(No Model.) 2 Sheets—Sheet 1.

O. PIPER.

WARP STOP MOTION FOR LOOMS.

No. 594,213. Patented Nov. 23, 1897.

Fig. 2.

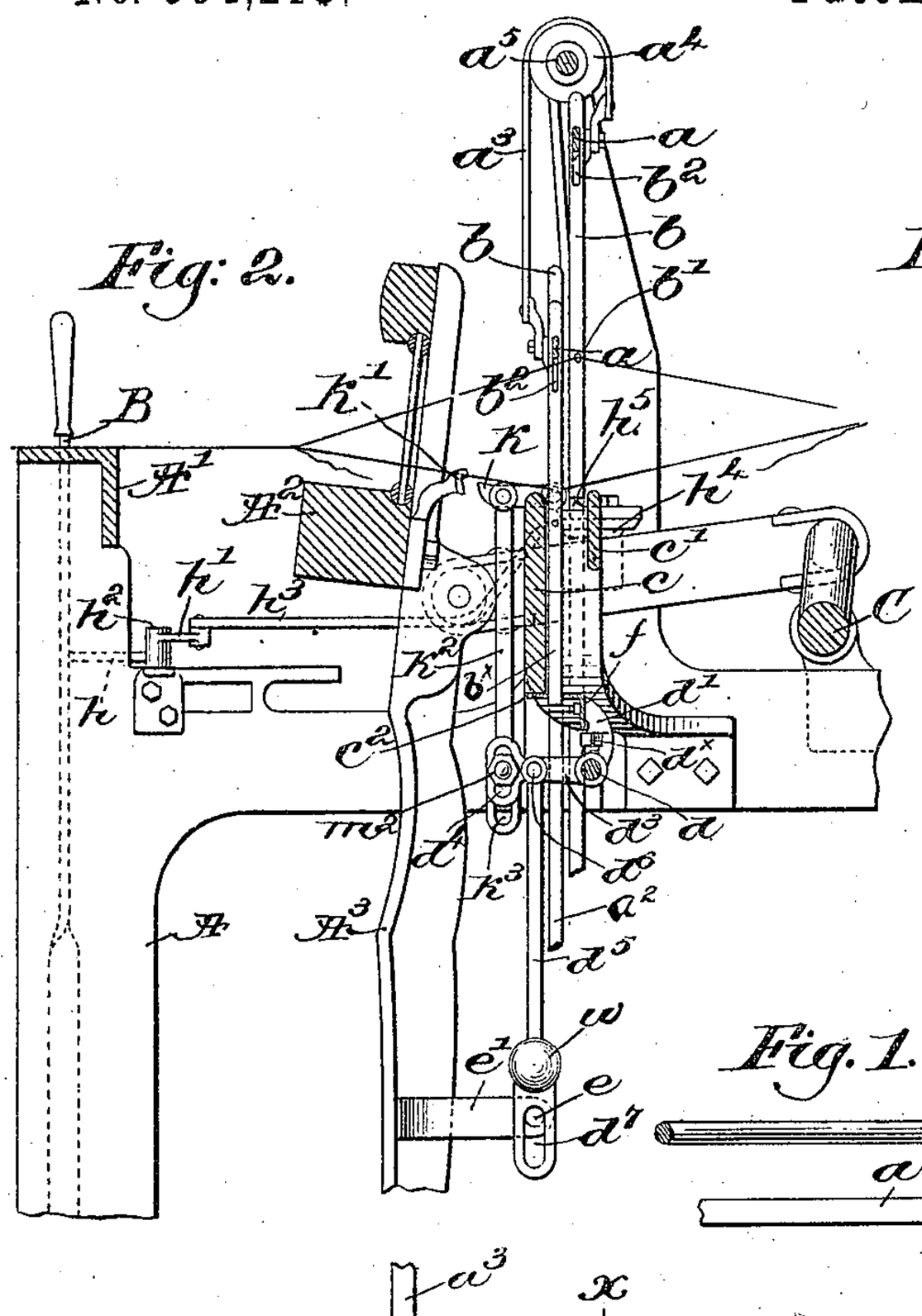

Fig. 3.

