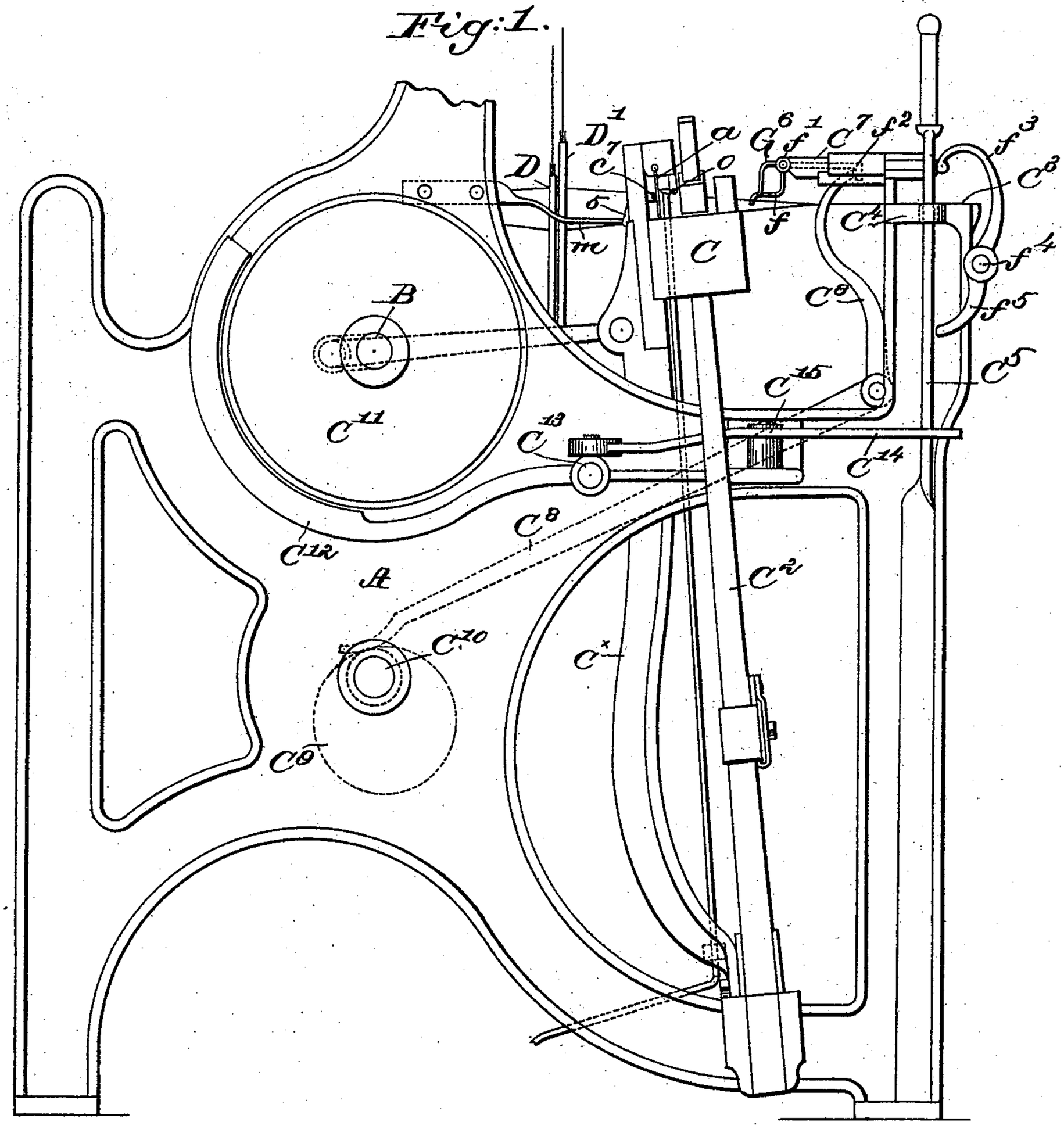
(No Model.) 3 Sheets—Sheet 1.

O. SMITH.

WARP STOP MOTION FOR LOOMS.

No. 498,194. Patented May 23, 1893.

