No. 784,920. PATENTED MAR. 14, 1905.

C. E. CHASE.

WARP STOP MOTION FOR LOOMS.

APPLICATION FILED OCT. 18, 1904.

2 SHEETS—SHEET 1.

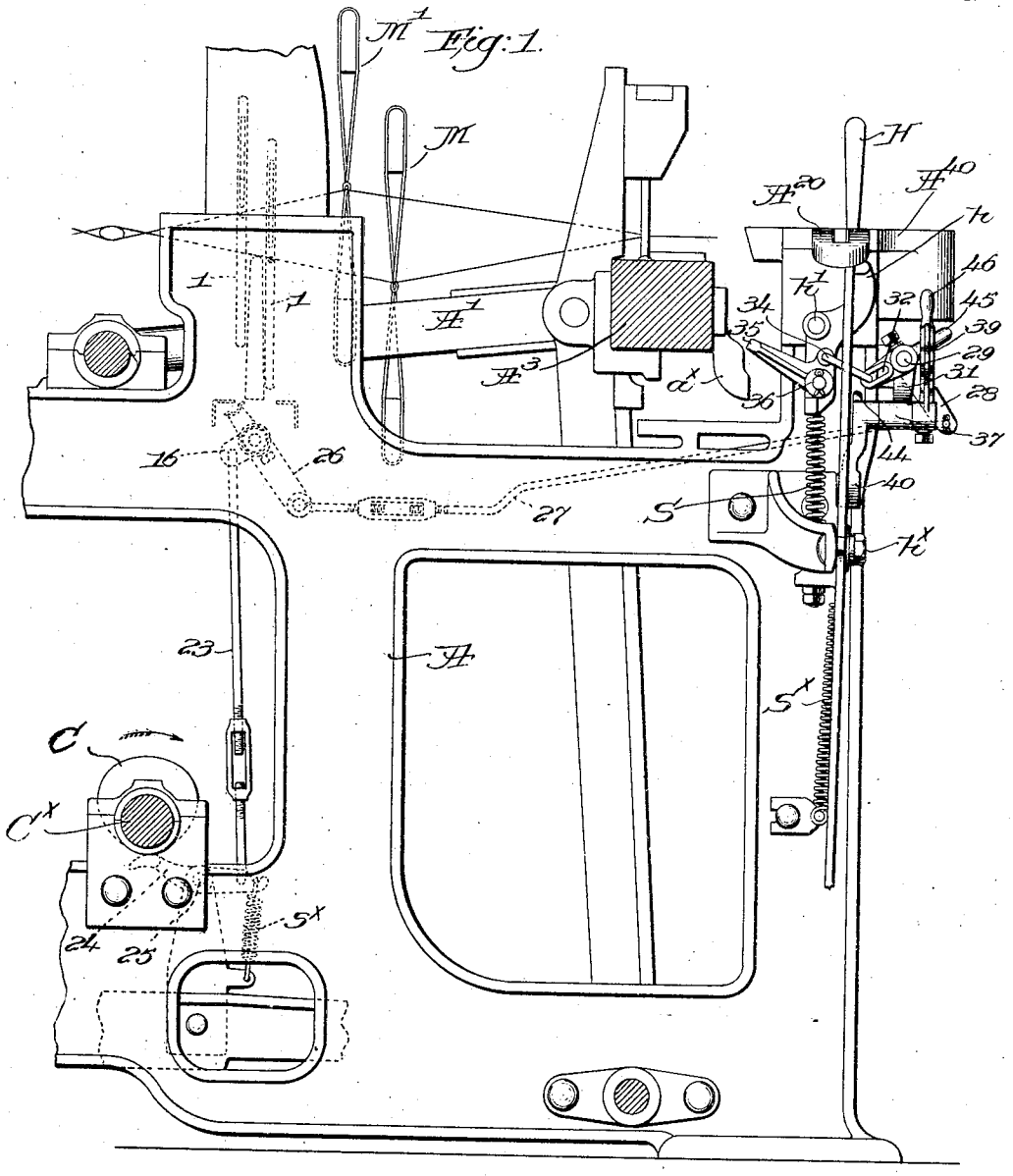

Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 2.

