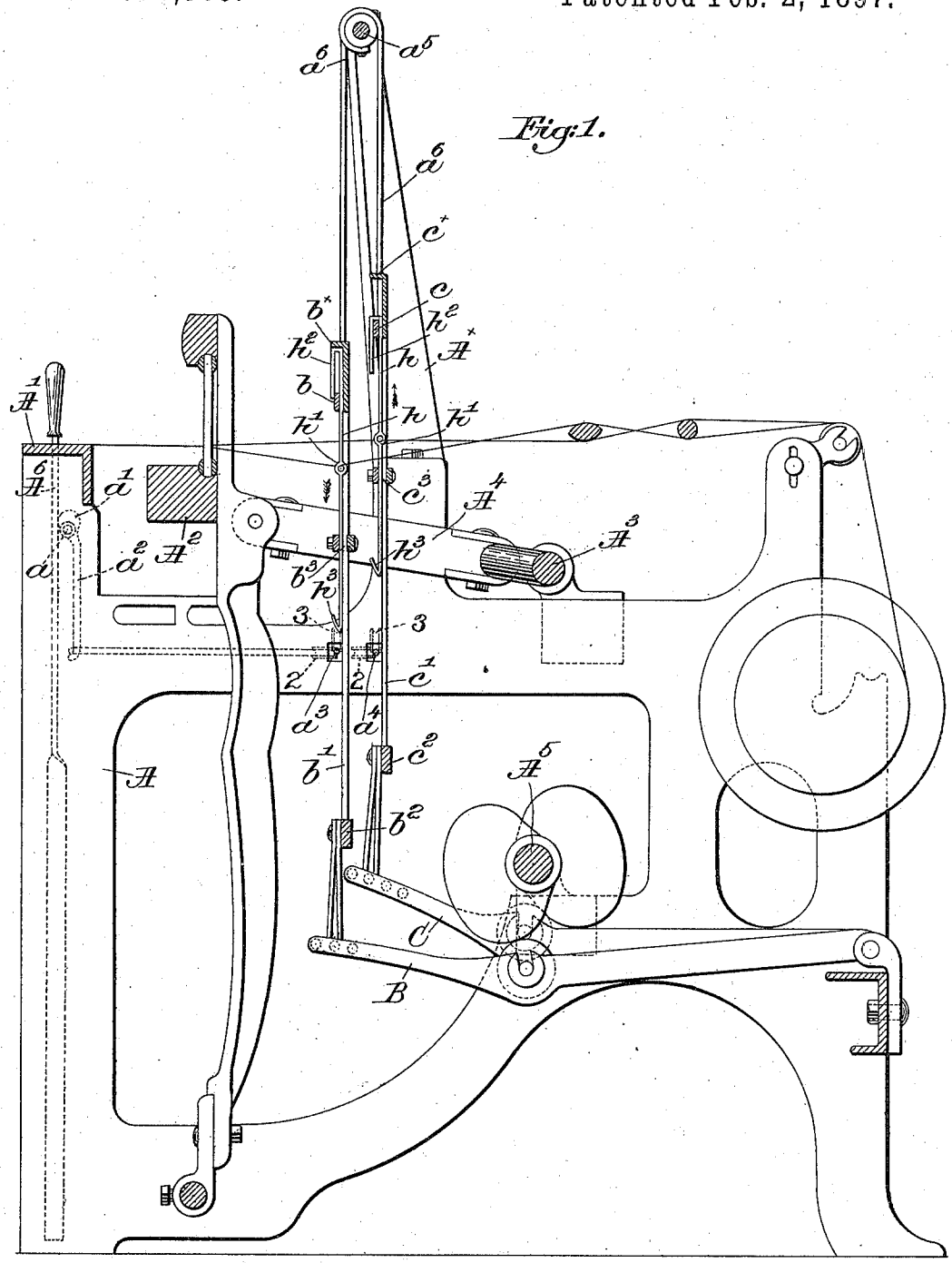
(No Model.) 2 Sheets—Sheet 1.

G. O. DRAPER.

WARP STOP MOTION FOR LOOMS.

No. 576,505. Patented Feb. 2, 1897.

