No. 631,240. Patented Aug. 15, 1899.

H. WYMAN.

WARP STOP MOTION FOR LOOMS.

(Application filed Dec. 31, 1897.)

(No Model.) 2 Sheets—Sheet 1.

Fig: 1.

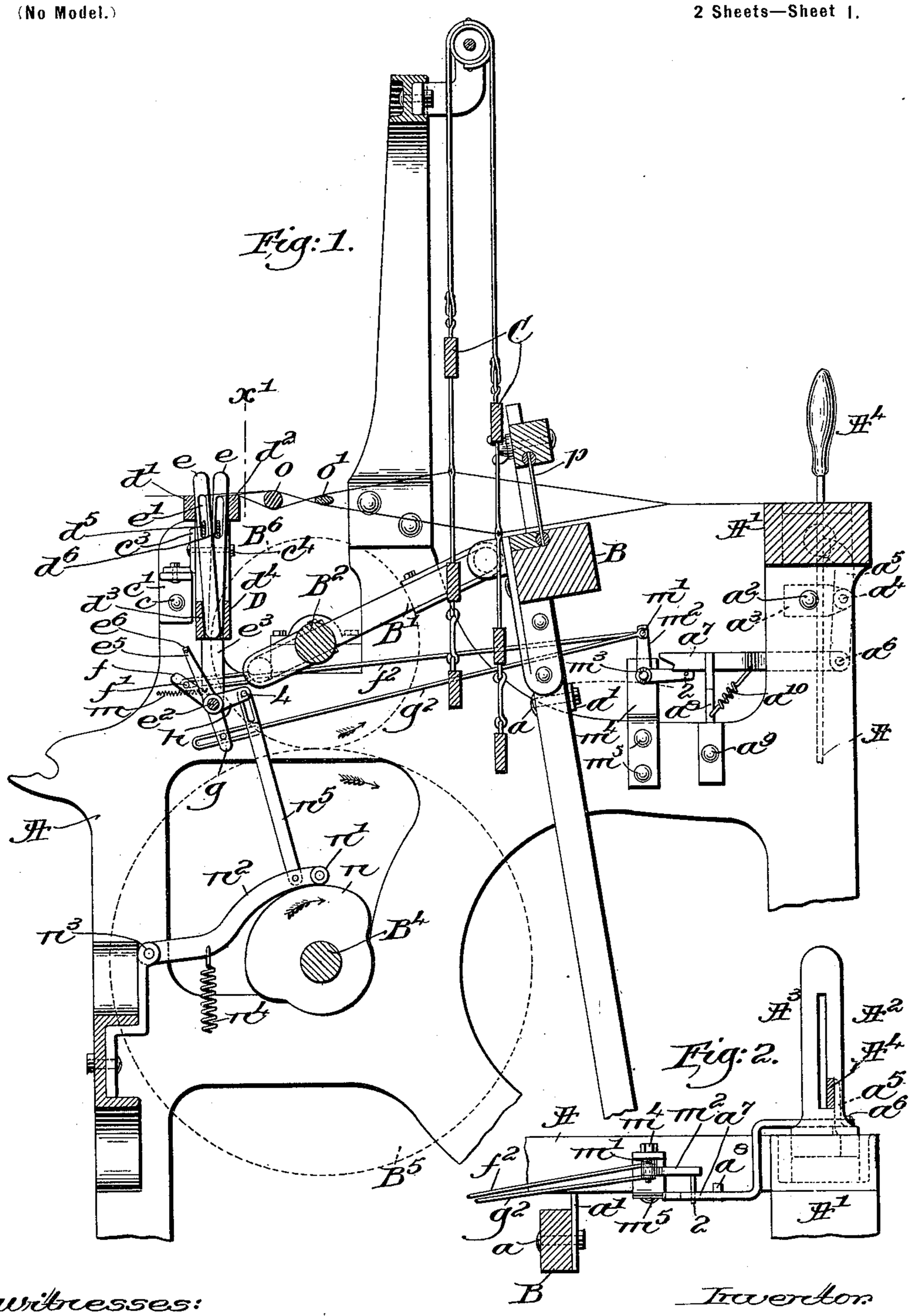

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Fig: 3.