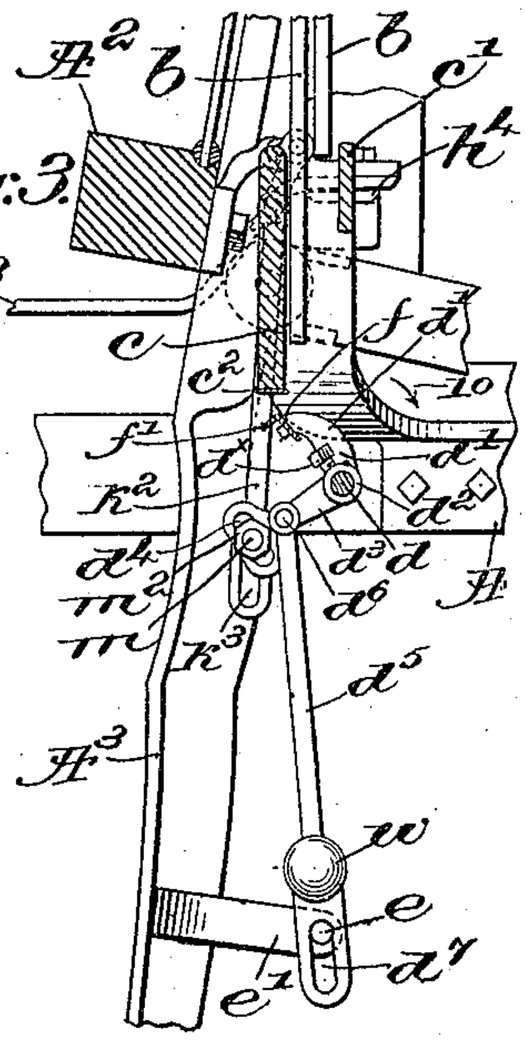

Fig. 1.

