J. F. DUSTIN.

WARP STOP MOTION FOR LOOMS.

APPLICATION FILED MAR. 2, 1912.

1,043,814.

Patented Nov. 12, 1912.

2 SHEETS—SHEET 1.

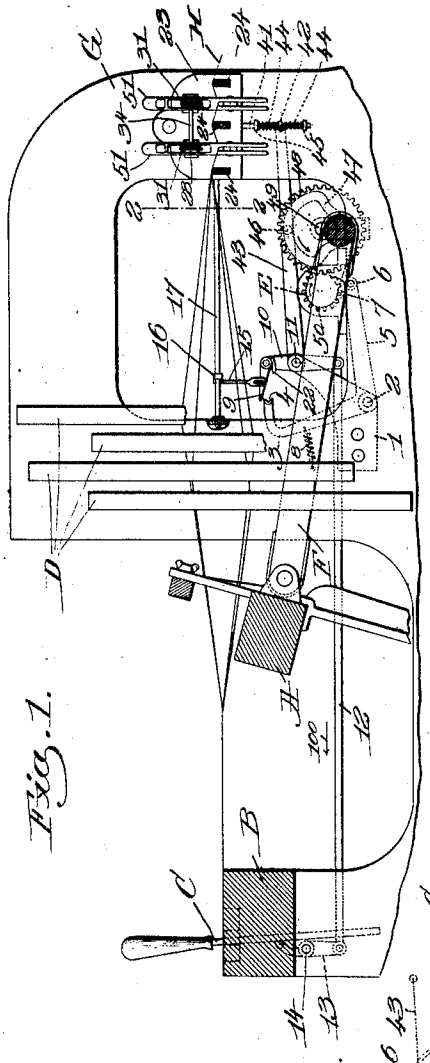

Fig. 1.

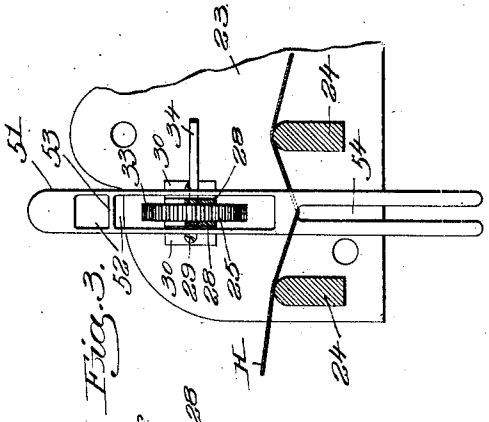

Fig. 3.

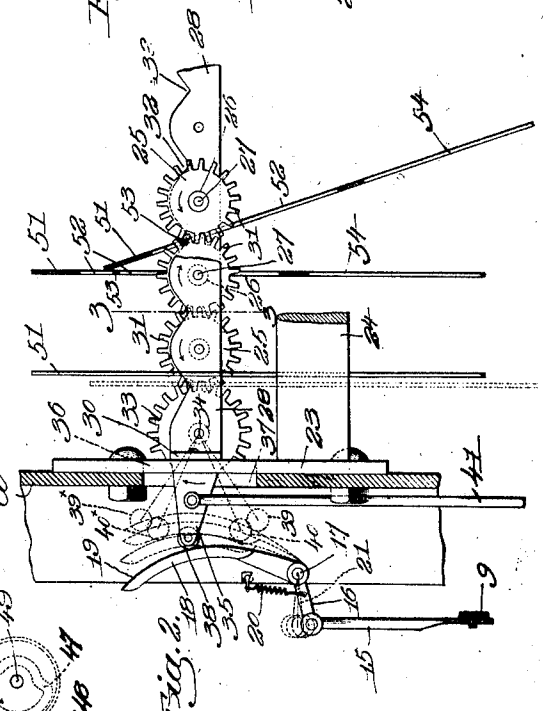

Fig. 2.

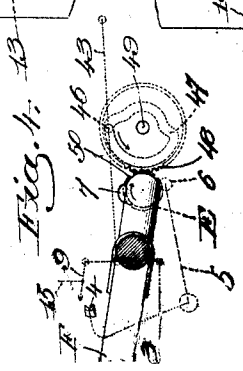

Fig. 4.