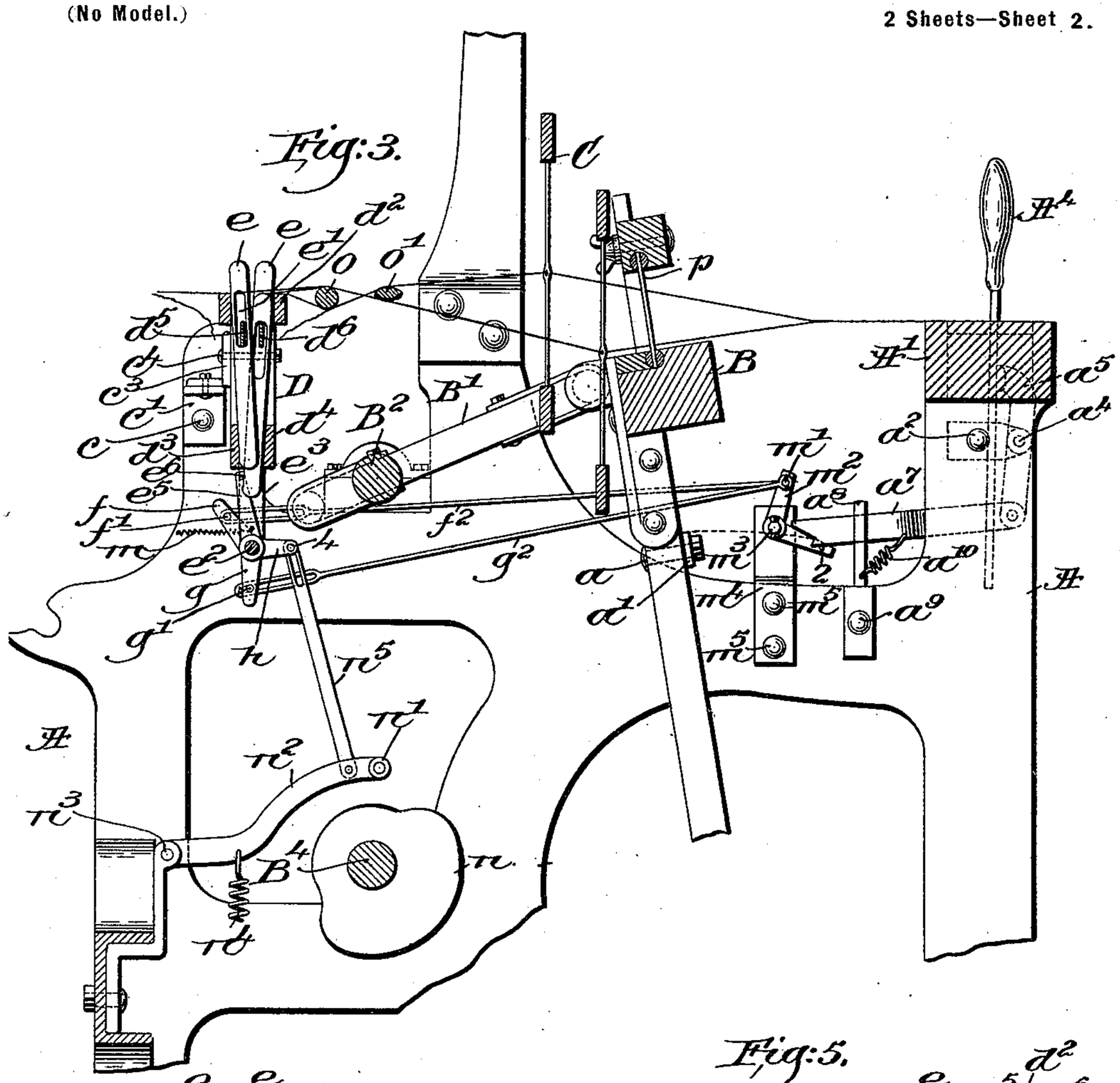


Fig: 4.

