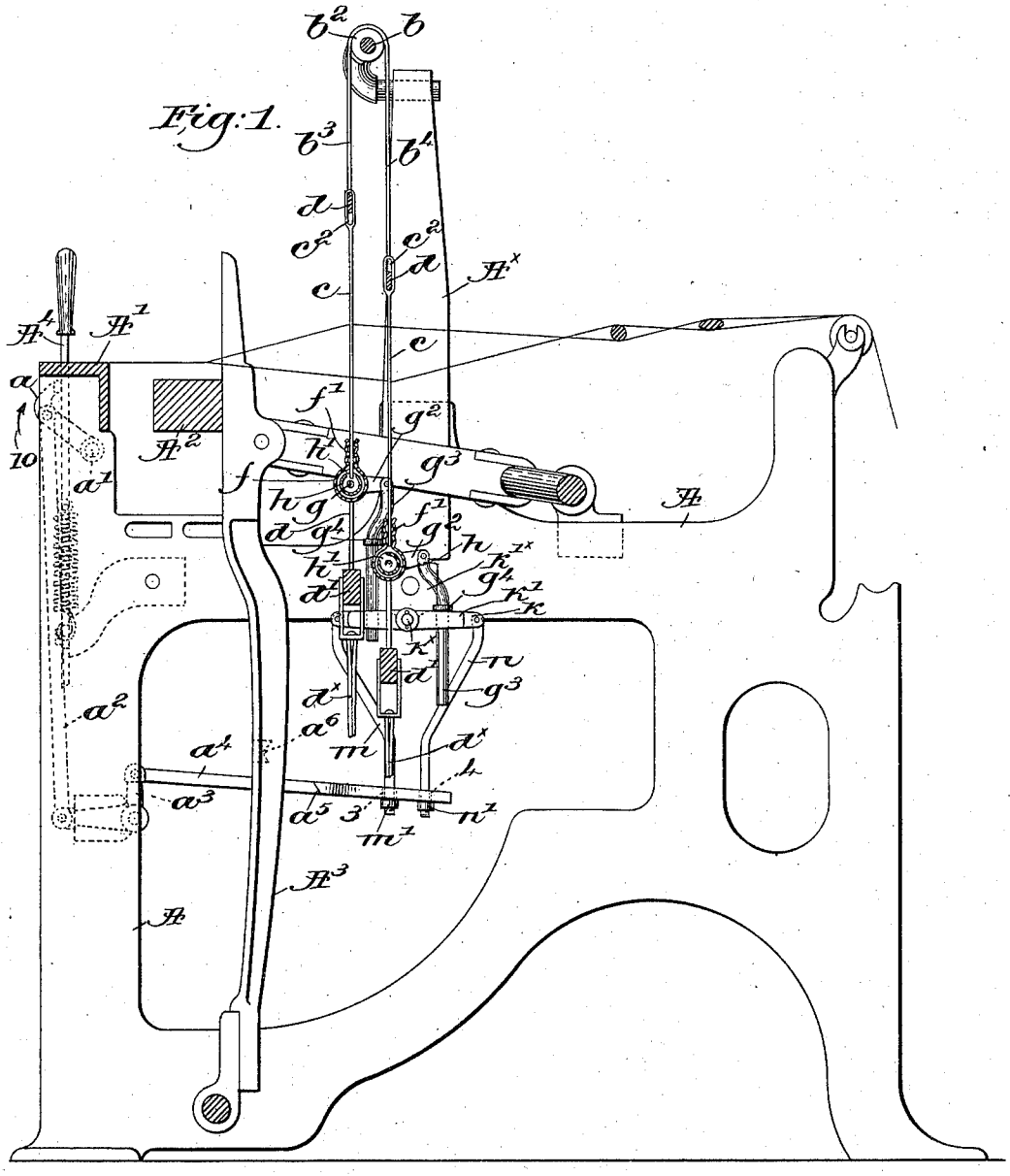
(No Model.) 2 Sheets—Sheet 1.

C. F. ROPER.

WARP STOP MOTION FOR LOOMS.

No. 576,509. Patented Feb. 2, 1897.

Fig. 1.



Witnesses.
Edward F. Allen.
Thomas J. Drummond.