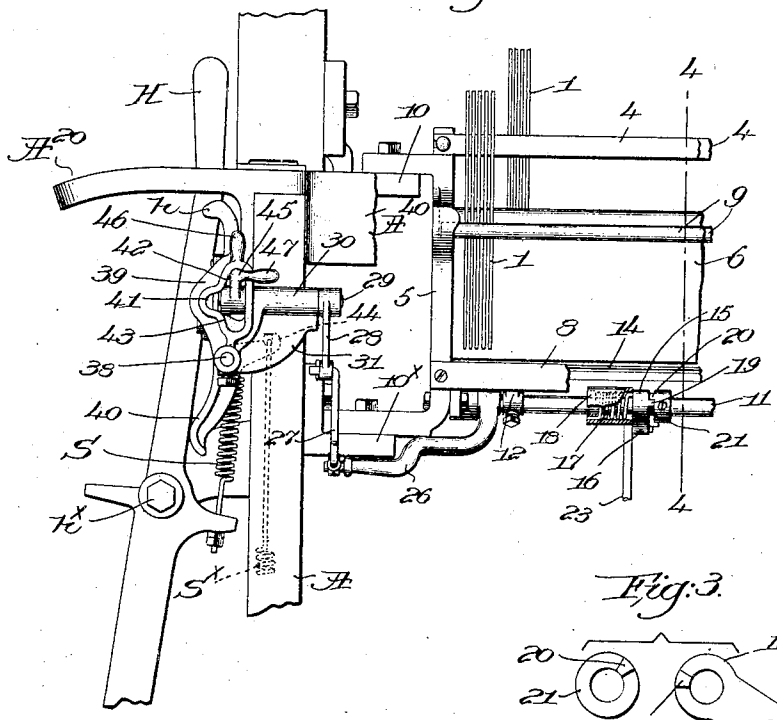
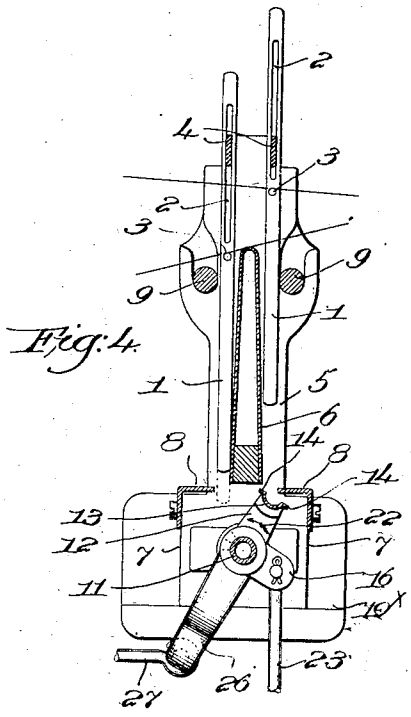


Fig. 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

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WARP STOP-MOTION FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 784,920, dated March 14, 1905.

Application filed October 18, 1904. Serial No. 228,957.

To all whom it may concern:

Be it known that I, CHARLES E. CHASE, a citizen of the United States, and a resident 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 characters on the drawings representing like parts.

This invention relates to warp-stop-motion mechanism for looms; and it has for one of its objects the production of novel detecting means constructed and arranged to effect promptly the stoppage of the loom upon detection of a warp fault.

Another object of the invention is the production of means to enable the weaver to quickly ascertain the location of the faulty warp-thread, a matter of very considerable importance in saving time and particularly valuable in the case of a broad loom.

Another object of the invention is the production of means whereby the stop-motion can be readily adapted for use either when weaving with slack warps or with relatively taut warps, it being at times desirable to avoid unnecessary stoppage of the loom from slack threads, while at other times it is desirable to detect slack warps, as well as those which break or run out.

I have also provided novel means for releasing automatically an abnormally-positioned detector from the strain of the feeler, so that the weaver can readily correct the fault and restore such detector to normal position.

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

My invention relates to that class of stop-motion apparatus wherein each warp-thread is provided with a detector normally maintained inoperative by the warp-thread, and the detectors are so arranged that in the formation of the shed the warp-threads impart vertical reciprocation to the detectors, preventing them from sticking together or acting sluggishly. Such class of stop-motion apparatus is technically known as a "single-thread" stop-motion, and the detectors form no part of the shed-forming devices in the embodiment of my invention herein shown.

