(No Model.) 4 Sheets—Sheet 1.

O. SMITH.

WARP STOP MOTION FOR LOOMS.

No. 521,298. Patented June 12, 1894.

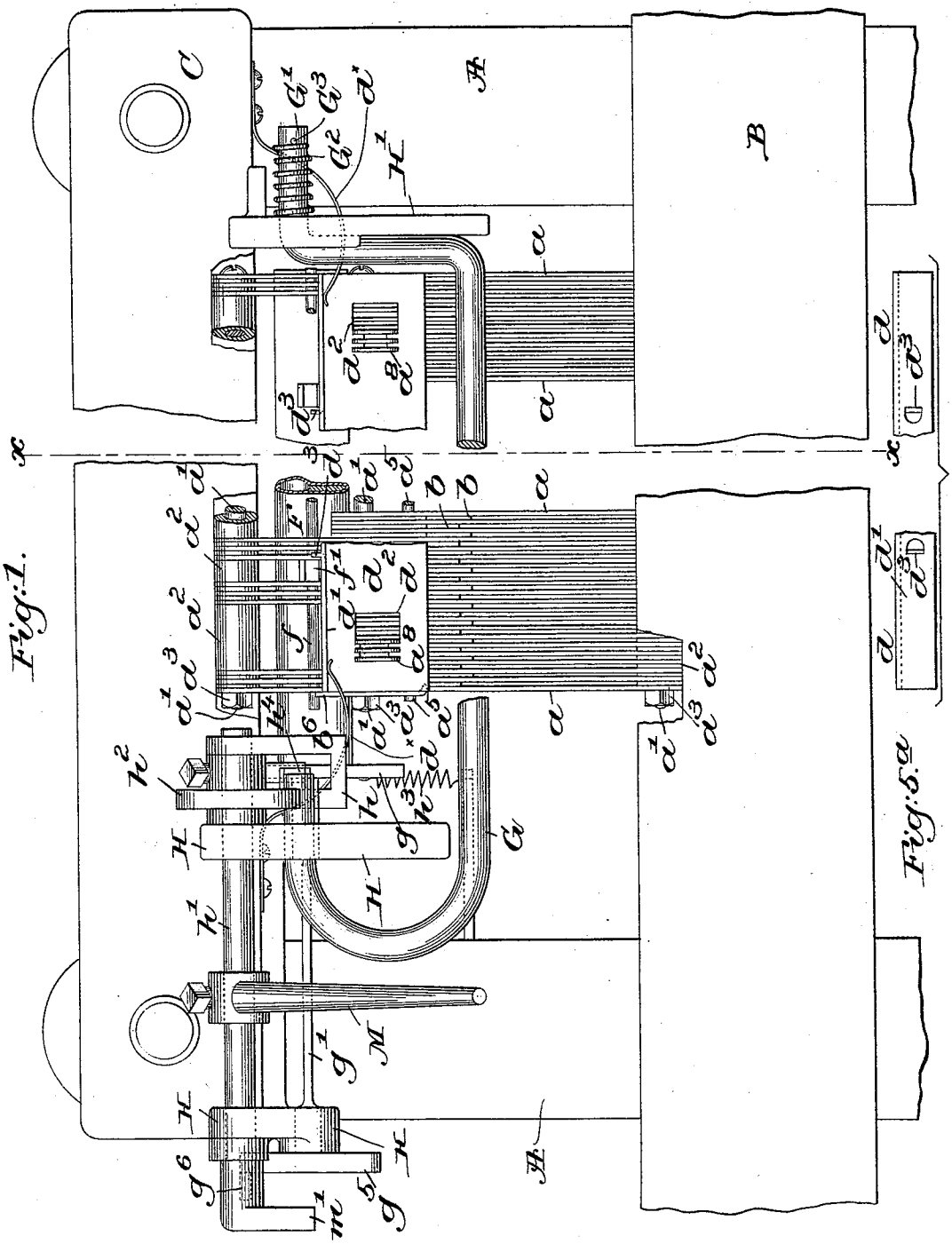

Fig. 1.

Fig. 5a.

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WARP STOP MOTION FOR LOOMS.

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Fig: 2.

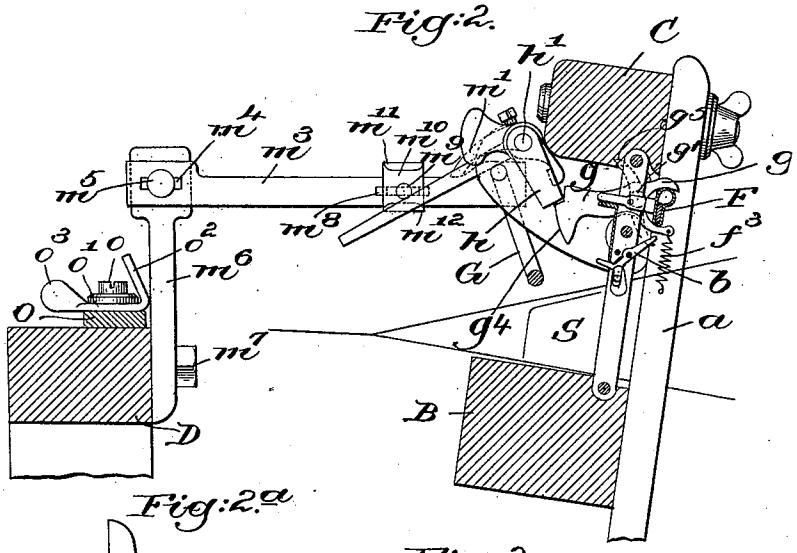

Fig: 1b

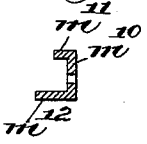

Fig: 1a

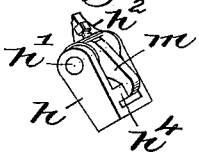

Fig: 2a

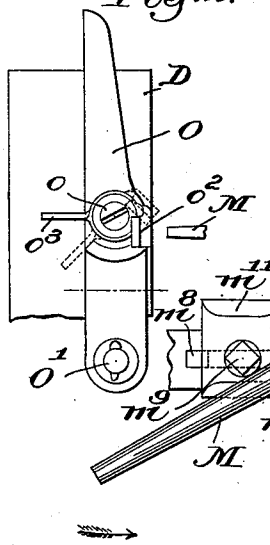

Fig: 3.

