(No Model.)

J. H. NORTHROP.

WARP STOP MOTION FOR LOOMS.

No. 583,416. Patented May 25, 1897.

Fig. 1.

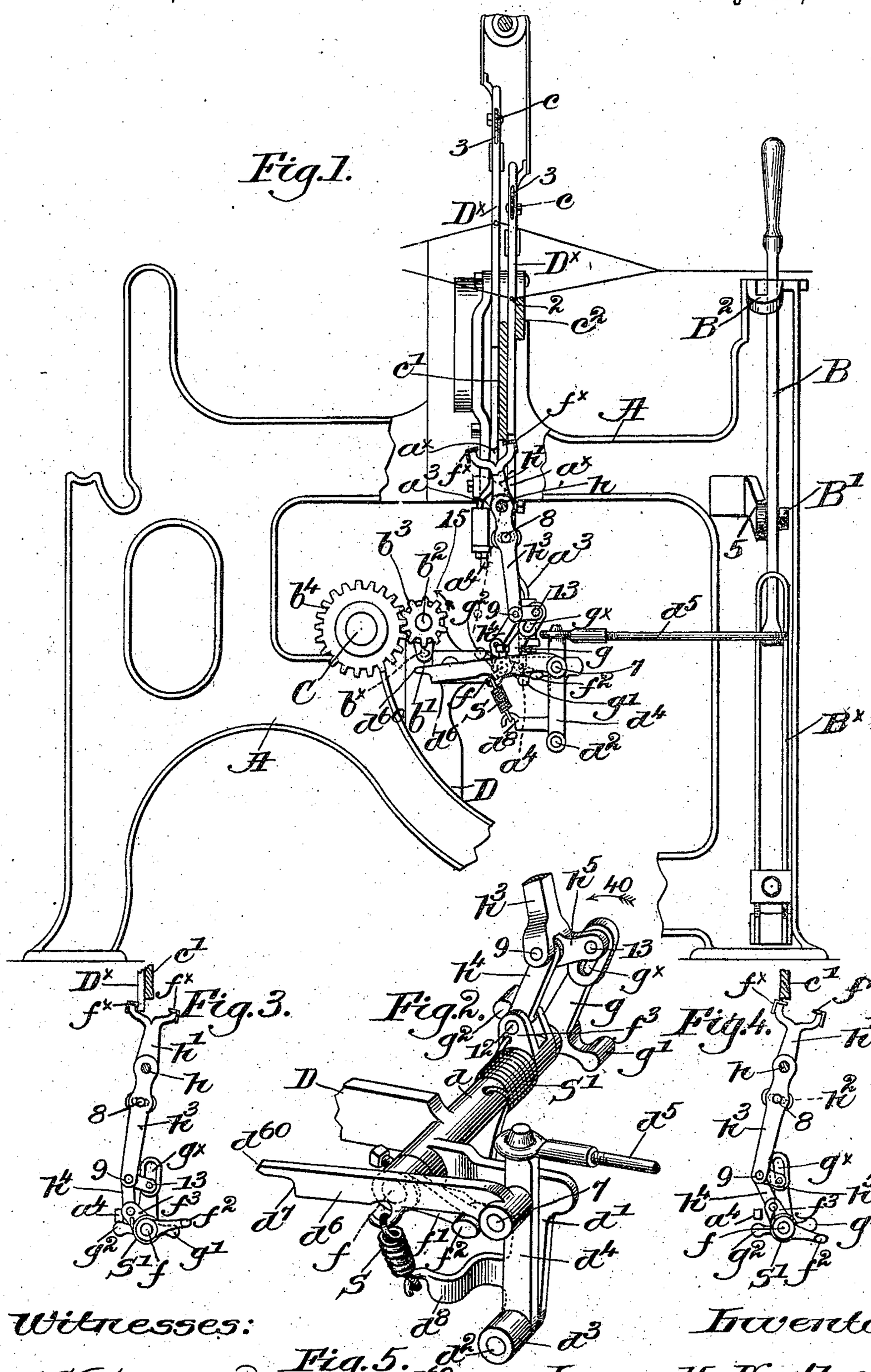
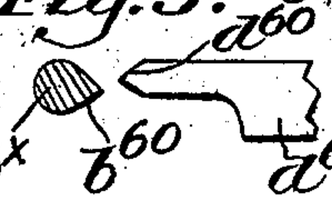


Fig. 3.

