(No Model.) 2 Sheets—Sheet 1.

O. SMITH.

WARP STOP MOTION FOR LOOMS.

No. 498,192. Patented May 23, 1893.

Fig. 1.

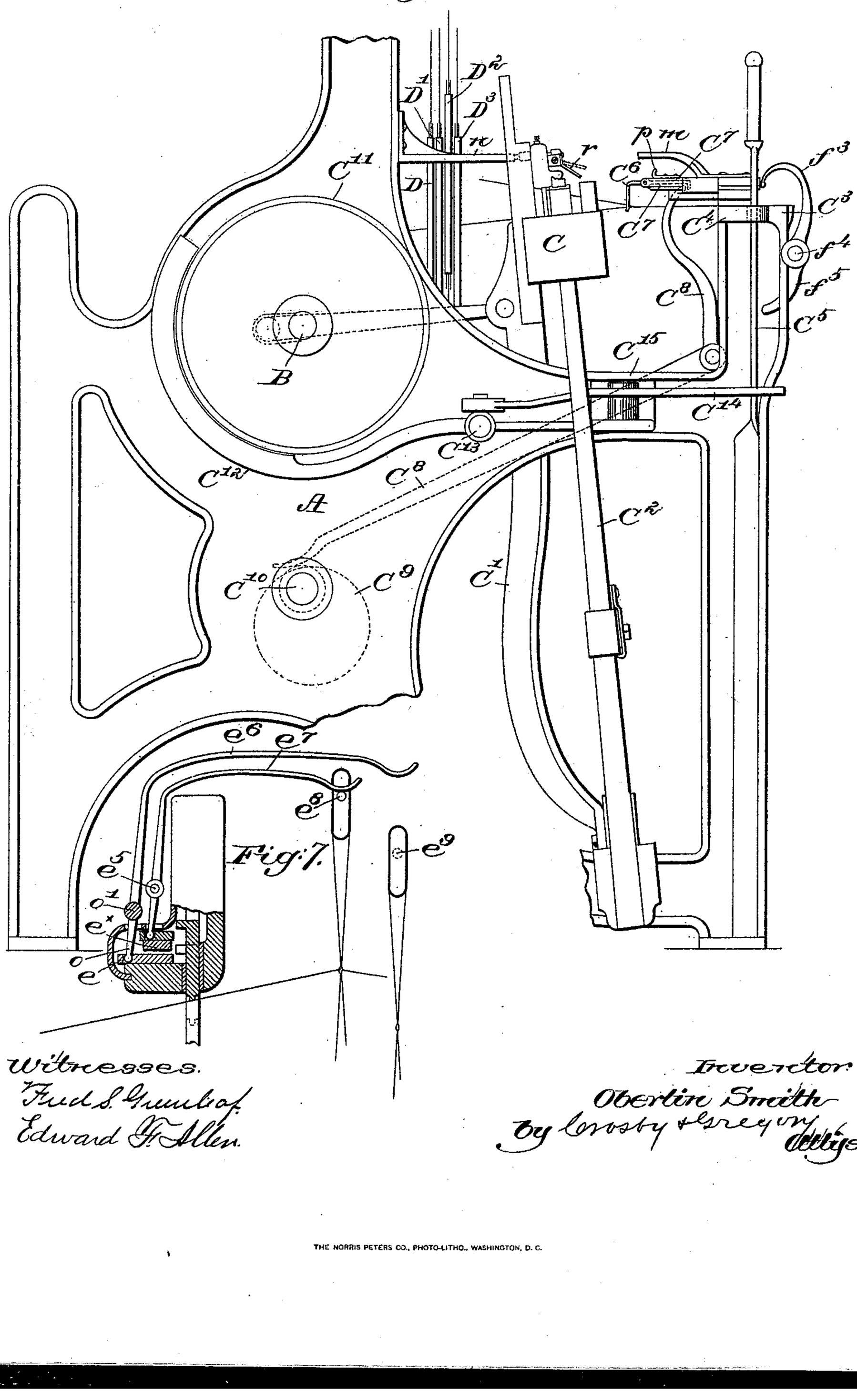


Fig. 7.

