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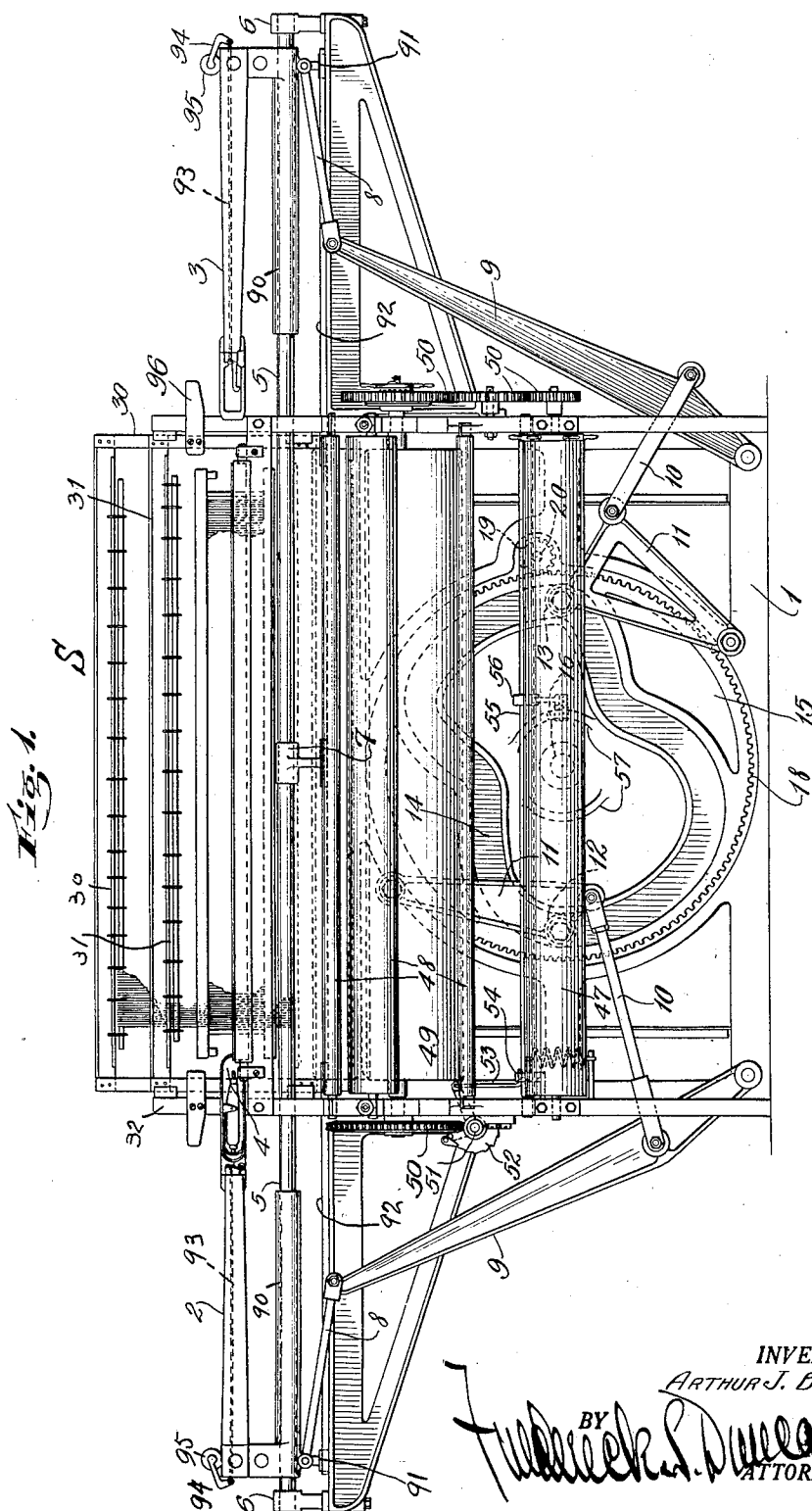
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1,925,044