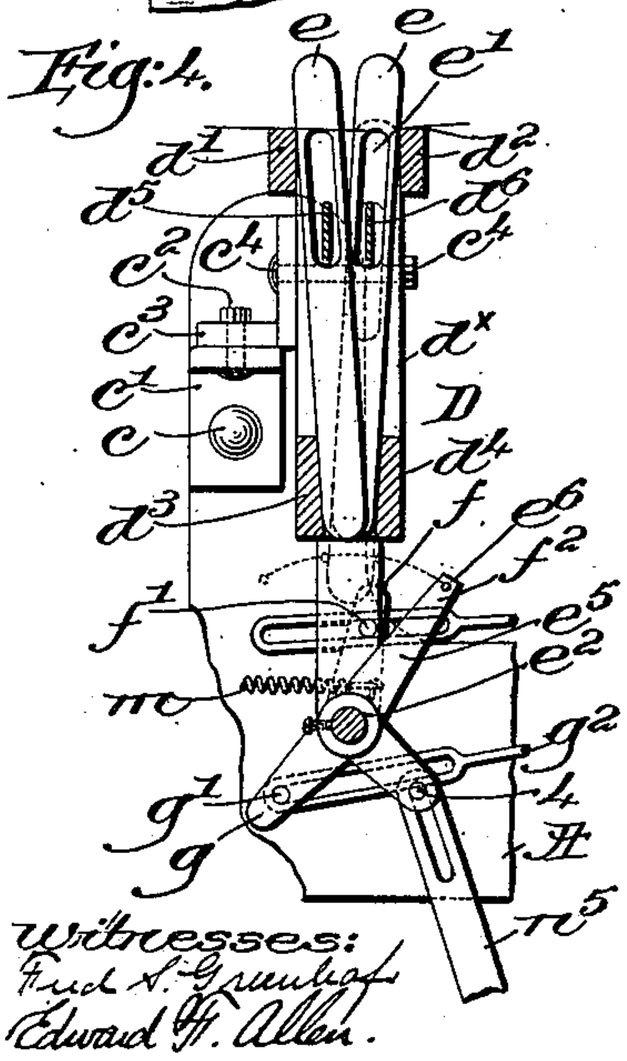
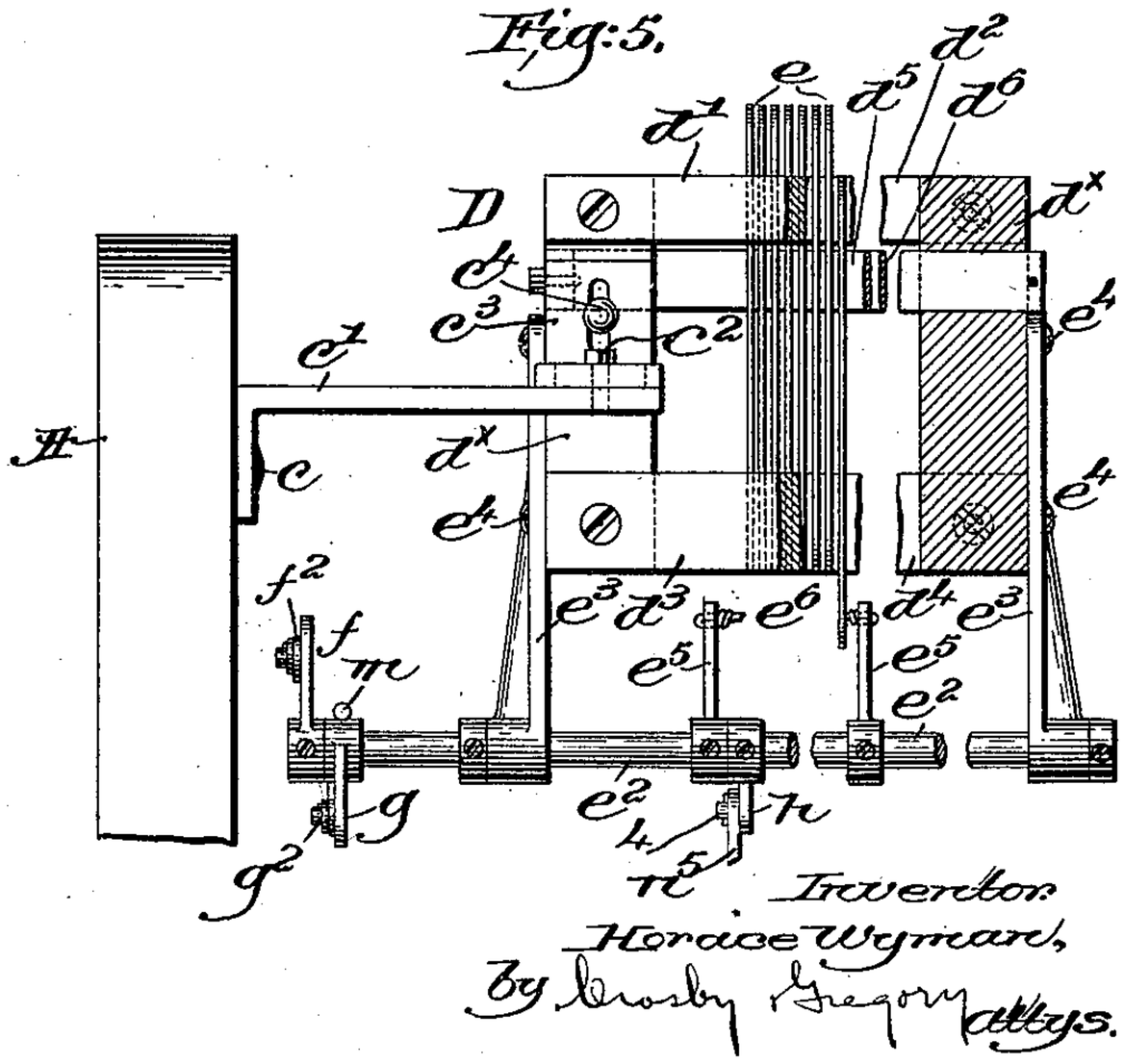


Fig: 5.