Witnesses.
Fred S. Grumbof.
Edward F. Allen.

Inventor.
Oberlin Smith
by Crosby & Gregory
Attys.

(No Model.) 2 Sheets—Sheet 2.

O. SMITH.

WARP STOP MOTION FOR LOOMS.

No. 498,192. Patented May 23, 1893.

Fig: 2.

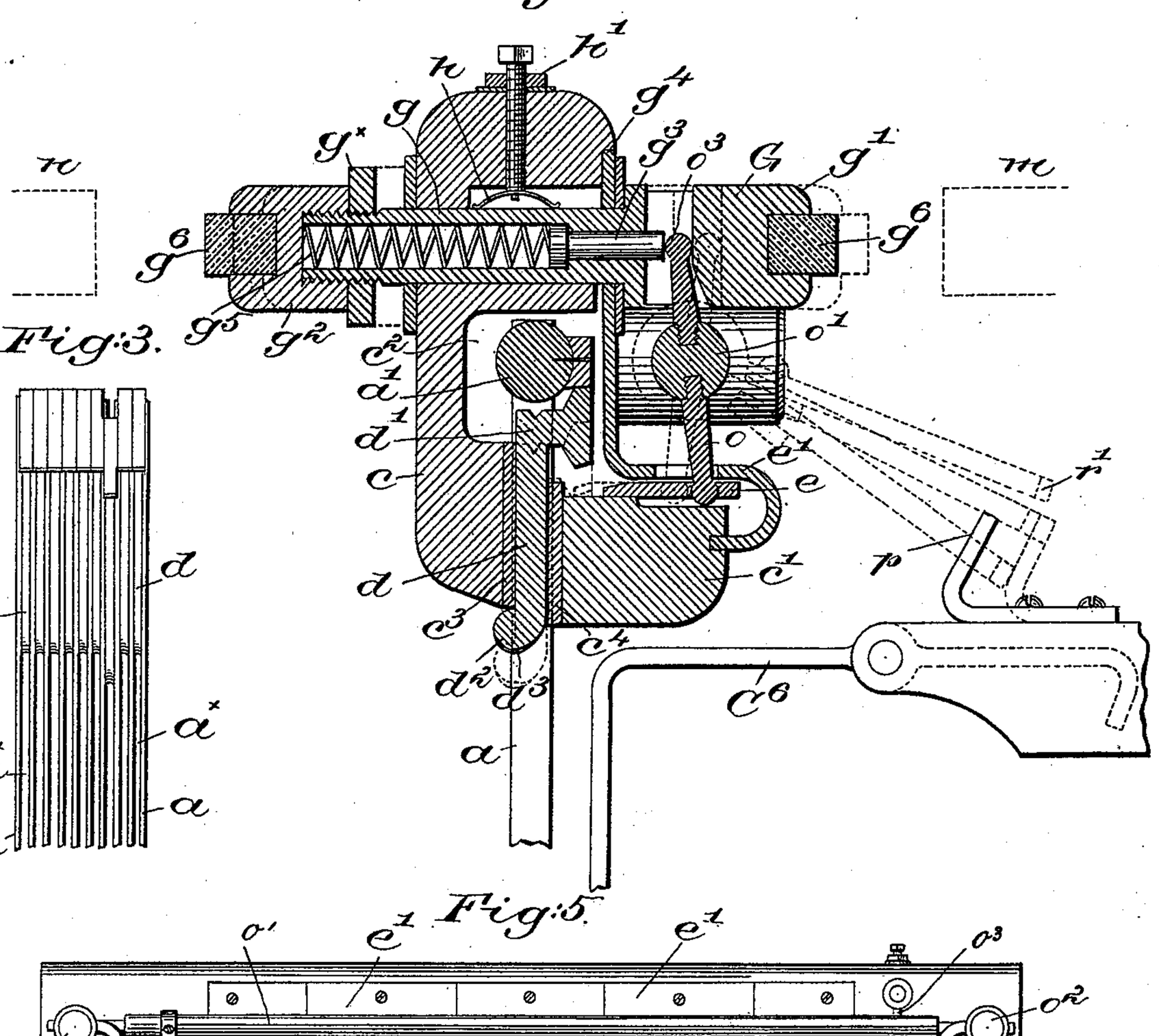


Fig: 3.