Figure 1 is a left-hand side elevation of a sufficient portion of a loom to be understood with one embodiment of my present invention applied thereto. Fig. 2 is a front elevation of a portion of the stop-motion mechanism illustrated in Fig. 1. Fig. 3 is a detail of a clutch device on the feeler rock-shaft to be referred to; and Fig. 4 is an enlarged transverse sectional detail on the line 4 4, Fig. 2, looking toward the left.

Referring to Fig. 1, the loom side A, lay A^3, breast-beam A^{40}, having a notched holding-plate A^{20} for the shipper H fulcrumed at $h^\times$ and having a controlling-spring S, the knock-off arm h, fulcrumed on the loom side below the plate A^{20} and adapted to be actuated by the usual frog (not shown) when the protector mechanism operates, and the cam-shaft $C^\times$ may be and are all of well-known or usual construction.

I have located the warp-stop-motion-controlling detectors 1 back of the harnesses M M′ (see Fig. 1) and near enough thereto to enable the warp-threads to impart vertical reciprocation to such detectors as the shed is changed, the detectors being for convenience preferably divided into two parallel banks, each warp-thread coöperating with a detector.

As best shown in Fig. 4, each detector is made of a thin flat metal strip (a well-known construction) having an enlongated slot 2 in its upper end and a warp-eye 3 below the slot, flat supporting-bars 4 being extended loosely through the slots and sustained at their ends on brackets 5, secured to the loom sides.

A separator 6 extends between the two banks of detectors and is suitably attached to the brackets, the latter having at their lower ends vertical shoulders 7, to which are secured back-stops 8, shown in Fig. 4 as angle-irons so placed that their horizontal flanges project toward each other and somewhat below the

lower ends of the detectors when their warp-threads are lowered.

It will be seen that there is sufficient clearance between the bottom of the separator 6 and each back-stop to permit a detector to descend into dotted-line position when released by failure or breakage of its warp-thread, the end of such a released detector depending below the back stop, the downward movement being limited by the supporting-bar 4, as will be obvious. Rods 9, sustained in the brackets 5, serve as warp-rests and are located at the back and front of the two banks of detectors, respectively.

Referring to Fig. 2, it will be seen that the brackets are secured to the loom sides at their upper and lower ends, being bolted to stands 10 and $10^{\times}$, thereby leaving an open space for the lay-pitman A′, Fig. 1, while rigidly supporting the brackets and the parts sustained thereby. A rock-shaft 11 is supported in suitable bearings in the lower ends of the brackets and has fast upon it arms 12, which carry the feeler formed by a longitudinal bar 13, secured to the ends of said arms and having feeling edges 14, the feeler vibrating below the separator 6 and the back-stops 8 when the rock-shaft is oscillated. One of the edges 14 is adapted to engage a released detector in the front bank when the feeler is swung to the left, Fig. 4, while the other edge 14 engages a released detector in the rear bank on the opposite stroke of the feeler, arrest on either stroke causing the actuation of the stopping means for the loom, as will be described. A collar 15, loose on the shaft and having an attached arm 16, has secured to it one end of a spring 17, Fig. 2, coiled around the shaft and secured at its other end to an inclosing sleeve 18, fixedly attached to the shaft, the spring forming a yielding connection between the shaft and the collar. On its inner face the collar has a lug 19, Figs. 2 and 3, which at times coöperates with a lug 20 on an adjacent collar 21, fast on the rock-shaft. Rotation of the collar 15 in the direction of the arrow 22, Fig. 4, turns the rock-shaft by or through the spring 17 and not through the lugs, so that if the shaft is stopped, as by arrest of the feeler, the collar 15 can continue to turn through its full arc of movement, the lugs 19 and 20 then separating. The lugs are so set angularly that when the collar 15 is turned opposite the direction of the arrow 22, Fig. 4, its lug will engage the lug 20 and turn the collar 21 and rock-shaft therewith. A transmitting member or link 23 is pivotally connected at its upper end with the arm 16 and at its lower end with a follower 24, Fig. 1, having a fixed fulcrum 25 and coöperating with a feeler-cam C on the cam-shaft $C^{\times}$, a spring $s^{\times}$, connected with the follower, maintaining it normally in coöperation with the cam.

