H. I. HARRIMAN.

WARP STOP MOTION FOR LOOMS.

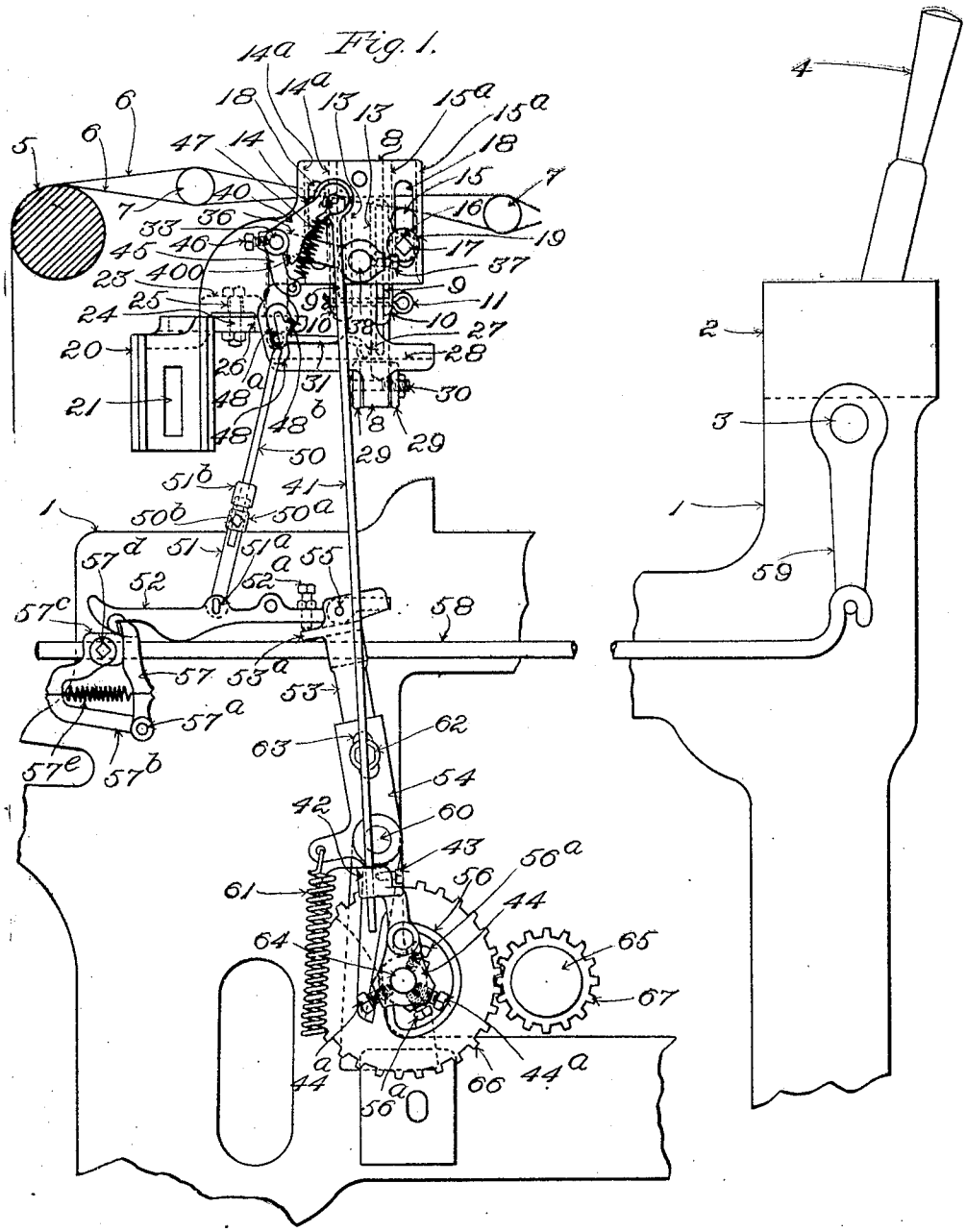
APPLICATION FILED JUNE 29, 1907.