Fig: 3a

Fig: 3b

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(No Model.) 4 Sheets—Sheet 3.

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WARP STOP MOTION FOR LOOMS.

No. 521,298. Patented June 12, 1894.

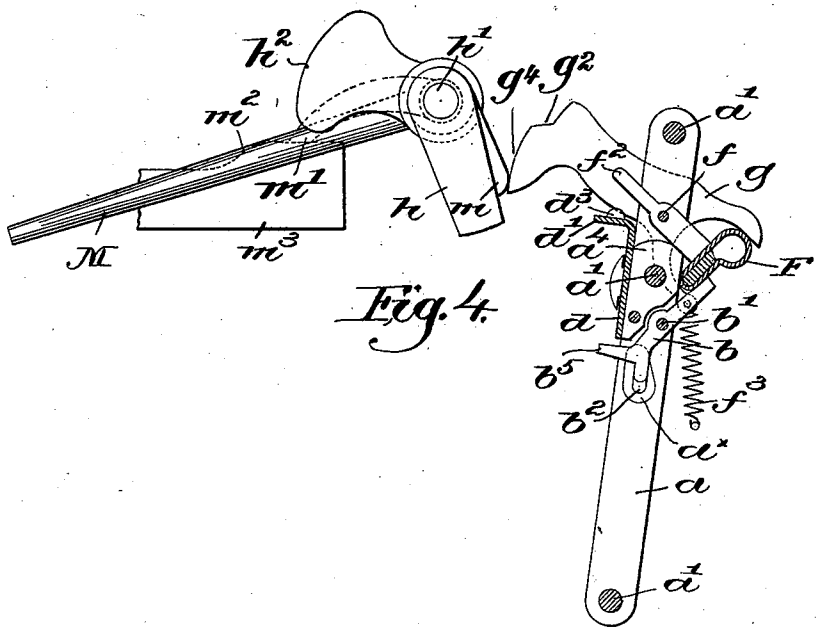
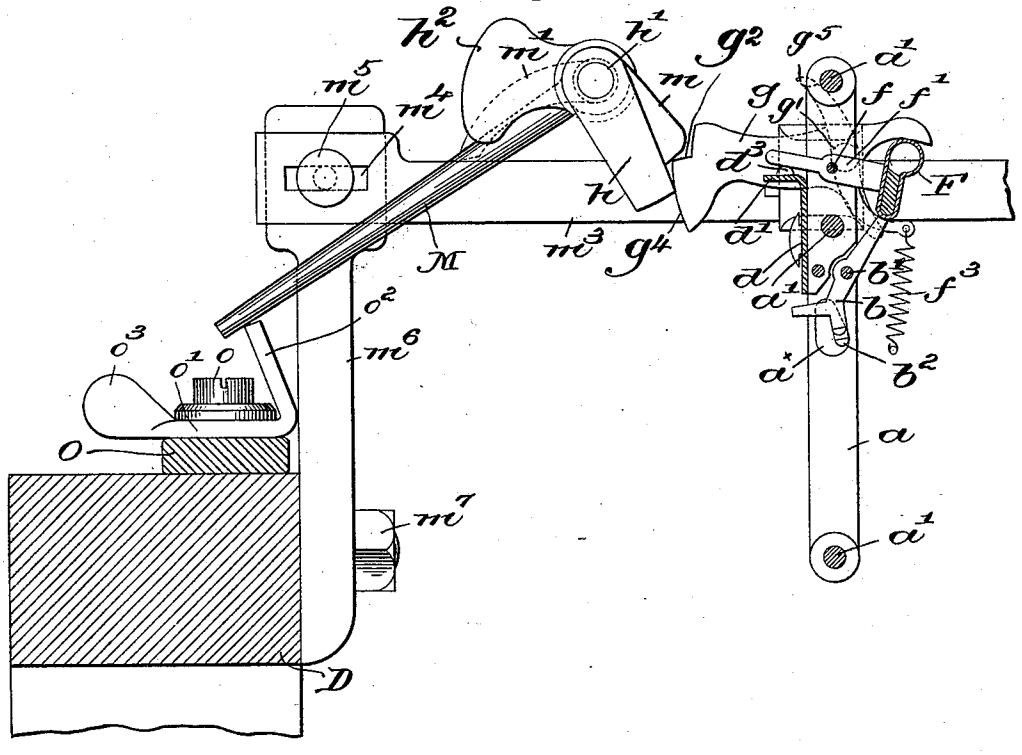


Fig. 4.

Fig. 5.



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(No Model.) 4 Sheets—Sheet 4.

O. SMITH.

WARP STOP MOTION FOR LOOMS.

No. 521,298. Patented June 12, 1894.

Fig. 9.