Fig. 1.



Witnesses.
Fred S. Gunlock
Thomas J. Drummond.

Inventor.
George O. Draper
by Crosby & Gregory, Attys.

(No Model.)

2 Sheets—Sheet 2.

G. O. DRAPER.

WARP STOP MOTION FOR LOOMS.

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Fig. 2.

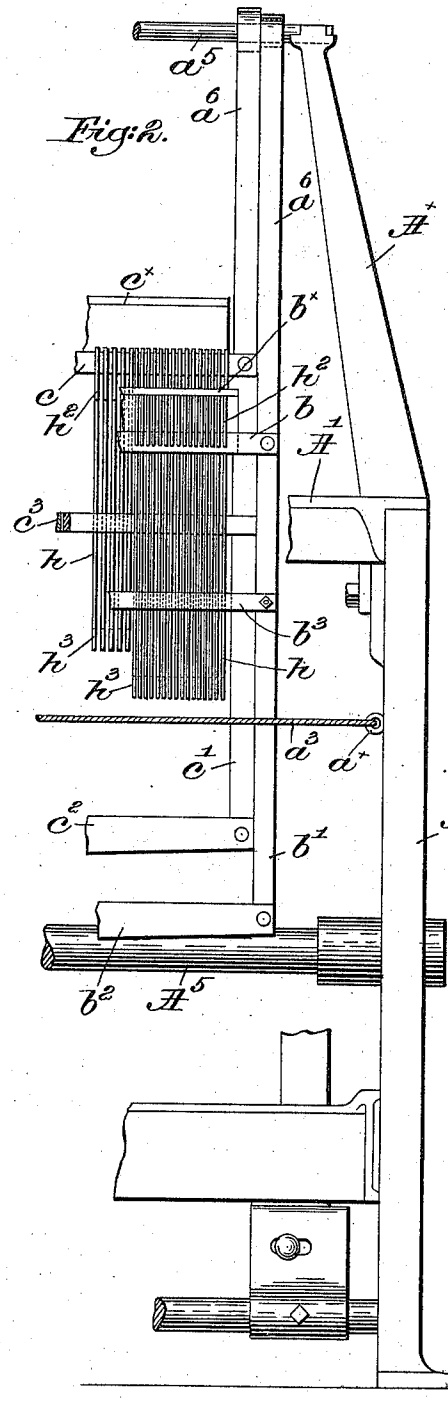

Fig. 3.

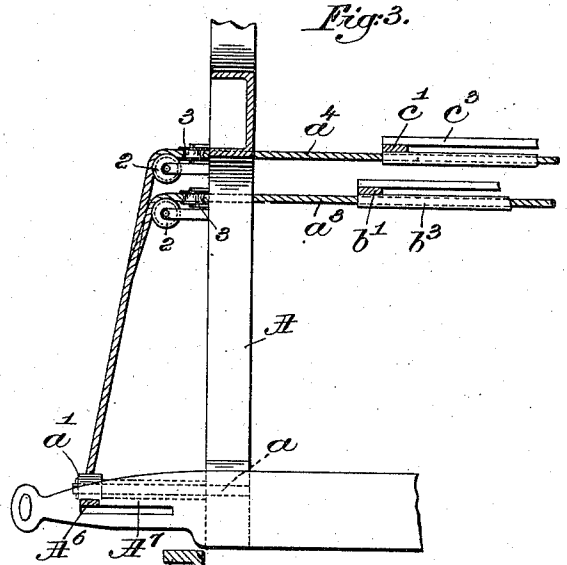

Fig. 4.

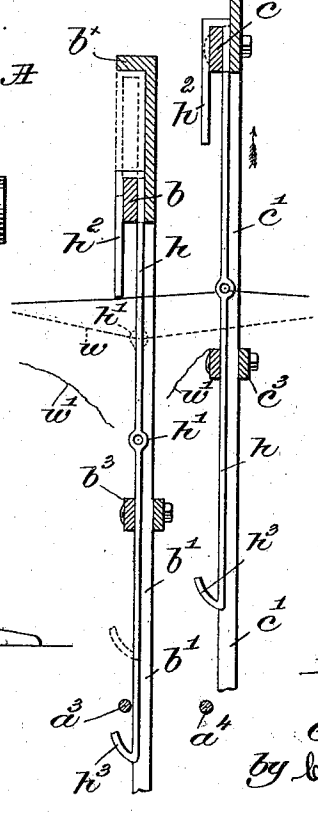

Fig. 5.