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Fig. 5.

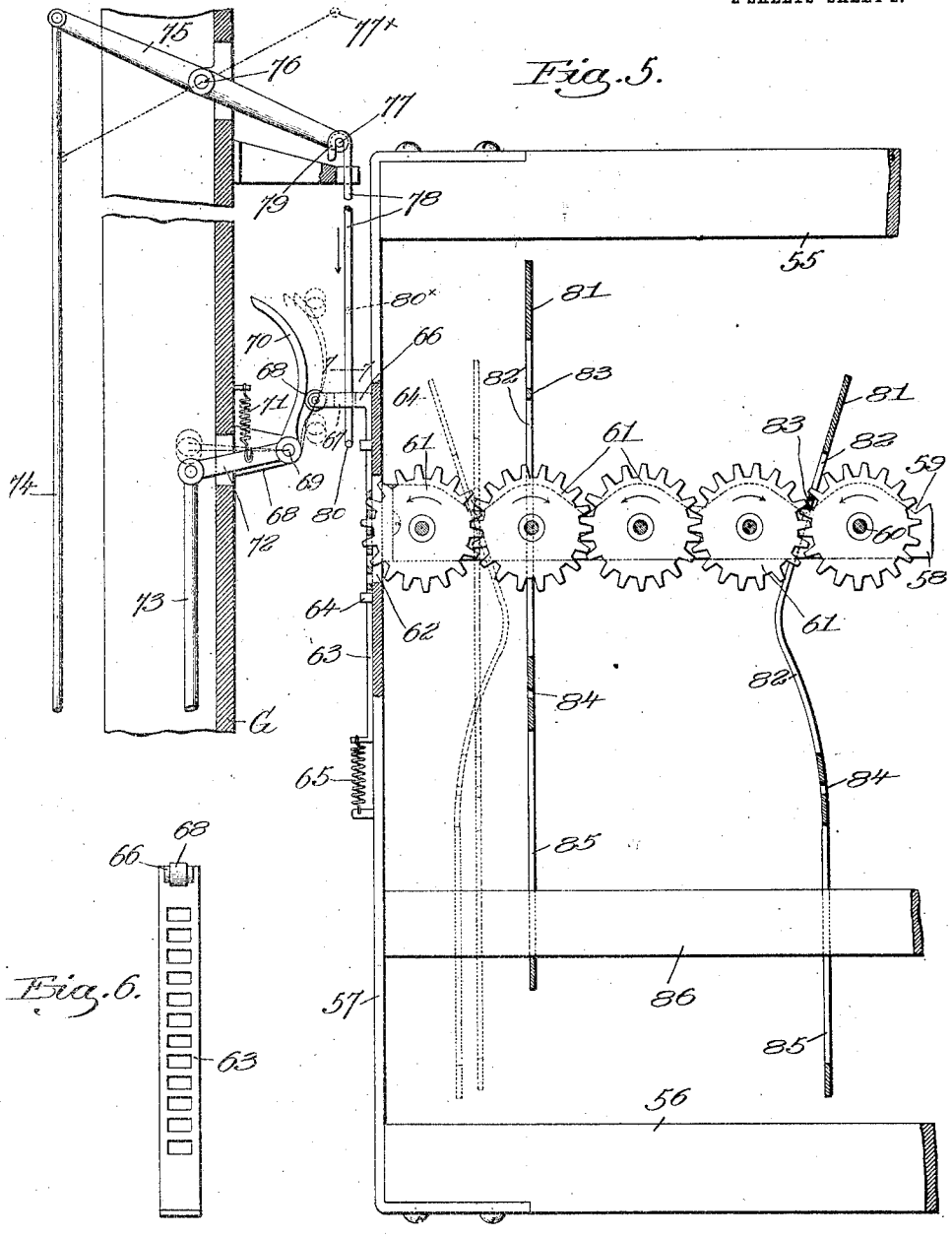
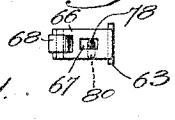


Fig. 7.



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UNITED STATES PATENT OFFICE.

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WARP STOP-MOTION FOR LOOMS.