LOOM

Filed Sept. 16. 1930

3 Sheets-Sheet 1



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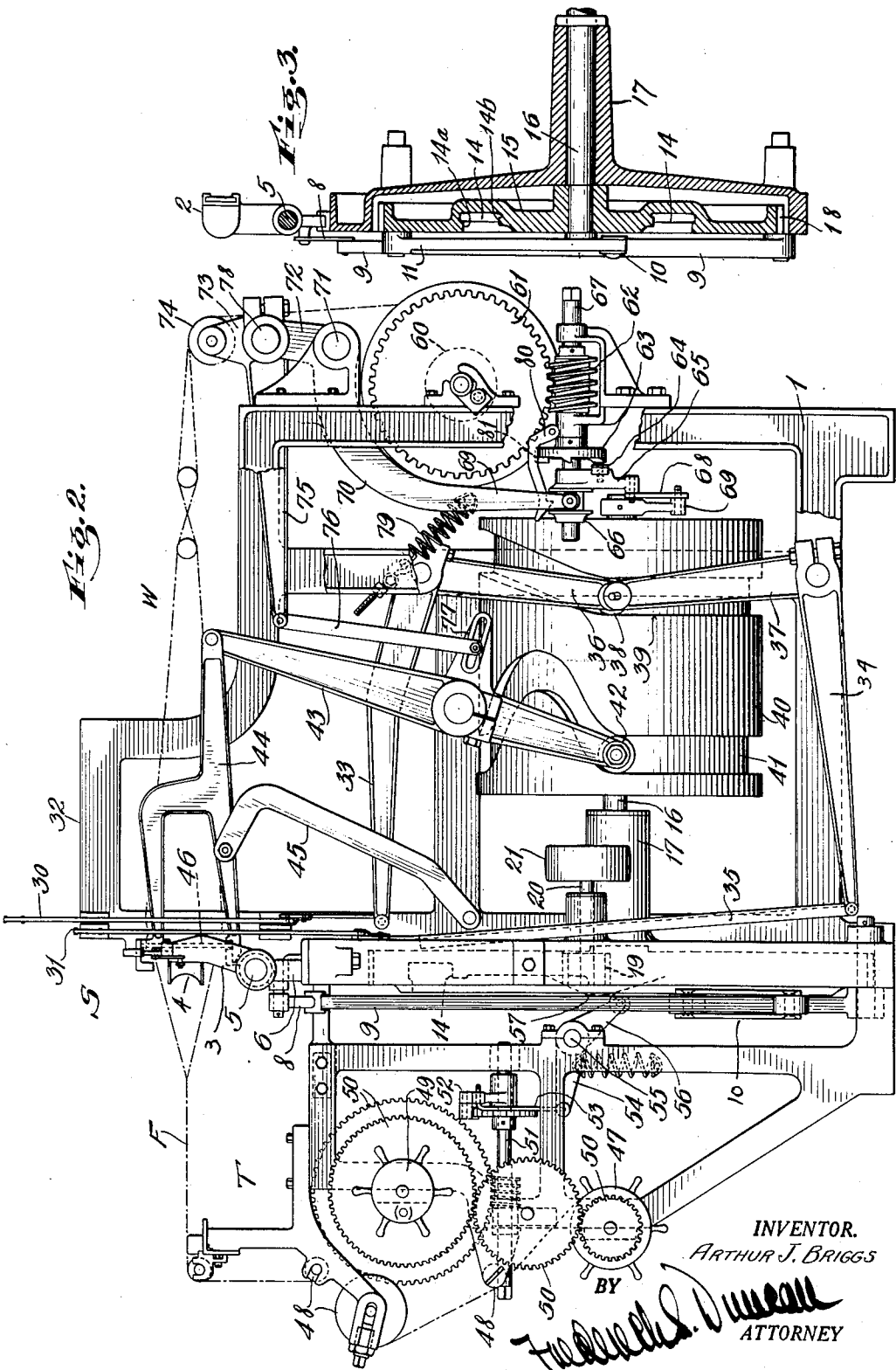
