No. 763,119. PATENTED JUNE 21, 1904.

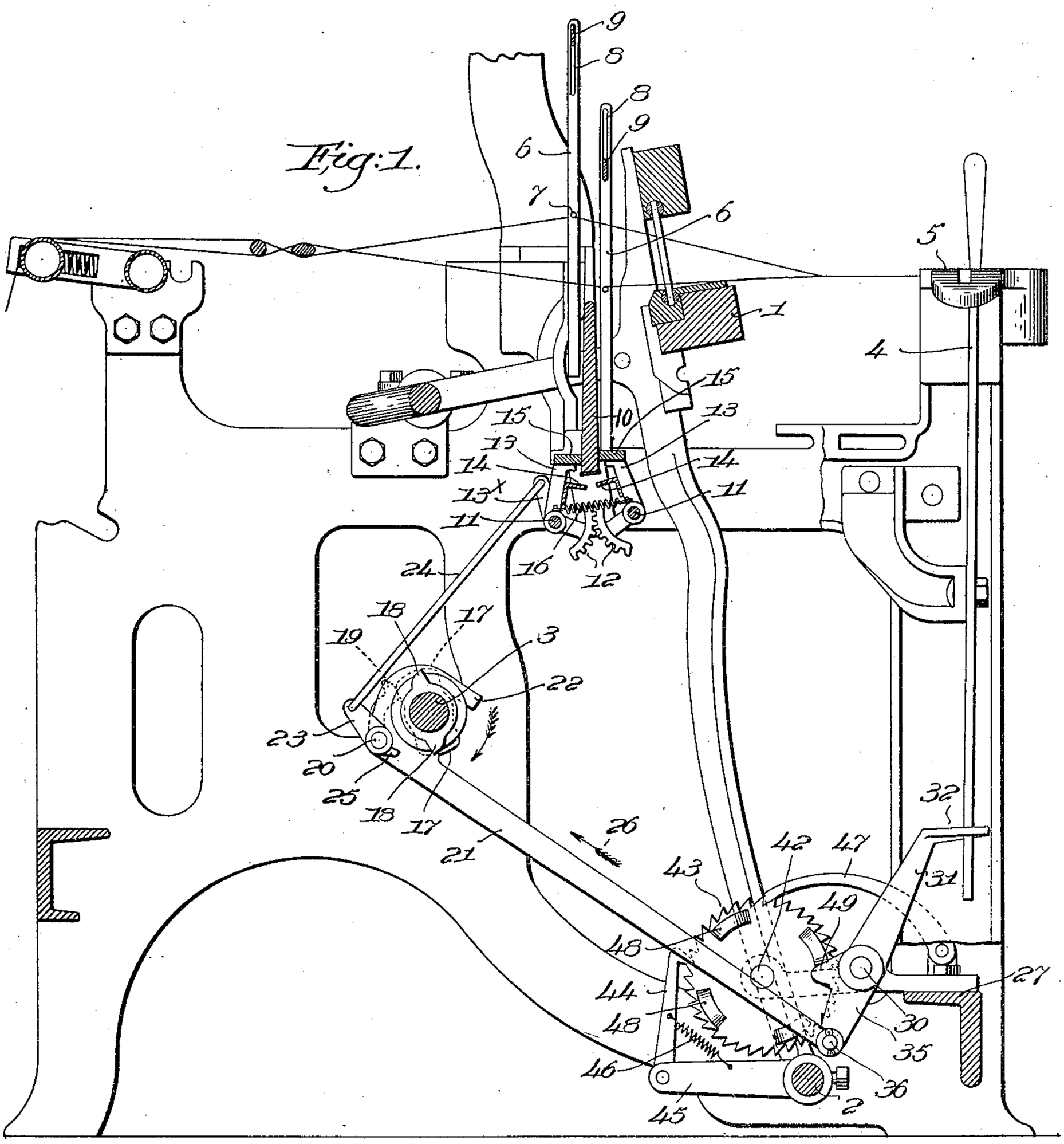
O. A. SAWYER.