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UNITED STATES PATENT OFFICE.

HORACE WYMAN, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO THE CROMPTON & KNOWLES LOOM WORKS, OF SAME PLACE.

WARP STOP-MOTION FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 631,240, dated August 15, 1899.

Application filed December 31, 1897. Serial No. 665,039. (No model.)

To all whom it may concern:

Be it known that I, HORACE WYMAN, of Worcester, county of Worcester, State of Massachusetts, have invented an Improvement in Warp Stop-Motions for Looms, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention has for its object to provide a loom with devices whereby when the warp breaks the loom may be stopped.

In this invention I employ a guide, herein represented as fixed at the rear end of the loom and crossing the same between the usual whip-roll or warp-beam and the lease-rods, said guide receiving a series of drop devices made of thin sheet-steel, each drop device having a slot and being strung on a narrow parallel bar, the said drop devices being guided in their vertical movement by said guides, aided by the bar on which the drop devices move. Herein I have shown two such narrow bars, which I shall designate "stringer-bars," and I have separated the drop devices so that their upper ends stand in two different parallel planes, thereby enabling the drop devices to control a larger number of warps than if all were arranged on one bar.

The drop devices herein shown have each a single slot, in which rests the stringer-bar and through which is also extended a warp-thread. The unbroken warp-threads support the drop devices in their normal positions, with the lower ends of the slots therein substantially near the lower edge of the stringer-bar, and in such condition the feeler or vibrator, hereinafter to be described, may swing freely back and forth under the drop devices and the guide. In case, however, a warp-thread breaks or becomes unduly slack a drop device properly supported by it descends into its abnormal position, where it acts to arrest the movement of the feeler, the arrest of such movement stopping automatically the loom.

The feeler herein described may act against either edge of a drop device in going backward or forward under the guide, and in either condition a drop device in its abnormal position will effect the stopping of the loom.

The particular features in which this invention consists will be hereinafter particularly described in the specification and specified in the claims at the end thereof.

Figure 1 shows in section, from front to rear, a sufficient portion of a loom embodying this invention to enable this improvement to be understood. Fig. 2 is a detail in plan view and section chiefly to show the devices employed to release the shipper-handle. Fig. 3 is a sectional detail substantially the same as shown in Fig. 1, but with a drop-wire in its abnormal position, a warp-thread having been broken. Fig. 4 shows the drop-wires and the vibrator in the position they will occupy when the lay is forward next to the breast-beam and the warp-threads are unbroken. Fig. 5 is a sectional detail looking to the left of the dotted line x', Fig. 1, the guide for the drop devices being broken out, the entire figure being broken out centrally to save space upon the drawings.

The loom-frame A, the breast-beam A′, the plate A^2, fixed to the end of the breast-beam and slotted at A^3, one side of said slot having a notch to receive the shipper-lever A^4, the lay B, its connecting-rods B′, the crank-shaft B^2, the lower or cam shaft B^4, the gear B^5 on the cam-shaft engaging a gear B^6 on the crank-shaft, and the shed-forming mechanism C are and may be all as common in usual looms for weaving cloth, so need not be herein further described, and instead of the particular shed-forming mechanism shown there may be employed any other usual equivalent mechanism. The lay has fixed upon it by a suitable bolt a a striker a'.

The loom side has fixed upon it by a bolt a^2 a suitable stand a^3, which receives the fulcrum a^4 of a knock-off lever a^5, the upper end of which normally rests against one side of the shipper-handle A^4 when the latter is in the notch of the slot A^3 of the plate A^2. The lower end of this knock-off lever is jointed at a^6 to a dagger a^7, which is free to play up and down in a guide a^8, fast to the loom side by a suitable bolt a^9, a spring a^{10}, connected with said guide and said dagger, acting normally to depress said dagger, so that the notch of the dagger may be struck by the striker a' as the lay comes forward, and when the striker so acts the knock-off lever a^5 is moved so that its upper end pushes the shipper-handle out of its notch, and thereafter said shipper-han-

dle acts in usual manner common to looms to stop movement of the loom. This dagger is, however, normally kept elevated, so that the lay will not meet it and stop the loom unless a warp-thread shall break or become too slack.