Inventor:
Charles E. Roper.
by Crosby & Gregory
attys.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

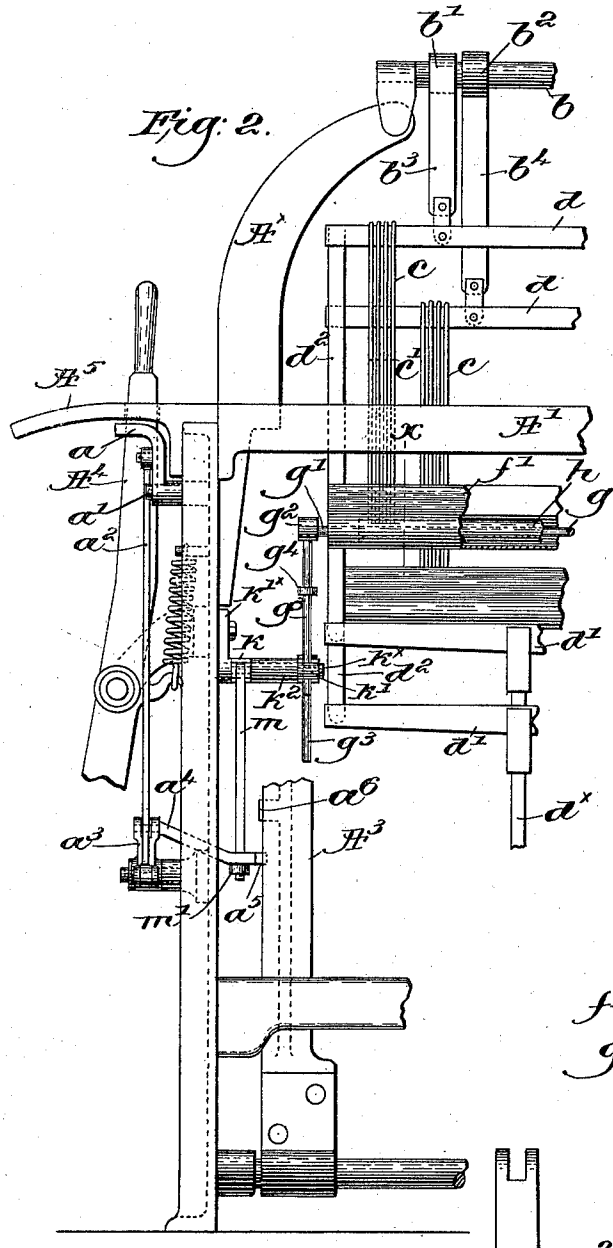


Fig. 3.

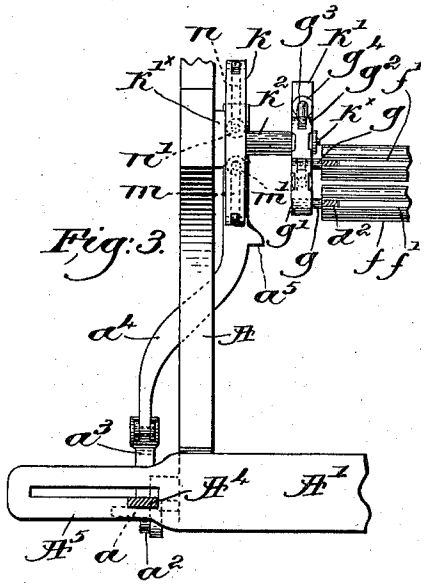


Fig. 4.

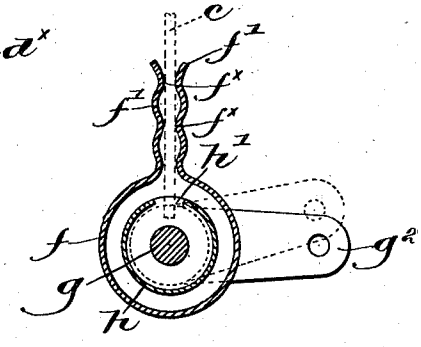
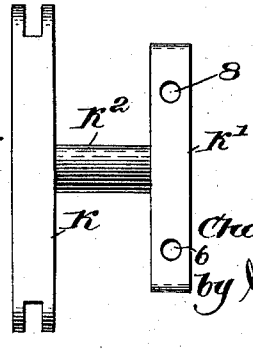


Fig. 5.



Witnesses.
Edward F. Allen.
Thomas J. Drummond.

Inventor:
Charles E. Roper.
by Crosby & Gregory.
Attys.

UNITED STATES PATENT OFFICE.

CHARLES F. ROPER, 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. 576,509, dated February 2, 1897.

Application filed August 24, 1896. Serial No. 603,690. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. ROPER, 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 relates to that class of looms wherein the heddles used to control the warp in the formation of the shed for the reception of the filling are utilized as warp-detectors to effect automatically the stopping of the loom when a warp-thread breaks or becomes unduly slack.