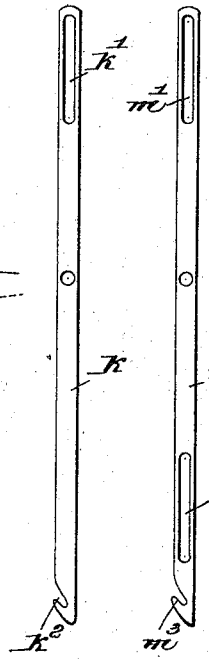

Fig. 6.

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UNITED STATES PATENT OFFICE.

GEORGE O. DRAPER, OF HOPEDALE, MASSACHUSETTS, ASSIGNOR TO THE NORTHROP LOOM COMPANY, OF SAME PLACE AND SACO, MAINE.

WARP STOP-MOTION FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 576,505, dated February 2, 1897.

Application filed July 20, 1896. Serial No. 599,815. (No model.)

To all whom it may concern:

Be it known that I, GEORGE O. DRAPER, of Hopedale, in the county of Worcester and 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 simple, efficient, and positively-operating warp stop-motion for looms; and it relates more particularly to that class of looms wherein the heddles are independent of each other and coöperate with the stopping mechanism of the loom, said heddles acting to detect a broken or unduly slack warp-thread.

In warp stop-motions of this class it has been heretofore customary to make use of a vibrator connected with and to operate the stopping mechanism upon the dropping of the heddle, the vibrator being oscillated adjacent the heddles to engage one when in abnormal position, caused by failure or slackening of the warp-thread.

In my present invention I have dispensed with the vibrator and its intermediate connections, and the subsequent movement of the dropped heddle or detector positively controls the stopping mechanism of the loom, whereby the construction is simplified, the operation made more rapid, and the loom more efficient.

Various features of my invention will be hereinafter described in the specification and particularly pointed out in the claims.

Figure 1 is a transverse sectional view of a sufficient portion of a loom to be understood with one form of my invention embodied therein. Fig. 2 is a partial front elevation of the right hand of the loom shown in Fig. 1. Fig. 3 is a partial plan view of the shipper-plate and the connections between the shipper-lever and the heddles. Fig. 4 is an enlarged detail view with the heddle-frames in the same relative position shown in Fig. 1, but with one of the heddles in its abnormal position, caused by breakage of its warp-thread; and Figs. 5 and 6 are side elevations of modified forms of heddles to be described.

The loom-frame A, breast-beam A′, lay A^2, crank-shaft A^3, and connecting-link A^4, the cam-shaft A^5, and the levers B and C for reciprocating the heddle-frames in opposite directions are and may be of usual construction.

As shown in Fig. 3, the belt-shipper handle A^6 and the notched plate A^7 to hold it in place when the loom is moving properly are of usual construction, and below the plate A^7, Figs. 1 and 3, I have mounted a rock-shaft a, having fast thereon a cam-lug a' and a depending arm a^2, the cam-lug when in normal position permitting the shipper-handle A^6 to rest in its notch, as shown in said figures.

Two cords, wires, or other suitable flexible members a^3 a^4 are attached at one end to the arm a^2, and are led thence around guide-sheaves 2 3 on the loom side and across the loom, the other ends of the said flexible members a^3 a^4 being permanently attached to the opposite loom side or some stationary part thereof, as at $a^\times$, Fig. 2. Said flexible connections are located below and substantially in the planes of the paths of movement of the heddle-frames, as clearly shown in Figs. 1 and 4.

The loom is provided with uprights $A^\times$, in which is mounted a shaft a^5, provided with suitable pulleys, over which pass the straps a^6, connected to the upper bars of the heddle-frames, two such frames being herein shown, and as I do not employ vibrators I am enabled to place the frames quite close to each other and can in consequence use a large number of such frames in the naturally-limited space therefor usually found in looms.

