pivotally attached to the main portion of the rod at 91 so as to permit the end portion to swing about its pivot as may be required by the swinging of the batten. With the mechanism illustrated in Figs. 6 to 8, the actual movement of the shuttles is accomplished by pairs of swinging elements similar in all respects to that shown and described in connection with the form of drive shown in Fig. 1.

The new shuttle is of simple construction and by being made in two parts the several devices which it carries are easily inspected and repaired. The wearing parts of the shuttle are protected and these parts are made of metal, so that great durability is secured.

While I have illustrated and described a batten with the swinging forks mounted on the front face of it to engage pins forming parts of the shuttles, I contemplate that in some instances it may be desirable to mount the forks on the rear face of the batten. In that event, the construction shown in Figs. 9 to 11 will be employed. Here the shuttles 17 are mounted in guide blocks defining raceways and attached to the batten in any convenient or usual manner. These raceways have an open bottom through which extend pins 92 projecting from the bases of the shuttles and placed one near each end of each shuttle. The shuttles are driven by forked members 93 pivoted at 94 to a fixed part of the batten. At one end the members 93 are slotted to receive the shuttle pins and at the other end, each member is engaged with an actuator bar 22. The bars are mounted in guideways in the rear face of the batten and the members 93 are pivoted on the rear face of the batten. For convenience the connection between each member 93 and its bar may include a pin 95 on the bar received in a slot in the tail of the member. The bars 22 may be reciprocated in any convenient manner as, for example, by a lever 86 having a slot and pin connection 89, 90, with a cross member 13 connecting the upper and lower bars 22.

With this arrangement the actuating means for the individual shuttles are out of the way at the rear of the batten and these

moving parts are thus protected from injury. The operation of the parts in this modified embodiment of the invention is the same as of those illustrated in the preceding figures of the drawings.

I claim:

1. In a loom, the combination of a batten, a row of shuttles thereon reciprocable in a direction lengthwise of the row, a pair of members for each shuttle arranged to swing and in their swinging movement to reciprocate the shuttle, a reciprocable rod carrying means engaging the members to swing them, certain of the members for the shuttles crossing one another in the plane of the rod and at the point of crossing being engaged and swung by the same means, and means for reciprocating the rod.

2. In a loom, the combination of a batten, a row of shuttles thereon, each shuttle being reciprocable in a direction lengthwise of the row, a pair of spaced members for each shuttle arranged to swing and to reciprocate the shuttle by their swinging movement, a rod carrying a plurality of pins engaging the members and swinging them, certain of the pins being arranged to engage a pair of the members, and means for reciprocating the rod.

3. In a loom, the combination of a shuttle raceway, a pair of forks disposed at spaced points along the raceway and adapted to swing lengthwise of the raceway, and a shuttle movable in the raceway and comprising a pair of members separably connected by means including pins having normally exposed portions, these portions being engageable by the forks in their swinging movement.

4. A shuttle for use in a narrow fabric loom, comprising a body portion carrying means for mounting a quill, a cover member having guides for the yarn to be drawn from the quill, and means on the body member by which the cover member is detachably secured thereto, the said means including pins on the body having heads detachably received in recesses in the cover, the bodies of said pins being exposed between the body and cover and adapted to be engaged by shuttle driving means.

5. A shuttle for use in a narrow fabric loom comprising an open frame body adapted to carry a quill, this frame being formed in two parts, and means connecting the parts including members carried by one part detachably engaging the other part and holding it in spaced relation to the first, said members having portions exposed when the parts of the shuttle are assembled, such portions being adapted to be engaged by shuttle driving means.

6. A shuttle for use in a narrow fabric loom comprising a body having a recess in one face adapted to receive a quill, means on the body for supporting the quill partly

within the recess, a cover member extending from one end to the other of the body, and having its intermediate portion spaced from the body, and means for detachably securing the body and cover together.

5 7. A shuttle for use in a narrow fabric loom comprising a body having a recess in one face adapted to receive a quill, means on the body for supporting the quill partly with-
10 in the recess, a cover member extending from one end to the other of the body, and having its intermediate portion spaced from the body, and means projecting from the body at each end thereof and received by the cover
15 for detachably securing the body and cover together.

8. A shuttle for use in a narrow fabric loom comprising a body having a recess in one face adapted to receive a quill, means
20 on the body for supporting the quill partly within the recess, a cover member extending from one end to the other of the body, and having its intermediate portion spaced from the body, and means for detachably securing
25 the body and cover together in spaced relation.

9. In a loom, the combination of a batten, a plurality of shuttles movably mounted thereon, and arranged in a row, a pair of
30 swinging members for each shuttle adapted to engage the shuttle alternately to move it, these members being pivotally mounted, and a reciprocable rod mounted in the batten and carrying means for engaging and swinging
35 the members, certain pairs of said members crossing one another in the plane of the rod and being operatively engaged at the point of crossing by a single means on the rod.

10. In a loom, a batten, a plurality or
40 spaced shuttles mounted movably thereon in a row, forks pivotally mounted on the batten and adapted to engage the shuttles, a rod reciprocably mounted on the batten, a plurality of pins on the rod adapted to engage be-
45 tween the legs of the forks to swing the latter, and means for reciprocating the rod.

11. In a loom, a batten, a plurality of spaced shuttles mounted movably thereon in a row, forks pivotally mounted on the bat-
50 ten, a pair for each shuttle, a rod mounted on the batten for reciprocation, a plurality of pins on the rod adapted to be straddled by the forks to swing the latter, means for reciprocating the rod, and pins carried by the shut-
55 tles adapted to be straddled by the forks.

12. In a loom, the combination of a plurality of shuttles arranged in a row, a pair of swinging members for each shuttle adapted
60 alternately to engage the shuttle to move it, these members being pivotally mounted, and a reciprocating rod carrying means for engaging and swinging the members, certain parts of said members crossing one another
65 in the plane of the rod, the members of said

pairs being actuated by a single means on said rod.

13. In a loom, the combination of a plurality of shuttles arranged in a row, a plurality of pivotally mounted forks, a pair for each shuttle, these forks being adapted to engage
70 the shuttles to drive them, a reciprocating rod carrying a plurality of pins, each lying between the legs of a fork to cause it to swing as the rod reciprocates, and means for recip-
75 rocating the rod.

In testimony whereof I affix my signature.

HERMAN BAADER.

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