The loom sides at the rear of the loom have bolted to them by suitable bolts c stands c', upon which in turn are bolted by bolts c^2 stands c^3, and to upright portions of the stands c^3 there is attached by bolts c^4 a guide-frame D, said guide-frame being composed of suitable uprights $d^\times$, which at their upper ends are connected across the loom by bars d' d^2 and at their lower ends by bars d^3 and d^4, the bars at the upper end being more widely separated than the bars at the lower end. The uprights $d^\times$ of this frame receive two stringer-bars d^5 and d^6, separated some distance apart. These stringer-bars have mounted upon them, first one and then the other, alternately, a series of drop devices e, each having a slot e', each drop device receiving one single warp-thread, each warp-thread passing over and normally resting on the guide-bars d' and d^2, so that the drop devices hang on said warp-threads when they are unbroken, and so long as the warp-thread is unbroken or is not unduly slack the lower ends of the drop devices, which lie contiguous one to the other in substantially the same horizontal plane, are contained or protected within the space between the bars d^3 and d^4; but as soon as a warp-thread becomes broken or unduly slack the drop device hanging on it drops and its end is projected and descends and meets, it may be, the stringer-bar d^5 or d^6, extended through its eye, leaving the end of that drop device in the range of movement of a feeler or vibrator, to be described.

The feeler or vibrator herein represented consists, essentially, of a rock-shaft e^2, having its bearings in depending arms e^3, connected by suitable screws e^4 to the uprights $d^\times$ of the guide-frame D, said rock-shaft having fixed to it suitable arms, as e^5, which are connected by a suitable rod e^6, so that said rod in the movement of the rock-shaft and its arms may meet the lowered end of a drop device in its abnormal position, as in Fig. 3; but in case the drop devices are held up in their normal position, as they will be when the loom is running and the warp is unbroken, then the wire will pass freely under the guide-frame D and will not meet with any obstruction whatever. This rock-shaft, forming part of the feeler or vibrator, has fixed to it, at or near one end, two arms f g, and at or near the central part of the said rock-shaft there is attached to it a third arm h.

A suitable spiral or other spring m (shown in Figs. 1, 3, and 4) acts normally to turn the vibrator and its rock-shaft into the position shown in Fig. 1 to place the wire e^6 at the rear side of the guide-frame D.

The arms f and g have, respectively, pins f' and g', which enter elongated slots, respectively, in rods f^2 g^2, said rods being connected, respectively, by a suitable bolt m' with the upper end of an elbow-lever m^2, pivoted at m^3 on a stand m^4, fixed to the loom-frame by suitable bolts m^5.

The elbow-lever m^2 and the rods f^2 g^2 and their actuating-arms f and g constitute a dagger-controller, and this lever has a pin or projection 2, upon which normally rests the dagger a^7 when the loom is running regularly and the warp-threads are unbroken, and by viewing Fig. 1, where the vibrator is shown in one of its extreme rearmost positions, it will be seen that the pin f' acts at that time in the rear end of the slot of the rod f^2 to keep the pin-carrying end of the elbow-lever m^2 in position to hold up the dagger, and by viewing Fig. 4, where the vibrator is shown in its other extreme position, its forward extreme, the pin g' of the arm g is in the rear end of the slot of the rod g^2 and holds up the elbow-lever m^2 and the dagger.

The arm h of the rock-shaft e^2 has a pin or projection 4, which is embraced by the slotted end of a link n^5, connected to a lever n^2, pivoted at n^3, said lever having, it may be, a roller or other stud n', which is acted upon by a cam n, carried by the cam-shaft B^4, said cam rotating once while the crank-shaft rotates twice and the lay makes two complete strokes or movements. The lever n^2 is actuated positively to turn the rock-shaft e^2 by the spring n^4, which may be stronger than the spring m.

The feeler or vibrator may act in both directions of its movement on a drop device if the latter is in its abnormal or dropped position, but the time of such action is herein represented as taking place when the lay is completing its back stroke.