The heddle-frames are composed of top bars b c, rigidly attached, respectively, by side bars b' c' to bottom bars b^2 c^2, which latter are connected to the actuating-levers B and C, Fig. 1.

The heddles h are preferably made of round wire enlarged at the eye portion h' and having hooks h^2 h^3 at the ends, the hook h^2 at the upper end being shaped to embrace the top bar of the heddle-frame, the hook being left open, so that single heddles may be removed from or placed in the frame without disturbing the latter.

I prefer to pass the heddles loosely through a transverse guide, as b^3 or c^3, secured to the frames below the warp-eyes of the heddles to prevent undue motion in the direction of the

warps, the heddles being freely movable vertically in and relatively to the heddle-frame.

Depressing-bars $b^{\times}$ $c^{\times}$ at the tops of the heddle-frames extend over the tops of the heddle-hooks h^2 and act, as shown in Fig. 1, to push the heddles down when the frame is descending, the depressor $b^{\times}$ being shown therein as so acting.

The lower ends of the heddles are bent up at an angle of about forty-five degrees to form the hooks h^3, open at their upper sides and which coöperate with the stopping mechanism when a heddle drops to stop the loom, as will be described.

The heddles may descend by their own weight, but the depressor insures their positive descent to the proper point each time.

While the heddles are shown in the main portion of the drawings as made of round wire, they can be made of flat stock, if desired, as in Figs. 5 and 6, the heddle k having a longitudinal slot k' in its upper end instead of a hook, and preferably it will be cut out at the lower end to form an upturned hook k^2.

In Fig. 6 two slots m' and m^2 are shown in the heddle m, which also has a hook m^3 at its lower end, and with this heddle two supporting-bars may be employed, one for each slot, while in Fig. 5 a single bar passed through the slot k' is employed, but in either case the depressor to act on the upper ends of the heddles can be omitted.

When a heddle-frame is lifted, as, for instance, the rearmost frame, Figs. 1, 2, and 4, its bar c acts to lift the heddles h by their hooks h^3, and when the frame is on its downward path the heddles will either descend by their own weight or by virtue of the depressor, as $b^{\times}$, acting on the tops of the hooks.

In the lower shed the heddles will rest on their warp-threads until in the upward movement of their frames the lost motion between the supporting-bar and the heddle-supporting hooks is taken up. When, however, a warp-thread, as w, Fig. 4, in the lower shed breaks or unduly slackens, its particular heddle will drop from at or near its dotted-line position, Fig. 4, to full-line position substantially the distance between the supporting and depressor bars. The hook h^3 of a dropped heddle passes by and below the adjacent cord or other flexible member, as a^3, Fig. 4, the curvature of the hook pressing the heddle back sufficiently to pass it. Now when the frame next ascends the lower hook of the dropped heddle engages the flexible connection a^3 and pulls it up out of normal position, the strain upon said connection turning the cam-lug a' to force the shipper-handle A^6 out of its notch, such release of the handle shipping the belt in usual manner to stop the loom. After the attendant has pieced up the ends of the broken warp, as w', Fig. 4, the hook is readily disengaged from the connection a^3, and the loom is then ready to be started up again.

The open guides b^3 or c^3 of the heddle-frames permit the slight backward motion of the dropped heddles necessary to permit their lower hooks to pass by the flexible connection with the shipper-handle on the descent of the dropped heddle and also serve to steady the heddles when in use.

So far as I am aware it is broadly new to control the operation of the stopping mechanism of the loom directly and positively by the subsequent movement of a dropped heddle or detector, and accordingly my invention is not restricted to the precise construction and arrangement of parts herein shown, as the same may be modified in various particulars without departing from the spirit and scope of my invention.

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

1. In a warp stop-motion for looms, a vertically-reciprocating heddle-frame, and a series of heddles supported thereby and adapted to move vertically for a limited distance independently of the frame, combined with stopping mechanism for the loom, and controlling means therefor to engage a heddle in abnormal position due to breakage or undue slackening of its warp-thread, and to be positively operated by subsequent movement of the heddle, substantially as described.