1,043,814. Specification of Letters Patent. Patented Nov. 12, 1912.

Application filed March 2, 1912. Serial No. 681,045.

To all whom it may concern:

Be it known that I, JOHN F. DUSTIN, a citizen of the United States, and resident of Lawrence, county of Essex, State of Massachusetts, have invented an Improvement in Warp Stop-Motions for Looms, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention has for its object the production of a novel and efficient warp stop-motion particularly adapted for looms, so constructed and arranged that the loom will be stopped automatically upon the occurrence of a warp fault, such as breakage or running out of a warp thread, or abnormal slackness thereof. The mechanism is so designed that when a warp fault occurs the warp threads will be opened or separated by the positioning of the detecting member, whereby the location of the faulty thread is indicated instantly and clearly to the weaver, so that the correction of the fault is facilitated.

In the present embodiment of my invention the detectors are thin, flat strips of metal, suspended by the warp threads, and slotted to loosely embrace a series of normally and simultaneously oscillated feeler members arranged edge to edge transversely of the warp, a released detector engaging two adjacent members and locking them from oscillation, to thereby bring about the operation of a loom stopping instrumentality, each pair of adjacent feeler members being oscillated in opposite directions. The peripheral portions of said members are so constructed that a released detector will be engaged thereby and moved laterally in one or the other direction into engagement with the next adjacent feeler member. Inasmuch as the feeler members are arranged above the sheet of warp any fluff or lint accumulating from the threads will drop down and cannot clog the stop-motion devices.

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

Figure 1 is a transverse section of a sufficient portion of a loom with a warp stop-motion applied thereto embodying one practical form of my invention, the lay being on back center; Fig. 2 is an enlarged detail of a portion of the stop-motion, located at the right of the line 2—2, Fig. 1, to show the feeler members and adjacent parts in front elevation, two of the detectors, however, being illustrated in section and broken off to save space; Fig. 3 is a cross-sectional detail on the line 3—3, Fig. 2, looking to the left, showing in side elevation a detector and one of the feeler members, the detector being shown in normal position; Fig. 4 is a detail of a portion of the mechanism shown in Fig. 1, but in the position assumed when the lay is on front center; Fig. 5 is an enlarged view in front elevation and part section showing my invention applied to a harness frame wherein the heddles serve also as stop-motion detectors; Fig. 6 is a detail in elevation of a part of the mechanism, to be referred to; Fig. 7 is a top plan view of the device shown in Fig. 6, on the line 7—7, Fig. 5.

Referring to Fig. 1, the lay A, breast-beam B, shipper C, harnesses D, partly broken off, crank-shaft E, and pitman F connecting said shaft and the lay, are and may be of usual construction, the part G of each loom side back of the harnesses sustaining certain parts of the stop-motion as will appear hereinafter.

A bracket 1 on the loom side has pivoted thereon at 2 a bell-crank, the upturned arm 3 of which is bent rearward at its upper end and notched at 4, constituting a bunter, the other arm 5 of the bell-crank having a follower 6 which coöperates with a tappet cam 7 on the crank-shaft E. A spring 8 fixed at one end and at its other end secured to the bunter arm 3 keeps the follower in engagement with said cam, and retracts the bunter after each rearward cam-actuated stroke, which stroke is effected as the lay A is moving from top center to back center, and as will be explained such active stroke of the bunter knocks off the shipper when a detector is positioned abnormally by a warp fault. Said bunter is arranged to coöperate at such a time with a dagger 9 pivoted on the upper end of a lever 10 fulcrumed at 11 on the bracket 1, the lower end of the lever being connected by a link 12 with a knock-off arm 13 for the shipper C, said arm being fulcrumed at 14. When the bunter on its active stroke engages the dagger 9 the lever 10 is rocked on its fulcrum 11 and the link is moved longitudinally in the direction of the arrow 100, Fig. 1, to turn the knock-off

arm 13 and thereby release the shipper from its usual holding plate, to stop the loom in well known manner.