Fig: 5.

Fig: 4.

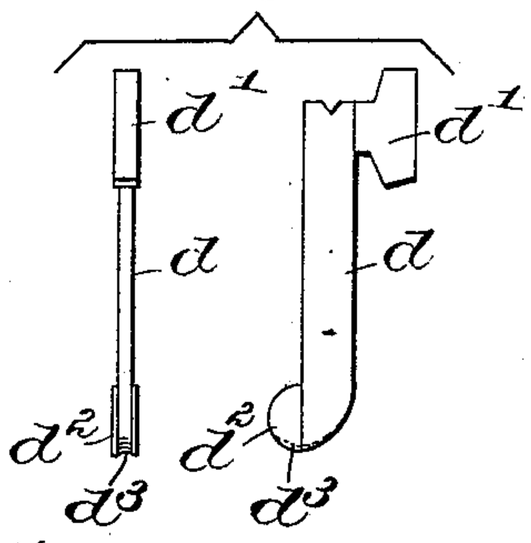


Fig: 6.

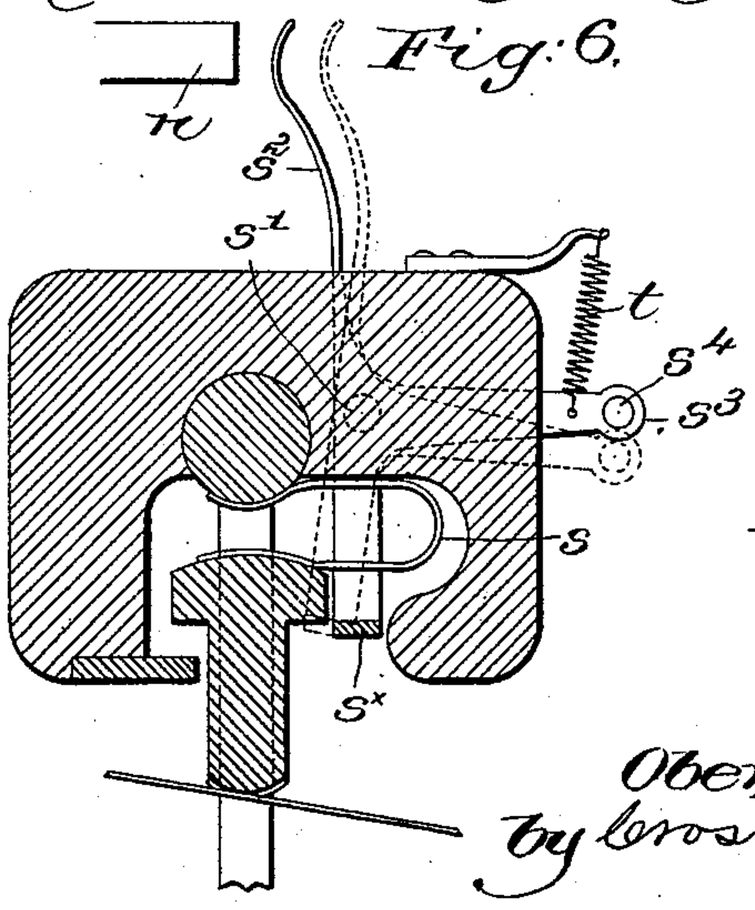
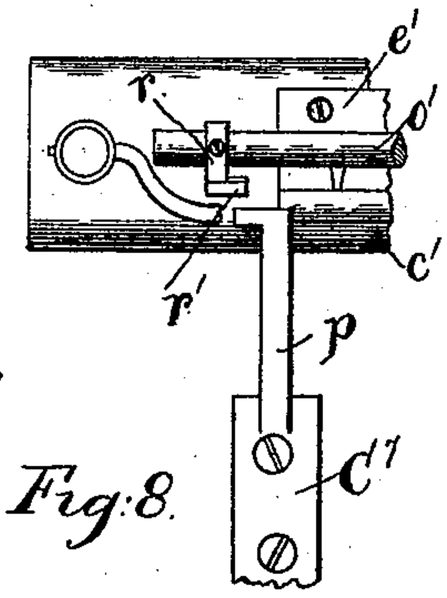