Referring to Fig. 1, it will be seen that the backward stroke of the feeler is due to the spring $s^{\times}$, while its opposite or forward stroke is effected by the cam C, the link 23 rising on the cam-induced stroke and descending on the spring-induced stroke. If on its forward stroke the feeler engages and is arrested by a released detector in the front bank, the rock-shaft 11 will of course be stopped with the feeler; but the transmitting-link 23 continues to rise, and the spring 17 yields to permit such rise and corresponding angular movement of the collar 15 after stoppage of the shaft. On the other hand, when the spring $s^{\times}$ is lowering the link 23 the lug 19 is then in engagement with the lug 20 on the collar 21 and the rock-shaft is turned rearwardly; but if on such rearward stroke of the feeler it engages and is arrested by a released detector in the rear bank the spring $s^{\times}$ will be held stretched and the outer end of the follower 24 will be kept away from the cam. It will thus be seen that upon feeler arrest on one stroke the yielding connection formed by spring 17 comes into play, while arrest on the opposite stroke of the feeler is accommodated and provided for by the spring $s^{\times}$.

An elongated and outwardly-bent arm 26 (clearly shown in Fig. 2) is fixedly attached to the feeler rock-shaft 11 and is pivotally connected with one end of a link 27, which is carried forward adjacent the inner face of the loom side A to an arm 28, rigidly secured to a short horizontal rock-shaft 29, mounted in an elongated bearing 30, forming part of a bracket 31, secured to the front of the loom side.

At the outer end of the bearing 30 the rock-shaft 29 has a rigidly-attached and rearwardly-extended arm 32, longitudinally slotted at 33 to receive a short loop-like link 34, pivotally connected above its fulcrum with a dog 35, fulcrumed at 36 on the lower end of the knock-off lever h, the dog when in operative position being adapted to engage a bunter $a^{\times}$ on the lay. When the dog is so positioned as to engage with the bunter, the lay as it beats up will push forward said dog, and thereby rock the knock-off lever on its fulcrum h' to release the shipper from its holding-notch to stop the loom.

Referring to Fig. 1, it will be seen that the rock-shaft 29 is parallel to the feeler rock-shaft and that the arms 26 and 28 are in substantial parallelism, so that they swing back and forth in unison, the oscillation of the feeler rock-shaft effecting the corresponding oscillation of the short shaft 29. By means of the loop-like link 34 the dog 35 is moved into and out of the bunter-path at each stroke of the feeler, and unless the feeler is arrested the dog will be out of the feeler-path on each forward beat of the lay. Upon arrest of the feeler, however, the connections between it and the dog operate to position the dog in the path of the bunter to coöperate therewith and effect release of the shipper, as has been de-

scribed. The slot 32 affords the proper clearance for the rocking movement of the knock-off lever at the time of shipper-release.

It is very desirable to free the arresting-detector from feeler-pressure as soon as possible after the actuation of the stopping means has been effected, to thereby leave such detector free to be returned to proper position by the weaver after the warp fault has been corrected and also to avoid any unnecessary continuance of the feeler-pressure on the detector. I have provided means herein to effect such operation by automatically centralizing the feeler upon actuation of the stopping means. To this end the lower end of the bracket 31 is provided with a bearing 37, Fig. 1, in which is mounted a rock-shaft 38, having attached to it a centering-cam 39 and a controller 40, the latter normally bearing against the edge of the shipper, as shown in Fig. 2, and thereby maintaining the centering-cam in normal position, as shown in said figure. This centering-cam is made as an open casting having a central locking-depression 41 and converging cam-faces 42 43 above and below the depression, respectively. A spring $S^{\times}$, fixedly secured to the loom-frame at one end, is connected at its other end with an arm 44, (see dotted lines, Fig. 2,) forming a part of the controller 40, the spring holding the controller against the shipper and acting to throw the cam 39 to the right, viewing Fig. 2, when the shipper is released. A finger 45, fast on the rock-shaft 29, extends through the opening in the cam, and as the rock-shaft oscillates the finger vibrates in a vertical plane; but when the shipper is released it frees the controller 40 and permits the spring $S^{\times}$ to throw the cam to the right, so that one or the other of the faces 42 or 43 will engage the finger and direct it into the locking depression 41. When the finger is so located, the feeler will be in central position and retracted from whichever one of the detectors it had previously engaged. When the shipper is returned to running position, it acts through the controller 40 to rock the shaft 48 and automatically return the centering-cam to the position shown in Fig. 2. Of course when the feeler is centered, as has been described, the weaver can lift the arresting-detector after piecing up or otherwise correcting the faulty warp.