1,032,542.

Patented July 16, 1912.

2 SHEETS—SHEET 1.

Fig. 1.



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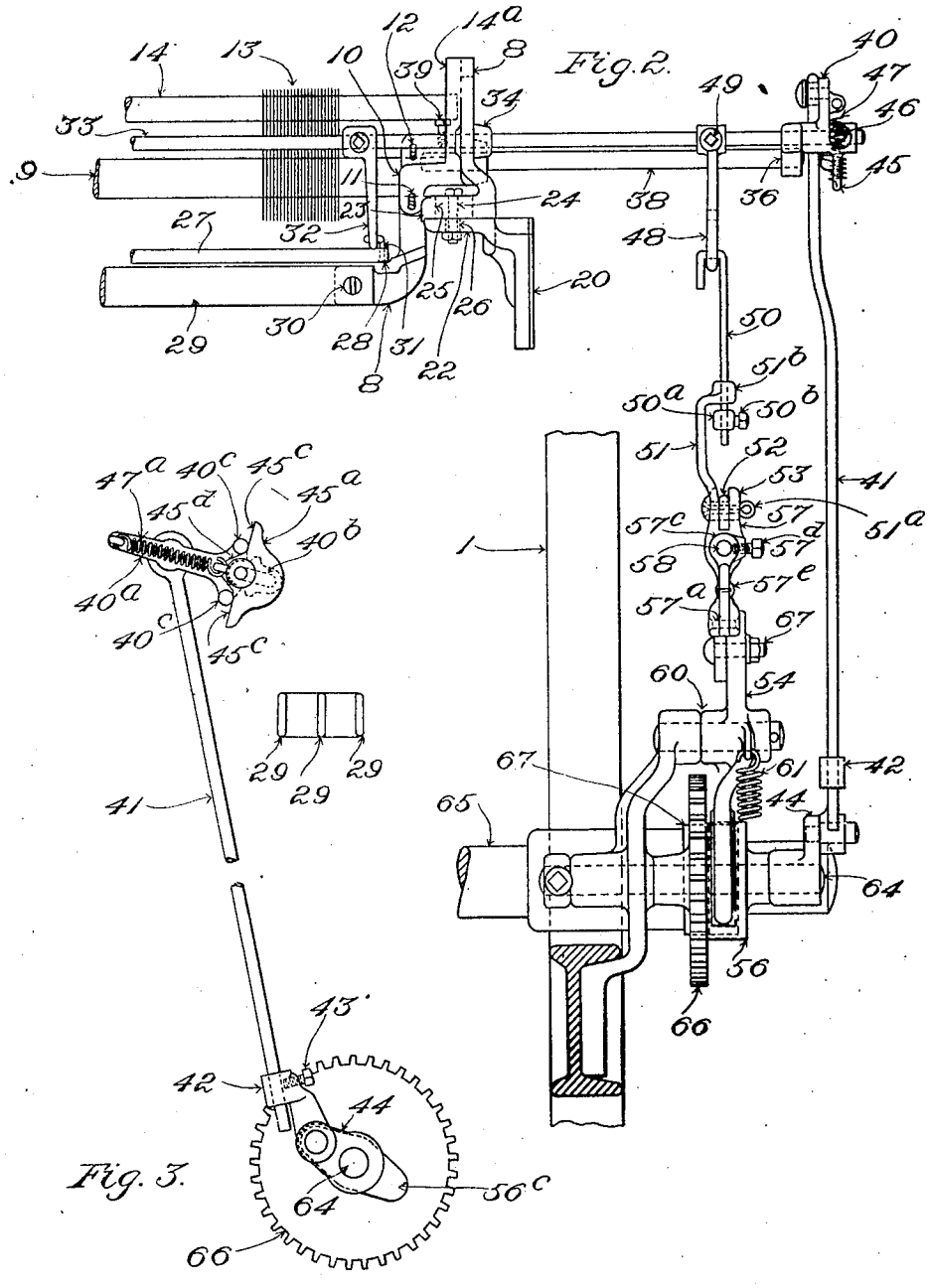

Fig. 2.