Fig: 8.



Witnesses.
Fred S. Grundy.
Edward F. Allen.

Inventor:
Oberlin Smith.
by Crosby & Gregory
Attys.

UNITED STATES PATENT OFFICE.

OBERLIN SMITH, OF BRIDGETON, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, OF ONE-HALF TO THE NORTHROP LOOM COMPANY, OF HOPEDALE, MASSACHUSETTS.

WARP STOP-MOTION FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 498,192, dated May 23, 1893.

Application filed February 13, 1892. Serial No. 421,389. (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.

In another application, Serial No. 421,388, filed by me February 13, 1892, I have illustrated and described a warp stop-motion wherein a series of warp detectors are adapted to be moved from their normal into abnormal positions by the warp threads, provided the latter are unbroken; but should a warp thread become broken it will fail to thus move its co-operating detector into its abnormal position, and such detector thus permitted to remain in its normal position operates, through suitable electrically-actuated stopping mechanism, to stop the loom.

This present invention has for its object to provide a warp stop-motion wherein the failure of a warp thread to move its detector from a normal into an abnormal position will operate, through suitable mechanical rather than electro-mechanical mechanism, to stop the loom.

In this present invention, if a detector by reason of breakage of a warp thread fails to be moved from its normal into its abnormal position, it is struck by a feeler which is automatically moved forward or toward the series of detectors at each beat of the lay, and the said feeler having met a detector, effects through suitable mechanism the stopping of the loom; but, on the other hand, should the feeler when moved forward fail to encounter a detector, the mechanism to stop the loom will not be actuated.

One part of this invention in warp-stop motion for looms therefore consists of a series of sliding warp detectors adapted to be acted upon and moved from their normal into their abnormal positions by the warp threads, provided the latter are unbroken, combined with a feeler adapted to be moved toward the detectors, and stopping mechanism for the loom controlled as to its operation by the contact of said feeler with one or more detectors in their normal positions, substantially as will be described.

Other features of this invention will be hereinafter described and pointed out in the claims.

In the drawings, Figure 1, represents in end elevation a sufficient portion of a loom to enable this invention to be understood. Fig. 2 is an enlarged sectional detail, showing a portion of the reed and lay-cap, together with a portion of the weft-fork and its carrying slide. Fig. 3 represents in face view a portion of the reed; Fig. 4, one of the detectors by itself; Fig. 5, a front elevation on a smaller scale of the lay-cap. Figs. 6 and 7, in section represent modified constructions to be hereinafter described; and Fig. 8, a detail to show the ends of the hook P and dagger *r*.

Referring to the drawings, A represents a portion of the side frame of a loom; B the lay or crank-shaft; C the lay; C′ the lay-sword operated from said shaft; C^2 the picker-stick; C^3 the breast-beam; C^4 a holding-plate having a slot for the shipper C^5 to move in, and a notch to hold the said shipper in position; C^6 a weft-fork; C^7 a weft slide-bar; C^8 a weft-hammer; C^9 a cam on the shaft C^{10} to actuate the said weft-hammer; C^{11} a driving pulley on the shaft B; C^{12} a belt-controller mounted to slide on the rod C^{13}, and having its outer end in engagement with the shipper C^5; and D, D′, D^2, D^3, heddle frames, all of which are and may be of well-known or desired construction and arrangement and which may be actuated in usual manner, so need not therefore be herein further described.