WARP STOP MOTION MECHANISM FOR LOOMS.

APPLICATION FILED APR. 7, 1904.

NO MODEL. 2 SHEETS—SHEET 1.

Fig: 1.



Witnesses,
Edward H. Allen.
L. Wm. Lutton.

Inventor;
Orrete A. Sawyer;
By Shanby & Gregory.
Atty's.

No. 763,119. PATENTED JUNE 21, 1904.

O. A. SAWYER.

WARP STOP MOTION MECHANISM FOR LOOMS.

APPLICATION FILED APR. 7, 1904.

NO MODEL. 2 SHEETS—SHEET 2.

Fig: 2.

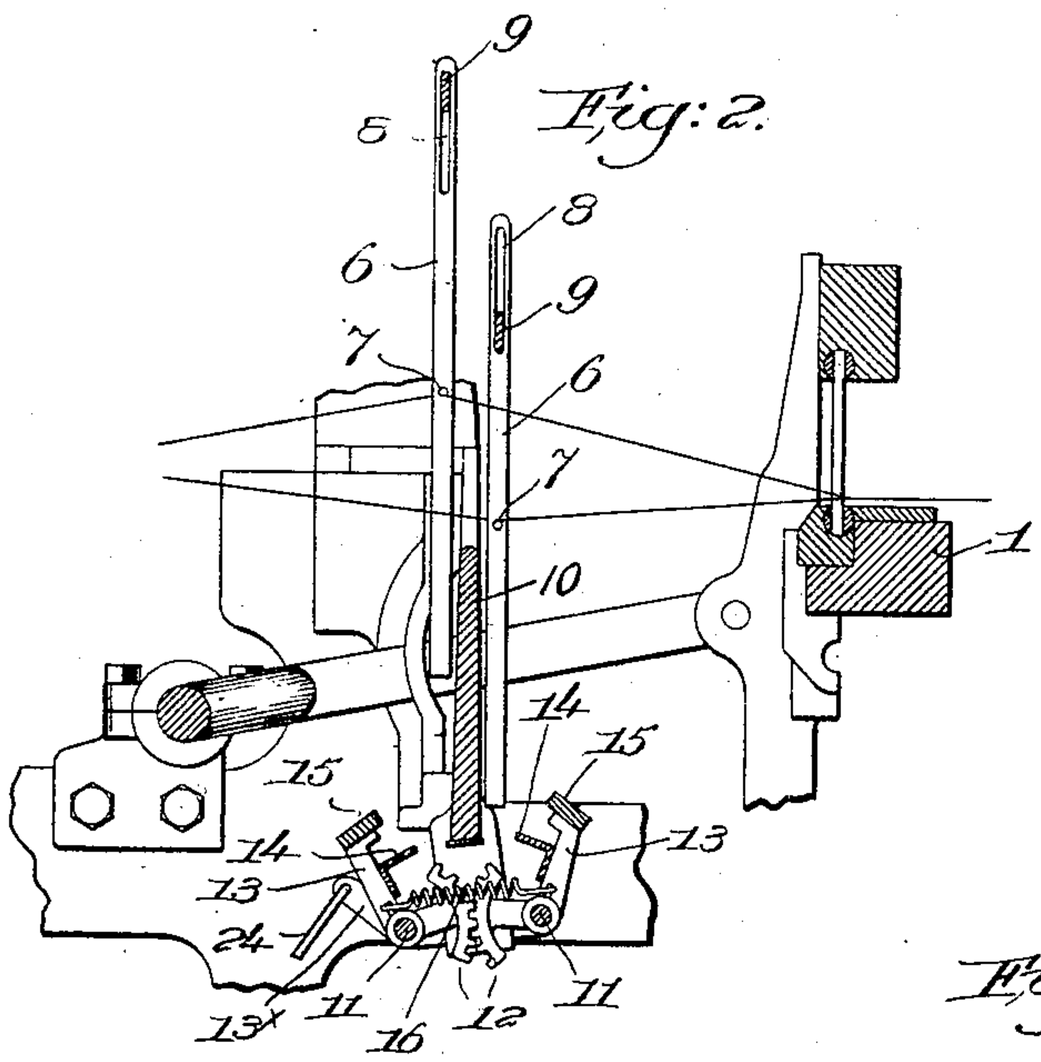


Fig: 5.