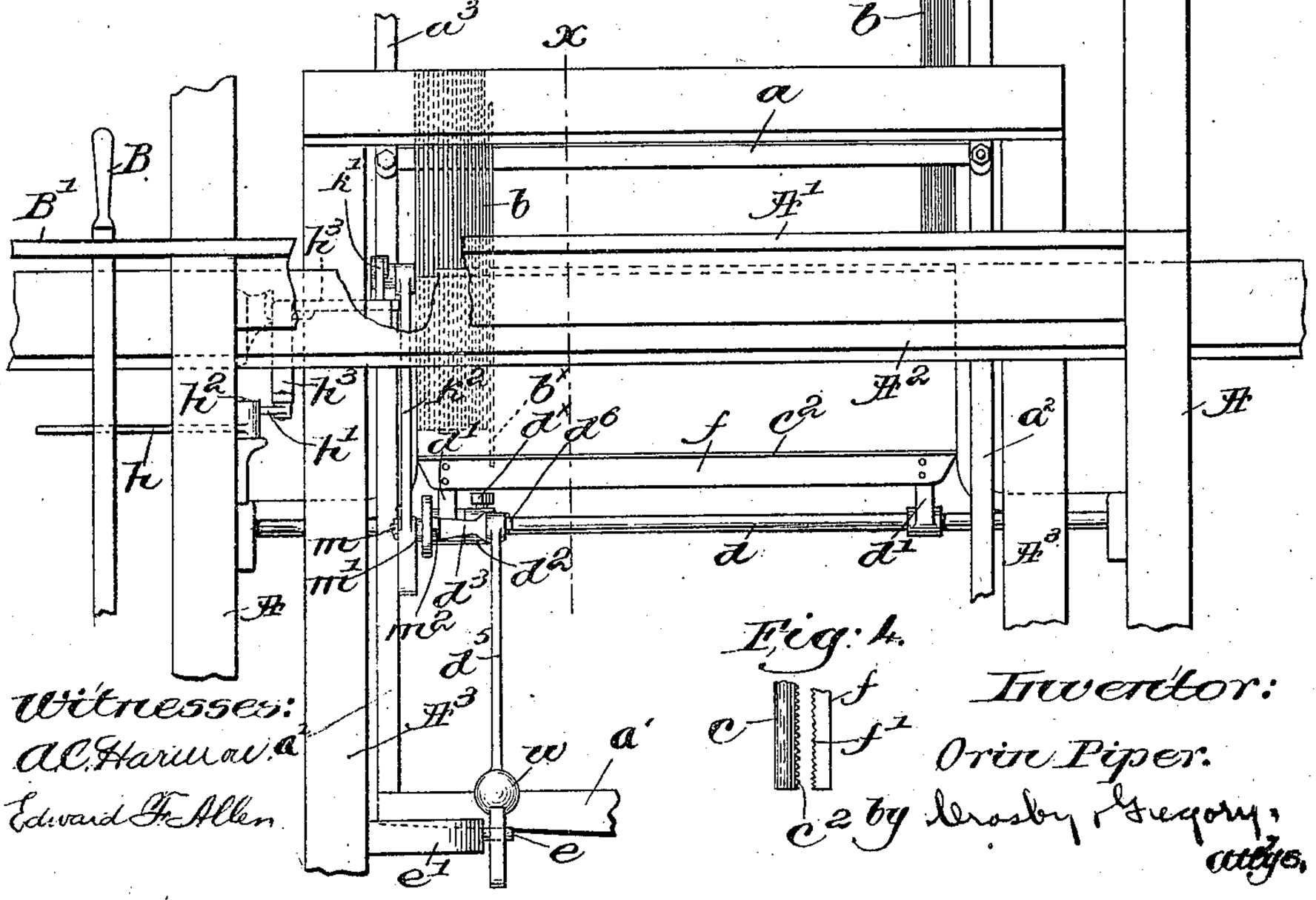

Fig. 4.

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(No Model.) 2 Sheets—Sheet 2.

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WARP STOP MOTION FOR LOOMS.

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Fig: 5.