Viewing Fig. 1, the vibrator is shown in its rearmost position and the lever n^2 is shown elevated by the cam, so that the spring m holds the feeler or vibrator back. Now as the lay is moved forward the large part of the cam n acts and holds up the lever n^2, and the arm f of the rock-shaft acts by its pin f' in the slot of the rod f^2 to hold up the end of the lever n^2 and keep the dagger lifted, and as the lay approaches its back stroke the large part of the cam n passes from under the lever n^2 and lets the spring n^4 act through said lever and the link n^5 to turn the rock-shaft e^2 into its full-line position, Fig. 4, unless a drop-wire has descended, due to a broken or slack wire, and this movement of the rock-shaft e^2 causes the pin g' of the arm g to meet the end of the slot in the rod g^2 and hold up the lever m^2. At this time, a warp-thread not having been broken, the lay again starts forward, and at this forward stroke the small radius of the cam n is under the lever n^2 and the spring n^4 controls the position of the rock-shaft, and the arm g, acting as described, keeps up the lever m^2 until the lay has again nearly completed its back stroke, when the larger part of the cam again becomes operative and lifts

the lever n^2, again permitting the spring m to assume control of the rock-shaft e^2 and vibrator to keep the lever m^2 in position to hold up the dagger. This operation will be continued and the rods f^2 and g^2 will act at alternate forward strokes of the lay and keep the dagger lifted so long as a warp-thread is unbroken; but during this time the lever m^2 is turned and the dagger drops, but such dropping takes place only as the lay has nearly completed its back stroke, at which time it is immaterial what is the position of the dagger. If a drop device descends while the lever n^2 is held up by the cam n, (see Fig. 1,) said vibrator as the lay nearly completes its back stroke is permitted to start by the spring n^4, and the vibrator meets the rear side of the drop device, as in Fig. 3, and its further movement is arrested, while the cam n continues to turn and leaves the lever n^2 in its arrested or upper position, and consequently the rock-shaft e^2 cannot turn and cause the pin of the arm g to act in the slot of the rod g^2 to move the lever m^2 and lift the dagger, and said dagger is therefore held in a position to be met by the striker a' at that forward movement of the lay, and the shipper-handle is thrown out of its usual holding-notch, so that it may move and in usual manner stop the further running of the loom.

I have not herein shown the connections between the shipper-handle and the usual fast and loose pulleys on the cam-shaft b^4, as such devices are and may be as common to usual looms.

If a drop-wire descends during the forward stroke of the lay while the smaller radius of the cam n is uppermost, the vibrator at such time occupying the position Fig. 4, the vibrator is permitted to start by the spring m as the lay approaches its backward position, and the said vibrator will meet the right-hand or front side of the drop device in its abnormal position and will be arrested, so that the pin f' of the arm f cannot act in the slot of the rod f^2 to turn the lever m^2 and lift the dagger and stop the loom; but during this time the lever n^2 is started by the larger part of the rotating cam n; but owing to the slot in the link n^5 the rock-shaft e^2 is not turned. This drop device may fall when the lay is in any position.

There is a drop device for each warp-thread, and each device acts on a thread back of the usual lease-rods, while the threads are all massed together in one plane and have no rising-and-falling motion, as when a shed is opened, and to enable these drop devices to not unduly crowd or pinch the warp-threads and so enable the drop devices to be free to descend when a thread is broken I have separated the upper ends of the drop devices into two planes, and they hang on the warp-threads, all of which rest on the top of the guide D. The lay has a reed p of usual construction.

The upper end of the guide D presents a warp-rest, and the stringer-bar used to support the drop devices in their abnormal positions lies entirely below the top of the guide and rest, which is a matter of convenience, as it enables access to be had more readily to the drop device to put warp-threads through the slots therein than though the upper end of the drop device was obstructed in its movements by a bar extended through it.

This invention is not limited to the exact means shown between it and the shipper-handle to release the latter so long as the movement of the dagger toward the breast-beam to effect the release of the shipper-handle is controlled by a device connected to the lay.

From the foregoing description it will be understood that the vibrator-rail derives its feeling or to-and-fro movement by or through the two springs m and n^4, the spring n^4, as shown, being the stronger. The spring m acts directly on an arm movable with the vibrator, but the spring n^4 acts through intermediate devices represented as the lever n^2 and slotted link n^5, the lever and link being designated as a "vibrator" connection, said connection being in turn made movable by a cam n, designated as the "actuator." The slot of the slotted link n^5 embraces a pin or projection 4, extended from an arm attached to the vibrator, and when said actuator operates to lift the vibrator connection to enable the spring m to control and move the vibrator in a direction away from the breast-beam should the vibrator at such time meet a drop device the slot in the link n^5 permits it and the lever n^2 to be moved by the actuator, leaving the vibrator, however, at rest, and so, also, if the vibrator in its movement toward the breast-beam by or through the spring n^4 is checked by a drop device then the pin 4, movable in unison with the vibrator, but lying in the slot of the link n^2 of the vibrator connection, checks the further movement of said connection by the spring n^4 and arrests the said connection, permitting the said actuator to break its contact with said connection and leave it at rest.