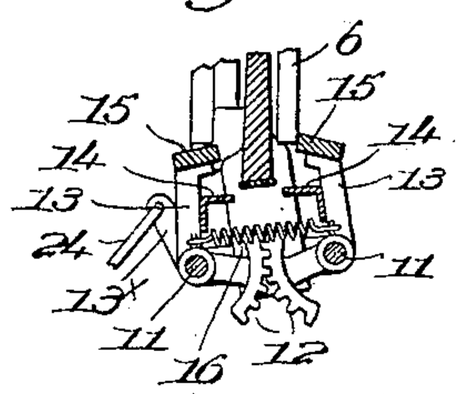


Fig: 3.

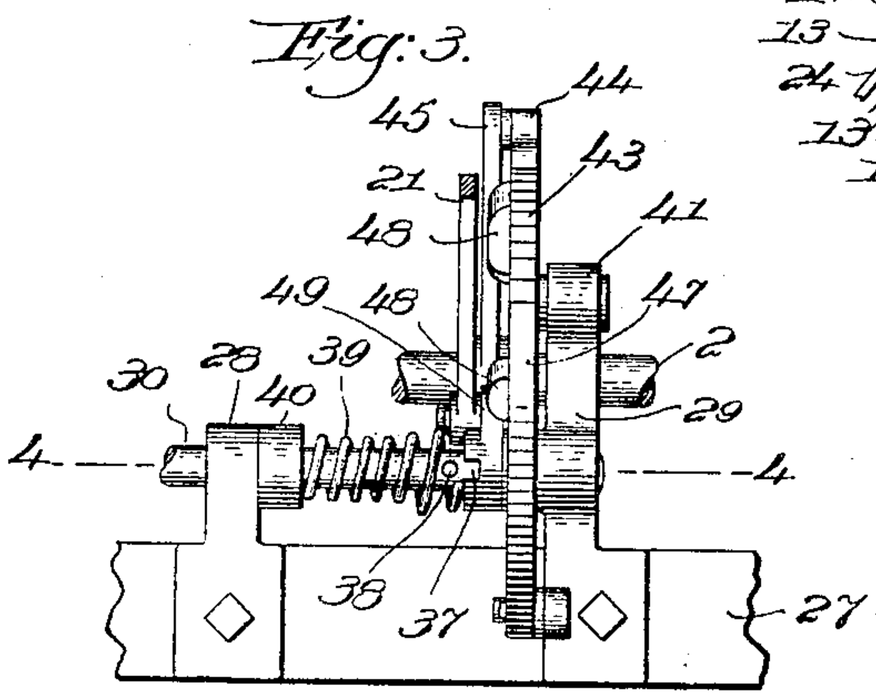
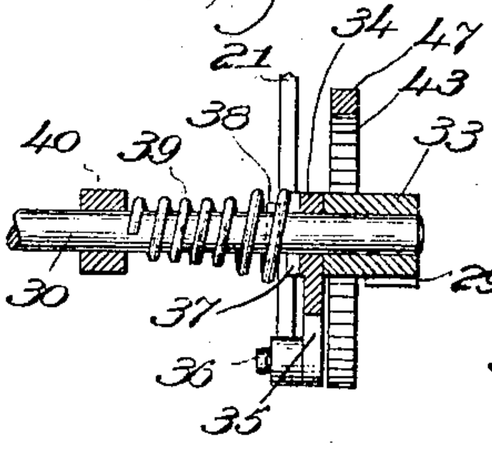


Fig: 4.



Witnesses,
Edward F. Allen.
L. Wm Lutton.