Fig. 2.

Fig. 4.

Fig. 5.



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UNITED STATES PATENT OFFICE.

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WARP STOP-MOTION FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 583,416, dated May 25, 1897.

Application filed January 11, 1897. Serial No. 618,751. (No model.)

To all whom it may concern:

Be it known that I, JAMES H. NORTHROP, of Hopedale, 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 the production of a warp stop-motion for looms wherein a series of vertically-reciprocated stop-motion-actuating detectors, preferably serving also as heddles, act, when in abnormal position due to failure or undue slackness of their warp-threads, directly upon stopping mechanism for the loom independent of the means for reciprocating the detectors and control the operation thereof, effected by vertical movement of said means. Inasmuch as the operation of the stopping mechanism is effected by the movement of the means for reciprocating the actuating-detectors, the set of the harness-cams is immaterial when said detectors also serve as heddles, as shown in the present embodiment of my invention, for the change in position of the harness itself effects the operation of the stopping mechanism when a detector-heddle is in abnormal position, and as a consequence the nice adjustment to secure the proper cooperation of detector mechanism and harness-operating mechanism is obviated. Such adjustment is necessary in other forms of warp stop-motions in order to render the same operative, and at times the adjustment is a long and delicate matter productive of delay and decreased output of the loom. I utilize the vertical movement of the means for reciprocating the detectors to vibrate a feeler, which feeler is directly engaged by a detector in abnormal position, such engagement controlling the operation of the stopping mechanism for the loom effected by movement of the detector-reciprocating means, the said stopping mechanism being independent of the latter, and by stopping mechanism for the loom I include, broadly, the devices intermediate the belt-shifter and the detector-reciprocating means.

Figure 1, in side elevation and partly in section, represents a sufficient portion of a loom to be understood with my invention applied thereto, the loom side being broken out and various details of the loom of usual construction omitted to avoid confusion. Fig. 2 is an enlarged perspective detail of a portion of the stopping mechanism of the loom, showing the connection between said portion and the feeler. Fig. 3, in side elevation, represents the position assumed by the feeler and its connected mechanism when the feeler is engaged by a detector in abnormal position. Fig. 4 is a detail showing the feeler at the opposite end of the throw from that shown in Fig. 1, and Fig. 5 is an enlarged detail of the bunter and the adjacent end of the dog cooperating therewith.

I have herein illustrated my invention as applied to a loom wherein the detectors are also utilized as heddles, the detectors $D^{\times}$ being represented as made of thin strips of sheet metal provided each with a warp-receiving eye 2 and an elongated slot 3, which is entered by a cross-bar *c* of less depth than the length of the slot, the cross-bar forming part of a vertically-reciprocating harness-frame or detector-support, substantially as shown in United States Patent No. 536,969, dated April 2, 1895, the harness cams and treadles being herein omitted for the sake of clearness. As in said patent, the elongated slots enable the detector-heddles to be moved longitudinally independently of the vertical movement of the supporting-frame, whereby breakage or undue slackness of a warp-thread will permit its detector-heddle to move into abnormal operative position to effect, through intervening mechanism, the stoppage of the loom.