Fig. 3.

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UNITED STATES PATENT OFFICE.

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WARP STOP-MOTION FOR LOOMS.

1,032,542. Specification of Letters Patent. Patented July 16, 1912.

Application filed June 29, 1907. Serial No. 381,461.

To all whom it may concern:

Be it known that I, HENRY I. HARRIMAN, a citizen of the United States, residing at Hyde Park, in the county of Norfolk, State of Massachusetts, have invented a certain new and useful Improvement in Warp Stop-Motions for Looms, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention relates to mechanical warp stop motions for looms. A warp stop motion of this class comprises, as is well known, a moving feeler, movable detectors which are controlled as to their positions by the warp-threads with which they are engaged, and held out of the path of movement of the feeler so long as such threads remain unbroken and under proper tension, and devices by means of which the working of the loom is arrested when the feeler in its movement engages with a detector that has changed its position in consequence of breaking or undue slackening of the corresponding warp-thread.

The invention consists, further, in improved means for actuating the unshipping devices of a loom under control of the feeler.

In accordance with this portion of the invention, the feeler-actuating rockshaft is furnished with two arms, one of which is fixed thereto while the other is spring-held and yielding, and the said rockshaft is rocked by means of a rotating actuator (preferably constituted by a crank) that is operatively connected with the said spring-held or yielding arm. The fixed arm is connected loosely by means of a longitudinally adjustable link with a catch that is pivoted to a moving carrier which is operated by a rotating actuator (preferably constituted by a cam). The loom unshipping connections have applied thereto a dog adapted to be engaged by the catch, the said catch engaging with the said dog when the feeler and rockshaft are arrested in their movement by a dropped detector in the path of the feeder, and the engagement of the catch with the dog operating the said unshipping connections to bring about the unshipping of the loom.

The invention consists, further, in means for rendering the warp stop motion at will and for any desired length of time during the operation of the loom, ineffective to operate the unshipping devices. In accordance with this portion of the invention I provide means for putting the pivoted catch aforesaid out of action as long as it may be desired to render the warp stop motion ineffective during the weaving. In the preferred embodiment of the invention I form the fixed arm of the feeler-actuating rockshaft with a notch into which the link aforesaid may be hooked for the purpose of holding the catch elevated entirely out of reach of the dog of the unshipping connections.

Another portion of the invention consists in provisions for yielding interaction of the catch and dog aforesaid whereby one of such parts shall be permitted to yield to avoid breakage or other injury in case the catch should be in engagement with the dog at a time when the shipper devices are operated to start up the loom.

Another portion of the invention consists in improved actuating mechanism for the working parts of a warp stop motion designed with especial reference to enabling the timing of the said parts to be adjusted, and in particular to enabling the unshipping of the driving power of a loom to be so timed as to cause the loom to come to rest with the lay, etc., in predetermined positions. In accordance with this portion of the invention I connect the actuator (preferably constituted as aforesaid by a crank) for the feeler, and the actuator (preferably constituted as aforesaid by a cam) for the carrier of the catch, to rotate in unison, and connect them by gearing with the cam-shaft of the loom whereby the said actuators are driven from the said cam-shaft, and I furnish provisions for independently setting the said actuators to adjust the timing thereof with relation to each other and to the general operation of the loom. Thereby the actuators may be set to secure the required timing in the interaction of the catch and dog, and also in the unshipping of the driving power so as to cause the working parts of the loom to come to rest with the lay, etc., in predetermined positions.

Embodiments of the various features of the invention are shown in the drawings, in which latter,—

Figure 1 shows in side elevation a warp stop motion in which the said features are embodied, and a portion of the frame of a loom, only such parts being shown as are necessary for making clear the nature of the

invention. Fig. 2 is a view mainly in elevation, looking from the left hand side in Fig. 1. Fig. 3 shows a modification.

Having reference to the drawings,—a portion of the frame of a loom is shown at 1, the breast-beam being located at 2.