The dagger 9 is connected by a longitudinally slotted link 15 with an arm 16, Figs. 1 and 2, on a fore and aft horizontal rock-shaft 17 supported in suitable bearings on the part G of the loom side, the arm 16 being near the front end of the rock-shaft. Near its rear end the said shaft has fixedly attached to it an upturned cam member 18, Fig. 2, the inner edge of the arm presenting a longitudinally curved convex surface 19, said arm being moved inward, or to the right, Fig. 2, by a spring 20 attached at one end to the loom frame and at its other end secured to an adjacent arm 21 on the rock-shaft 17, the spring-induced rotation of the latter serving to elevate the dagger 9 above the path of the bunter, as shown in Fig. 1. Descent of the dagger to operative position, with its tip in the path of the notched end of the bunter, is limited by a stop 22 on the lever 10. If the cam member 18 is held in full line position, Fig. 2, the dagger will be operatively positioned by said stop, and also if said cam member is in its left hand dotted position, but if it is moved inward to either of the other two dotted line positions the link 15 will operate to lift the dagger to inoperative position.

Upon each of the parts G of the two loom sides I bolt a plate 23, which plates sustain the feeler-devices which coöperate with a released detector, and as the detectors are arranged herein in two parallel banks or series, see Fig. 1, said plates are adapted for such arrangement, the lower portions of the plates supporting three fixed and transversely extended bars or warp rests 24, each bank of detectors being located between two of such warp rests. In the present embodiment of my invention a series of feeler members, shown as disks 25, are arranged to rotate on pivot pins 26 reduced at their ends at 27 to enter holes in parallel, upright guides, shown as bars 28 extended from one to the other of the plates 23 and fixedly attached thereto, as by screws 29 through the flanged ends 30 of the guides, Fig. 2. The feeler members 25 are peripherally toothed, at 31, and in practice are thin gears, set edge to edge between the guides 28, each feeler member intermeshing with an adjacent member, the series of such toothed members extending transversely of the loom and above the warp threads H, Figs. 1, 2 and 3. The guides 28 support the feeler members, and preferably the reduced ends of the pivot pins are upset or headed upon the guides, to maintain a fixed connection therebetween, and referring to Fig. 2 it will be seen that the guides are provided with V-shaped notches 32 in their upper edges, opposite the meshing portions of adjacent feeler members. As the gear-like feeler members intermesh it will be obvious that any rotative movement of one will be imparted to all members of the series, and conversely, if any member is locked from rotative movement all of the members of the series will be locked. The endmost member of the series at the left hand side of the loom, as herein shown, is caused to mesh with an actuating or master gear 33, Figs. 2 and 3, shown herein as of somewhat larger diameter than the members 25, so that a given angular movement of the master gear will effect a greater angular movement of the feeler members 25, it being obvious that adjacent feeler members will turn in opposite directions. Herein the oscillating motion of the master gear will impart an angular oscillation to the several feeler members through an arc of about 90°, which is ample for the purpose desired. For convenience where two series of feeler members are employed the master gears thereof are fixed on a common shaft or axle 34, extended from one to the other of the guides 28 and rotatably mounted therein, so that oscillatory motion transmitted to one of the gears 33 will be transmitted to the other gear. Herein the actuating or master gear of the front series of feeler members has on its periphery a radially and outwardly extended arm 35, Fig. 2, projecting through a slot 36 in the plate 23 and through a corresponding slot 37 in the part G of the loom side, said arm carrying on its outer end a roll 38 adapted to coöperate with the cam surface 19 of the member 18, to rock the same at predetermined intervals when the warp is intact, and to hold said cam member in position to cause engagement of the bunter and dagger when a warp fault occurs. The spring 20 holds the cam member with its surface 19 in contact with the roll 38, in whatever position the latter may be, the extreme lower and upper positions of the roll being indicated at 39, 39ˣ, Fig. 2, and two intermediate positions are indicated at 40, 40ˣ, to be again referred to.