The described slot-and-pin connection is an important element of this invention, as it enables the vibrator—it moving in one direction, as, for the sake of illustration, away from the breast-beam—to stop when it meets a drop device, and so, also, is the spring n^4 an important element of this invention, for it yields when the vibrator, moving in the opposite direction, contacts with a drop device, and instead of the particular pin-and-slot connection and the spring shown I may employ any other well-known equivalent devices capable of sliding and yielding to effect the purposes herein provided for.

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

1. In a warp stop-motion for looms, a rest crossing the loom and constantly supporting the entire series of warp-threads, and a

stringer-bar located below said warp-rest, combined with a series of slotted drop devices mounted to slide up and down on said stringer-bar and receiving each a warp-thread whereby said drop devices are suspended in their abnormal position by the unbroken warp-threads, and are arrested in their abnormal position by the stringer-bar, substantially as described.

2. In a warp stop-motion for looms, a guide crossing the loom-frame back of the harness mechanism and acting as a constant support for the entire series of warp-threads, a stringer-bar located below the top of said guide and the line of travel of the warp through the loom; combined with a series of drop devices slotted and strung on said stringer-bar, the warp-threads being passed through slots of said drop devices, the unbroken warp-threads supporting the drop devices in their normal position the breaking or slackening of a warp-thread permitting a drop device to descend into its abnormal position; stop mechanism, and means intermediate it and a drop device in its abnormal position to stop the loom, substantially as described.

3. In a warp stop-motion for looms, a guide crossing the loom-frame back of the harnesses and presenting at its upper end a warp-rest forming a constant support for the entire series of warp-threads, a stringer-bar located below the top of said guide and the line of travel of the warp through the machine, and a series of drop devices slotted and strung on said stringer-bar, said drop devices receiving through openings therein the warp-threads; combined with a feeler, means to move it to and fro under the drop devices in their normal position; stop mechanism, and means cooperating therewith to actuate the stop mechanism and stop the loom when the feeler is arrested by a drop device in its abnormal position.

4. In a warp stop-motion for looms, a warp-rest crossing the loom between the harness mechanism and warp-beam and constituting a support for the entire series of warp-threads, a stringer-bar located below the warp-rest, a series of slotted drop devices strung on said bar and adapted to receive and be sustained in their normal positions by unbroken warp-threads, and stop mechanism adapted to be actuated by a drop device in its abnormal position.

5. In a warp stop-motion for looms, an open guide crossing the loom-frame back of the harness mechanism and constituting a rest for the entire series of warps and presenting at its lower end faces to coöperate with the edges of the drop devices, a stringer-bar located below the open upper end of said guide, a series of slotted drop devices strung on said bar and adapted to receive and be suspended in normal position by unbroken warp-threads, the edges of the said devices at their lower ends below said bar being adapted to contact with one or the other of said faces under the action of a feeler, combined with a feeler, means to swing it to and fro under the lower end of said guide and the drop devices in normal position, and means under the control of said feeler to stop the loom when the feeler is arrested by a drop device in abnormal position.

6. In a warp stop-motion for looms, a warp-rest crossing the loom-frame back of the harness mechanism and sustaining the entire warp at each side of warp-detectors, a plurality of stringer-bars located below said rest, a plurality of series of slotted drop devices located in the space at the upper end of said rest and strung on said bars and adapted to be suspended in their normal positions by unbroken warp-threads, a feeler, means to operate it, and devices under the control of said feeler to stop the loom when a feeler descends into its abnormal position due to a broken or slack warp-thread.

7. In a warp stop-motion for looms, a guide crossing the loom-frame back of the harnesses and presenting at its upper end a rest to sustain the entire warp-threads, said guide being slotted at its lower end to present walls between which the edges of the lower ends of a series of drop devices may slide; combined with a stringer-bar and a series of slotted drop devices strung on said bar leaving the upper ends of said drop devices above said stringer-bar entirely unobstructed except by warp-threads.

8. In a warp stop-motion for looms, a guide-frame crossing the loom back of the harnesses, a series of slotted drop devices mounted in said frame, and a stringer-bar extended through the slots of said drop devices, said stringer-bar occupying a position below the upper end of said frame, a feeler composed of a rock-shaft having arms and carrying a device to contact with a drop device in its abnormal position; combined with a secondary arm connected with said rock-shaft, a slotted link, means to actuate it to move said secondary arm; two other controller-actuating arms, means to connect said controller-actuating arms with said controller above and below the center of the said rock-shaft carrying said controller-actuating arms, and a dagger supported by said dagger-controller, and a shipper-handle under the control of said dagger, to operate, substantially as described.