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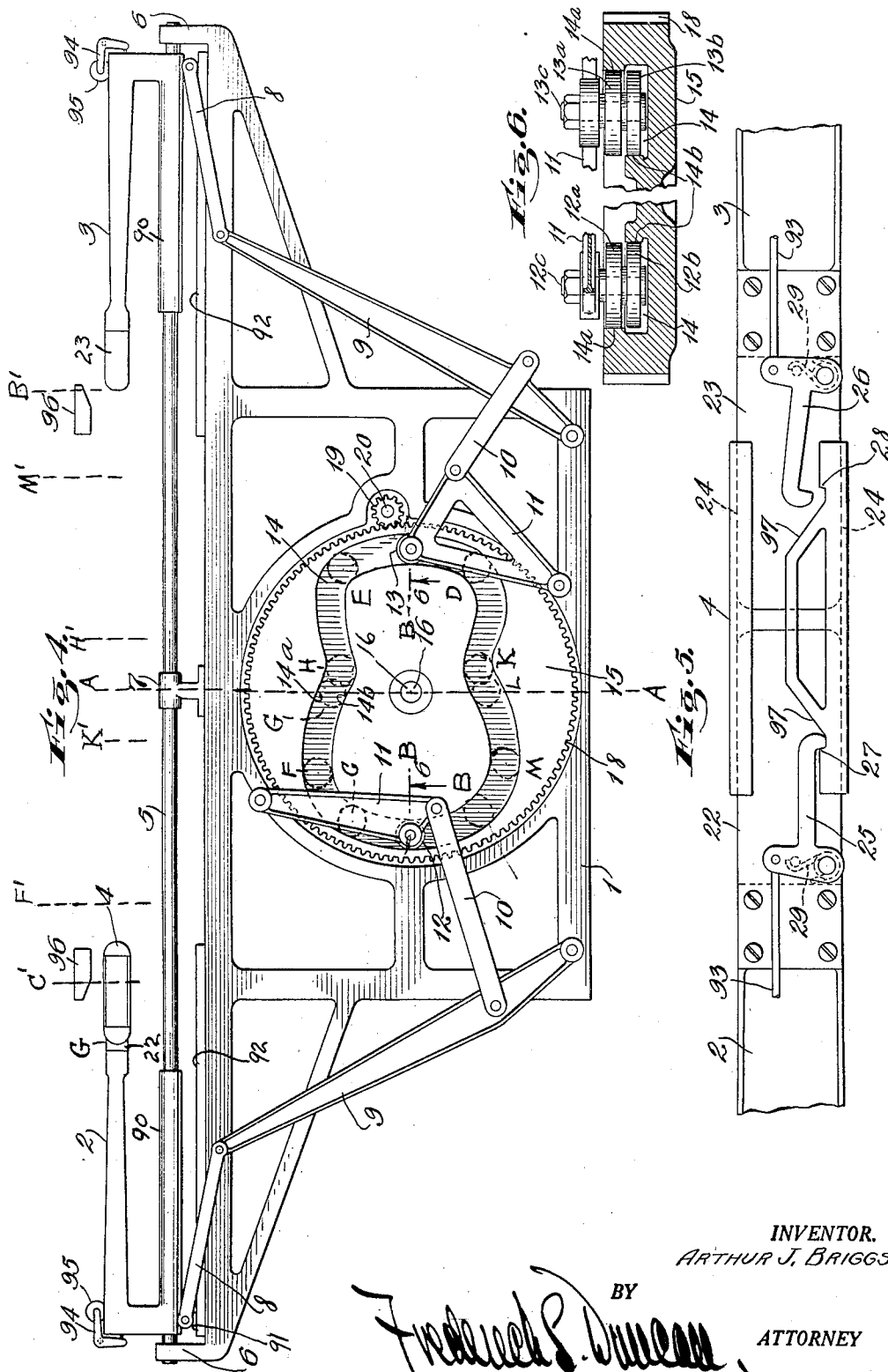
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3 Sheets-Sheet 3