A link 41 pivotally connected with and depending from the gear arm 35 is extended through an eye 42, Fig. 1, of a rearwardly extended arm 43 rigidly connected with the lever 10, springs 44 on the link above and below the eye being held on the link by collars 45 and serving to yieldingly connect said link and arm, which permits continued movement of the arm even if the link be held from movement. The arm 43 has a roller or other stud 46, Figs. 1 and 4, which travels in a groove cam 47 in the face of a gear 48 rotatably mounted on the loom side at 49 and meshing with a pinion 50 on the crank shaft E, the gear rotating once for every two revolutions of said shaft. The

throw of the cam 47 is such that on one revolution of the crank shaft the arm 35 will be moved to carry the roll 38 from the position 39, Fig. 2, to the position 39ˣ, and on the next revolution of said crank shaft said roll will be moved from 39ˣ to 39, oscillating the master or actuating gear 32 and the series of feeler members 25 provided the warp is intact.

It will be remembered that the operating stroke of the bunter 3 is effected each time the lay moves from top to back center, as has been explained, and if the oscillation of the master gear is stopped with roll 38 at either of the positions 40 or 40ˣ, Fig. 2, or at any intermediate position, the dagger 9 will remain in position to be struck by the bunter and the shipper will be knocked off to effect loom stoppage. Such stoppage of the master gear is caused by the stoppage from oscillation of any one or more of the feeler members 25 of the coöperating series, effected by movement of a detector into abnormal position. When the master gear is held from rotative movement one or the other of the springs 44 will be compressed as the gear 48 revolves, so that any breakage or straining of the parts is obviated.

Herein the detectors are made of thin, flat strips of sheet metal, each detector 51 having a longitudinal opening or slot 52 crossed near its upper end by a transverse bar or bridge 53, the part of the slot below the bridge loosely embracing the guides 28 and the interposed feeler members 25, an elongated slot 54 open at its lower end and below the slot 52 straddling a warp thread, as clearly shown in Fig. 3. The warp threads are supported by the warp rests 24, and normally they sustain the detectors with the bridges 53 well above the toothed peripheries of the feeler members, so that even should a thread become quite slack it would not permit descent of its detector to active position. In Fig. 2 I show a normally positioned detector in elevation, and also one in section, and in dotted lines a detector is shown as just having dropped into active position, at the left, so that the bridge 53 has engaged teeth of the master gear and the next feeler member 25. Of course a detector may drop at any instant, and at any place in the series of detectors, each warp thread having its own detector, and pivot, if a detector drops directly between two adjacent toothed members, if they are rotating toward each other they will continue to turn until a tooth of one bears against the bridge 53 and forces it into the space between two teeth of the next member, (see Fig. 2, at the right). This causes the detector to be tipped laterally into an inclined position, as shown, for the bridge rests upon the edges of the two opposite notches 32 of the guides 28 and swings thereupon, such tipping of the detector opening the sheet of warp so that the position of the indicating detector is shown instantly and clearly to the weaver, whereby the faulty thread may be promptly located and the fault corrected. When the tipping is effected the teeth of the feeler member toward which the upper end of the detector is moved enter the upper end of the slot 52 above the bridge, permitting such tipping or diagonal positioning of the detector, as will be obvious from Fig. 2, and when the bridge is brought against the edge or side of the notch 32 both of the coöperating feeler members will be stopped from rotation. Consequently the entire series of such members and the corresponding master gear will be stopped and locked, so that the cam member 18 will be held in such position that the dagger, and bunter will coöperate. The slight rotative movement of adjacent feeler members which is permitted even when the released detector drops exactly between them corresponds to a movement of the roll 38 from 39 to 40, Fig. 2, and vice versa, or from 39ˣ to 40ˣ and vice versa. Should the released detector be somewhere between the engaging points of a feeler member with its adjacent members then the detector will be moved laterally, in one or the other direction, by the rotating member 25 upon which it drops, until it is brought into position to engage the teeth of two adjacent members the upper edges of which are moving toward each other. It might happen that a detector would drop between two feeler members just as their upper edges were moving away from each other, but in that case the stoppage of the loom would be delayed only until the next pick, for on one pick a given feeler member is rocked or turned to the right, and on the next pick to the left, and so on in regular order.

The construction is very effective and prompt in its action, there is no tendency to clog as all of the feeler members are located above the sheet of warp, hence they are out of the way of dropping lint, and the separation of the threads of the warp at the point where the faulty thread is located is of great assistance to the weaver in piecing up.