At 3 is a shipping rockshaft which extends crosswise of the loom beneath the breast-beam, and at 4 is a shipper-handle which is fixed upon the said rockshaft for use in turning the latter by hand.

The whip-roll is represented in vertical cross-section at 5, Fig. 1, and at 6, 6, are indicated warp-threads passing around the whip-roll and extending therefrom toward the front of the loom.

At 7, 7, are indicated warp-separating rods, alternate warp-threads being passed over these rods and the others beneath them. The forward rod 7 constitutes one of the lease-rods.

At 8 is the warp stop motion stand pertaining to one side of the loom, a companion stand (not shown) being located at the opposite side of the latter in practice, and at 9, 9, are the detector-supporting bars, they consisting of flat bars extending crosswise of the loom with their edges vertical. The bars 9, 9, are held in position by having their ends entered within vertical slots made in ears 10, 10, projecting from the stand 8 toward the middle of the loom, whereby the bars are prevented from turning over, the said ends resting upon a cotter-pin 11 that extends horizontally through holes in the lower portions of the said ears, whereby the bars are supported vertically, and the bars being prevented from rising by a cotter-pin 12 passing through holes in the upper portions of the said ears, above the ends of the bars. The removal of the pin 12 permits the bars, or either of them, to be removed and replaced when necessary.

At 13, 13, are detectors consisting of strips of highly elastic sheet-metal, slotted longitudinally, strung on the respective bars 9, 9, and respectively hung upon the individual warp-threads.

At 14, 15, are supporting-rods for the warp-threads, to uphold the latter so as to prevent them and the detectors from sagging, located at front and rear, respectively, of the lines of detectors, and held in position by having their ends entered between vertical guide ribs 14^a, 14^a, and 15^a, 15^a, projecting toward the middle of the loom from the inner side of the warp stop motion stand. Each of the said supporting-rods is supported vertically by means of a small block 16, fitting between two of the said guide-ribs and held in place by means of a bolt 17 which occupies a vertical slot 18 in the upright web of the stand 8, a washer 19 being applied to the said stem between the head of the said bolt and the outer face of the stand. The vertical slot 18 enables the block 16, and supporting-rod 14, or 15, to be adjusted vertically higher or lower to locate the said supporting-rods at the proper heights for the respective planes of warp-threads which rest upon the respective rods. For the sake of clearness, the block 16 for the left-hand rod, and its securing means, have been omitted from the drawings.

At 20 is a so-called intermediate stand having an upright portion which is slotted vertically at 21 for the bolt or bolts by which the same is secured in practice to the whip-roll stand, and having horizontal shelf 22 upon which the foot 23 of the warp stop motion stand 8 rests. The stand 8 is secured to the stand 20 by means of the bolt 24 passing through slots 25 and 26, respectively, which are formed in the said foot and table, respectively. Slot 25 extends transversely with reference to the loom and slot 26 extends in the direction from front to rear, these two slots providing for universal adjustment in a horizontal plane, and the slot 21 of the intermediate stand providing for vertical adjustment of the said intermediate stand and the warp stop motion stand 8.

As thus far described, the parts are not in themselves of the gist of the invention.

At 27 is the feeler, and at 28 is one of the guide-ways which I provide for supporting the said feeler in position and guiding it in its movements. The said guide-way is shown formed in connection with the lower portion of the warp stop motion stand 8. The guide-ways extend horizontally in the direction from front to rear in the loom, and on them the feeler is adapted to slide back and forth. The guide-way shown in Figs. 1 and 2 is located immediately above the upper edge of the back-stop bars 29, 29, and in equally close proximity to the edges of both of the latter. The said back-stop bars are supported at the side of the loom which is shown in Figs. 1 and 2 by the inwardly extending lower extremity of the stand 8, to which extremity the ends thereof are made fast by means of a bolt 30, and are similarly supported at the other side of the loom.