2. In a warp stop-motion for looms, a heddle-frame, a series of heddles supported thereby, and means to reciprocate said frame, combined with stopping mechanism for the loom, and controlling means therefor to engage a heddle in abnormal position, and be actuated by subsequent movement of the heddle, to thereby operate the stopping mechanism at the next change of shed, substantially as described.

3. In a warp stop-motion for looms, the lay, a series of stop-motion-actuating detectors mounted independently thereof, means to reciprocate them vertically at each change of shed, stopping mechanism for the loom, and a controlling device for said mechanism, to engage a detector when its warp-thread breaks or unduly slackens, and to be positively operated by subsequent movement of the detector at the next change of shed, substantially as described.

4. In a warp stop-motion for looms, a series of independently-supported heddles, means to positively reciprocate them, at each change of shed, a shipper, and a controlling device therefor, to engage a heddle after breakage or undue slackening of its warp-thread, and to be positively actuated by subsequent movement of the heddle, substantially as described.

5. In a warp stop-motion for looms, a series of heddles each having a hook, and a frame for and in which said heddles are vertically movable for a limited distance, combined with a shipper, and controlling means therefor to be engaged by the hook of a heddle in abnormal position and to be positively moved by said heddle at the next change of shed, substantially as described.

6. In a warp stop-motion for looms, a heddle-frame provided with a cross-bar and a series of metallic heddles each having a warp-eye and a hook, means to vertically reciprocate said frame, and a guide for and to loosely receive the lower ends of the heddles, combined with a shipper, and controlling means therefor, including a flexible member extended in the path of and to be engaged by the hook of a heddle in abnormal position due to breakage or undue slackening of its warp-thread, subsequent movement of the heddle by its frame actuating the controlling means to release the shipper, substantially as described.

7. In a warp stop-motion for looms, a heddle-frame, a series of heddles supported thereby and having a vertical movement relative thereto, each heddle having a hook, means to reciprocate the heddle-frame, and means to depress the heddles positively, combined with a shipper, a releasing device therefor, including a flexible member to be engaged by the hook of a dropped heddle and positively moved thereby to release the shipper at the next change of shed, substantially as described.

8. In a warp stop-motion for looms, a series of heddles each having a hook, a frame for and in which the heddles are relatively movable for a limited distance, and means to reciprocate the frame, combined with a shipper, and a controlling device therefor including a flexible member, one end of which is fixed, to be engaged by the hook of a heddle in abnormal position and flexed by movement of the latter with its frame, to thereby release the shipper, substantially as described.

9. In a loom, a series of drop-pieces through which warp-threads are drawn, and means to positively reciprocate them at each change of shed, combined with stopping mechanism for the loom, and a normally stationary controller therefor to be engaged by said drop-pieces when their warp-threads are broken or unduly slack, and actuated by movement of said detectors at the next change of shed, substantially as described.

10. In a loom, the combination of a series of independent heddles serving as warp stop-detectors, with a stop-motion for the loom, controlling means therefor directly engaged by and operated through said heddles by the motion of the harness, substantially as described.

11. In a loom, a series of warp-stop-motion-actuating detectors, means to reciprocate them vertically, and stopping mechanism for the loom adapted to be engaged by a detector in abnormal position due to breakage or undue slackness of its warp-thread, and to be positively operated by subsequent movement of said detector, substantially as described.

12. In a loom, shedding mechanism, including a series of stop-motion-actuating detectors serving also as heddles and moved into abnormal actuating position by failure or undue slackening of the warp-threads, and stopping mechanism for the loom independent of the shedding mechanism and adapted to be engaged by a detector in abnormal position, to be positively operated by subsequent change of position of said detector due to movement of the shedding mechanism, substantially as described.

13. In a loom, a series of heddle-frames provided with heddles serving as warp-stop-motion-actuating detectors, and stopping mechanism for the loom independent of said frames operated directly and positively by subsequent movement of a dropped detector, substantially as described.

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

GEORGE O. DRAPER.

Witnesses:
FRED W. ABELE,
E. D. BANCROFT.