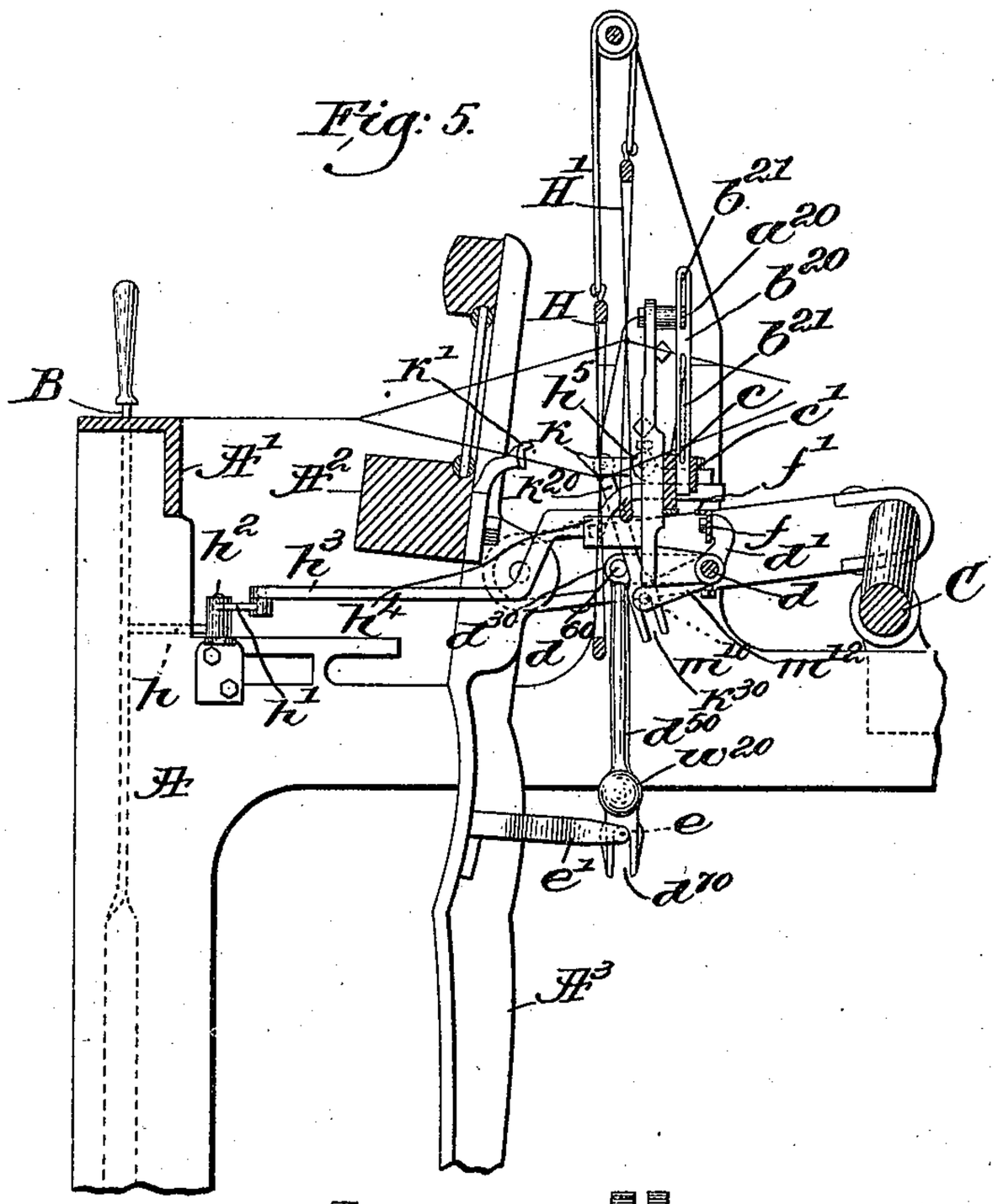
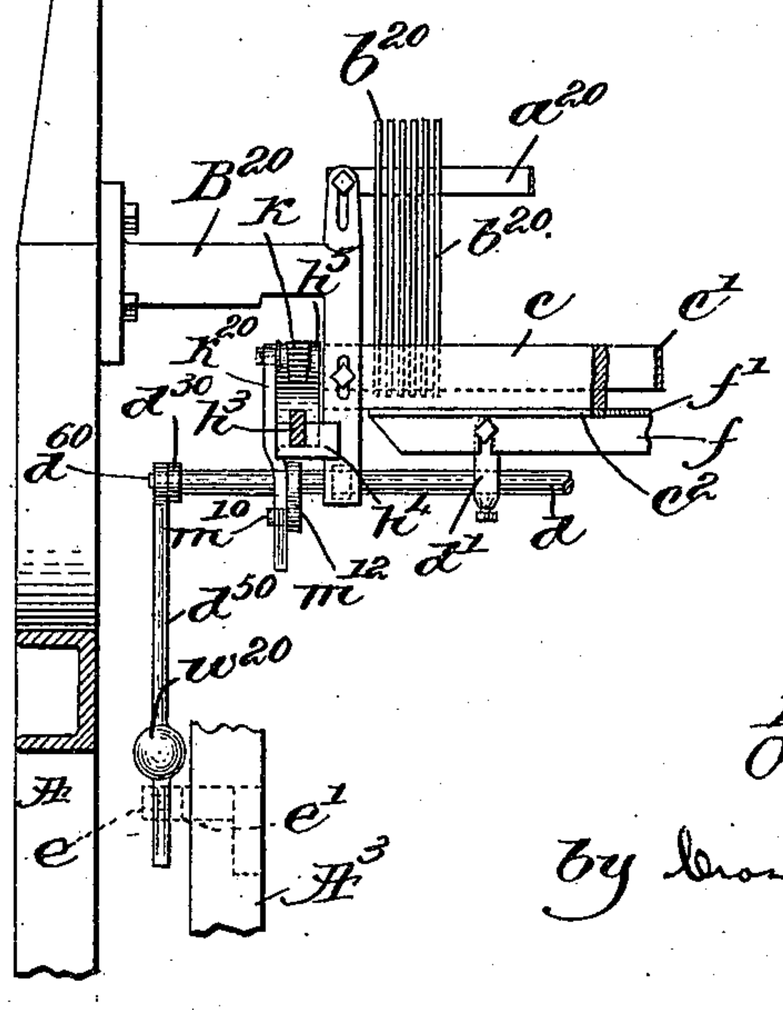


Fig: 6.