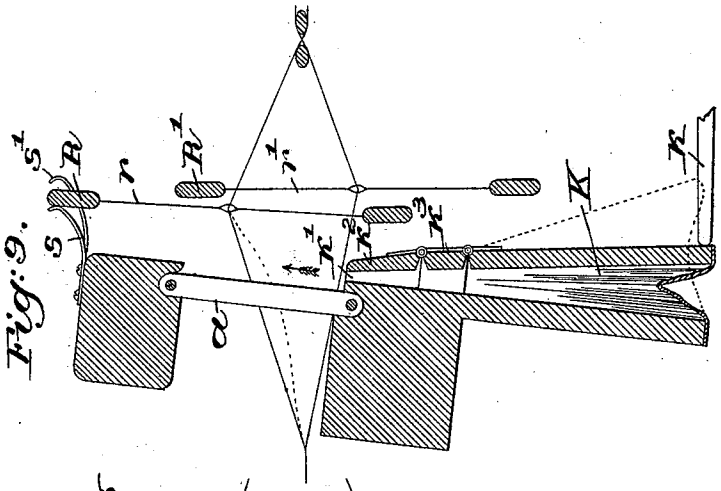

Fig. 10.

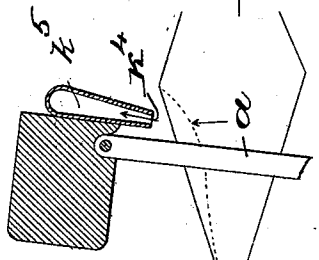

Fig. 8.

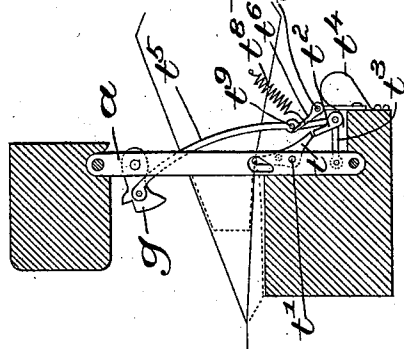

Fig. 11.

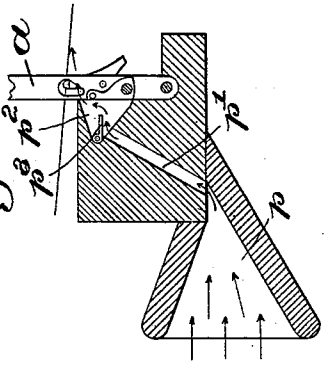

Fig. 7.

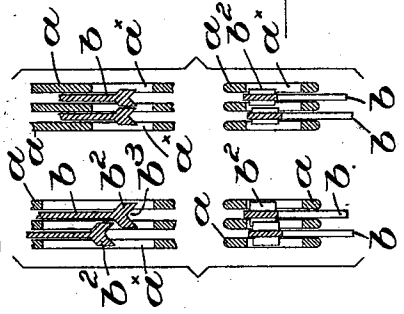

Fig. 6.

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UNITED STATES PATENT OFFICE.

OBERLIN SMITH, OF BRIDGETON, NEW JERSEY, ASSIGNOR OF ONE-HALF TO GEORGE DRAPER & SONS, OF HOPEDALE, MASSACHUSETTS.

WARP STOP-MOTION FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 521,298, dated June 12, 1894.

Application filed May 2, 1893. Serial No. 472,706. (No model.)

To all whom it may concern:

Be it known that I, OBERLIN SMITH, of Bridgeton, county of Cumberland, State of New Jersey, 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, the object of the invention being to provide a stop motion simple and cheap in construction, delicate and sensitive in its action, and one not easily disarranged or otherwise made unsuitable for proper operation. In this stop motion, as in other stop motions of this class now in use, I employ a series of warp detectors which are arranged between the reed dents and are moved from their normal into their abnormal positions by the perfect or unbroken warp threads, a broken thread failing to move its detector and thereby stopping the loom.

One of the principal features of this invention consists in so pivoting the detectors with relation to the point of contact of the detector with its warp thread, that longitudinal movement of the detector and its warp thread, one with relation to the other, will by reason of the friction incident to such movement act to move the detector about its pivot, as well as any lateral—up and down in this case—movement of the warp thread due to shedding of the same, thereby greatly increasing the sensitiveness and efficiency of the stop motion.

Another important feature of this invention is a depressor, which at the proper times is moved to push the detectors from their normal into their abnormal positions in order that they may be properly acted upon and moved by the warp threads to indicate that the said threads are unbroken.

Other features of this invention, including means by which to draw any slack threads taut, together with various constructional details will be hereinafter described, and pointed out in the claims.

Figure 1, is a face view of a part of the lay partially broken away, showing the reed, detectors, feeler, and depressor as constructed in accordance with the present embodiment of this invention; Fig. 1^a, a perspective detail of the catch *h;* Fig. 1^b, a sectional detail of the abutment plate showing the difference in length of the two cam surfaces m^{11} and m^{12}; Fig. 2, a section taken on the dotted line *x*—*x* showing the lay in its rearmost position, and also showing the breast beam, weft fork lever, cut-out, and abutments to be described, the same being on a smaller scale than Fig. 1; Fig. 2^a, a detail top view of the weft fork lever and cut-out, Fig. 2. Fig. 3, shows the lay, parts carried thereby, and a part of the abutment shown in Fig. 2, on a larger scale; Fig. 3^a, top and side views respectively of one of the spacers inserted between the reed dents and provided with a side lug to support the depressor; Fig. 3^b, a side view of one of the spacers without the side lug; Fig. 4, sectional views showing the reed, parts carried thereby, dagger, and a part of its abutment, with the parts in different position from the position Figs. 2 and 3; Fig. 5, a sectional view similar to Fig. 1, on a larger scale, showing the parts in yet another position; Fig. 5^a, a partial top view of the depressor; Figs. 6 and 7, vertical and cross sectional details of each of two different forms of constructions of detector heads; Fig. 8, a sectional detail showing one application of my stop motion to the lower ends of the reed dents in position to be controlled by the threads in the lower plane of the shed; Fig. 9, a cross sectional view showing devices whereby the warp threads may be tightened by lateral movement of the heddle and also by means of a circulation of air; Fig. 10, a sectional detail showing yet another means of moving the threads by circulation of air; and Fig. 11, a sectional detail illustrating one form of lint clearing device.