For the actuation of the feeler, it is connected by links, one of which is shown at 31, with arms, one of which is shown at 32, fixed upon a rockshaft 33 extending across the loom at one side of the lines of detectors. The feeler-actuating rockshaft 33 is supported by bearings 34 with which the warp stop motion stands are formed, and at the side of the loom shown in the drawings it is extended outward beyond the said bearing for the convenient connection therewith of the devices by means of which it is rocked, and also of the devices by means of which the unshipping of the loom is brought about. This extended portion of the rockshaft, near

its extremity, is sustained by a bearing formed in an arm 36 which is secured by a clamping-screw 37 upon the outer end of a long pin 38 having its inner end seated in a socket in the stand 8 and secured therein by a clamping-screw 39.

The devices by which the rockshaft 33 is rocked comprise an arm, designated 40 in Figs. 1 and 2, which is mounted upon the said rockshaft, a connecting-rod 41 having its upper end connected pivotally to the said arm, a connector 42 having a sleeve through which the lower end of the said connecting-rod extends, and within which sleeve the said rod is clamped by a clamping-screw 43, and a rotating actuator constituted by the crank 44, to the crank-pin of which the said connector is pivotally hung. The said devices are made yielding, in order that, when the feeler in its reciprocation encounters a dropped detector and presses the lower end of the latter against a back-stop bar 29, as indicated in Fig. 1, the sliding movement of the feeler in that direction, and consequently the turning movement of the rockshaft 33, may be arrested. To this end, a spring is interposed in the train of connections and when the resistance by which the sliding movement is opposed becomes sufficient to overcome the tension of the said spring, the latter yields. In Figs. 1 and 2 the arm 40 is loosely hung upon the rockshaft 33, between the bearing at the end of the arm 36 and the hub of an arm 45 which is fixed by means of a clamping-screw 46 upon the outer extremity of the rockshaft, and a contracting spiral spring 47 has one end thereof engaged with the said loosely hung arm 40 and the other end thereof engaged with the said fixedly mounted arm 45. The said spring operates to hold a shoulder 400 of the loose arm 40 and a portion of the fixed arm 45 pressed together so that movement transmitted to arm 40 causes rockshaft 33 to turn in unison with such arm 40 except when, in the movement of the feeler from left to right in Fig. 1, the feeler encounters a dropped detector and is held from further movement in that direction by the resistance offered by the back-stop against which the detector takes bearing. In this event, the corresponding turning movement of the rockshaft being arrested, the spring 47 yields and permits arm 40 to move relatively upon the rockshaft, as represented in the said figure. When subsequent movement of arm 40 in the opposite direction takes place, the tension of the spring 47 operates to restore the shoulder 400 to its bearing against the fixed arm 45. In Figs. 1 and 2, in which only two back-stop bars 29, 29, are employed, one at the right hand side of each line of detectors, the arm 40 is intended to yield only during the stroke of the feeler from left to right in such figure. It is not necessary that the arm should yield in the movement of the feeler from right to left, because the stroke from left to right does not carry the feeler quite to the right hand stop-bar, and consequently, a detector of the right hand line cannot drop down at the left hand side of the feeler so as to arrest the return stroke of the latter to the left, and should a detector of the left hand line drop while the feeler is at the right hand of such line, the feeler in its movement to the left will bend the lower end of the dropped detector ahead of it toward the left until, there being no back-stop bar at the left hand side in position to prevent such bending, the feeler passes out from under such detector. The arm 40 of Figs. 1 and 2, therefore, needs to yield only during the stroke of the feeler from left to right in such figures. The feeler of Figs. 1 and 2, it will be perceived, makes its detecting stroke in one direction only.

