No. 734,834. PATENTED JULY 28, 1903.

C. H. DRAPER.

SHEDDING MECHANISM FOR LOOMS.

APPLICATION FILED MAR. 2, 1903.

NO MODEL.

Fig: 1.

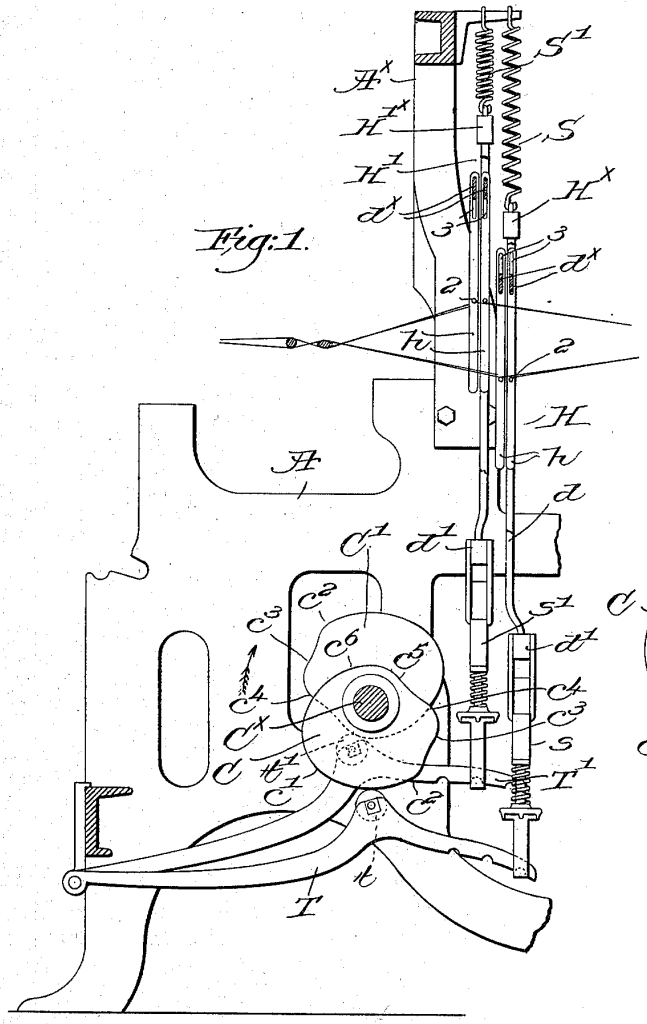
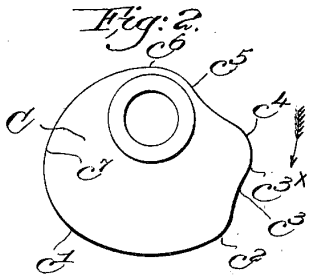


Fig: 2.



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No. 734,834. Patented July 28, 1903.

UNITED STATES PATENT OFFICE.

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SHEDDING MECHANISM FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 734,834, dated July 28, 1903.

Application filed March 2, 1903. Serial No. 145,670. (No model.)

To all whom it may concern:

Be it known that I, CLARE H. DRAPER, a citizen of the United States, and a resident of Hopedale, county of Worcester, State of Massachusetts, have invented an Improvement in Shedding Mechanism for Looms, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

Shedding or harness cams for effecting the shedding of the warps in a loom have been used having various amounts of dwell and with various accelerations in raising and lowering the harnesses, and the acceleration has frequently been determined according to some uniform system—that is, the harnesses have been moved slowly near their top and bottom positions and more rapidly through the intermediate or central portion of their stroke, and the cams are usually what are known as "crank" or "falling-body" cams. With the common string or cotton harness this harmonic motion may be desirable; but when used in connection with a steel harness of the type wherein the heddles serve also as warp-stop-motion-controlling detectors—as, for instance, in United States Patent No. 536,969—a disturbing factor enters into the operation. As is known to those skilled in the art, such heddles are longitudinally slotted and strung upon a transverse bar forming a part of the harness-frame, the heddles having a limited longitudinal movement relative to the bar. When the harness-frame is up, with the heddles in the high position, they hang on the bar, which is at the upper end of the heddle-slots. In the bottom position of the harness-frame, however, the heddles hang upon or are sustained by the warp-threads and the bar presses against the lower ends of the slots. Now as the bar leaves the bottom position when the harness-frame is raised the heddles follow the bar for a short distance, owing to the tension of the warp, and when the heddles come to rest the bar continues to rise and passes from the bottom to the top of the slots, then picking up the heddles and raising them till the shed is open. With the ordinary cam the bar attains considerable speed in traversing the slots, and in practice the bar is very apt to pick up the heddles with a sharp quick jerk. The blow may be sufficiently strong to throw the heddles upward, and as the bar slows down after half of its upward travel the heddles may beat the bar to the high position and strain the warps.