Referring to the drawings, the lay swords A; lay B; hand rail C and breast beam D are and may be of any suitable or desired construction so far as concerns this present invention.

Referring particularly to Figs. 1 to 5, inclusive, in the embodiment of my invention herein selected for the purpose of illustrating the same, the reed dents *a*, are shown as bolted together to form a reed by means of

three longitudinal bolts or rods a', the reed dents being drawn together, with suitable spacing blocks a^2 between their ends to maintain them at the proper distance from each other, by nuts a^3 threaded upon the ends of said bolts or rods. Suitable spacers a^4, Figs. 3^a and 3^b, are interposed between the reed dents intermediate their ends, the middle bolt rod a' preferably passing through these spacers, as shown. The spacers a^4 are also further secured against displacement by a small rod a^5 which extends longitudinally of the lay through to the reed dents and spacers between the same, see Figs. 1 and 3, so that the reed dents may be clamped firmly and rigidly together without danger of cramping in any degree the reed spaces between the dents in which the detectors are placed, the reed when thus bolted together being inserted in the lay in usual manner, it being at all times removable therefrom. Each reed space receives a warp detector b, the said detectors, as herein shown and preferably, being pivoted upon a rod b' extended longitudinally of the lay through the reed dents and constituting a common pivot rod for all the detectors. Each detector is provided preferably at its lowermost point with a head b^2, see Fig. 6, which is notched at its under side, as at b^3, to constitute a warp contact, the detectors being moved by the unbroken warp threads by the action of the latter upon or in the said warp contacts. As herein shown and preferably, the heads b^2 of the detectors are made thicker or wider than the bodies of the detectors, said heads projecting laterally beyond the reed spaces into openings $a^\times$ in the reed dents, the said heads being staggered, as shown in Fig. 6, the alternate heads being lower than the intermediate heads in order that the heads may be extended at each side of their respective detector bodies to a distance equal to the entire thickness of the reed dents at either side to thereby avoid as far as possible displacement of the warp threads from the warp supports in the heads of the detectors. Each detector is provided with a tail portion b^4, to be hereinafter referred to, and with a laterally extended arm b^5, also to be referred to.

It will be noticed by referring particularly to Fig. 3, that the spacers a^4 are located immediately above and in close proximity to the detectors arranged in the several reed spaces and that each spacer has a downwardly extended tail portion a^6 which extends down past the pivotal point of and terminates immediately above the detector in the same space with it, the result being that the reed dents are firmly held between the spacers and immediately above the warp supports, so that liability of the reed dents separating at any time is practically prevented, thereby practically avoiding any possibility of the warp thread becoming displaced from the warp contact in its detector.

By reference to Fig. 1, it will be seen that a portion only of the reed dents are extended to the upper bolt rod a', nearly all of the reed dents terminating at the middle rod a', the end reed dents alone being continued beyond to the upper rod a'. This reduces the size of the intermediate reed dents and at the same time by continuing the end reed dents to the uppermost rod, as shown, convenient support or supports are provided for other parts of the mechanism, as will be hereinafter described.

The reed is made intact before it is applied to the lay or support and carries with it, as shown, both the feeler and depressor, and when said reed is applied to the lay, as shown in the drawings, it is readily slipped into suitable grooves provided for it in a manner well known in loom construction.

A rod f extending through the upper ends of the longer reed dents, see Figs. 1 and 3, constitutes a pivot for the feeler F, shown as made tubular or hollow in cross section, and preferably compressed into the shape shown in Fig. 3. This feeler is mounted at its opposite ends upon the feeler arms f', made thin and extended between the longer end reed dents a, and pivoted upon the pivot rod f, said arms having fingers f^2 which extend through to the front of the reed and overlie in a position to act upon the depressor d, shown as a flat plate flanged or turned over at its upper edge, as at d' Fig. 3. This depressor is provided with T-shaped holes d^2, see Fig. 1, by which it is supported upon the projecting lugs a^7 standing out from several of the spacers, as shown in Fig. 3^a, said lugs having heads a^8, as there shown. The depressor is placed upon these lugs, the larger parts of the openings d^2 permitting the heads of the lugs a^7 to pass through the front side; the depressor is then slid bodily to the right Fig. 1, to bring the narrower portions of the openings upon the necks of the lugs, the heads of the latter when the depressor is in such a position preventing displacement, the narrower portions of the openings being of sufficient size, however, to permit necessary vertical movement of the depressor behind the said heads to properly depress the depressor, as will be described. Ears d^3 standing up from the flange d' of the depressor stand at the sides of the fingers f^2 on the feeler levers and prevent longitudinal movement of the depressor so long as said feeler levers are in position, so that the depressor, itself simple in construction, is readily attached to and made detachable from the reed dents. A spring $d^\times$, Fig. 1, secured to the hand rail acts to raise the depressor into its uppermost normal position. The pivot rods f and b' for the feeler and detectors respectively, are restrained from longitudinal or sliding movement in the reed by slotting their ends and inserting in such slots a thin plate b^6, Fig. 1, clamped beneath the nut a^3, said plate having its lowest end turned in and permitted to spring into an opening in the endmost reed

dent, as shown, to thereby restrain it from rotative movement except when the said inturned end is withdrawn from the opening in the reed dent, the plate being then readily rotated to remove it from the grooves in the ends of the pivot rods to permit the latter to be withdrawn. At one end of the reed is a feeler carrier g mounted upon the inner end of a shaft g' journaled in the housings H, H secured to the hand rail, said carrier at its rear end or at the right Fig. 3, being forked to straddle the projecting end of the feeler F, while at its opposite end the said carrier is, in the present instance, provided with a notch g^2, and with a lower arc-shaped surface g^4, see Fig. 3. The pivotal shaft g' for this feeler carrier is provided at its end outside the lay with a lever g^5, the upper end of which has a lug g^6, shown in dotted lines Fig. 1. Movement of the feeler is effected by rocking this shaft g' and with it the carrier g, the latter carrying with it the feeler. Means for rocking this shaft and feeler will be hereinafter described.