The detectors can be divided into as many banks or series as may be most convenient, each bank having its own arrangement of normally oscillating and intermeshing feeler members, and the master or actuating gears of the several series will be fixedly connected with each other to oscillate in unison by suitable mechanism, one practical form of the latter being shown herein.

While in many cases it will be found most desirable to arrange the detectors and feeler mechanism wholly separate from and independent of the harnesses, as so far described and illustrated, I may mount the

detectors in the harnesses, to serve as heddles as well as detectors, such an arrangement being shown in Fig. 5. Referring thereto, the top and bottom bars 55, 56 of a harness frame are rigidly connected by preferably metal side bars, as 57, and above the middle of the frame the side bars have attached to them the transverse supports, as 58, notched at 59, and sustaining the pivots 60 of the series of peripherally toothed and intermeshing feeler members 61. In Fig. 5 the front one of the supports 58 is omitted to make the illustration clearer. The end-most member 61 of the series of feeler members projects through a slot 62 in the adjacent side bar 57, and its teeth engage a rack 63 mounted to slide vertically in guides 64 on the outside of the bar 57. At its lower end the rack is attached to a contractile spring 65 fixed to the side bar 57, which spring acts to draw down the rack until its outturned head 66 rests against the upper guide 64. The rack-head 66 is slotted at 67, Fig. 7, and bifurcated to receive a roll 68 rotatably mounted thereon, each harness frame of a set being equipped with the devices thus far described.

The loom side G is provided with a bracket 68′ carrying a horizontal rock shaft 69 having fixedly attached to it as many cam members 70 as there are harnesses, each member 70 being located adjacent to and coöperating with a roll 68 on one of the racks. Said members 70 are moved inward by a spring 71, Fig. 5, attached at its opposite ends to the loom side and to an arm 72 fast on the rock shaft 69, and this arm is connected by a link 73 with the dagger 9, Fig. 1, the link 73 controlling the position of the dagger in the same manner as such control is effected, in Figs. 1 and 2, by the link 15. The cam governed arm 43, Fig. 1, is connected with a long link 74, Fig. 5, by means of a double-acting yielding connection such as is illustrated in Fig. 1, the upper end of the link being pivotally attached to a lever 75 fulcrumed at 76 on the loom side and carrying at its inner end a rigid horizontal rod 77 extended fore and aft of the loom adjacent the paths of the harness frames. This rod has hooked upon it and depending therefrom a series of jacks 78, one for each harness frame, each jack having its upper end bent to form an open, downturned hook 79 to embrace detachably the rod 77, the lower portion of the jack passing loosely through the slot 67 of its rack head, and being bent laterally to form a retaining foot 80. A bracket 81 fixed on the loom side has guide slots 82, one for each of the jacks 78, to maintain them in proper position and prevent their upper ends from crowding together on the rod 77. Now when the rod 77 is in its lowest position, shown in full lines, Fig. 5, all of the jacks depending therefrom will occupy their lowest positions, with their feet 80 so low that any rack 63 can be drawn by its spring 65 to its lowest position on its harness frame when the warp threads thereof are intact, even when the frame is in its lowest position, which is that occupied by the frame shown in Fig. 5. When, however, the rod 77 is in its highest position, as at 77^x, Fig. 5, the jack feet 80 will be positioned at 80^x, so that when any harness frame descends the head of its rack will be caught and held stationary by the elevated foot of the corresponding jack, and as the harness frame continues its downward movement the stationary rack 63 will, under normal conditions, cause rotative movement of the meshing feeler member 61, the latter in turn causing the entire series of feeler members to be turned, adjacent members revolving in opopsite directions. The change in the position of the rod 77 is effected when the shed is open, and if a harness is down when the rod is lifted the rack will be raised relatively to its frame, effecting rotation of the members 61. Whenever a rack is held up or raised its spring 65 is stretched, so that when the corresponding harness frame is raised, or the rod 77 is lowered, or both, the spring will contract and will effect a downward movement of the rack relatively to the harness frame. Thereupon the series of feeler members 61 will be again rotated, but spring actuated rotation of any of such members is opposite to that effected through the action of a jack when it coöperates with the rack, as has been described. I have thus provided for the oscillation of the feeler members of each harness frame, whenever the warp threads thereof are intact, on each downward stroke, and also when the frame remains down and the rod 77 is raised to dotted line position 77^x, and if the roll 68 can move from one to the other of its extreme dotted line positions the loom continues to operate. Should said roll be held, however, at either of its intermediate dotted line positions, Fig. 5, or at any point therebetween, then the loom shipper will be knocked off on the backward stroke of the lay, as previously explained, for the corresponding one of the cam members 70 will be abnormally positioned by the roll 68 coöperating therewith. The abnormal or active positioning of a roll 68 is effected by arrest of oscillating movement of the feeler members 61 of a harness frame when that frame is down or is moving down and is near the lower end of such down stroke, and the arrest of the feeler members is effected by detectors which serve also as heddles. Such detector heddles 81 are made of thin flat metal strips, and each is longitudinally slotted at 82 to loosely embrace the feeler mem-