Inventor:
Orren A. Sawyer.
by Crosby Gregory,
Attys

No. 763,119. Patented June 21, 1904.

UNITED STATES PATENT OFFICE.

ORREN A. SAWYER, OF LOWELL, MASSACHUSETTS, ASSIGNOR TO DRAPER COMPANY, OF HOPEDALE, MASSACHUSETTS, A CORPORATION OF MAINE.

WARP-STOP-MOTION MECHANISM FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 763,119, dated June 21, 1904.

Application filed April 7, 1904. Serial No. 202,053. (No model.)

To all whom it may concern:

Be it known that I, ORREN A. SAWYER, a citizen of the United States, and a resident of Lowell, county of Middlesex, State of Massachusetts, have invented an Improvement in Warp-Stop-Motion Mechanism for Looms, of which the following description, in connection with the accompanying drawings, is a specification, like numerals on the drawings representing like parts.

This invention relates to that class of warp-stop-motion mechanism for looms wherein the movement into abnormal position of a controlling-detector operates by or through a feeler and suitable coöperating means to effect the actuation of a stopping instrumentality, the controlling-detectors being normally maintained out of range of the feeler by intact warp-threads. A very general application of this class of mechanism comprehends the use of the heddles as controlling-detectors also, the heddles being vertically reciprocated to form the shed, the construction and arrangement being such that when a warp-thread fails or becomes slack its heddle-detector will be abnormally positioned when in the lower plane of the shed and arrest of the feeler is effected. Heretofore, so far as I am aware, it has not been profitable to use such mechanism when weaving with slack warp because of unnecessary stoppage of the loom, as comparatively slight slackness of the threads would cause their heddle-detectors to engage and arrest the feeler and because the weight and momentum of the heddles often stretch the yarn and increase the slackness of threads. It is desirable sometimes to weave with slack warp-threads in order to produce certain effects in the cloth, and so, too, with slacker warp there is not the same strain upon the threads thereof and fewer warp breakages result. Again, quite slack threads will from time to time be presented which will weave in properly, the weaving gradually taking up the slack without detriment to the cloth; but in warp stop-motions of the class described the detecting movement of the feeler accompanies each descent of a harness-frame, so that the detector of the slack thread will be engaged by the feeler and the loom will be stopped in consequence.

My present invention has for its object the production of means whereby the feeler is permitted to coöperate with a detector only when the warp-thread thereof fails—that is, breaks or runs out—so that the occurrence of a casual slack thread will not effect stoppage, and when desired slack warp may be employed, but in either case without affecting the efficiency of the stop-motion mechanism upon the occurrence of warp failure.

The various novel features of my invention will be fully described in the subjoined specification and particularly pointed out in the following claims.

Figure 1 is a partial cross-sectional view of a loom equipped with warp-stop-motion mechanism of the class hereinbefore referred to and with one embodiment of my invention applied thereto, the feeler being shown as quiescent. Fig. 2 is a detail view of some of the parts illustrated in Fig. 1, but showing the feeler as just about to make the feeling stroke. Fig. 3 is a plan view of a portion of the means for governing the intermitting operation of the feeler. Fig. 4 is a longitudinal sectional detail thereof on the line 4 4, Fig. 3; and Fig. 5 is a detail showing the relative position of the feeler and the heddle-rest when the latter engages a heddle-detector, to be hereinafter referred to.

The lay 1, its rocker-shaft 2, cam-shaft 3, shipper 4, adapted in practice to throw the motive power of the loom into or out of operation, its notched holding-plate 5, and the heddles 6, each having a warp-eye 7 and a longitudinal slot 8 at or near its upper end to receive the supporting cross-bar 9 of a vertically-reciprocating harness-frame, may be and are of well-known construction and operate in a manner familiar to those skilled in the art. As is common in such mechanism, the heddles 6 are preferably made of thin flat metal strips having a limited longitudinal movement relative to the cross-bars 9, whereby the heddles also serve as warp-stop-motion-