It is a matter of considerable convenience to be able to determine quickly the cause of loom stoppage and, if such stoppage is due to a warp fault, to readily locate the bank of detectors in which lies the arresting-detector, and I have provided means whereby this may be easily accomplished. The cam 39 is provided with an upturned handle 46, and the pin 45 has a lateral handle 47. When the loom is stopped, the finger will be in the locking-depression 41 of the cam, and the weaver grasps the handle 46 and throws the cam into its normal position, thereby freeing the finger 45. He now by means of the handle 47 vibrates the finger, and if it can vibrate freely the weaver knows that stoppage is not due to a warp fault. On the other hand, if stoppage is due to a warp fault the movement of the finger will be arrested either on its upward or its downward stroke, according to which bank of detectors contains the one which arrests the feeler. If the arresting-detector is in the rear bank, the finger cannot be fully raised, whereas its downward movement will be restricted if the released detector is in the front bank. This indicating device is of great value on a broad loom because of the great number of detectors employed, for it saves the weaver much time if he can tell instantly whether or not stoppage is due to warp failure and, if it is, where the arresting or released detector is located, whether in the front or the rear bank.

In the construction herein shown the feeling stroke of the feeler is effected when the detector is lifted by the movement of its warp-thread in the upper plane of the shed, as will be manifest from an inspection of Fig. 1, the slot 2 in each detector being of ample length to permit the dropping of a released detector into proper arresting position at such time. This is of value when it is desired to weave with slack warp-threads, because slackness of the threads will not cause the detectors to move into arresting position, and thereby cause unnecessary stoppages of the loom. If it is desired to alter the feeler-action so that it will feel when the detectors are depressed by movement of their warp-threads into the lower plane of the shed, it is only necessary to adjust the feeler-cam by giving it an angular rotation of one hundred and eighty degrees on its shaft from the position shown herein.

My invention is not restricted to the precise construction and arrangement herein shown and described, as the same may be modified or varied in various particulars 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 stop-motion-controlling detectors maintained inoperative by intact individual warp-threads, a feeler to cooperate with and be arrested by a released detector, loom-stopping means adapted to be actuated by or through arrest of the feeler, and means the operation whereof is dependent upon the actuation of the stopping means to free the arresting detector from feeler-pressure.

2. In a loom, a series of stop-motion-controlling detectors maintained inoperative by intact individual warp-threads, and reciprocated vertically thereby during the formation of the shed, a vibratable feeler to coöperate with and be arrested by a released detector, loom-stopping means adapted to be actuated

by or through such feeler arrest, and means operated by actuation of the stopping means to centralize the feeler automatically and free the arresting-detector from feeler-pressure.

3. In a loom having harnesses to effect the formation of the shed, a series of longitudinally-slotted stop-motion detectors located behind the harnesses and each normally maintained inoperative by a single warp-thread, change of shed effecting reciprocatory movement of the detectors, a vibratable feeler to engage and be arrested by a dropped detector, loom-stopping means the actuation whereof is caused by or through feeler arrest, a centering-cam, connections between it and the feeler, and means to operate said cam automatically upon the actuation of the stopping means, to centralize the feeler and free the arresting-detector from feeler-pressure.

4. In a loom provided with shed-forming devices and a shipper, in combination, a series of single-thread warp-stop-motion-controlling detectors, a vibrating feeler to coöperate with and be arrested by a released detector, shipper-releasing means actuated by or through arrest of the feeler, and means, including a member operated through release of the shipper, to withdraw the feeler from and thereby free the arresting-detector.

5. In a loom provided with shed-forming devices and a shipper, in combination, two banks of single-thread warp-stop-motion-controlling detectors, a vibrating feeler to coöperate with and be arrested by a released detector in either bank, shipper-releasing means actuated by or through arrest of the feeler, and feeler-centering means, including a spring-actuated member maintained inoperative by the shipper when in running position, to center the feeler and thereby free the arresting-detector from pressure.

6. In a loom provided with shed-forming devices and a shipper, in combination, two banks of single-thread warp-stop-motion-controlling detectors, arranged in parallelism behind the shed-forming devices and vertically reciprocated by the warps in the formation of the shed, a vibrating feeler to engage and be arrested by a released detector in either bank, shipper-releasing means actuated by or through arrest of the feeler, and feeler-centering means, including a centering-cam, an operating-spring therefor, and a controller coöperating with the shipper to maintain the cam inoperative until release of the shipper, operation of the centering means causing the feeler to free the arresting-detector from pressure.