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Inventor:
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UNITED STATES PATENT OFFICE.

ORIN PIPER, OF MANCHESTER, NEW HAMPSHIRE, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE NORTHROP LOOM COMPANY, OF SACO, MAINE, AND HOPEDALE, MASSACHUSETTS.

WARP STOP-MOTION FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 594,213, dated November 23, 1897.

Application filed November 20, 1896. Serial No. 612,790. (No model.)

To all whom it may concern:

Be it known that I, ORIN PIPER, of Manchester, county of Hillsborough, State of New Hampshire, 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 on the drawings representing like parts.

This invention relates to warp stop-motions for looms wherein the breakage or undue slackness of a warp-thread is effective through the operation of a warp-stop-motion-actuating detector and suitable intervening mechanism to release the usual shipper-lever and thereby stop the loom. The detectors may be utilized as heddles, or they may be used entirely independent of the shedding mechanism of the loom, my invention being equally well adapted to either construction, and I have herein shown both adaptations or embodiments of my invention.

In some looms of well-known construction the reciprocating heddle-frame is provided with a series of metallic heddles, each having a warp-eye and a longitudinal opening through which the supporting-bar is extended, the heddles having a limited vertical movement independently of the heddle-frame. When the loom is running properly, the heddles in the lower plane of the shed are supported by their warp-threads; but should a warp break or unduly slacken its heddle will drop into abnormal position to engage and stop the movement of a normally rocking or vibrating feeler, such stoppage setting into operation devices for releasing the shipper-lever. If the detectors do not also constitute heddles, they will be mounted independently of the shedding mechanism, but they will cooperate with the feeler as before. Considerable trouble has been encountered in adjusting the movement of the vibrator or feeler, more particularly as regards the spring or springs which have formed a part of the connections between the feeler and the positively-driven means for operating it. If the adjustment of the spring makes it too strong, there is great danger of bending or otherwise injuring the dropped detector or detectors, and if the spring is too light the releasing mechanism for the shipper-lever may fail to act promptly or at all. In my present invention I have overcome these objectionable features and have obviated the use of any spring or yielding connection whatever between the feeler and its vibrating mechanism, whereby the operation of the stop-motion mechanism is rendered more positive and accurate without any of the nicety of adjustment now absolutely necessary to produce good work.

In accordance therewith my invention consists in various features to be fully described hereinafter and particularly pointed out in the claims.

Figure 1, in front elevation and partly broken out, represents a sufficient portion of a loom to be understood with my invention applied thereto, the detectors being utilized as heddles. Fig. 2 is a partial sectional view thereof on the line $x\,x$, Fig. 1, looking to the left. Fig. 3 is a similar view, the lay, however, being shown as fully back with the heddles in normal position, whereas in Fig. 2 a heddle has dropped and the lay is on its backward throw. Fig. 4 is a detail to be referred to. Fig. 5, partially in section and elevation, represents a loom with the warp-stop-motion-actuating detectors mounted independently of the shedding mechanism; and Fig. 6 is a partial front elevation of the loom shown in Fig. 5, taken between the lay and the harness mechanism, with the latter omitted.

The loom-frame A, breast-beam A′, lay A^2, lay-sword A^3, the crank-shaft C, and the shipper-lever B, held normally in the usual notched plate B′ and controlling a suitable belt-shipper, (not shown,) are and may be all as usual in looms.