controlling detectors. An upright separating-plate 10, extended transversely of the loom, is interposed between the lower ends of the series of heddles of the front and back harness-frames, and two rock-shafts 11 below said plate are connected by intermeshing segmental gears 12 to rock in opposite directions. Arms 13, fast on the rock-shafts, support feelers 14, which are adapted to vibrate toward and from each other in paths below the heddles when the latter are in the lower plane of the shed and their warp-threads are intact substantially in well-known manner. In my present invention, however, I have provided a heddle-rest movable with and located above each feeler, and these heddle-rests are shown as flat bars 15, attached to the arms 13 and so positioned thereon that when the feelers are at the end of their inward stroke said rests will be substantially horizontal and just below the lower ends of the detectors when in the lower plane of the shed. (See Fig. 1.) These heddle-rests are preferably made of wood, being thereby light and serving to cushion the heddles which may descend thereupon.

Referring to Fig. 1, it will be seen that so long as a rest is in operative position the descending heddles cannot move into the feeler-path, and if the warp-threads are comparatively slack the rest will support the heddles when they descend, taking the strain off the threads at such time. Even if an occasional thread becomes unduly slack the rest will prevent its descent into the feeler-path so long as the rest is in its operative position. The feelers are moved on their inward or feeling stroke by a spring 16, and they are moved outward positively by means to be described; but in my present invention the feelers are operative only during intermittent periods.

Referring to Fig. 1, the cam-shaft 3 has fast upon it a double feeler-actuating cam 17 and a double tappet-cam 18, the cam 17 acting upon a follower 19 twice for every revolution of the shaft 3—*i. e.*, once for each pick. The follower 19 is fulcrumed at 20 on a longitudinally-movable member or link 21, hooked at 22 to embrace the cam-shaft, an arm 23, rigidly connected with the follower, being jointed to a rod 24, pivotally attached at its upper end to an arm $13^{\times}$, fast on the rear rock-shaft 11. If the link 21 is held from movement, it will be manifest that the double cam 17 will rock the follower 19 and through the described connections will swing the feelers outward once for every pick, the spring 16 swinging them inward and also keeping the follower in coöperation with the cam 17. A bunter 25, fast on the arm 23, is movable into and out of the path of the tappet-cam 18 by or through the movement of the follower. If on the inward stroke a feeler engages a heddle, the arrest of the feeler will act, [illegible] 24, to retain the bunter in the path of the tappet-cam 18, and the latter will then move link 21 in the direction of arrow 26, Fig. 1, to release the shipper, as will be described. The feeler-actuating means thus described is not novel *per se*, and but for changes which I have made and am about to explain the feelers would be constantly vibrating until one was arrested by engagement with an abnormally-positioned heddle.

Referring to Figs. 1, 3, and 4, the cross-girth 27 of the loom is provided with brackets 28 29, having bearings for a short rock-shaft 30, extended beyond the loom side and having fast upon it a knock-off lever 31, provided with a slotted head 32 to receive the lower end of the shipper. (See Fig. 1.) The shaft-bearing of the bracket 29 is provided with an inward extension 33, Figs. 3 and 4, and adjacent thereto the hub 34 of a depending rocker-arm 35 is loosely mounted on the rock-shaft 30, the free end of said arm being pivotally connected with the link 21 at 36. A notch 37 is made in the hub 34 to at times receive a pin 38, projecting radially from the rock-shaft, a spring 39, coiled about the shaft, tending to maintain the hub and pin disconnected, the opposite end of the spring bearing against a collar 40, fast on the shaft. The spring is enlarged adjacent the hub to avoid interference with the pin, as best shown in Fig. 4. The bracket 29 is rearwardly extended at 41 to support a stud 42, on which is rotatably mounted a ratchet 43, with which coöperates a pawl 44, pivoted on an arm 45, fast on the lay-rocker 2, (see Fig. 1,) a spring 46 keeping the pawl and ratchet in engagement. A detent-pawl 47 prevents retrograde movement of the ratchet, and by referring to Fig. 1 it will be manifest that at each backward stroke of the lay the ratchet will be advanced a distance of one tooth, as herein shown. A series of segmental cams 48 are formed on the side of the ratchet (see Fig. 1) and so located that as the ratchet is rotated one after another of the cams will engage a lug 49 on the hub 34 and move the same to the left, Figs. 3 and 4, to effect engagement of the pin 38 with the notch 37 to lock the rocker-arm and the shaft 30 together. As long as a cam bears against the lug 49 the rocker-arm will be operatively connected with the knock-off lever 31, and if at such time the arm is rocked the shaft 30 will be turned and the knock-off lever operated. As soon as one of the cams passes beyond the lug 49 the spring 39 expands and disconnects the rocker-arm and shaft, and the rocker-arm is then free to swing, and while unlocked the coöperation of the cam 17 with the follower 19 will operate to move the link 21 in the direction of the arrow 26, Fig. 1, on each pick; but such movement will not operate the feelers, as the rod 24 will swing on its connection with the arm $13^{\times}$ as a center. The weight of the link 21 will retract it opposite to the arrow 26. It will thus be manifest that