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1,925,044

LOOM

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Application September 16, 1930
Serial No. 432,205

9 Claims. (Cl. 139—141)

This invention relates to looms, and has for an object the provision of an improved shuttle mechanism for looms used for weaving fabrics, from silk, cotton, wool, wire, etc.

A particular object of the invention is to provide a simple and positive mechanically operated shuttle mechanism, which will operate smoothly at high speed, having the shuttle under positive control at all times during its passage through the shed, and also to provide a mechanism which passes the shuttle through the shed at an approximately uniform speed, avoiding the stop at the point of transfer of the shuttle from one arm to the other necessary with other devices for positive shuttle operation.

A further object of my invention is to provide simple and reliable mechanism to produce the sequence of motion of the shuttle carrying members necessary to accomplish the desired result.

Among other objects of the invention are the provision of a cam movement characterized by a single large cam having a cam path adapted to actuate each carrier throughout the complete cycle of its movements, whereby each revolution of the cam effects a complete cycle of movements of both carriers; also the provision of a novel cam movement characterized by a cam having a cam path embodying a plurality of cam tracks arranged in different parallel planes, in combination with a cam-roller device having a plurality of cam rollers mounted upon a common axis in position for engagement of one of the rollers with each cam track, the rollers being freely rotatable in opposite senses of rotation relatively to each other, whereby there is no need for reversal in the direction of movement of any of the rollers and much friction and jarring is avoided, and greater smoothness of operation and durability of parts is secured.

Still another object of the invention is to provide an improved tension and let-off mechanism for the warps.

The above, and other features of the invention are illustrated and described fully in the accompanying drawings and specification, and as pointed out in the claims.

In the drawings,

Fig. 1 is a view in front elevation of a loom in the construction of which the invention has been embodied.

Fig. 2 is a view in side elevation thereof.

Fig. 3 is a fragmentary detail view in vertical section on the line 3—3 of Fig. 1, upon a larger scale.

Fig. 4 is a view of a diagrammatic character of the shuttle actuating mechanism in elevation.

Fig. 5 is a fragmentary detail view in rear elevation of the shuttle-transferring parts with the shuttle at the transfer point.

Fig. 6 is a fragmentary, detail view in section on the line 6—6 of Fig. 4, showing the preferred cam-roller devices, on a larger scale.

In the now-preferred embodiment of the invention selected for illustration and description, the part designated by the reference character 1 is a frame upon which the operating parts are mounted.

In pursuance of the invention, a plurality of reciprocating shuttle carriers 2 and 3 are provided, of any construction suitable to effect positive reciprocating movement of the shuttle 4 in both directions through the shed, designated generally by the reference character S, in a manner characterized by the fact that the shuttle is caused to move in each direction with a uniform rate of acceleration during the first part of its travel, and at substantially uniform speed at the region of transfer from carrier to carrier, and at a uniform rate of deceleration toward the end of its travel.

The carriers 2 and 3 are fitted slidably upon suitable ways 5 mounted rigidly upon the top of the frame, and which may be of any suitable form, being shown as comprising a rod fixed in brackets 6 and 7, at the ends and middle of the frame respectively.

The shuttle carriers 2 and 3 are operated respectively by connecting links 8, levers 9, connecting links 10, and sub-levers 11, the latter having cam-rollers 12 and 13 which respectively work at diametrically opposite sides of a continuous cam-path 14 formed in the face of a large gear wheel 15 fixed on a shaft 16 journaled in bearings 17 supported by the frame, the peripheral teeth 18 of the wheel 15 being driven by a pinion 19 on a shaft 20 provided with a pulley 21 adapted to be actuated by a belt running to any suitable source of power (not shown).

The shuttle carriers 2 and 3 are herein shown as U-shaped members, each of which has a tubular lower leg 90 fitted to slide freely on the rod 5, and provided with a stud 91 arranged to run in slotted bars 92 which keep the carriers in alignment. On the inner free ends of the arms 2 and 3 are blades 22 and 23 which are adapted to engage slotted portions 24 at the top and bottom of the rear side of the shuttle 4 (see Fig. 5).

The blades are provided with latches 25, 26, adapted to engage notched portions 27, 28 of the

shuttle, the latches being normally biased toward the notched portions by springs 29. Wires 93 run from the latches to bell-crank levers 94 having rollers 95 arranged to be engaged with cams 96 suitably mounted on the frame to cause the lever 94 to pull the wires 93 and raise the latches just as the shuttle reaches its central position.