bers and the supporting guides 58, the upper end of the slot being bridged transversely at 83, for coöperation with two adjacent feeler members 61 when a warp thread fails, in substantially the manner previously described. Such engagement of the detector heddle and the feeler members arrests rotative movement of the latter and also tilts the heddle, as shown, but it also tends to bend the heddle, for the warp threads pass through eyes 84 below the slots 82, and a depressing bar 86 on the harness frame passes through a slot 85 below the warp eye of each heddle. The tilting and bending of the released heddle opens the warp sheet so that such heddle can be located instantly by the weaver.

Various changes and modifications in details of construction and arrangement may by made by those skilled in the art without departing from the spirit and scope of my invention as set forth in the claims annexed hereunto.

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

1. In a warp stop-motion, a series of disk-like and rotatably movable feeler members arranged in a row transverse to the sheet of warp, means normally operative to effect simultaneous oscillating movement of said members, means maintained inoperative by intact warp threads to coöperate with and lock said members from oscillation when a warp thread fails, and a stopping instrumentality caused to operate by or through such locking of the feeler members.

2. In a warp stop-motion, a series of toothed, rotatable feeler members arranged in a row transverse to and adjacent the sheet of warp, means normally operative to effect simultaneous oscillatory movement of said members, means maintained inoperative by intact warp threads to coöperate with two adjacent feeler members and lock from oscillatory movement the entire series of such members when a warp thread fails, and a stopping instrumentality set into operation by or through such locking of the feeler members.

3. In a warp stop-motion, a series of rotatable feeler members having toothed peripheries, adjacent members intermeshing, means normally operative to effect simultaneous oscillatory movement of said members, a support on which the latter are mounted, detectors maintained inoperative by intact warp threads and slotted to receive the support and the feeler members thereon, a dropped detector coöperating with two adjacent feeler members to lock the series from oscillation, and a stopping instrumentality set in action by or through locking of the feeler members.

4. In a warp stop-motion, a series of rotatable peripherally engaging feeler members, means normally operative to effect simultaneous oscillatory movement thereof, a support for said members, said support having notches in its upper edge opposite the engaging portions of adjacent members, detectors slotted to receive said support and feeler members and maintained inoperative by intact warp threads, a dropped detector engaging a feeler member and being moved thereby into engagement with the adjacent member, in a notch of the support, to thereby lock said members from oscillation, and a stopping instrumentality rendered operative by locking of the feeler members.

5. In a warp stop-motion for looms, a support transverse to the travel of the warp threads, a series of peripherally toothed and intermeshing feeler members rotatably mounted on said support, the axes of said members being in parallelism to each other and at right angles to the support, means normally operative to oscillate the feeler members, detectors slotted to straddle the support and the train of feeler members and held inactive by the warp threads, a released detector engaging two adjacent feeler members and locking them from oscillatory movement, and means whereby locking of the feeler members causes stoppage of the loom.

6. In a warp stop-motion for looms, a series of rotatable feeler members extended transversely of the warp threads and operatively connected to transmit rotative movement from one to another, means to effect oscillatory movement of said members when the loom is operating normally, means whereby failure of a warp will lock automatically the series of feeler members and prevent rotative movement thereof, and a stopping instrumentality set in action by or through locking of the feeler members.