The loom-frame A, of suitable shape, is provided with a shipper-lever B, pivoted at B′ on a stand 5, (see Fig. 1,) the pivot permitting slight lateral movement of the lever thereon, the usual spring $B^{\times}$ acting to throw the lever when released from the notched holding-plate B^2 in usual manner to shift the belt from the fast to the loose pulley (not shown) and thereby stop the loom. A thin upright plate or bar *c*′ is extended across the loom between the two series of detectors $D^{\times}$ at their lower ends to maintain them separate, and a second smaller bar c^2, Fig. 1, par-

allel to the separator c', is extended across the loom in front of the front series of detectors to prevent their displacement in the direction of travel of the warps and also to serve as a rest or support for the warp-threads in the lower plane of the shed.

The side bars $a^{\times}$ of the harness or supporting frames are downwardly extended and oppositely bent at their lower ends, as at a^3, and to each is secured a depending lug a^4 at or near one side of the loom for a purpose to be described, said lugs alternately rising and falling as the frames are reciprocated in changing the shed.

The loom-frame A has mounted thereon a stand D, having a laterally-extended sleeve-like bearing d, provided with a bent downturned leg d', (clearly shown in Fig. 2,) said leg having a stud d^2, on which is mounted the hub d^3 of an upturned rocker-arm d^4, connected by a link d^5 with the shipper-lever B to swing the latter laterally on its pivot B' when the arm d^4 is rocked, and thereby withdraw the shipper-lever from the notch in the holding-plate B^2. A lateral stud 7 on the rocker-arm provides a fulcrum for a dog d^6, preferably having at its rear end a shoulder d^7 to coöperate with a bunter $b^{\times}$, shown in dotted lines, Fig. 1, and in section in Fig. 5 as a pin on an arm b' of a rotatable shaft b^2, having fast thereon a gear b^3 in mesh with and rotated by a gear b^4, fast on one of the continuously-rotated shafts, as C, of the loom. If the dog is in the path of the bunter $b^{\times}$ as it is rotated in the direction of arrow 15, Fig. 1, the rocker-arm d^4 will be moved to act upon and withdraw the shipper-lever B from its holding-plate and thereby stop the loom.

As best shown in Figs. 2 and 5, the rear end of the dog d^6, projecting beyond the shoulder d^7, is oppositely beveled, as at d^{60}, and the bunter $b^{\times}$ is likewise beveled at b^{60} (see Fig. 5) for a part of its circumference, so that if the movement of the dog, to be described, should not be always quick enough to move its projecting end relatively to the path of the bunter the beveled portions of said bunter and dog will slide over each other without injury. Were the end of the dog made blunt and the bunter cylindrical, such engagement would disarrange the operation of the parts and might result in injury to the loom. A rock-shaft f, mounted in the bearing d, has fast thereon at its end adjacent the dog d^6 an arm f', provided with an ear f^2, extended beneath said dog, the latter being maintained in engagement with said arm by a spring S, attached at one end to the dog and at its other end to a projecting part d^8 of the leg d', the rocking of the shaft f thus controlling the position of the dog d^6 relatively to the path of the bunter $b^{\times}$. Two feelers $f^{\times}$, which may be angle-bars, are herein shown as secured to bifurcated arms h', only one of which is shown, fast on a rocking shaft h, mounted in suitable bearings and below the separator c', the feelers having their acting longitudinal edges facing each other, so that when the shaft h is oscillated or rocked the feelers will be vibrated in the direction of the length of the warp-threads toward and away from the vertical paths in which the two series of detectors $D^{\times}$ are reciprocated. Normally the feelers will be vibrated freely and beneath the detectors, as shown in Figs. 1 and 4, the extreme vibration in each direction being shown therein; but if a detector drops into abnormal position by reason of breakage or undue slackness of its warp-thread its lower end will be in the path of movement of and engage its cooperating feeler as the latter is moved toward it. One of the arms h' is preferably extended below the rock-shaft h and is transversely slotted at h^2 to receive a bolt 8, passed through a depending arm h^3, mounted at its upper end on the rock-shaft, the bolt and slot providing convenient means for adjusting the feelers when setting up the loom, so that their action on their respective detectors will be equal.