The heddles herein illustrated are made of metal, each provided with a warp-receiving eye and having an elongated loop or eye, which is entered by a cross-bar on the heddle-frame, said bar being of less depth than the length of the loop or eye, whereby when a warp in the lower plane of the shed breaks or unduly slackens the heddle sustained thereby is free to drop relatively to the cross-bar, the lower end of the dropped heddle being thus moved into position to engage a feeler having a normally vibratable or rocking movement in the direction of the length of the warp. In order to insure greater accuracy of operation and also to simplify the construction, I have herein mounted the feeler upon the heddle-frame to move therewith and thus always preserve the same position relative to the series of heddles. The feeler, of peculiar construction, is mounted to rock on its journals below the heddles and to be engaged and prevented from further rocking by the lower end of a dropped heddle, and I have utilized the traverse of the heddle-frame to normally rock the feeler and, through suitable connections, to automatically actuate the shipper-handle-releasing devices when the feeler engages a dropped heddle. In order to prevent twisting or bending of the heddles when engaged by the feeler, I preferably mount an open guide on the heddle-frame just above the feeler, and into which guide the lower ends of the heddles enter, and when a heddle drops its lower end is engaged by the feeler close to the bottom of the guide, thus obviating a long leverage on the engaged heddle.

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

Figure 1 is a longitudinal sectional view of a sufficient portion of a loom to be understood with my invention applied thereto. Fig. 2 is a front elevation of the left-hand side of the loom with the guide on one of the heddle-frames partially broken out. Fig. 3 is a plan view, partly in section, of the shipper-handle-releasing devices and the controller therefor. Fig. 4 is an enlarged sectional detail on the line x x, Fig. 2, of the feeler and adjacent heddle-guide; and Fig. 5 is an enlarged detail of part of the mechanism intermediate the vibrator and shipper-lever, to be described.

The loom-frame A, breast-beam A′, lay A^2, lay-sword A^3, and the shipper-lever A^4 are and may be of any usual or well-known construction, the shipper-lever actuating a belt-shipper, as usual, to transfer the belt from a fast to a loose pulley (not shown) to stop the loom.

The shipper-lever A^4 is normally held in the usual notched plate A^5, and I have provided simple and effective releasing mechanism therefor, comprising a knock-off lever a, pivoted at a' on the loom side and adapted to act upon the shipper-handle, said knock-off lever being connected by a link a^2 to one arm of an elbow-lever a^3. The other arm of the latter pivotally supports a dog a^4, having a shoulder or projection a^5, adapted to be brought at times into the path of a bunter a^6, shown as mounted on the lay-sword A^3, engagement of the dog by the bunter moving the former longitudinally to swing the knock-off a in the direction of arrow 10, Fig. 1, to push the shipper-lever out of the notch in the plate A^5.

I have erected uprights $A^\times$ on the loom sides to support a rotatable shaft b, provided with sheaves or pulleys b' and b^2 to which flexible bands or straps b^3 b^4, are secured and oppositely wound, the depending ends of said bands being attached to the top bars d d of the heddle-frames.

The heddle-frames each consist, essentially,

of a top bar d, bottom bar d', and rigid side bars d^2, firmly secured thereto, the bottom bars being attached by straps or links $d^\times$ to the usual harness-operating levers, (not shown,) and by the overhead connection described the heddle-frames are reciprocated vertically in opposite directions.

A series of heddles c, having each a warp-receiving eye c' and a slot or longitudinal opening c^2 at or near its upper end, is strung upon a cross-bar of each heddle-frame, the top bar thereof being herein utilized, and the slots c^2 are made somewhat longer than the depth of the bar to permit a limited vertical movement of the heddles relatively thereto. The lower ends of the heddles enter loosely a guide, comprising the upturned edges f' of a metal cylinder f, secured to the side bars d^2 of the frame, said upturned portions f' being preferably longitudinally corrugated, as at $f^\times$, (best shown in Fig. 4,) to provide a series of separate points to engage a heddle, and thus reducing friction.

Within the cylinder f I have mounted a rock-shaft g, extended beyond it at one end at g' and having fast thereon a laterally-extended arm g^2, and inside of the cylinder f I have secured to the rock-shaft a vibrator or feeler, shown as a hollow cylinder h, longitudinally slotted along its top at h' to receive the end of a dropped heddle, as shown in Fig. 4, and in the front heddle-frame, Fig. 1. The vibrator and guide thus have a fixed relation to each other and to the heddles, and the cylinder f forms a convenient protective housing or cover for the vibrator.