While the feeler F is of such weight that it will fall by gravity, yet I prefer to employ a light spring f^3, Fig. 3, connecting the feeler-carrier with the lay sword, such spring acting to pull the feeler down into its lowermost position.

The feeler-carrier with the feeler are normally retained in their elevated positions Figs. 1, 2 and 3, by a U-shaped catch h loose upon a shaft h' journaled in the housings H, H, said catch having a counterpoise h^2 which acts to throw the lower end of the catch h to the right Fig. 3, into engagement with the notch in the end of the feeler-carrier g, the action of the counterpoise, if desired, being assisted by a light spring h^3 connected with the housings, as shown. The catch h is provided with an inturned ear h^4, shown in detail Fig. 1ª, back of which lies an arm m fast on the shaft h', to which shaft is also attached between the housings H, H, a dagger M. The outer end of the shaft h', outside of the housings H has an arm m', which, just before the lay reaches the end of its backward movement rides upon an inclined cam surface m^2 on an abutment m^3 Fig. 3, and thereby turns said shaft to raise the dagger M, and at the same time causes the arm m to act upon the ear h^4 on the catch h and move the same to the left Fig. 3, out of engagement with the notch of the feeler-carrier g. The abutment m^3 is provided at its end, see Fig. 2, with a slot m^4 through which is passed a bolt m^5 adjustably securing the said abutment to an upright m^6 secured and made vertically adjustable with relation to the breast beam or frame D, by means of the bolt m^7 and a slot in the support m^6, not shown. The abutment m^3 intermediate its ends has a slot m^8 through which is passed a bolt m^9 adjustably securing an abutment plate m^{10} to the abutment m^3, said plate having at its upper and lower edges respectively the cam surfaces m^{11} and m^{12}, the surface m^{11} co-operating with the lug g^6 on the lever g^5, while the lower surface m^{12} co-operates with the lower end of the said lever. The lower cam surface m^{12} stands out from its plate m^{10} farther than the surface m^{11}, as best shown in Fig. 1ᵇ, the lever g^5 being provided with the lug g^6 in order to reach the shorter cam surface m^{11}. These surfaces m^{11} and m^{12} are made to project outwardly at unequal distances in order to permit the lever g^5 to pass by the upper surface without being engaged by it, leaving it entirely under the control of the lower surface m^{12} except when its lug g^6 contacts with said upper surface.

O, Fig. 2ª, represents the usual weft fork carrier, which may be in some instances a sliding carrier, but which in the present instance is shown as pivoted at O′ to the breast beam, and which, in the usual way, pushes forward the shipper to stop the loom; said carrier having secured to it by a screw o, a plate o' having an upturned lug o^2 at one side and a handle o^3 at its opposite side. This plate o' constitutes a cut-out which may be turned upon the screw o into one or another position for a purpose to be hereinafter referred to.

The operation of my improved stop motion is as follows, viz:—Referring first to Figs. 1, 2 and 3, the lay is shown in a position just previous to the completion of its backward movement, the feeler being held in its raised position by the catch h in engagement with the notch g^2 in the feeler carrier g. The warp threads opened to form a shed by the heddles r, r', see Fig. 10, carried in suitable heddle-frames R, R′, and shifted in usual manner, are supposed in Figs. 2 and 3, to have acted upon and raised or turned about their pivots the detectors b. With the parts in this position, further backward movement of the lay in completing its movement, will cause the dog m' on the shaft h' to ride up on the cam surface m^2 on the abutment m^3 and thereby turn the said shaft h' on its pivot in the direction of the arrow Fig. 3, to cause its arm m to move the catch h to the left Fig. 3, out of engagement with the notch g^2 in the feeler-carrier g, thereby permitting the latter, acted upon by the weight of the feeler and by the spring f^3 to be turned on its pivot, and drop the feeler F behind the tails b^4 of the raised detectors, as shown in Fig. 4, the plain surface g^4 of the feeler-carrier being carried upwardly into position directly back of the end of the arm m on the shaft h' to prevent the latter from resuming its former position when released from the cam surface m^2 by the forward movement of the lay. The shuttle having passed through the open shed, the lay begins its forward or beating in movement and the heddle frames R, R′ are shifted to cross the warp threads and to form a new shed. As the lay moves forward the dog m' first moves off from the cam surface m^2, leaving the rock shaft h' free to resume its normal position as soon as its arm m is released by the feeler-carrier g. Just before the lay com-