7. In a loom provided with stopping means, in combination, two banks of stop-motion-controlling detectors each governed by a single warp-thread, a vibrating feeler to engage and be arrested by a released detector in either bank, connections between the feeler and the stopping means to effect the actuation of the latter by or through arrest of the former, and manually-operated means to indicate in which bank the released detector is located.

8. In a loom provided with stopping means, in combination, two banks of stop-motion-controlling detectors each governed by a single warp-thread, a vibrating feeler to engage and be arrested by a released detector in either bank, connections between the feeler and the stopping means to effect the actuation of the latter by or through arrest of the former, means rendered operative by actuation of the stopping means to centralize the feeler automatically and thereby free the arresting-detector from feeler-pressure, and a manually-operated device acting through the centering means to indicate in which bank the arresting-detector is located.

9. In a loom, a lay having a bunter, a shipper, a knock-off lever therefor having a dog pivoted thereon to at times coöperate with the bunter, a vibrating feeler to engage and be arrested by a released detector, two banks of stop-motion-controlling detectors each governed by a single warp-thread, connections, including a vibrating finger, between the feeler and dog to normally rock the latter out of the bunter-path, arrest of the feeler positioning the dog to be engaged by the bunter, and feeler-centering means, including a spring-actuated cam maintained inoperative by the shipper when in running position, actuation of the cam upon shipper release causing the finger to center the feeler and thereby free the arresting-detector from feeler-pressure.

10. In a loom, a lay having a bunter, a shipper, a knock-off lever therefor having a dog pivoted thereon to at times coöperate with the bunter, a vibrating feeler to engage and be arrested by a released detector, two banks of stop-motion-controlling detectors each governed by a single warp-thread, connections, including a vibrating finger, between the feeler and dog to normally rock the latter out of the bunter-path, arrest of the feeler positioning the dog to be engaged by the bunter, and feeler-centering means, including a cam having a locking-depression, a spring to move the cam into coöperation with the finger, to cause the latter to enter the depression and lock the feeler in mid-position, to thereby free the arresting-detector from pressure, and a controller fixedly connected with the cam, the shipper when in running position coöperating with the controller and thereby maintaining the cam inoperative.

11. In a loom, a lay having a buntèr, a shipper, a knock-off lever therefor having a dog pivoted thereon to at times coöperate with the bunter, a vibrating feeler to engage and be arrested by a released detector, two banks of stop-motion-controlling detectors each governed by a single warp-thread, connections, including a vibrating finger, between the feeler and dog to normally rock the latter out of the

bunter-path, arrest of the feeler positioning the dog to be engaged by the bunter, and means to free the arresting-detector from feeler-pressure, said means including a cam maintained inoperative by the shipper when in running position and adapted when operative to coöperate with the finger and move it into position to center the feeler, manual movement of said cam into inoperative position when the loom is at rest permitting vibration of the feeler to indicate in which bank the released detector is located.

12. In a loom having a shipper, and a knock-off lever therefor, in combination, two banks of stop-motion-controlling detectors governed by single warp-threads and vertically reciprocated thereby in the formation of the shed, a feeler vibratable below said detectors and adapted to be arrested by engagement with a released detector of either bank, a rock-shaft on which the feeler is mounted, a cam to turn the rock-shaft in one direction and a spring to turn it in the opposite direction, a single transmitting member between the cam and spring and the rock-shaft, a yielding connection between the latter and said transmitting member, angular adjustment of the cam causing the feeler to feel when the warp-threads are in the upper or lower plane of the shed, as desired, and means to operate the knock-off lever upon arrest of the feeler by a released detector.

13. In a loom, stopping means therefor, a rotatable shaft, and a feeler-cam thereon, combined with stop-motion-controlling detectors governed by single warp-threads and vertically reciprocated thereby in the formation of the shed, a feeler located below and adapted to engage and be arrested by a released detector, to thereby cause the actuation of the loom-stopping means, and connections between the feeler-cam and feeler to normally vibrate the latter, angular adjustment of the cam on the rotatable shaft effecting the feeling stroke of the feeler when the warp-threads are in the upper or the lower plane of the shed, as desired.

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

CHARLES E. CHASE.

Witnesses:

GEORGE OTIS DRAPER,

ERNEST W. WOOD.