These latches do not perform any part in the operation of transferring the shuttle from one carrier to the other. They simply function to hold the shuttle in position on the blades during the period of acceleration at the beginning of its flight and during the period of deceleration toward the end of its flight, preventing accidental displacement, and are not indispensable to the operation of the loom. The back sides of the notched portions 28 on the shuttle may be provided with inclined portions 97, the object of which is to compensate for over travel or inaccuracies of the operating mechanism, the latch sliding up the incline without disturbing the flight of the shuttle, and the springs 29 insuring the return of the latches to the proper position.

The sequence of movements of the shuttle and shuttle carriers 2 and 3 is best understood by reference to Fig. 4, in which the positions of the shuttle carriers are indicated for various angular positions of the cam 14.

The sections of the cam B to C and D to E are dwells during which the arms remain at rest. During this interval, the beating and the shed-changing mechanism of the loom operate. From C to F the shuttle is accelerated and brought up to speed, the shuttle advancing to the point F'. From F to G the speed is uniform. At G on the cam the shuttle reaches the center of travel at A at which point it is transferred to the other carrying arm. From G to H the empty carrier is brought to a stop and returned to the outer position by the section of the cam H—E—.

During the time that the shuttle is moving from E to A, the empty carrier on the other side is advanced at a faster speed than the shuttle is traveling, going past the center to K and K', reversing its motion and arriving at L and A at the same time as the carrier carrying the shuttle. The time consumed in bringing the empty carrier to a stop and to start it moving in reverse direction enables the shuttle to overtake it, and when they both reach in the central position A they are both traveling in the same direction at the same speed. Both blades 22 and 23 being in the slot 24 in the back of the shuttle 4, the latches 25 and 26 change without relative motion between them and the shuttle, and, therefore, without shock at high speed. As the cam is symmetrical about the axis —B—B—, the travel of the shuttle through to the other side is symmetrical with its travel to the center.

The result is that the shuttle is accelerated at a uniform rate of acceleration from C' to F', travels at uniform speed to M', from M' to B' it is decelerated at a uniform rate of deceleration, and brought to rest.

As the cam travels through one-half a revolution to a complete pick and dwell, and the two cam rollers are diametrically opposite, it is obvious that the travel of the shuttle in the opposite direction is identical, as the same sections of the cam are operating on the shuttle and empty carrier respectively in both directions.

The shed-forming mechanism S may be of any suitable character, and is herein illustrated as of a well-known type, comprising heddles 30 and 31, mounted to reciprocate vertically in the frame

part 32, and actuated respectively by a lever 33, and a lever 34 with connecting link 35, the levers 33 and 34 respectively having arms 36 and 37 connected pivotally with a cam-roller 38 running in a cam-slot 39 upon the periphery of a barrel cam 40 fixed upon the main shaft 16 which also carries the shuttle actuating cam wheel 15 already described.

The barrel cam 40 also has a cam slot 41 in which runs a cam-roller 42 operating a lever 43 which actuates the beater frame 44, provided with a link 45 to insure parallel horizontal motion of the beater 46, these parts being of conventional construction, as are also the take-up mechanism designated generally by the reference character T, comprising a roll 47 on which the fabric F is accumulated, after passing around guide rolls 48 and a drum 49, the roll 47 being actuated by suitable gearing 50 including also a worm-shaft 51 operated by a pawl and ratchet mechanism 52, actuated through a link 53 by a lever on a rock-shaft 55, and an arm 56 which receives its motion from a cam 57 on the cam wheel 15.

The warps W are derived from a suitable warp-beam 60 provided preferably with tension and let-off mechanism which may be of any suitable construction.

As a now-preferred form of let-off and tension mechanism the drawings show the warp-beam as having a worm-gear 61 meshing with a worm 62 provided with a crown-ratchet wheel 63 adapted to be given a step-by-step rotation by a pawl 64 on a lever 65 carried by a collar 66 mounted slidably on the worm-shaft 67, the lever 65 being oscillated by a link 68 actuated by a crank-arm 69 on the shaft 16.