It will be manifest that the actual raising of the upper plane of the shed, moving the warp-threads, is effected in less time than that taken by the bar to rise, as the warp is not moved while the bar is traversing the heddle-slots. As a matter of fact warp breakage in practice will be less when the sheds open slowly.

My present invention has for its object the production of means for overcoming or obviating to a very large extent the hereinbefore-mentioned difficulties experienced with steel harness. In accordance therewith I have designed the shedding-cams in such manner that the harness-bar rises quickly nearly to the point at which the heddles are picked up and is then slowed down, so that the heddles are picked up gently and without a jerk. After picking up the heddles the bar proceeds with a harmonic motion to the top position. By this motion of the harness member or frame I gain two advantages—viz., first, I avoid throwing the heddles upward ahead of the bar, and, second, by rushing or accelerating the movement of the bar through the slots I give more time to the actual moving of the warp. By the quick rush of the bar it will be manifest that the strain is taken off the warps in the lower plane of the shed very quickly immediately after the dwell.

The novel features of my invention will be described hereinafter in the subjoined specification and particularly pointed out in the following claims.

Figure 1 is a cross-sectional view of a sufficient portion of a loom to be understood, showing the shed-forming mechanism embodying one form of my invention; and Fig. 2 is an enlarged side elevation of one of the harness or shedding cams shown in Fig. 1.

In Fig. 1 the loom-frame A, cam-shaft $C^{\times}$, treadles T and T', having rolls t and t', respectively, to coöperate with the shedding or harness cams, to be referred to, and the harness-

frames H and H′ may be and are of well-known construction. The harness members or frames comprise upright side bars d, rigidly connected at their lower ends by a cross-bar d' and at their upper ends, as herein shown, by two parallel cross-bars $d^{\times}$ $d^{\times}$, on which the heddles h are strung, substantially as in United States Patent No. 590,551, dated September 21, 1897, each frame being provided with two banks or series of heddles. As in said patent, the heddles are made as thin flat metal strips, each having a warp-eye 2 and a longitudinal slot 3 at or near its upper end, longer than the depth of the bar $d^{\times}$ extended therethrough, so that the heddles have a limited movement longitudinally relatively to said bar. The lower cross-bars of the frames are connected by suitable stirrups, as s and s', with the treadles T and T′, respectively. I have indicated the front harness member generically as H, and the back harness member as H′. The heddles herein shown serve also as warp-stop-motion-controlling detectors, as in the United States patents referred to hereinbefore. I have herein shown the harness-frames as depressed positively by or through the action of the shedding-cams and controlled thereby during their upward movement, but the rise of the frames is in the present embodiment of my invention effected by overhead springs, as s and s', attached at their lower ends to top bars $H^{\times}$ and $H'^{\times}$ of the frames, the upper ends of the springs being fixedly secured to the arch $A^{\times}$ of the loom-frame. When a frame is depressed, its lifting-spring is stretched, and when the controlling-cam permits it the contraction of the spring raises the frame, as will be readily understood. When a harness-frame is raised, the heddles hang on the bar $d^{\times}$, the latter engaging the upper ends of the slots 3, but the heddles of the other frame are held up (by the tension of the warps in the lower plane of the shed) against the transverse bar $d^{\times}$ of such frame, the lower edge of the bar engaging the bottom ends of the heddle-slots, both cases being shown in Fig. 1.

In my present invention when the depressed frame is lifted after the dwell I have provided means to give it a rapid movement, quickly relieving the warp tension, until the top of the bar is nearly ready to pick up the heddles, and just before this picking up is accomplished the speed of the harness member is reduced, so that the heddles are picked up without any injurious jerk or shock by the upwardly-moving bar. To effect this variable and peculiar movement of the harness-frame, I have devised a harness or shedding cam having a controlling-surface of a novel shape or configuration.