when the rocker-arm 35 is unlocked the feelers will remain quiescent for a predetermined number of picks—viz., the number of picks intervening between the cams 48 on the ratchet. When the rocker-arm is locked to the shaft, as has been described, the resistance of the shaft 30 to rotative movement will be greater than the strength of the spring 16, and at such time the engagement of the cam 17 with the follower 19 will rock the follower on its fulcrum 20, and through the arm 23 and rod 24 the feelers will be moved outward at each pick and then inward by the spring 16. The length of the vibrating or active period of the feelers is determined by the length of the cams 48, and it will be obvious from the foregoing description that the rest periods of the feeler alternate with the active or operating periods. If a heddle is released by failure of its warp-thread, it can coöperate with the feeler only when the latter is active and will then arrest the inward stroke of said feeler and retain the bunter 25 in the path of one of the tappets 18. Such engagement of the bunter and a tappet will move the link 21 in the direction of the arrow 26, Fig. 1, and inasmuch as the rocker-arm 35 is locked to the shaft 30 during the active period of the feeler such movement of the link will turn the shaft 30, and through the knock-off lever 31 the shipper will be released from its holding-notch and the loom will be stopped. Should a warp-thread fail during one of the inactive feeler periods, the released heddle-detector will descend upon the heddle-rest 15 each time the corresponding harness-frame descends, and on the first inward stroke of the feeler in the next active period thereof such released heddle will engage and arrest the feeler. During the rest periods slack threads cannot cause stoppage of the loom, as has been explained, and they cannot cause stoppage during active periods of the feeler, because the path of movement of the feeler is so low down that the slackness of a thread will not permit its detector to descend far enough to cross the feeler-path. If the heddle-detectors or any of them descend into the path of one of the rests 15 during the vibrating period of the feelers, the stop-motion mechanism will not be operated, because the arrest of the inward movement of a feeler, due to engagement of the rest with a detector, will not elevate the bunter 25 into the path of one of the tappets 18. This is due to the fact that the rest is much farther from the rock-shaft 11 than is the feeler and also because of the angular distance between the inner edge of the feeler and the rest. If a heddle is caught by the rest on the inward stroke of the feeler, such heddle will be readily withdrawn from engagement with the rest when the corresponding harness-frame is elevated to change the shed.

In Fig. 5 a heddle is shown in engagement with a rest, and from an inspection of said figure it will be seen that at such time the feeler has almost completed its full inward stroke, this detail making clear the explanation hereinbefore given as to why the possible engagement of the rest and a heddle or heddles will not operate the stop-motion mechanism.

My invention is not restricted to the precise construction and arrangement herein shown and described, as the same may be modified or rearranged in various ways by those skilled in the art 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 loom, a series of warp-stop-motion-controlling detectors, a feeler adapted when operating to engage a detector released by failure of its warp-thread, to thereby effect the actuation of a stopping instrumentality, and means to operate the feeler at predetermined intervals.