The harness-frames consist each of a top cross-bar a, Fig. 1, bottom bar a', and rigidly-attached side bars a^2, Figs. 1 and 2, said frames being connected by flexible bands or straps a^3 with sheaves a^4, fast on a rotatable shaft a^5 above them. The usual harness mechanism for actuating the frames to give them their reciprocating motion is omitted in the drawings for the sake of clearness and inasmuch as such mechanism forms no part of this invention.

In Figs. 1, 2, and 3 the warp-stop-motion-actuating detectors are utilized as a series of heddles b, preferably composed of thin flat strips of metal, and have each a warp-eye b' and an enlarged slot b^2 at or near its upper end to receive the supporting cross-bar a, said bar being of less depth than the length of the slot b^2. A plate c is extended across the loom in front of and adjacent the vertical path of the front series of detector-heddles, as clearly shown in Figs. 2 and 3, and a second plate or bar c' parallel thereto is extended across the loom back of and adjacent the path of the second or rearmost series of heddles, the two forming an open stationary guide, into which the lower ends of the detector-heddles enter loosely. A foot c^2, having preferably a notched or milled edge c^3, (see Fig. 4,) is secured to the bottom of the plate c to engage the front edge of a dropped heddle and prevent it from twisting when acted upon by the feeder.

A rock-shaft d is extended across the loom below the open guide, said shaft having fast thereon arms d', to which is bolted or otherwise secured a feeler, shown as a piece of angle-iron f, the overhanging flange thereof being preferably notched at f' along its edge. This feeler is normally swung or vibrated back and forth below the guide and below the lower ends of the heddles; but should a heddle drop, owing to breakage or slackness of its warp-thread, as shown as $b^\times$, Figs. 1 and 2, the vibrator in its forward movement will be engaged and stopped thereby, as clearly shown in Fig. 2, the front part c of the guide engaging and holding the front edge of such dropped heddle. A hub d^2, provided with a bent arm d^3, is shown as adjustably secured to the rock-shaft d by a set-screw $d^\times$ near the side of the loom at which the shipper-lever is located, said arm d^3 extending toward the front of the loom and having an enlarged end provided with a slot d^4, and the arm is then bent laterally. A link d^5 is pivoted at its upper end at d^6 to the lateral bend of the arm to be thus pivotally connected eccentrically with the rock-shaft, and at its lower end it is longitudinally slotted at d^7 to be entered by a laterally-extended stud e on a stand e', rigidly secured to the lay-sword A^3. The link d^5 is preferably enlarged near its lower end or provided with a weight w to control the forward or operative movement of the feeler by gravity, and as the lay moves back and forth it will oscillate the link on its pivot d^6. Owing to the curved path of movement of the stud e the link will be lifted as the lay moves forward and lowered as the lay moves back, the extreme position of the link and the lay when back being shown in Fig. 3. When the link is raised, it will act to rock the shaft d and positively swing the feeler f backward in the direction of arrow 10, Fig. 3, and when the link is lowered the shaft d will be rocked in the opposite direction by the weight of the link and its enlargement w, the latter normally keeping the upper end of the slot d^7 on the stud e. When, however, the feeler engages a dropped heddle, the movement of the rock-shaft is stopped, and then the link is merely swung on its pivot d^6, the stud e moving in the slot d^7.

A bell-crank lever $h\ h'$ is pivoted at h^2 on the loom-frame A, the arm h resting against the inner side of the shipper-lever B, Figs. 1 and 2, the arm h' being pivotally connected to a slide-rod h^3, bent upwardly at its inner end to enter and slide in a bearing h^4 on the main frame. The slide-rod has an ear h^5, erected thereon near the bearing, to which is pivoted a dog k, adapted at times to be engaged by a coöperating bunter k', shown as rigidly secured to a suitable part of the lay.