The collar 66 can be shifted axially on the shaft 67 by means of a yoke 69 at the free end of a lever 70 which is pivoted at 71 on the frame 1 and has short arms 72 which carry a bell-crank lever 73 on which is mounted a whip-roll 74 over which the warps W pass in conventional manner. The long arm 75 of lever 73 is connected adjustably by a link 76 with an arm 77 on the lever 43 of the beater motion mechanism and is oscillated thereby in a conventional manner to take up the slack incidental to the shed formation, the lever 73 being pivotally mounted at 78 on the arm 72 of lever 70.

A spring 79 acts to bias the arm 70 toward the left into the normal position shown in Fig. 2, in which the pawl 64 on collar 66 is out of engagement with the crown wheel 63, and the whip-roll 74 tends to resist the tension normally exerted by the warps W.

When the tension on the warps becomes sufficient at any time to overcome the tension of spring 79, the arm 70 is moved toward the right, bringing the pawl 64 into position to engage one of the teeth on the crown wheel 63, as the pawl is oscillated, and such engagement causes the crown-wheel to rotate and turns the worm 62, which causes rotation of the worm gear 61 and beam 60 to let off a supply of warp sufficient to supply the shed for the weaving operation.

In order to insure the letting off of an adequate supply for weaving, provision may be made for holding the collar 66 in position to permit engagement of the pawl 64 with several teeth of the crown wheel 63, successively, and for this purpose a latch 80 is shown acting to hold the collar and pawl at their extreme right-hand position, until a projection 81 on the crown wheel is brought into contact with the latch 80 and throws

it off, the projection 81 making one such contact for every rotation of the crown wheel.

When the collar is thus released, the lever 79 is again drawn to the left by action of the spring 79, and the collar 66 with its pawl 64 is moved away from the crown wheel 63, the movement of the levers 70, 72, 73, acting to move the whip roll 74 and subject the warps W to the tension exerted by the spring 79.

In order to secure smooth co-operation between the cam 15 and the cam-rollers 12 and 13 working in the cam-groove 14, I have formed the walls of the latter in the novel form best seen in Fig. 6, where they are shown as comprising an outer wall or cam track 14a and an inner wall or track 14b, arranged in different planes so that they are adapted each to be engaged by one of a pair of rollers 12a, 12b which, in accordance with the invention, constitute one of the cam-roller devices, the other cam-roller device being similarly constituted by a pair of rollers 13a, 13b, each of the pairs of rollers being mounted co-axially upon a bearing pin, 12c, 13c, so that the rollers are free to turn, independently of each other, in opposite senses of rotation, one roller of each pair, as 12a, 13a having its outermost portion engaged with the track 14a while the other roller, 12b, 13b, has its innermost portion engaged with the track 14b.

Inasmuch as the track 14a acts to draw the carriers 2 and 3 inwardly, at the appropriate times, while the track 14b acts to force them outwardly at other times, it is clear that if a single cam roller be used, when diametrically opposite portions of its periphery are successively urged against the co-operating cam tracks, its direction of rotation will be reversed during each rotation of the cam wheel 15, with consequent friction and some jarring of the mechanism, which is avoided by the novel provision of independent rolls herein described. The rollers can be fitted snugly against their co-operating tracks respectively, and as they operate substantially without wear upon their peripheries, this snugness of fit is maintained for a long period, and the cam system operates without loose motion and with corresponding smoothness and freedom from noise.

This feature of the invention is susceptible of use in cam movements embodied in other structures than that of the loom herein illustrated, and is accordingly made the subject of generic claims herein.

Its embodiment is not limited to face cam structures, but may be utilized in connection with cam tracks formed in the peripheries of barrel cams, and in general wherever it may be applied advantageously by virtue of the nature of my improvements.

From the foregoing description it will be apparent that the following advantageous results are secured: viz.,

The shuttle is under positive mechanical control at all times, and the speed of travel of the shuttle through the warp shed is uniform, thus laying the filler yarn evenly and with uniform tension at high speeds.

The shuttle and shuttle carrying mechanism are not subjected to destructive shock at high speed, resulting in long life, continuous operation and freedom from noise, and the shuttle does not come in contact with the warp and cause fraying of delicate yarns.