A rocking head, consisting of parallel laterally-extended arms $k\,k'$ on a hub k^2, is mounted to rock on a stud $k^\times$, extended inwardly from a plate $k'^\times$, secured to the loom side, (see Fig. 2,) the arm k having pivotally attached thereto depending links m n, extended loosely through holes 3 4 in the dog a^4, and having fast thereon adjustable collars m' n', respectively, upon which the dog normally rests and is held in the position shown in Fig. 1.

It will be obvious that if the head is rocked in either direction one of the links will be raised and the other lowered, the raised link acting to lift the dog a^4 and bring its shoulder a^5 into the path of the bunter a^6, to thereby operate the shipper-lever-releasing means and effect the stopping of the loom, said rocking head and its links thus constituting a controlling device for the releasing means.

The arms g^2 of the two vibrators are shown in Fig. 1 as extended rearwardly, and a rod g^3 is pivotally connected at its upper end to each arm and extended to slide freely, yet with little lateral movement, through one of the holes 6 8 in the arm k' of the controller, each rod having a shoulder or annular enlargement g^4 thereon above said arm. The distance between the shoulder g^4 and the arm g^2 is such that the shoulder rests on the arm k' in the descent of the frame before the completion of such movement, so that as the descent continues the arm g^2 will be swung to rock the shaft g and the vibrator h, so that the slot h' therein will be carried beyond the bottom of the heddle-guide, as shown by the rear heddle-frame, Fig. 1, the weight of the dog and the friction of the parts keeping the controller stationary, and when the frame rises the weight of the rod g^3 is sufficient to rock the vibrator in the opposite direction, the rocking of the vibrator continuing until the arm g^2 and its attached rod g^3 form an obtuse angle with each other, alinement of the two being prevented by the fit of the rod g^3 in its hole in the arm k' of the controller. It will be obvious that, if desired, a stop-pin or projection could be readily arranged on the cylinder f to project under the arm g^2 and limit its downward movement, such device being a common mechanical expedient. If, however, a warp-thread breaks or unduly slackens, its heddle will drop, as shown in the front heddle-frame, Fig. 1, its lower end passing from the guide into the slot h' of the vibrator, such position of the heddle being shown by dotted lines, Fig. 4. When the frame descends until the shoulder g^4, connected to the said vibrator, encounters the arm k', the vibrator h will be partially rocked until one edge of the slot therein engages the heddle and will be stopped thereby, the adjacent guide assisting the heddle in taking up the strain upon the lower end of the latter. As the vibrator cannot rock, the arm g^2 must continue its descent without turning and the rod g^3 must move with it, so that the arm k' yields and turns the rocking head or controller on its pivot, to thereby move the dog a^4 into operative position, as described, to be acted upon by the bunter.

The strain exerted upon the heddle by the movement of the controller is slight, inasmuch as the latter has nothing to do but raise the free end of the dog a^4 a limited distance.

When the bunter acts to move the dog longitudinally, the links m and n can swing relatively to the rocking head to accommodate themselves to such movement of the dog.

As soon as the heddle is raised and the warp-thread pieced up the loom is ready to be started, the operation moving the shipper-lever back into the holding-notch.

I make the reciprocation of the heddle-frame operative to normally rock the vibrator and to operate the controller for the shipper-lever-releasing means when a heddle drops, thereby effecting a reduction in the number of parts and consequent increase in simplicity and a positive operation of the mechanism.

So far as I am aware it is broadly new to mount a rocking vibrator on and to move with the heddle-frame, to engage a dropped heddle, and accordingly my invention is not restricted to the precise construction and arrangement herein shown.

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

1. In a loom the following instrumentalities, viz: a heddle-frame having a cross-bar, and a series of metallic heddles adapted to move independently of said bar, having each a warp-eye, combined with a vibrator movable in the direction of the length of the warp, and mounted on the heddle-frame and adapted to engage a dropped heddle, a shipper-lever, means to release it, a controller for said means, and connections between the vibrator and controller, to operate the latter, substantially as described.

2. In a loom the following instrumentalities, viz: a heddle-frame having a cross-bar, and a series of metallic heddles adapted to move independently of said bar, having each a warp-eye, combined with a rocking vibrator mounted on the heddle-frame and adapted to engage a dropped heddle, a shipper-lever, means including a pivoted dog, and a cooperating bunter, to release the shipper-lever, a controller to move the dog into operative position, and connections between the vibrator and controller, to operate the latter upon failure or undue slackening of a warp-thread, substantially as described.