2. In a loom, a series of warp-stop-motion-controlling detectors, a normally quiescent feeler adapted when operating to be arrested by a detector released by failure of its warp-thread, to thereby effect the actuation of a stopping instrumentality, and means to operate the feeler at intervals, to feel for a released detector.

3. In a loom, a series of warp-stop-motion-controlling detectors, a vibratable feeler adapted, when arrested by a detector released by failure of its warp-thread, to effect the actuation of a stopping instrumentality, and means to vibrate the feeler to feel for a released detector and then to retain it quiescent for a predetermined number of picks.

4. In a loom, a series of warp-stop-motion-controlling detectors governed by intact warp-threads, a feeler adapted when operative to be arrested by engagement with a released detector, means adapted to cause the operation of a stopping instrumentality by or through such arrest of the feeler, means to operate the feeler for a predetermined number of picks and then to maintain it quiescent during a number of succeeding picks, and a detector-rest operative when the feeler is quiescent.

5. In a loom, a series of heddles serving also as warp-stop-motion-controlling detectors, a feeler to coöperate with a heddle released by failure of its warp-thread, a device to coöperate with a heddle when its warp-thread slackens but remains intact, means to render the feeler and said device operative in alternation, and means adapted to effect the actuation of a stopping instrumentality when the feeler coöperates with a released detector.

6. In a loom, a series of heddles serving also as warp-stop-motion-controlling detectors, a vibratable feeler, means to maintain it quiescent and to vibrate it during alternating periods, a device automatically moved beneath the heddles during the quiescent periods of

the feeler to limit descent of the heddles, whereby slack warp-threads may be employed, and means adapted to effect the operation of a stopping instrumentality when the feeler in one of its active periods engages a heddle released by failure of its warp-thread.

7. In a loom, a series of warp-stop-motion-controlling detectors, a normally quiescent feeler to coöperate with a detector released by failure of its warp-thread, means to operate the feeler at predetermined intervals to feel for a detector released by failure of its warp-thread, and means operative by or through engagement of the feeler and a detector at such time to effect the actuation of a stopping instrumentality.

8. In a loom, a series of warp-stop-motion-controlling detectors, a normally quiescent feeler to coöperate with a detector released by failure of its warp-thread, means to operate the feeler at predetermined intervals to feel for a detector released by failure of its warp-thread, said means including a continously-moving feeler-actuating cam, and an intermittingly-acting device to effect a vibrational movement of the feeler by said cam, and means adapted to effect the actuation of a stopping instrumentality upon engagement of a released detector by the feeler during its vibrational movement.

9. In a loom, a shipper, a knock-off lever therefor, a rocker-arm, means to connect it with the lever at predetermined intervals, a series of heddles serving also as warp-stop-motion - controlling detectors, a vibratable feeler, a spring to move it toward the detectors, and means, including a continuously-rotating cam, a coöperating follower connected with the feeler, and a longitudinally-movable link upon which the follower is mounted, the other end of the link being jointed to the rocker-arm, the latter when connected with the knock-off lever preventing movement of the link and permitting the follower to effect rocking movement of the feeler, combined with separate means to move the link and operate the knock-off lever when the feeler engages a released heddle.

10. In a loom, a series of heddles serving also as warp-stop-motion-controlling detectors, a rock-shaft, an attached feeler, a heddle-rest above and movable with the feeler, a spring to move the latter and the rest toward the heddles, and means to oscillate the rock-shaft at predetermined intervals and thereby vibrate the feeler and heddle-rest, the latter normally remaining quiescent below and to limit downward movement of the heddles due to slack warp-threads, a heddle released by failure of its warp-thread engaging and arresting the feeler during its vibrational movement, combined with means adapted to effect the actuation of a stopping instrumentality upon such arrest of the feeler, the heddle-rest preventing engagement of the feeler and a heddle when its warp-thread is slack but intact.

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

ORREN A. SAWYER.

Witnesses:
WILLIAM C. TROMBLY,
GRACE CROWLEY.