Referring now to Fig. 2, the reed, composed of the reed-dents *a*, secured together by the reed-heads *a′*, only one of which is herein shown, and leaving reed-spaces $a^\times$ between them, are and may be of any usual or well-known construction.

The two members *c*, *c′* of the lay-cap are each represented as having guide or clamp-plates c^3, c^4, recessed to receive the edges of the reed-dents *a*, the said members being clamped together in suitable manner to hold the said reed-dents firmly between the said plates, as represented, the member *c* of the

lay-cap being recessed, as at c^2, to receive the head a' of the reed.

In accordance with this invention, each thread-receiving reed-space $a^\times$ is supplied with a warp detector d fitted to slide vertically, and as herein shown they slide in the box-like guideways formed by the reed-dents at either side and the guide-plates c^3, c^4, at their edges, said detectors at their lower ends being preferably turned back, as represented, to form bearings d^2, which for the best results may be grooved, as at d^3, for the reception of the warp threads in the particular reed-spaces in which the said detectors are arranged, said bearings d^2 being located behind the reed-dents a and being thickened, as represented in Figs. 3 and 4, so that the adjacent edges of the several detectors in the series will almost meet,—that the warp threads may not be caught between any two detectors, or between a detector and either of its adjacent reed-dents. The detectors d are provided with heads d', which in the present instance overlie the lay-cap member c' as shown, so that when the said detectors are in their lowermost or normal positions their heads d' will rest upon the member c' of the lay-cap. The heads d' are preferably thickened, as best shown in Fig. 4, so that they may contact with and guide one another to insure accurate movement, the lower edges of the heads being for the best results also beveled, as shown, to co-operate with the beveled edge of the feeler to be described.

In practice whenever the warp threads are raised in the formation of the shed, each lifted thread will lift the warp detector located in the reed-space through which said thread passed, from its normal into its abnormal position, shown by full lines Fig. 2; but should a warp thread become broken, it will fail to lift its detector into its abnormal position and the said detector will remain in its lowermost or normal position, as indicated in dotted lines Fig. 2, with its head d' resting upon the surface of the member c' of the lay-cap. It is necessary to stop the loom whenever such a detector remains in its normal position, as such position indicates a broken warp thread; and one form of mechanism for this purpose is herein illustrated.

In the drawings I have shown a plate e which I designate a feeler, it extending across the loom or the lay in front of the detectors, and being arranged to slide on the upper surface of the member c' of the lay-cap. The feeler e is retained in position by a shield or guide e' suitably shaped, shown best in Fig. 2, the said feeler being moved toward and from the series of detectors at each beat of the lay or during each shed-forming operation, by means of an arm o on the rock shaft o', journaled in suitable standards o^2 on the lay-cap, the said shaft being actuated by an arm o^3, which enters a suitable recess in a slide-bar G, which, as herein represented, consists of a shank g, provided with a head g' at one end and threaded at its opposite end to receive a nut or head g^2, the shank g being hollow to receive the pin g^3, having a head g^4, acted upon by a spring g^5, said head limiting the movement of the pin by the spring, the end of the pin normally bearing against the arm o^3 on the rock shaft o', as represented in Fig. 2. A suitable friction device is provided to prevent the feeler moving except it be moved by one or the other of the abutments n, m, such friction device in the present instance of my invention being shown as a flat spring h made adjustable by a set-screw h', to thus vary the friction as required, but the friction may be furnished in other suitable manner if desired, as for instance, to the rock-shaft o'. The shank g has a lock-nut $g^\times$ to retain the nut g^2 in adjusted position. The heads g', g^2, of the slide-bar G, of whatever form used, may be fitted with rubber or other yielding cushions g^6, adapted to strike against the fixed abutments m, n, erected in the path of and adapted to be struck in the forward and backward movements of the lay respectively, thus causing the said slide-bar to be reciprocated and through the rock-shaft o' move the feeler e toward and from the series of detectors.