3. In a loom the following instrumentalities, viz: a heddle-frame having a cross-bar, and a series of metallic heddles adapted to move independently of said bar, having each a warp-eye, combined with a rocking vibrator mounted on the heddle-frame and adapted to engage a dropped heddle, an arm on said vibrator, a shouldered rod depending therefrom, a shipper-lever, releasing means therefor, and a controller for said means, having a sliding connection with said rod, whereby the vibrator is normally rocked, engagement of a dropped heddle by the vibrator acting through said rod to operate the controller, substantially as described.

4. In a loom the following instrumentalities, viz: a heddle-frame having a cross-bar, and a series of metallic heddles adapted to move independently of said bar, having each a warp-eye, combined with a rocking vibrator mounted on the heddle-frame and adapted to engage a dropped heddle, a shipper-lever, releasing means therefor, including a pivotally-mounted, longitudinally-movable dog, a coöperating bunter, a rocking controller for the dog, to move it into operative position, and means, connected to the vibrator to rock the controller when a dropped heddle is engaged by the vibrator, substantially as described.

5. In a loom, a reciprocating heddle-frame having a cross-bar, and a series of metallic heddles each having a warp-eye and adapted to move independently of the cross-bar, a vibrator adapted to be rocked, connections between said vibrator and the heddle-frame, to normally rock the former as the heddle-frame reciprocates, stopping mechanism for the loom, a controller therefor, and a connection between the vibrator and controller, whereby one or the other will be operated by reciprocation of the heddle-frame, substantially as described.

6. In a loom, a reciprocating heddle-frame having a cross-bar, and a series of metallic heddles each having a warp-eye and adapted to move vertically for a limited distance independently of the cross-bar, a vibrator mounted on the heddle-frame below the heddles, a guide for the lower ends of said heddles, stopping mechanism for the loom, including a dog, and a coöperating bunter, a rocking controller to move the dog into operative position, and a sliding connection between the vibrator and controller, whereby when the vibrator engages a dropped heddle the controller is rocked, substantially as described.

7. In a loom the following instrumentalities, viz: a heddle-frame having a cross-bar; a series of metallic heddles supported upon said bar and adapted to be moved longitudinally independently thereof, combined with a rocking vibrator mounted on the heddle-frame and adapted to engage the end of a dropped heddle, and means to normally rock the vibrator when the heddle-frame reciprocates, substantially as described.

8. In a loom the following instrumentalities, viz: a heddle-frame having a cross-bar; a series of metallic heddles supported upon said bar and adapted to be moved longitudinally independently thereof, combined with a longitudinally-slotted vibrator, mounted below the heddles, a dropped heddle entering the slotted vibrator to prevent rocking thereof, and means to normally rock the vibrator when the heddle-frame reciprocates, substantially as described.

9. In a loom the following instrumentalities, viz: a heddle-frame having a cross-bar; a series of metallic heddles supported upon said bar and adapted to be moved longitudinally independently thereof, combined with an open guide on the heddle-frame, into which the lower ends of the heddles enter, a rocking vibrator mounted on the heddle-frame below the guide, to engage and be held from oscillation by a dropped heddle, and means to normally rock the vibrator when the heddle-frame oscillates, substantially as described.

10. In a loom the following instrumentalities, viz: a heddle-frame having a cross-bar; a series of metallic heddles supported upon said bar and adapted to be moved longitudinally independently thereof, combined with a rock-shaft mounted on the heddle-frame, a longitudinally-slotted cylindrical vibrator fast on said shaft, below the heddles, to receive in the slot a dropped heddle, and means to normally rock the vibrator as the heddle-frame descends, substantially as described.

11. In a loom the following instrumentalities, viz: a heddle-frame having a cross-bar; a series of metallic heddles supported upon

said bar and adapted to be moved longitudinally independently thereof, combined with a rock-shaft mounted on the heddle-frame, a longitudinally-slotted cylindrical vibrator fast on said shaft, below the heddles to receive in the slot a dropped heddle, an open guide on the heddle-frame for the lower ends of the heddles, and located above the vibrator, and means to normally rock the vibrator when the heddle-frame descends, substantially as described.

12. In a loom, shedding mechanism, a stop-motion for the loom, a series of stop-motion-actuating detectors moved into actuating, operative position by failure or undue slackening of the warp-threads, a longitudinally-slotted vibrator mounted below and to receive a dropped detector, and means to normally rock the vibrator when the shed is changed, substantially as described.

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

CHARLES F. ROPER.

Witnesses:
GEORGE OTIS DRAPER,
C. N. NICHOLS.