pletes its forward movement and after the end of the raised dagger M has passed over the lug o^2 on the weft fork carrier without engaging the said lug, the lower end of the lever g^5 on the shaft g', on which is mounted the feeler-carrier, is brought into engagement with the cam surface m^{12} on the abutment plate m^{10}, said cam surface acting to turn the lever g^5, its shaft and the feeler-carrier g back to the left, Fig. 3, into their original positions, lifting the feeler F from behind the tails of the detectors, leaving them free to drop back into their original lowermost positions, such movement of the feeler-carrier releasing the catch h and permitting the same, the shaft h' and dagger M to resume their original positions Fig. 3. The lay having completed its forward or beating-in movement, begins its return or backward movement with the detectors in their lowermost positions, the feeler raised, and the catch h in engagement with the notch g^2 in the feeler-carrier holding the latter and the feeler in their raised positions. When the lay has completed preferably about one-half its backward movement, and as the warp threads are beginning to be opened by the shifting of the heddle-frames, the lug g^6 on the upper end of the lever g^5 reaches and comes into engagement with the upper cam surface m^{11} on the abutment plate m^{10}, and is depressed slightly by said cam surface, turning its shaft g' and the feeler-carrier g to the left Fig. 3, such movement of the feeler-carrier raising the feeler slightly and causing the fingers f^2 on its supporting arms f' to act upon the depressor d, push the same downwardly a short distance to thereby positively push into their lowermost positions any of the detectors which may possibly have become clogged with lint, or which from any other reason have remained in their raised positions and have not dropped with the others when permitted to do so by the withdrawal of the feeler from behind their tails b^4. This movement of the depressor is a slight movement only, after which it is returned to its normal raised position by the feeler, its carrier and the shaft g' resuming their normal positions respectively after the lug on the lever g^5 has passed the cam surface m^{11}. After this movement of the depressor all the detectors must necessarily be in their lowermost positions to be acted upon during further backward movement of the lay by the open warp threads and raised or turned about their pivots into their elevated or abnormal positions, Figs. 2 and 3, in order to permit the feeler F to drop behind their tails when the feeler is permitted to drop by the dog m' riding up on the cam surface m^2 of the abutment, as previously described. It will thus be seen that so long as all the detectors are acted upon and raised by the unbroken warp threads, the feeler F is at each movement of the lay permitted to drop behind the tails of the detectors to thereby carry the plain surface g^4 of the feeler-carrier up into position behind the arm m of the shaft h' and thereby hold the dagger M in its elevated position during the forward or beating-in movement of the lay, so that the said dagger will clear the lug o^2 on the weft fork carrier and fail to move the latter, thus permitting continued operation of the loom. If, however, any warp thread should break or become so slack that it would form a defect in the fabric, the detector at the top of the reed space, through which such broken or loose warp thread is passed, will fail to be raised by said thread at the time when the other detectors are raised by the shedding of the unbroken threads. Such detector will, therefore, remain in its lowermost position as in Fig. 5, and just before the lay reaches the end of its backward movement when the feeler is released and permitted to drop by the dog m' riding upon the abutment cam m^2, said feeler, instead of dropping behind the tails of the detectors as before, will immediately encounter the tail of the depressed detector which has been permitted to remain in its normal position by the breaking of the warp thread, the said feeler being thereby prevented from dropping to its lowermost position, it remaining in its position as shown in Fig. 5, with the surface g^4 of the feeler-carrier lying below the end of the catch h. With the feeler-carrier in this position, as the lay begins its next succeeding forward or beating-in movement, and the dog m' leaves the abutment cam m^2 and releases the dagger shaft h', said dagger will not be restrained as before by the said surface g^4, but will immediately fall into its position Fig. 5, where it will, just before completion of the beating-in movement, strike the lug o^2 on the weft fork carrier and move the latter to stop the loom. The broken warp thread having been mended, the loom is again set in motion, when the detector which stopped the loom will again be raised with the others, and operation of the loom permitted to continue until another broken thread permits another detector to remain in its lowermost or normal position with its tail in the path of movement of and to obstruct the feeler F, when the loom will be stopped as before.

Referring to Fig. 2^a, by turning the cut-out into its dotted position, the lug o^2 is carried to one side out of the path of movement of the dagger on the lay and the stop motion thereby rendered inoperative. It frequently happens that one or more of the warp threads while not broken, yet become so slack that they fail to raise their respective detectors, and thus stop the loom when there is no breakage. Referring to Fig. 9, I have shown two devices to prevent stoppage of the loom from this cause when there is no breakage. In said Fig. 1 I have shown the lay cap or hand rail as provided with two rearwardly extended yielding arms s, s', one of which at each backward movement of the lay strikes the harness frame which is raised, and pushes

the same backwardly with its heddles to thereby draw any slack threads taut in order that they may be brought into the same plane with the other raised threads and properly move their detectors to prevent the stopping of the loom. In addition to this, I have shown mounted upon the lay a bellows K which is compressed at each backward movement of the lay by an abutment k on the loom frame, to force air through its outlet k' upwardly, and to blow or force slack warp threads into the same plane with the other threads, the circulation of air produced being sufficient to cause any slack threads to act upon and raise their respective detectors, said blast of air also acting as a lint clearing device to free the reed dents and detectors from lint. The outlet k' is made variable by the two hinged members k^2, k^3, one or both of which may be turned down to enlarge, as necessary, the area of the outlet and correspondingly vary the circulation of air therethrough.

In Fig. 2, I have shown a shuttle S having its upper side made inclined to approximate the upper plane to the shed, thus making the side of the shuttle nearest the harness motion or heddles higher than that side of the shuttle nearest the fell, the result being that the shuttle by reason of its shape acts to raise any slack warp threads into their proper positions in the shed.

To keep the shuttle in its proper position while traveling through the shed, I have provided a shuttle guard G which is hinged to be turned up out of the way when necessary.

In Fig. 7, I have shown a construction for the detectors, in which, instead of staggering the heads thereof and extending each head to the full thickness of the reed dents at either side, I arrange the heads all in the same line, each head extending at the sides a distance substantially equal to one-half the thickness of the adjacent reed dents.