The position of the dog is controlled by and in accordance with the movement of the feeler f, and for this purpose a link k^2 is pivoted on the dog and depends therefrom, the lower end of the link being longitudinally slotted at k^3, adjacent the slotted end of the arm d^3. A stud m, having a head or shoulder m', is held in adjusted position in said slotted arm by a set-nut m^2, the other end of the stud entering the slot k^3 and bearing against its upper end. When the feeler f is swung fully forward, as in Fig. 3, meeting no obstruction, the weight of the link k^2 will turn the dog k down out of the path of the bunter, and when the feeler is swung in the opposite direction the dog will be turned up above the bunter k'. Should the feeler engage and be stopped by a dropped heddle in either series, however, as in Fig. 2, the stud m will be held by arm d^3 in such position that the dog k will be engaged by the bunter k' as the lay moves back, and as the lay completes such backward throw the bunter pushes the dog and the slide-rod h^3 back, turning the bell-crank lever until its arm h presses the shipper-lever out of its holding-notch, thereby stopping the loom, the bell-crank lever thus acting as a releasing device for the shipper-lever. The slot k^3 in the link k^2 allows such rearward movement of the dog, the link being moved thereby longitudinally and relatively to the stud m.

The dog and the connections between it and the feeler constitute controlling means for the shipper-lever-releasing device.

It will be observed that there is no spring or yielding device included in or forming a part of the connections between the feeler and the means to vibrate it, said feeler being positively swung in one direction and in the other by gravity and that no nice adjustment is required, for it is only necessary that the vibrator swings through a proper arc and that such swing will normally move the dog out of the path of the bunter.

I have shown one convenient and simple form of releasing means for the shipper-lever controlled by the dog; but my invention is not restricted thereto.

Referring to Figs. 5 and 6, the detectors b^{20} are shown as slotted at b^{21} to receive a

supporting-bar a^{20}, secured to brackets B^{20} on the loom sides, a second slot b^{22} in each detector receiving two warps, one in each shed, the detectors being mounted independently of the harnesses H H', which may be of any usual construction, the detectors being vertically movable relative to the bar a^{20}. Two plates or bars c and c', substantially the same as herein described, extend across the loom and form the open stationary guide for the lower ends of the detectors, the plate c having preferably the milled-edge foot c^2 to engage the front edge of a dropped detector.

The rock-shaft d, the arms d' thereon, and the feeler f, bolted thereto and notched at f', are as described, the feeler being normally swung or vibrated below the lower ends of the detectors, but being engaged and stopped by a dropped detector due to breakage or undue slackness of its warp-thread in the upper plane of the shed. An arm d^{30}, fast on the rock-shaft, has pivotally connected thereto at d^{60} a link d^{50}, slotted or forked at d^{70}, to be entered by the stud e on the stand e', secured to the lay-sword A^3, as before described, the link having near its end an enlarged or weighted portion w^{20}. As the lay moves forward the link is lifted and lowered as the lay moves back, rocking the shaft d and swinging the feeler f back and forth except when a dropped detector is engaged by the feeler, the operation being practically the same as described when the detectors are utilized as heddles. The bell-crank lever $h\,h'$, the slide-rod h^3, bent to slide in a bearing h^4 on the main frame, and the ear h^5 on the slide-rod, having a pivoted dog k to be at times engaged by the coöperating bunter k', rigidly attached to the lay, are substantially as before described.

In Figs. 5 and 6 the dog k has pivoted thereto a link k^{20}, depending therefrom and slotted at k^{30}, to be entered by a stud m^{10} on an arm m^{12}, fast on the rock-shaft d, so that when the feeler f is swung fully forward the arm m^{12} will descend, permitting the weight of the link k^{20} to depress the dog k out of the path of the bunter, and when the feeler is swung in the opposite direction the dog will be turned up above the bunter. If the feeler engages and is stopped by a dropped detector, the rock-shaft d will be held so that the link k^{20} cannot depress the dog, and the bunter will engage it as the lay completes its backward throw, acting through the slide-rod h^3 to release the shipper-lever and stop the loom.

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

1. In a loom, the lay, a series of warp-stop-motion-actuating detectors independent thereof and adapted to drop into operative position upon failure of the warp-threads, a vibrating feeler mounted in stationary bearings independent of the lay, a weight operatively connected with and to move said feeler toward and to be stopped by engagement with a dropped detector, means connected with the lay to positively move the feeler away from the detectors, and stopping mechanism for the loom, rendered operative by stoppage of the feeler due to a dropped detector, substantially as described.