The rock-shaft o' is herein represented as provided with a dagger r, frictionally clamped upon the shaft to permit of ready rotative adjustment, said dagger at its outer end being adapted preferably through a hook-like end r' to co-operate with preferably a corresponding hook p, fast on the weft slide-bar C^7, in which is pivoted or mounted the weft-fork C^6 which, when moved to the right, Figs. 1 and 2, will act upon the arm f^3 to move the rock-shaft f^4 and by its arm f^5 release the shipper to stop the loom, as will be clearly understood by reference to Fig. 1; but instead of releasing the shipper by the particular devices shown, I may release it in any other suitable equivalent manner, made operative through the shaft o' or the feeler.

The operation of the stop motion is as follows:—During each backward movement of the lay, the warp threads, through suitable shed-forming mechanism or harnesses, are moved to form the shed for the passage of the shuttle, and said warp threads, if unbroken, will act upon and move their detectors d into their abnormal positions, as in Fig. 2. Immediately before the lay reaches its rearmost position the head g^2 on the slide-bar G will strike the abutment n, and will be moved to the right, Fig. 2, into its dotted line position, acting through the rock-shaft o' and its arms to move the feeler e to the left beneath the elevated heads d' of the detectors d, such movement of the rock-shaft moving the dagger r into its lowermost dotted line position, Fig. 2, so that upon the next forward movement of the lay, the hook r' on the dagger will pass beneath the hook p on the weft slide-bar without moving the latter, thus failing to stop the loom. During the forward

movement of the lay the shedding mechanism, of whatever form, begins its movement to change the positions of the warp threads from one to the other plane of the shed, so that the detectors are permitted to move into their normal positions until they are arrested by their heads d' meeting the feeler e then beneath them, said feeler supporting the detectors until the lay has entirely completed its forward movement to beat in the weft thread, when the abutment m will strike the head g' on the slide-bar G and move said slide-bar to the left into its full line position, Fig. 2, causing the rock-shaft o' to move the feeler e back into its full line position, Fig. 2, and permit the detectors to further move into their normal positions, with their heads d' resting upon the upper surface of the member c' of the lay-cap. The movement of the slide-bar G into its full line position, Fig. 2, by striking against the abutment m, and the consequent rotation of the rock-shaft o', will move the dagger r into its uppermost position, Fig. 2, so that on the return or backward movement of the lay, the hook r' on the end of the dagger will pass above the hook p on the weft slide-bar. From the foregoing it will be seen that if the warp threads are all unbroken and all of the detectors d have been acted upon and raised or moved into their abnormal positions during the backward movement of the lay, the loom will be permitted to continue its operation, and the hook r' on the dagger r will pass below the hook p on the weft slide-bar during the forward movement of the lay, and above the hook p on the backward movement thereof; but should a warp thread be broken it will fail to lift or move its detector into its elevated or abnormal position as the shed is formed during the backward movement of the lay, so that when the slide-bar G during such backward movement of the lay, strikes the abutment n and is moved to the right into its dotted line position, Fig. 2, the feeler e as it is moved to the left will strike against the detector which has remained in its lowermost normal or dotted line position, Fig. 2, and will thus be moved only through one-half the distance that it would be moved, provided all the detectors were raised into their abnormal positions; therefore the rock-shaft o' would be rotated only one-half as far as before, and the dagger r, instead of being moved from its uppermost into its lowermost dotted line position, Fig. 2, would be moved through one-half such distance only into its intermediate dotted line position, as shown, the path of movement of its hook r' being directly in line with the hook p on the weft slide-bar C^7, so that as the lay is moved forward to beat in the weft thread, the hook r' on the dagger will engage the hook p on the weft slide-bar and push the latter before it to the right, Figs. 1 and 2, and act through the arm f^3, rock-shaft f^4, and arm f^5, to move the shipper C^5 from its notch and stop the loom in usual manner. This movement of the weft slide-bar by the dagger, takes place just prior to the completion of the forward or beating-in stroke of the lay, the dagger r, after having moved the slide-bar, being moved out of engagement with the hook p by the abutment m, which strikes the slide-bar G and moves the feeler and dagger into their uppermost dotted line position, in readiness to, as described, again stop the loom after a broken warp thread has been mended, if another warp thread should become broken. The abutments m and n must always give to the slide-bar G a full movement, but if a detector should happen to remain in its normal position by reason of a broken warp thread, the feeler e cannot be given a full movement, and for this reason the spring-controlled pin g^3 is arranged in the slide-bar to act against one side of the arm o^3, as represented in Fig. 2, so that when the slide-bar is moved to the right by striking against the abutment n, if the feeler should encounter a detector and thus be stopped after having moved through one-half only of its full movement, the pin g^3 will yield and still permit a full movement of the slide-bar, the spring g^5 being of sufficient strength to move the feeler e, provided all the detectors are in their abnormal positions, but it will permit the pin to yield if a detector happens to be in its normal position to thus prevent breakage of any of the parts, and leave the slide-bar G always in the proper position for operation after the warp thread has been mended, the spring g^5 moving the feeler e to the left beneath the heads of the detectors d when the latter have been raised by the mending of the warp thread. The friction furnished by the spring h is sufficient to retain the slide-bar in either extreme position without a positive locking device, although such a locking device may be provided, if desired, instead of the friction.