Fig. 3 shows a construction designed for employment with three back-stop bars 29, 29, 29, and in which the arm 40^a is arranged to yield in case of encounter of the feeler with a dropped detector in the movement of the feeler in either direction. In Fig. 3, the said arm has an extension which is formed with a longitudinal slot 40^b that accommodates the rockshaft 33, and with contact-projections 40^c, 40^c, at opposite sides of the said slot. A piece 45^a fixed upon the outer end of the rockshaft has opposite bearing faces 45^c, 45^c, and an intermediate triangular projection 45^d. A contracting spiral spring 47^a has one end thereof engaged with the outer extremity of arm 40^a and the other thereof with the fixed piece 45^a. The tension of the said spring operates to hold the two contact-projections 40^c, 40^c, squarely against the two bearing faces 45^c, 45^c, at opposite sides of the triangular projection 45^d, which enters between the said contact-projections and operates to prevent undesired angular displacement of the arm 40^a. So long as the feeler is not opposed in its reciprocatory stroke in either direction, the rockshaft 33 is caused to rotate in unison with arm 40^a by the tension of the spring. In case, however, the feeler encounters a dropped detector in its movement in either direction, it first presses such detector against the back-stop bar which is in position to oppose the movement of the detector with the feeler, and then its movement and that of the rockshaft is stopped, whereupon spring 47^a yields, permitting the arm 40^a to turn relative to the rockshaft. In thus turning the said arm swings upon the point of contact between the leading contact-projection 40^c and the corresponding bearing-face 45^c, the slot 40^b permitting

the arm 40ª to shift lengthwise somewhat with relation to the rockshaft. When subsequent movement of arm 40ª in the other direction relieves the tension of spring 47ᶜ, the said spring causes the arm 40ª to recover its normal position, with both contact-projections 40ᶜ, 40ᶜ, resting squarely upon the bearing-faces 45ᶜ, 45ᶜ. When the devices of Fig. 3 are employed, each movement or stroke of the feeler in either direction is a feeling stroke.

The devices by which the unshipping of the loom is brought about when the feeler and feeler-actuating rockshaft are arrested in their movement by a dropped detector in the path of the feeler comprise an arm 48 which is fixed upon the rockshaft 33 by a clamping-screw 49, an extensible link 50, 51, the upper portion 50 of which is engaged with the said arm, a catch 52 with which the lower portion 51 of the said link is pivotally connected, a movable carrier 53, 54 to which the said catch is pivoted at 55, a rotary actuator 56 in operative control of the said carrier, a dog 57 adapted to be engaged by the said catch, an unshipping rod 58 upon which the said dog is mounted, and an arm 59 fixed upon the shipper rockshaft and having the forward end of the said rod connected therewith. The said rotary actuator is, in this instance a cam, and the carrier comprises a member 54, mounted pivotally at 60 and engaged by a contracting spiral spring 61, by the tension of which the lower arm of such member is held in contact with the face of the said cam. The upper member 53 of the carrier is fitted to the upper arm of the lower member with capacity for longitudinal adjustment thereon, and is clamped in the position to which it has been adjusted upon the said arm by means of a screw 62, the stem of which passes through a longitudinal slot 63 formed in the arm. The vibratory motion that is communicated to the carrier causes the catch to move back and forth with relation to the dog 57. The connection of the catch with the fixed arm 48 of the feeler-actuating rockshaft by means of the link operates to raise the engaging portion of the catch above the dog as the feeler completes its feeling stroke. The actuator for the feeler and that for the catch are so timed, and the parts are so set and adjusted, that each time the feeler is caused to make its feeling stroke the catch is caused to make its stroke in the direction to engage the dog connected with the unshipping rod, but so long as the feeler is permitted to complete its said stroke the catch is lifted by its connections with the feeler rockshaft 33, so as to prevent it from engaging with the said lug. When, however, the feeler is arrested before the completion of its feeling stroke, the catch is not lifted, and the latter, as it is moved by the action of the corresponding actuator upon its carrier, engages with the dog as in Fig. 1, and imparts endwise movement to the unshipping rod 58 in the direction to turn the shipper rockshaft and unship the driving power of the loom. The link by which the catch 52 is operatively connected with arm 48 of the feeler rockshaft comprises a lower member or connector 51 which is pivotally hung to the catch at 51ª and provided at its upper end with a perforated guide 51ᵇ, and an upper member 50 formed of wire having its upper end hook-shaped to enter the slot 48ª of arm 48, the lower end of said wire passing through the hole of the said guide 51ᵇ and having applied thereto below the guide a collar 50ª which is fixed adjustably in position thereon by a clamping screw 50. The adjustability of the said collar enables the operative length of the link to be varied, so that the height of the engaging portion of the moving catch with relation to the engaging portion of the dog may be adjusted to secure the proper interaction between the two, and so, also, that such length may be made to suit the height to which the intermediate stand and warp stop motion stand are adjusted in the loom.