Many other advantages are apparent, such as the ability to construct all shuttle and shuttle

operating parts of metal; the use of permanent bearings properly lubricated; the reduction to a minimum of necessary repairs; and the ability to operate at varying speeds without adjustment. Less skill is required to operate and keep the loom in repair.

I claim:

1. A loom of the type characterized by having shed-forming means and a plurality of carriers adapted respectively to be moved through the shed, carrying the shuttle and acting to transfer said shuttle to each other alternately at an intermediate portion of its path, said loom being further characterized by means to actuate said carriers in such manner that the transit of the shuttle is effected continuously and each transfer of the shuttle is effected positively from carrier to carrier without change of the velocity of the shuttle.

2. A loom of the type characterized by having shed-forming means and a plurality of carriers adapted respectively to be moved through the shed, carrying the shuttle and acting to transfer said shuttle to each other alternately at an intermediate portion of its path, said loom being further characterized by means to actuate said carriers in such manner that the transit of the shuttle is effected continuously and each transfer of the shuttle is effected positively from carrier to carrier without change of the velocity of the shuttle, and when said shuttle is approximately at the middle of its travel.

3. A loom as in claim 1, and further characterized by the fact that the shuttle is caused to move with a uniform rate of acceleration during the first part of its travel, and at a uniform rate of deceleration toward the end of its travel, and at substantially uniform speed at the region of transfer.

4. A loom as in claim 1, further characterized by latching devices to retain the shuttle on the carriers and means to operate said latches respectively for simultaneous release of the shuttle from one carrier and retention of the shuttle by the other carrier at the transfer point, at which point said carriers are both moving in the same direction and at the same speed.

5. A loom as in claim 1, further characterized by latching devices to retain the shuttle on the carriers and means to operate said latches respectively for simultaneous release of the shuttle from one carrier and retention of the shuttle by the other carrier at the transfer point, at which point said carriers are both moving in the same direction and at the same speed, said latches being spring urged into shuttle retaining position, and means to hold said latches positively out of engagement with the shuttle until the empty carrier has receded from the shuttle.

6. In a loom as in claim 1, means for operating the shuttle carriers comprising a rotating cam member having a cam path adapted to actuate each carrier throughout the complete cycle of its movements, and carrier-operating devices engaging said cam path at diametrically opposite regions of its extent, one-half of this cam path being adapted to operate the carrier containing the shuttle while the other half of the cam path is operating the empty carrier.

7. In a loom as in claim 1, means for operating the shuttle carriers comprising a rotating cam member having a cam path adapted to actuate each carrier throughout the complete cycle of its movements, and carrier-operating devices engaging said cam path at diametrically opposite re-

gions of its extent, one-half of this cam path being adapted to operate the carrier containing the shuttle while the other half of the cam path is operating the empty carrier, whereby each revolution of the said cam effects a complete cycle of movements of both carriers.

8. A loom of the type characterized by having shed-forming means and a plurality of carriers adapted respectively to be moved through the shed, carrying the shuttle and acting to transfer said shuttle to each other alternately at an intermediate portion of its path, said loom being further characterized by means for operating the shuttle carriers comprising a rotating cam member having a cam path adapted to actuate each carrier throughout the complete cycle of its movements, and carrier-operating devices engaging said cam path at diametrically opposite regions of its extent, one-half of this cam path being adapted to operate the carrier containing the shuttle while the other half of the cam path is

operating the empty carrier, whereby each revolution of said cam effects a complete cycle of movements of both carriers.

9. A loom of the type characterized by having shed-forming means and a plurality of carriers adapted respectively to be moved through the shed, carrying the shuttle and acting to transfer said shuttle to each other alternately at an intermediate portion of its path, said loom being further characterized by means to actuate said carriers in such manner that each transfer of the shuttle is effected from a carrier moving continuously at uniform speed with the shuttle on its inward path through the shed to a carrier moving at the same speed on its outward path through the shed, whereby the complete transit of the shuttle through the shed is effected continuously and without change of the velocity of the shuttle throughout the region of its transfer.

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25	100
30	105
35	110
40	115
45	120
50	125
55	130
60	135
65	140
70	145
75	150