Fig. 6 represents a modified construction wherein the lay-cap is formed of a single member only, the detectors d being pressed down by a spring s, the feeler in this instance consisting of a U-shaped bar $s^\times$, having its ends pivoted at s' and extending along in front of the detectors, as represented, a yielding arm s^2 extending from one end of the feeler into suitable position to be acted upon by an abutment n to throw the feeler beneath the heads of the detectors, provided the latter are in their abnormal positions, but which will yield should the feeler be restrained from movement by striking against a detector in its normal position, the feeler being returned to its normal position by a spring t, which acts upon an arm s^3 said arm being also provided with a pin s^4, adapted to engage the hook p on the weft slide-bar, or to strike against a warp fork to lift the same, upon the principle referred to in my previous application.

Fig. 7, represents one form of adapting the invention herein disclosed to fancy looms. Referring to said figure I have provided two feelers e, $e^\times$, each actuated by arms attached

to or forming a part of independent rock-shafts o', e^5, said arms having tails e^6, e^7, which extend up and over the lay-cap terminating at different points as shown, to be acted upon by suitable pins e^8, e^9 on the harness frames as one or another of the latter is raised, the pin on the frame or frames raised acting to lift the tail with which it co-operates as the lay moves into its rearmost position, while the tail or tails which co-operate with the pins which are not raised will fail to be moved. Therefore the feelers controlled by them will also fail to be moved.

In accordance with this principle any number of feelers may be employed in connection with any number of series of detectors corresponding to the loom to which they are applied, each feeler being moved forward beneath its co-operating detectors whenever the harness frame controlling the warp threads which act upon the detectors of that series is raised and only when such harness frame is raised. In practice instead of forming the member c' of the lay-cap in a single continuous strip extending entirely across the reed I prefer to form the same of a series of sections as indicated in Fig. 5, the clamping plate c^4 and guide plate e' being also formed in sections corresponding thereto, each section being held in place by a clamping device or screw, as shown in said figure.

The sections may be made of any desired length and are of great advantage when it is necessary to remove the clamping plate c^4 for access to any one or more of the detectors, for the clamping plate which serves to confine the detectors in place is thus removed from several only of the detectors at a time as would not be the case were the member c' and clamping plate made in single continuous strips.

This invention is not limited to the particular construction or arrangement of parts herein shown and described, for so far as I am aware it is broadly new to provide a series of warp threads with any form of detectors, held or moved into their abnormal positions by the warp threads when the latter are unbroken, but which will fail to be moved from their normal positions if the warp threads are broken, the positions of the detectors, whether in their normal or abnormal positions, being detected by a feeler, automatically moved at each shed of the warp or at other suitable times, as desired, such feeler acting to stop the loom if it encounters a detector which has not been moved into its abnormal position by a perfect warp thread.