In Fig. 10 is shown another form of air circulating device in which the air is drawn or sucked through an opening k^4 in a suction tube k^5, thereby drawing the slack threads into their proper positions instead of blowing them into such positions as in Fig. 9.

In Fig. 11 is shown one form of lint clearing and air circulating device in which the lay is provided with a long tunnel p terminating in an inner port or opening p' leading to a groove or chamber p^2 formed in the lay immediately in front of the detectors, the latter in this figure being shown at the bottom of the reed dents. A simple flap valve p^3 controls the port p', so that when the lay moves forward, the air entering the tunnel in the direction of the arrows, is forced through the port to open the valve and blow from the detectors and reed dents any lint which may have collected and which would act to clog the detectors and prevent proper operation of the loom. Upon return movement of the lay, the valve p^2 closes to prevent any lint being drawn back into the detectors again.

In Fig. 8 is shown one manner of connecting up my stop motion when the detectors are placed at the bottom of the reed dents. In said figure, the detectors t are pivoted at t' on a rod extended through the reed dents, as in Figs. 2 to 5, inclusive, the tails of the detectors, however, in this present instance, extending downwardly while the warp contacts are arranged above the detectors, the centers of gravity of the detectors being in the rear of their pivotal points, so that the tendency of the detectors is to assume the position shown in Fig. 8. The feeler t^2 carried on the ends of the arms t^3 is normally raised by a spring t^4 but is depressed by a link t^5 connecting it with the feeler-carrier g pivoted at the top of the reed dents and connected up in the manner shown in Figs. 1 to 5, inclusive, and operated in the manner described in reference to that construction. When the feeler g is released by movement of the catch h, such movement will be communicated through the link t^5 to the feeler t^2 to raise the same and if all the detectors have been raised by the unbroken warp threads, the rising feeler will pass between the tails of the detectors and the reed dents, and the operation of the loom will continue. When a warp thread breaks, however, its detector will remain in the full line position, Fig. 8, where it will obstruct the movement of the feeler, as there shown, and cause the stopping of the loom by preventing full movement of the feeler-carrier g. In this construction, t^6 is the depressor pivoted at t^7 and normally drawn back from the detectors by a spring t^8. When the auxiliary depressing movement is given to the feeler-carrier g by the cam m^{11} on the abutment plate, such depressing movement will be communicated through the link t^5 and pin t^9 thereon to the depressor to push into their full line positions Fig. 8 any detectors which may remain in their abnormal position.

The principal features of this my present invention are as follows, viz:—By arranging the warp contact and the pivotal point of a detector in substantially the relative positions shown, *i. e.*, with the warp contact resting upon the warp threads within an angle of forty-five degrees of a perpendicular to the warp threads drawn through said pivotal point, the longitudinal or sliding movement of the warp thread in the contact or head of the detector by the friction which results from such sliding movement acts to turn the detector about its pivot and into or toward its abnormal position independent of and in addition to any lateral movement of the warp thread due to shedding, which, in warp stop motions as heretofore generally designed, has alone been depended upon to move the detectors.

So far as I am aware I am the first to conceive the idea of utilizing the sliding or fric-

tional contact between the warp contact or head of the detector and the warp thread or threads, to turn the said detector about its pivot from its normal into its abnormal position, in addition to or independent of any lateral movement or movements of the warp thread or threads due to shedding of the latter. To utilize this frictional contact as above it is necessary that the warp contact should rest against or upon the warp thread or threads within an angle of forty-five degrees of a perpendicular to the warp drawn through the pivotal point of the detector. If the warp contact is outside of an angle of forty-five degrees the sliding or frictional contact has no appreciable effect upon the detector, the latter being movable only by positive lateral movement of the warp thread or threads due to shedding. At any point, however, within an angle approximating forty-five degrees the frictional or sliding contact between the detector and the warp thread or threads is sufficient to at least assist, and in some cases, according to the relative positions of the said contact and pivotal point, to serve as the only means for turning the detector from its normal into its abnormal position to indicate that the warp thread or threads is or are unbroken.

By employing a tubular feeler, the same is made extremely light yet very rigid and stiff against lateral or torsional stresses, which is a very essential feature, inasmuch as it is desirable to operate the feeler at one end only, yet the action and accurate position of the feeler at the other end, and intermediate its ends, is as essential to the perfect operation of the stop motion as the correct position of such feeler at the operating end; and the depressor, which so far as I am aware, is new with me, absolutely precludes any possibility of one or more of the detectors remaining in their abnormal positions into which they have been moved by the unbroken warp threads.

The placing of the spacers between the reed dents and close to the detectors pivoted between the same permits the reed dents to be drawn or bolted firmly together to make a stiff reed without any possible liability of unduly cramping the detectors and thereby preventing free movement of the same.

This invention is not limited to the particular construction, shape, form, or arrangement of the different parts herein shown, for the construction shown is a single construction only selected by me to illustrate this invention.

I claim—

1. In a warp stop motion for looms, the combination with a series of reed dents and warp detectors arranged between the same and adapted to be moved from their normal into their abnormal positions by the unbroken warp threads, of a depressor, and actuating mechanism for the same to move said detectors toward their normal positions, substantially as described.

2. In a warp stop motion for looms, the combination of the following instrumentalities, viz:—a lay; warp detectors to be acted upon and moved by the unbroken warp threads; heddles to shed said warp threads, and means to move said heddles rearwardly to tighten said warp threads, substantially as described.

3. A warp stop motion for looms, containing the following instrumentalities, viz:—a lay; warp detectors to be acted upon and moved by the unbroken warp threads; heddles and frames for the same to shed said warp threads; and devices on the lay whereby the latter at each backward movement strikes a heddle frame and moves the same to tighten said warp threads, substantially as described.