For the purpose of putting the pivoted catch out of action temporarily during the weaving, as for instance when it is desired that the loom shall be run continuously while weaving past a break-out in the warp-threads occasioned by a smash, the arm 48 is formed with a notch or recess 48ᵇ extending off from the slot 48ª at a height such that when the top end of the upper member 50 of the link is lifted up into the said notch or recess the catch 52 will be held raised sufficiently high at all times to prevent it from engaging with the dog 57. Until the top end of the said link-member 50 is dropped into the lower end of slot 48ª the unshipping action of the warp stop motion devices will be suppressed. When the weaving has progressed so far that the ends of all the broken warp-threads extending forward to the break from the warp-beam have been woven in, the disengagement of the said top end from the said notch or recess will render the warp stop motion devices effective once more to arrest the working of the loom in case of breakage or undue slackening of a warp-thread.

For the purpose of avoiding breakage or other injury in case the catch and dog should be in engagement with each other at a time when the shipper devices are operated to restart the weaving instrumentalities, the dog 57 is pivoted at 57ª upon an arm 57ᵇ projecting from a collar or hub 57ᶜ mounted upon unshipping rod 58 and fixed in place thereon by a clamping-screw 57ᵈ. The body of the dog is held normally against one end of the said collar or hub

by the tension of a contracting spiral spring 57^e, one end of which is engaged with the dog and the other with the said arm 57^b. The spring is strong enough to hold the dog from yielding when the catch engages therewith in the regular working of the mechanism, and to cause the required movement to be transmitted to the unshipping rod and shipper-devices for unshipping the driving power. However, should the catch and dog happen to be in engagement with each other at a time when the shipper-devices are actuated to restart the weaving instrumentalities, as for instance in a weft replenishing loom in which the action of the weaving instrumentalities is arrested for the performance of the replenishing operations and automatically restarted after they have been performed, the spring will permit the dog to yield.

For the actuation of the rotary actuator (crank) for the feeler-devices, and of the rotary actuator (cam) for the catch, the crank 44 and cam 56 are fixed upon a short rotating shaft 64 which is operatively connected with the cam-shaft 65 of the loom by means of a spur-gear 66 fixed upon the said shaft 64, and a spur-pinion 67 fixed upon the cam-shaft. For the purpose of enabling the said actuators to be set to adjust the timing thereof with relation to each other and to the general operation of the loom, each thereof is fixed upon the shaft 64 by means of two clamping-screws, those employed in connection with the hub of the crank being designated 44^a, 44^a, and those employed in connection with the cam being designated 56^a, 56^a. After loosening the screws of the respective pairs, the crank and cam may be given any desired angular shift around the shaft 64, and then be secured in the position of adjustment by tightening up such screws again.

The proportions between the spur-gear 66 of the warp stop motion shaft 64 and the driving spur-pinion 67 on the cam-shaft 65 of the loom are as 2 to 1. Consequently, the said warp stop motion shaft makes one rotation to each two rotations of the said cam-shaft and each four rotations of the crank-shaft of the loom. The crank 44 of Figs. 1 and 2 occasions one complete reciprocation of the feeler in each rotation thereof, while the cam 56 produces the engaging stroke of the catch 52 only as the feeler moves from left to right. Consequently the detecting stroke of the feeler takes place once every four picks. The cam 56^c of Fig. 3 has two opposite throws, producing an engaging stroke of the catch every two picks, that is to say, for each stroke of the feeler in either direction, and hence the construction shown in Fig. 3 will act more promptly in occasioning the unshipping of the loom after breakage of a warp-thread occurs.