I claim—

1. In a warp-stop motion for looms, a reed, a series of sliding warp detectors between the dents thereof and resting directly upon and adapted to be moved from their normal into their abnormal positions by the warp threads, provided such threads are unbroken, combined with a feeler automatically moved laterally toward and from the edges of said detectors, and adapted to contact with any detector remaining in its normal position by reason of the breakage of a warp thread, substantially as described.

2. In a warp-stop motion for looms, a reed, a series of sliding warp detectors between the dents thereof and resting directly upon and adapted to be moved from their normal into their abnormal positions by the warp threads, provided the latter are unbroken, combined with a feeler automatically moved laterally toward the edges of said detectors, and limited in its movement by the position of said detectors, and stopping mechanism for the loom controlled by the length of movement of said feeler, substantially as described.

3. A loom containing a lay, a series of reed-dents carried thereby, sliding warp detectors arranged between the said reed-dents and acted upon and moved from their normal into their abnormal positions by said threads, provided the latter are unbroken, combined with a feeler automatically moved toward the said detectors, and limited in its movement by the position of said detectors, a dagger on the lay and adapted to be moved with said feeler, and co-operating mechanism to stop the loom, substantially as described.

4. A loom containing a lay, a series of reed-dents carried thereby, and warp detectors arranged between the said reed-dents, combined with a feeler adapted to be moved toward the said detectors and limited in its movement by the position of said detectors, a dagger controlled as to its position by said feeler, a co-operating slide on the loom frame, and a stopping mechanism actuated by movement of the said slide, substantially as described.

5. A loom containing a lay, a series of reed-dents carried thereby, and warp detectors arranged between the said reed-dents, combined with a feeler adapted to be moved toward the said detectors and limited in its movement by the position of said detectors, a dagger moved with said feeler, a weft slide-bar on the loom to be engaged by said dagger, a weft-fork pivoted in said slide-bar, and a stopping mechanism actuated by movement of said slide-bar, substantially as described.

6. In a warp-stop motion for looms, a lay, a series of reed-dents carried thereby, and warp detectors arranged between the said reed-dents, combined with a feeler, a slide-bar to move the same toward and from the said detectors, and abutments in the loom frame to actuate said slide-bar, substantially as described.

7. In a warp-stop motion for looms, a lay, a series of reed-dents carried thereby, and warp detectors arranged between the said reed-dents, combined with a feeler, a slide-bar to move the same toward and from the said detectors, abutments on the loom frame to actuate said slide-bar, and a friction device therefor, substantially as described.

8. In a warp-stop motion for looms, a lay, a

series of reed-dents carried thereby, and warp detectors arranged between the said reed-dents, combined with a feeler, a rock-shaft to move the same, a slide-bar on the lay to move the rock-shaft, and abutments to actuate said slide-bar, substantially as described.

9. In a warp-stop motion for looms, a lay, a series of reed-dents carried thereby, and warp detectors arranged between the said reed-dents, combined with a feeler, a rock-shaft to actuate the same, a slide-bar having a slot to receive an arm on the said rock-shaft, a yielding pin arranged at one side of said arm to move the latter, and a stopping mechanism controlled by said feeler, substantially as described.

10. In a warp-stop motion for looms, a lay, and a series of warp detectors combined with a feeler, devices to move the same toward and from the said detectors, and a friction device to retard the movements of the feeler, substantially as described.

11. A loom containing a lay, a reed, warp detectors arranged between the dents thereof and provided with heads having lower beveled faces combined with a feeler automatically moved toward and from the said detectors and having a beveled edge to co-operate with the beveled faces or the heads of said detectors, substantially as described.

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

OBERLIN SMITH.

Witnesses:
JAMES J. REEVES,
HUGH L. REEVES.