2. In a loom, the lay, a series of warp-stop-motion-actuating detectors independent of the lay and adapted to slide vertically, and each having a warp-eye, combined with a stationary guide for the lower ends of the detectors, a vibrating feeler mounted independent of the lay, a weight connected with said feeler to move it by gravity toward and to engage and be stopped by a dropped detector, means connected with the lay to positively rock the feeler in the opposite direction or away from the detectors, stopping mechanism for the loom, and connections between it and the feeler, substantially as described.

3. In a loom, the lay, a series of metallic warp-stop-motion-actuating detectors adapted to slide vertically and controlled by the warp-threads, a stationary guide for the lower ends of the detectors, a feeler mounted independent of the lay, a connected weight to move the feeler by gravity toward and to engage a dropped detector due to breakage or undue slackness of its warp-thread, means, including a link, positively oscillated by the lay, to retract the feeler from the path of movement of the detectors, and stopping mechanism for the loom, operative upon stoppage of the feeler by a dropped detector, substantially as described.

4. In a loom, the lay, a heddle-frame provided with a cross-bar, and a series of metallic heddles adapted to slide vertically on and independently of said bar, and a stationary guide for the lower ends of the heddles, combined with a rock-shaft independent of the lay, a feeler vibrated thereby to engage the end of a detector in abnormal position due to breakage or undue slackness of its warp-thread, a depending longitudinally-slotted link pivotally connected eccentrically to said rock-shaft, to rock the latter toward the heddles by its weight, a reciprocating actuator for the link, mounted on the lay and entering the longitudinal slot, whereby the link will be oscillated and moved longitudinally against its weight, such longitudinal movement positively rocking the shaft to move the feeler away from the heddles, stopping mechanism for the loom, and connections between said mechanism and the feeler, substantially as described.

5. In a loom, the lay, a cross-bar, and a series of longitudinally-slotted metallic warp-detectors adapted to slide vertically on and independently of said bar, a vibratable feeler mounted independently of the lay, to engage a dropped detector, a depending weighted link pivoted eccentrically to said vibrator, and having a longitudinal opening therein, a lug movable with the lay, to enter said opening, whereby said link will be oscillated and

moved upward to retract the feeler on one stroke of the lay, the weight of the link depressing it and moving the feeler toward the path of the detectors on the other stroke of the lay, and stopping mechanism for the loom, operative upon stoppage of the feeler by a dropped detector, substantially as described.

6. In a loom, the lay, a heddle-frame provided with a cross-bar, and a series of metallic heddles adapted to slide vertically on and independently of said bar, combined with a feeler mounted independent of the lay and heddle-frame, a connected weight to move it toward and to engage a dropped heddle, means to positively retract said feeler, a shipper-lever, a releasing device therefor, a controller for said device, rendered operative by stoppage of the feeler, and actuating connections between said controller and the feeler, substantially as described.

7. In a loom, the lay, a heddle-frame provided with a cross-bar, and a series of metallic heddles adapted to slide vertically on and independently of said bar, combined with a stationary guide for the lower ends of the heddles, a gravity-actuated, vibratable feeler mounted independently of the lay, to engage a dropped heddle, means operated by movement of the lay to retract the feeler positively, and stopping mechanism for the loom, including a dog and a coöperating bunter, and a connection between the dog and feeler, whereby the former is placed in operative position by stoppage of the feeler, substantially as described.

8. In a loom, the lay, a series of warp-stop-motion-actuating detectors having a vertical movement controlled by the warp-threads, combined with a reciprocating feeler independent of the lay, a weight connected with the feeler to move it by gravity toward and to engage a detector dropped by breakage or slackness of its warp-thread, means actuated by the lay to retract the feeler positively, and stopping mechanism for the loom, operative upon stoppage of the feeler by a dropped detector, substantially as described.

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

ORIN PIPER.

Witnesses:
A. W. MORGAN,
EDWIN F. JONES.