The lower end of the arm h^3 is pivotally connected at 9 to a short link h^4, which in turn is jointed at 12 to an arm f^3, fast on the rock-shaft f, projecting beyond the inner end of the bearing d, the arm h^3 and link h^4 forming the two members of a toggle.

A spring S' is attached at one end to the bearing d and at its other end to the arm f^3, the spring normally tending to return the arm and rock-shaft into the position shown in Figs. 1, 2, and 4.

Adjacent the pivot 9 the arm h^3 is offset or bent, as at h^5, substantially at a right angle and provided with a lateral pin or stud 13 to enter loosely the longitudinal slot $g^{\times}$ in a rocker-arm g, loosely mounted on the shaft f and provided with oppositely-extended projections or feet g' g^2 at the front and rear of the longitudinal axis of the rock-shaft, respectively, and adapted to be engaged alternately by the lugs a^4 on the harness-frames on the descent of the latter. Suppose the parts to be in the position shown in Figs. 1 and 2, the feelers $f^{\times}$ being at the rearmost end of their throw or vibration, and let it be supposed that the rear harness-frame is to descend. When the lug a^4 thereon engages the foot g^2, it depresses the latter and swings the arm g in the direction of the arrow 40, Fig. 2, first acting to straighten the toggle h^3 h^4, this act of straightening the toggle depressing the arm f^3 and rocking the shaft f to lift its arm f', the latter raising the dog into the path of the bunter $b^{\times}$. If no detector is in abnormal position, the continued swing of the arm g will carry the joint-line of the toggle past its center or out of line with the rock-shaft h and joint 12, and the springs S S' will immediately act to return the shaft f and arm f^3 and the dog to normal position with the latter out of the bunter-path, this movement of the short arm f^3 completing the swing or vibration of the feelers and the arm g, the feet g' and g^2 moving into the position shown

in Fig. 4, it being noticed that the lug a^4 at the completion of its stroke falls somewhat short of the foot g^2.

On the descent of the front harness-frames its lug a^4 will act on the foot g', referring now to Fig. 4, depressing said foot to throw the arm g to the right, swinging the feelers and tending to straighten the toggle, such tendency to straighten the toggle first acting to rock the shaft f and raise the dog d^6 to operative position, but as soon as the toggle is past center the springs will, as before described, complete the vibration of the feelers and return the dog to inoperative position, the feelers and the mechanism described resuming the position shown in Figs. 1 and 2. Accordingly at each normal vibration the dog d^6 is moved into and out of operative position, the initial and main portion of the vibration of the feelers being effected by the vertical movement of the harness-frames, while the vibration is completed by the spring action described. If, however, a detector is in abnormal position, (shown in Fig. 3,) it will engage the feeler after the partial rotation of the rock-shaft f has moved the dog d^6 into operative position, preventing further vibratory movement of the arm h^3, and the short arm f^3 cannot return to normal position, it acting, through its spring S', stronger than the spring S, to hold the rock-shaft, with the arm f', elevated to maintain the dog d^6 in operative position. The shoulder d^7 of said dog will accordingly be engaged by the bunter $b^\times$, and said dog will be moved longitudinally to effect, through the rocker-arm d^4 and link d^5, the release of the shipper-lever, stopping the loom. As the depending arm h^3 is held by the engagement of the feeler with the dropped detector, the arm g cannot complete its swing to give the final movement to the feeler, and the feet g' g^2 will be maintained in the position shown in Fig. 3, but the lug a^4, coöperating with the foot g^2, is then at the end of its downward stroke, (see Fig. 3,) and hence cannot act to force the foot down any farther.

It will be obvious from the foregoing that the stopping mechanism for the loom, while independent of the reciprocating detector support or frame, is controlled by the engagement of a detector in abnormal position with its feeler, the vibration of the latter being effected by vertical movement of the detector frame or support.

The part of the dog overhanging the shoulder d^7 prevents the accidental disengagement of the bunter before the release of the shipper-lever has been effected.