In Fig. 1 the like cams C and C′ for the front and back harness members are mounted on the cam-shaft $C^{\times}$ in usual manner, and an enlarged view of one of the cams, as C, is shown in Fig. 2. The controlling-surface of the cam comprises a dwell portion from c' to c^2 of an extent corresponding to the desired dwell of the harnesses when the shed is open for the passage of the shuttle therethrough, followed by a high-speed portion from c^2 to c^3, its extent being such that the transverse bar $d^{\times}$ will travel upward from its lowest position to a point just before it picks up the heddles by engaging the upper ends of their slots. From c^3 to $c^{3\times}$ there is a more gradual drop in the cam-surface, almost a short dwell, causing a slowing down of the speed of the ascending frame, in order that the heddles may be picked up by the bar $d^{\times}$ easily and without a jerk or sharp upward blow upon the upper ends of the slots thereof, the picking up being effected at practically the point $c^{3\times}$. From $c^{3\times}$ to c^4 there is a gradually-dropping portion to start up the frame after picking up is effected and the shape of the cam portion from c^4 to c^5, the latter being the beginning of the low portion of the cam, is such that there will be a properly rapid or harmonic rise of the frame to its highest position, such as illustrated in Fig. 1 for the rear frame H′. This low portion, extending from c^5 to c^6, gives the dwell of the harness-frame when in its high position, and from c^6 to c^7 is the gradual rise, giving an increasing speed to the frame, and from c^7 to the high point c', the beginning of the lower dwell, there is a gradual decrease of the speed of the frame. During the engagement of the portion from c^6 c' with the roll on the treadle the harness-frame is lowered with a gradually-increasing speed until its lowest position is attained, whereupon the dwell c' c^2 assumes control, and the frame is held down for the requisite time. By so arranging the cam-surface the warps in the lower plane of the shed are quickly relieved of tension, as the frame begins to rise and the heddle-bar is rushed through the slots of the heddles nearly to the picking-up point, it being understood that such rapid movement of the frame is greater than the actual length of the slots traversed by the bar, because at the beginning the heddles will follow up the bar until the tension of the warps is sufficiently relieved. The heddles are not thrown upward ahead of the bar, and by rushing the latter through the slots more time is permitted for the actual movement of the warp, decreasing the warp breakage because of the slower warp movement thus made possible.

In the arrangement shown the variable movement of the harness-frame is practically confined to the upward movement thereof. While there is not so much advantage to be gained on the downward movement of the frame, so far as concerns shock to the warp, there is the same advantage to be gained in the time of movement of the warp. Accordingly my invention is not restricted to merely the construction and arrangement shown and described, as the peculiar and novel movement imparted by the cam may be utilized on the downward stroke of the harness-frame.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In shed-forming mechanism for looms, a vertically-reciprocating frame having a transverse bar, a series of longitudinally-slotted heddles mounted thereon and having a limited longitudinal movement relative thereto, and means to raise the frame rapidly from the "dwell" and slow it down as the bar picks up the heddles, the upward movement of the frame thereafter being continued by said means with a harmonic movement.

2. In shed-forming mechanism for looms, a vertically-reciprocating frame having a transverse bar, a series of longitudinally-slotted heddles mounted thereon and having a limited longitudinal movement relative thereto, and means to raise the frame rapidly from the "dwell" until the bar is about to pick up the heddles, and with reduced speed as the heddles are picked up.

3. In shed-forming mechanism for looms, a vertically-reciprocating frame having a transverse bar, a series of longitudinally-slotted heddles mounted thereon and having a limited longitudinal movement relative thereto, and means to raise the frame with a rapid movement as the bar traverses the slots of the heddles and with a reduced speed as said bar engages the upper end of the slots and positively lifts the heddles.

4. In shed-forming mechanism for looms, a vertically-reciprocating frame having a transverse bar, a series of longitudinally-slotted heddles mounted thereon and having a limited longitudinal movement relative thereto, and means to raise the frame with a rapid movement as the bar traverses the slots of the heddles and with a reduced speed as said bar engages the upper end of the slots and positively lifts the heddles, and to complete the upward movement of the frame with a harmonic motion.

5. In shed-forming mechanism for looms, a vertically-reciprocating frame having a transverse bar, a series of longitudinally-slotted heddles mounted thereon and having a limited longitudinal movement relative thereto, and means to effect the movement of the harness-frame with a variable speed, said means including a controlling-cam having a dwell portion, a succeeding short high-speed portion terminating in a speed-reducing portion, and a harmonic portion between the speed-reducing and the dwell portions.

6. In shed-forming mechanisms for looms, a reciprocating frame having a transverse bar, a series of longitudinally-slotted heddles mounted thereon, and having a limited longitudinal movement relative thereto, and means to accelerate the speed of said bar when traversing said slots in the course of its reciprocation.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CLARE H. DRAPER.

Witnesses:
E. D. BANCROFT,
ERNEST W. WOOD.