To prevent the catch 52 from dropping too low in its descending movement permitted by the swing of arm 48 of the feeler-actuating rockshaft 33, it is provided with an adjustable contact-screw 52^a that is adapted to take bearing against the upper surface of a shelf 53^a forming part of the upper member 53 of the carrier for the said catch. By turning the said contact-screw, the limit of the descending movement of the engaging end of the catch may be adjusted to suit the height of the upper end of the dog, thus making it possible to prevent the said end of the catch from dropping below the said end of the dog.

I claim as my invention:—

1. In a warp stop motion, in combination, a vertically adjustable warp stop motion stand, detectors mounted therein, a feeler, a feeler-actuating rockshaft supported by the said stand, a yielding arm connected with said rockshaft, means for operating the arm to actuate the rockshaft, unshipping devices, a moving carrier, a catch and dog for interengagement to actuate the said unshipping devices, one thereof connected with the said unshipping devices and the other with the said carrier and operated thereby, and connections, including a longitudinally adjustable link through which one of the said interengaging elements is controlled as to its position from the said feeler-actuating rockshaft.

2. In a warp stop motion, in combination, the feeler, the feeler-actuating rockshaft having a yielding arm and a fixed arm, a crank operatively connected with the said yielding arm, a moving carrier, a cam actuating the said carrier, unshipping connections, a catch and dog for interengagement to actuate the unshipping connections, one thereof connected with the latter and the other with the said carrier, and a longitudinally adjustable link connecting said fixed arm with one of the said interengaging elements, whereby the position of the latter is controlled.

3. In a warp stop motion, in combination, a feeler, unshipping devices, a catch and dog for interengagement to actuate the said unshipping devices, controlled as to such interengagement through the action of the feeler, means for causing one thereof to feel for the other thereof regularly during the working of the loom, and means to prevent interengagement at will.

4. In a warp stop motion, in combination, the feeler, the feeler rockshaft having the slotted arm, unshipping devices, a catch and a dog for interengagement to actuate the said unshipping devices, and a link connecting one of the said interengaging elements with the slotted arm, the said arm having the notch or recess for said link whereby the said interengagement may be suspended to

render the warp stop motion temporarily ineffective.

5. In a warp stop motion, in combination, a feeler, unshipping devices, a catch and dog for interengagement to actuate the said unshipping devices, controlled as to the said interengagement through the action of the feeler, and having provisions for yielding interaction to obviate breakage in case the catch should be in engagement with the dog at a time when the shipper-devices are operated to start up the loom.

6. In a warp stop motion, in combination, a feeler, an unshipping device, the yielding dog connected with the said device, the catch controlled as to its engagement with said dog through the action of the feeler, and means to actuate the said catch the said dog giving way in case the catch should be in engagement with the dog at a time when the shipper-devices are operated to start up the loom.

7. In a warp stop motion, in combination, the feeler, the unshipping devices, a dog connected with the said unshipping devices, a catch for engagement with said dog, the said catch and dog engaging with each other under control of the feeler, a carrier for the said catch, the rotary actuator for the said feeler and the rotary actuator for the said carrier, connected to rotate in unison, a loom-shaft, and gearing for driving said actuators from said loom-shaft.

8. In a warp stop motion, in combination, the feeler, the unshipping devices, a dog connected with the said unshipping devices, a catch coöperating with said dog under the control of the feeler, a carrier for the said catch, the rotary actuator for the said feeler and the rotary actuator for the said carrier, the cam-shaft of the loom, gearing for driving the said rotary actuators from the said cam-shaft, and means for setting the said actuators to adjust the timing thereof.

9. In a warp stop motion, in combination, the feeler, the unshipping devices, a dog connected with the said unshipping devices, a catch coöperating with the said dog under the control of the feeler, a carrier for the said catch, the rotary actuators for the said feeler and carrier, respectively, the cam-shaft of the loom, a supplementary shaft carrying the said actuators, and gearing for driving the said supplementary shaft from the cam-shaft.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY I. HARRIMAN.

Witnesses:
CHAS. F. RANDALL,
EDITH J. ANDERSON.