7. In a warp stop-motion for looms, a series of rotatable, peripherally toothed members operatively connected to transmit rotative movement from one to another and extended transversely of the warp threads, means whereby the failure of a warp thread will lock the said members from oscillatory movement and open the warp threads to locate the fault, means normally operating to effect simultaneous oscillatory movement of said toothed members, and a stopping instrumentality operated by or through locking of said members.

8. In a warp stop-motion for looms, a series of peripherally toothed, oscillating feeler members arranged edge to edge in a transverse plane adjacent the sheet of warp, means normally operative to effect periodic oscillation of said members simultaneously, adjacent members turning in opposite directions, means maintained inoperative by intact warp threads to coöperate with and lock

said members from oscillation when a warp thread fails, and an instrumentality rendered operative to effect loom stoppage by or through locking of the feeler members.

9. In a warp stop-motion for looms, a series of peripherally toothed, oscillating feeler members arranged edge to edge in a transverse plane adjacent the sheet of warp, each member meshing with a member adjacent thereto, normally operative means, including a vibrating arm, to effect periodic and simultaneous oscillation of said feeler members, detectors maintained inoperative by intact warp threads and slotted to loosely embrace the series of feeler members, failure of a warp thread releasing its detector and permitting engagement thereof with the periphery of a feeler member, the movement of the latter causing the released detector to coöperate with two adjacent feeler members and lock the series from oscillation, to thereby operatively position the arm, and a stopping instrumentality for the loom, including a dagger rendered active by or through operative positioning of said arm, to effect loom stoppage.

10. In a warp stop-motion for looms, a series of peripherally toothed, oscillating feeler members arranged edge to edge in a transverse plane adjacent the sheet of warp, means normally operative to effect periodic oscillation of said members simultaneously, adjacent members turning in opposite directions, detectors maintained inoperative by intact warp threads and slotted to loosely embrace the series of feeler members, a released detector coöperating with two adjacent feeler members to lock them and the series from oscillation, a fixed guide extended through the slots of the detectors and having notches opposite the contacting portions of adjacent feeler members, to assist in positioning a detector when released, and a stopping instrumentality rendered operative by or through locking of the feeler members.

11. In a warp stop-motion for looms, a series of peripherally toothed feeler members arranged edge to edge and intermeshing each with its adjacent member, a guide adjacent said members and on which they are rotatably mounted, the upper edge of the guide having V-shaped notches opposite the contacting portions of adjacent members, a series of detectors, each having a slot to loosely embrace the feeler members and guide, and maintained inoperative by intact warp threads, the slot in each detector having a bridge near its upper end, release of a detector by its warp thread permitting the detector to descend until the bridge thereof engages the toothed periphery of a feeler member and is moved laterally thereby into engagement with the next adjacent member, locking the series of feeler members from oscillation, the bridge of the detector at such time being held against the side of a guide notch with the detector in an inclined position, to indicate the location thereof, means normally operative to effect periodic oscillation of the feeler members, and a stopping instrumentality set in action by or through locking of the feeler members.

12. In a warp stop-motion for looms, a harness frame, a series of toothed, rotatable feeler members mounted therein and extended transversely thereof, adjacent members rotating in opposite directions, means normally operative to effect simultaneous rotative movement of said members when the harness frame is at or near its low position, heddles serving also as detectors and held inoperative by intact warp threads, release of a heddle by its warp thread permitting the heddle to coöperate with two adjacent feeler members and thereby lock from rotative movement the entire series of said members, and a stopping instrumentality set into operation by or through such locking of the feeler members.

13. In a loom, a shipper, normally inactive means adapted to release the shipper on the backward stroke of the lay, a series of peripherally toothed, rotatable feeler members arranged edge to edge and extended transversely above the warp threads, means normally operative to effect periodic rotative and simultaneous movement of said members, adjacent members rotating in opposite directions, means, maintained inoperative by intact warp threads, to coöperate with and lock said feeler members from rotative movement when a warp thread fails, and an instrumentality to render active the shipper releasing means by or through locking of the feeler members.

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

JOHN F. DUSTIN.

Witnesses:
JOHN C. EDWARDS,
FREDERICK S. GREENLEAF