4. A warp stop motion for looms, containing the following instrumentalities, viz:—a series of reed dents; warp detectors moving between the same; and spacers between and separating said reed dents and having portions extending close to the moving parts of said detectors, clamping devices at opposite ends of said reed dents and an additional clamping device intermediate said ends and passing through said spaces close to the moving parts of said detectors, whereby said reed dents are firmly held separated at the proper distances from each other at the points where movement of the detectors takes place, substantially as described.

5. A warp stop motion for looms, containing the following instrumentalities, viz:—a series of reed dents, each provided with an opening extending laterally through it; warp detectors pivoted in and between said reed dents, and having warp supports also located between the said reed dents, and entering the lateral-openings therein and spacers between and separating said reed dents and having tail portions extending down past the pivotal points of the said detectors close to the warp supports thereof, to thereby maintain said reed dents properly spaced adjacent said warp supports to prevent displacement of the warp threads, substantially as described.

6. In a warp stop motion for looms, the combination of the following instrumentalities, viz:—a reed composed of reed dents of different lengths, the longer reed dents projecting above the shorter ones; spacers between the reed dents, and bolts to clamp the same and said reed dents firmly together; warp detectors pivoted between the shorter reed dents; and a feeler pivoted in the extended ends of the longer reed dents, substantially as described.

7. A warp stop motion for looms, containing the following instrumentalities, viz:—a reed; consisting of a series of reed dents and clamping devices to clamp the same rigidly together; warp detectors arranged between the said reed dents, and adapted to be moved from their normal into their abnormal positions by the unbroken warp threads; a feeler pivoted also in the dents of the said reed; and co-operating with the said detectors, whereby re-

moval of the reed takes with it both detectors and feeler without disturbing the adjustment of the same one with relation to the other, and a stopping mechanism for the loom controlled by the said feeler, substantially as described.

8. A warp stop motion for looms, containing the following instrumentalities, viz:—a removable reed; warp detectors pivoted in and movable between the dents thereof and adapted to be acted upon by the unbroken warp threads; a feeler; and a depressor both mounted in said reed, and actuating mechanism for the said detectors whereby removal of the reed takes with it the said detectors, feeler, and depressor without disturbing the adjustment of the same, substantially as described.

9. A warp stop motion for looms, containing the following instrumentalities, viz:—a series of reed dents; warp detectors arranged between the same and adapted to be moved by the unbroken warp threads; a feeler pivoted in said reed dents; an independent pivoted feeler-carrier; and means to move the same and thereby the said feeler, substantially as described.

10. A warp stop motion for looms, containing the following instrumentalities, viz:—a series of reed dents; warp detectors arranged between the same and adapted to be moved by the unbroken warp threads; a feeler; a depressor actuated thereby; and a lever to move said feeler in one direction toward said detectors and also in opposite direction to move said depressor toward said detectors, substantially as described.

11. In a warp stop motion for looms, a series of reed dents; spacers separating the same and having projecting lugs; and warp detectors arranged between the said reed dents, combined with a depressor mounted on said lugs, and means to move the same, substantially as described.

12. A warp stop motion for looms, containing the following instrumentalities, viz:—a series of reed dents; warp detectors arranged between the same and adapted to be moved by the unbroken warp threads; a feeler; a depressor actuated thereby; a pivoted lever to move said feeler; and two cam abutment surfaces to act upon opposite ends of said lever and move the same first in one direction to actuate the feeler and then in an opposite direction to actuate the depressor, substantially as described.

13. A warp stop motion for looms, containing the following instrumentalities, viz:—a series of reed dents each provided with an opening as $a^{\times}$; and warp detectors pivoted between and having thickened heads to constitute warp supports projecting laterally into said openings, the heads of successive detectors being staggered in said openings, substantially as described.

14. A warp stop motion for looms, containing the following instrumentalities, viz:—a series of reed dents, warp detectors arranged between the same and adapted to be moved by the unbroken warp threads; arms pivoted in said reed dents; a feeler carried at one of their ends; a depressor acted upon by the opposite ends of said arms; and a spring to maintain the said depressor in contact with said arms, substantially as described.

15. A warp stop motion for looms containing the following instrumentalities, viz:—a series of reed dents; warp detectors arranged between the same; a gravity-actuated feeler pivoted in said reed dents; an independently pivoted feeler-carrier to engage and move said feeler; a lever to move said carrier and feeler in one direction against gravity; and a catch to engage and hold said feeler and carrier in the positions into which they are so moved; a shaft carrying a dagger and a cam abutment to rotate said shaft and engage and thereby move said catch to release said feeler; and a stopping mechanism actuated by said dagger, substantially as described.

16. A warp stop motion for looms, containing the following instrumentalities, viz:—a series of reed dents; warp detectors arranged between the same and to be moved by the unbroken warp threads, a gravity-actuated feeler a feeler carrier and shaft on which it is mounted provided with the lever g^5; a catch to hold the said feeler in its normal position, the shaft h' on which said catch is journaled; its arms m and m', dagger M, moved by rotation of said shaft the vertically and horizontally adjustable abutment m^3, to control the shaft h' and its plate m^{10}, to control the lever g^5 all substantially as described.

17. In a loom, a lay, a bellows, and means to compress the same at each beat of the lay, and an adjustable outlet for said bellows, arranged to direct a current of air laterally against the warp threads to move the latter into their proper planes in an open shed, substantially as described.

18. In a warp stop motion for looms, a series of warp detectors arranged to be moved from their normal into their abnormal positions by the unbroken warp threads and a support for said detectors, combined with a depressor, and actuating mechanism for the same to move said detectors toward their normal position, substantially as described.

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

OBERLIN SMITH.

Witnesses:
ENOS PAULLIN,
LIDA M. BROOMALL.