In looms heretofore devised using heddles which are also employed as stop-motion detectors to coöperate with a vibrator or feeler and stop the loom when a warp-thread breaks change of position of the heddle-frames, such as is frequently necessary to produce certain effects in weaving, makes it necessary to adjust or change the position of the vibrator or feeler, so that it may work with the dropped heddle, and frequently in such looms there arises the necessity of making adjustments in the heddle-frames, with which the vibrator or feeler cannot without great trouble be adjusted to work properly. To overcome this difficulty of adjusting the vibrator or feeler, I have made the detectors effective in controlling the operation of the stopping mechanism effected by reciprocation of the heddle-frames.

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

1. In a loom, a series of warp-stop-motion-actuating detectors, means to support and reciprocate said detectors vertically, said detectors having a limited vertical movement relative thereto, and stopping mechanism independent of said means, a detector in abnormal position, due to failure or undue slackness of its warp-thread, acting directly upon and controlling the operation of the stopping mechanism by movement of the said reciprocating means, substantially as described.

2. In a loom, shedding mechanism, including a series of vertically and independently movable stop-motion-actuating detector-heddles, and stopping mechanism for the loom independent of said shedding mechanism, a detector-heddle in abnormal position, due to failure or undue slackness of its warp-thread, acting directly upon and controlling the operation of the stopping mechanism by vertical movement of the shedding mechanism, substantially as described.

3. In a warp stop-motion for looms the following instrumentalities, viz: a series of warp-stop-motion-actuating detectors, means to support and reciprocate them vertically, and stopping mechanism for the loom, independent of said means, and including a feeler normally vibrated by reciprocation of said means, a detector in abnormal position engaging said feeler and through it controlling the operation of said stopping mechanism, substantially as described.

4. In a warp stop-motion for looms the following instrumentalities, viz: a series of warp-stop-motion-actuating detectors, means to support and reciprocate them vertically, and stopping mechanism for the loom, independent of said means, and including a feeler initially vibrated by reciprocation of said means, a spring to normally effect the final vibration of the feeler, a detector in abnormal position engaging and preventing the complete vibration of the feeler and thereby effecting the operation of the stopping mechanism, substantially as described.

5. In a warp stop-motion for looms, the following instrumentalities, viz: a series of heddle-frames provided with heddles adapted to act as warp-stop detectors, a lug on each frame, means to reciprocate the frames, stopping mechanism for the loom independent of said frames and including a feeler, and means

to vibrate it in the direction of the length of the warps, said means being actuated initially by engagement of the lugs on the heddle-frames, and a spring to normally complete the vibration of the feeler, a detector in abnormal position engaging the feeler and preventing the action of the spring, substantially as described.

6. In a warp stop-motion for looms the following instrumentalities, viz: a series of heddle-frames provided with heddles adapted to act as warp-stop detectors, means to reciprocate said frames, a shipper-lever, a normally inoperative releasing-dog therefor, a coöperating continuously-rotated bunter, a vibrating feeler to engage a detector in abnormal position, and connections between said feeler and dog, the vibration of the feeler being effected by vertical movement of the heddle-frames to move the dog into and out of operative position, engagement of a detector in abnormal position by its feeler acting to maintain the dog in its operative position, substantially as described.

7. In a warp stop-motion for looms the following instrumentalities, viz: a vibrating feeler, a rock-shaft having an arm fast thereon, a link connecting said arm and a depending portion of the feeler to form a toggle, a rocker-arm loosely mounted on the rock-shaft and connected to the joint of the toggle, and a spring to normally maintain the toggle broken, combined with a shipper-lever, a releasing-dog therefor controlled as to its position by said rock-shaft, a coöperating bunter, connections between the dog and shipper-lever, and means to swing the rocker-arm and thereby vibrate the feeler and normally move the dog into and out of position at each stroke, substantially as described.

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

JAMES H. NORTHROP.

Witnesses:
E. WALTER DAVENPORT,
GEO. OTIS DRAPER.