9. In a warp stop-motion for looms, a series of slotted drop devices each suspended in its normal position by a warp-thread, a guide independent of the lay for said drop devices, a lay, and means to move it, a rock-shaft having a feeler and located under said guide in stationary bearings independent of the lay, means to move said rock-shaft and feeler to and fro, a dagger detached from the lay and located near the front of the loom, a support for the free end of said dagger, and devices between said rock-shaft and said dagger-sup-

port to put it in its inoperative position during each forward stroke of the lay while the said drop devices remain suspended by the unbroken warp-threads in their normal position, and means on the arresting of said feeler by a drop device in its abnormal position to put the dagger in position to be actuated by the lay to stop the loom.

10. In a warp stop-motion for looms, a guide crossing the loom at the rear of the harness-frames, said guide presenting a rest for the entire warp, a series of slotted drop devices located in said guide, a stringer-bar located below said rests, said drop devices being strung on said stringer-bars, and a rock-shaft having an attached feeler; combined with a spring to move said feeler in one direction, a slotted connection, and a cam and lever to move said feeler in the opposite direction, substantially as described.

11. In a warp stop-motion for looms, a feeler, a rock-shaft carrying it and provided with a projection, a spring to move said rock-shaft in one direction, combined with a link slotted to receive said projection, and a cam to move said link and turn said rock-shaft in the opposite direction.

12. In a warp stop-motion for looms, a lay, a shipper-handle, a dagger, means intermediate it and said shipper-handle to actuate the same, a lever to support the free end of said dagger in its inoperative position, a feeler-carrying rock-shaft having oppositely-extended arms, means to turn said rock-shaft in one direction during one complete stroke of the lay and in an opposite direction at the next complete stroke of the lay, and rods operated by the arms of said rock-shaft and connected with the lever supporting the free end of said dagger to lift the said dagger whenever the lay moves forward and the drop devices are in their normal position.

13. In a warp stop-motion for looms, a shipper-handle, a feeler-carrying rock-shaft, oppositely-extended arms, means to turn said rock-shaft in one direction during one complete stroke of the lay and in the opposite direction at the next complete stroke of the lay, a guide, a series of slotted drop devices inserted in said guide, a stringer-bar located below the upper end of said guide and receiving upon it said slotted drop devices, and means intermediate said oppositely-extended arms and said shipper-handle to stop the loom on the arrest of the feeler by a drop device in its abnormal position.

14. In a warp stop-motion for looms, a shipper-handle, a guide located behind the harness mechanism and presenting a rest for the warp, a series of slotted drop devices located in said guide, a stringer-bar on which said drop devices are strung, said stringer-bar occupying a position below the top of said guide on which the warp-threads rest; combined with a feeler, means to move it to and fro under the drop devices in their normal position, and means between said feeler and shipper-handle to release the latter when the feeler is arrested by a drop device in its abnormal position.

15. In a warp stop-motion for looms, the following instrumentalities, viz: a lay, a series of slotted drop devices normally suspended by unbroken warp-threads, a feeler-rail supported under said drop devices and having an arm provided with a pin, an actuator, a vibrator connection presenting a slot embracing said pin, and a spring to turn said feeler in one direction as herein shown away from the breast-beam, whereby when said feeler is arrested in its movement in the direction stated the slot in the feeler connection slides over said pin leaving the feeler at rest against a drop device, substantially as described.

16. In a warp stop-motion for looms, a lay, a series of drop devices controlled by warp-threads, a feeler, and springs to move it to and fro under said drop devices in their normal position; combined with a dagger operatively connected with the shipper-handle of a stopping mechanism and maintained in its inoperative position so long as a warp-thread is unbroken, and means to cause said dagger to be put into its operative position by and on the breakage of a warp-thread, substantially as described.

17. In a warp stop-motion for looms, a guide constituting a rest for the entire warp back of the harness mechanism, a plurality of stationary stringer-bars located below said warp-rest, a plurality of slotted drop devices adapted to be sustained stationary in their normal positions by unbroken warp-threads and strung on said bars, a rock-shaft located below and substantially central with relation to said guide, a feeler connected with said rock-shaft, and means to move said feeler to and fro under said guide and under the drop devices in their normal positions, said feeler acting in both directions of its movement to meet a drop device in abnormal position and be arrested thereby, and means controlled by said feeler to stop the loom when a drop device arrives in its abnormal position.

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

HORACE WYMAN.

Witnesses:
N. WINFIELD WYMAN,
GEO. W. GREGORY.