Fig: 1.



Witnesses.
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Inventor.
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(No Model.) 3 Sheets—Sheet 2.

O. SMITH.

WARP STOP MOTION FOR LOOMS.

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Fig: 3.

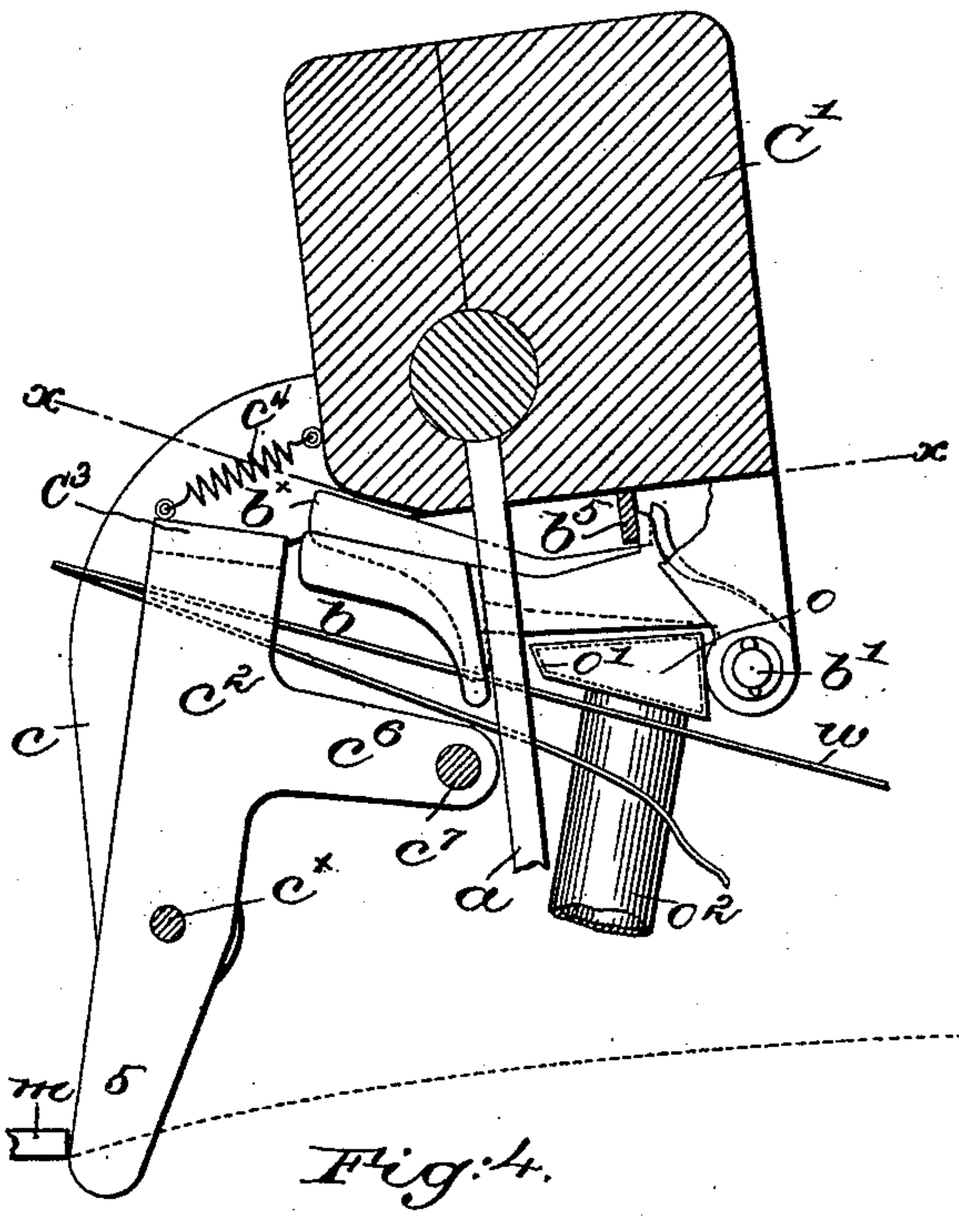

Fig: 4.

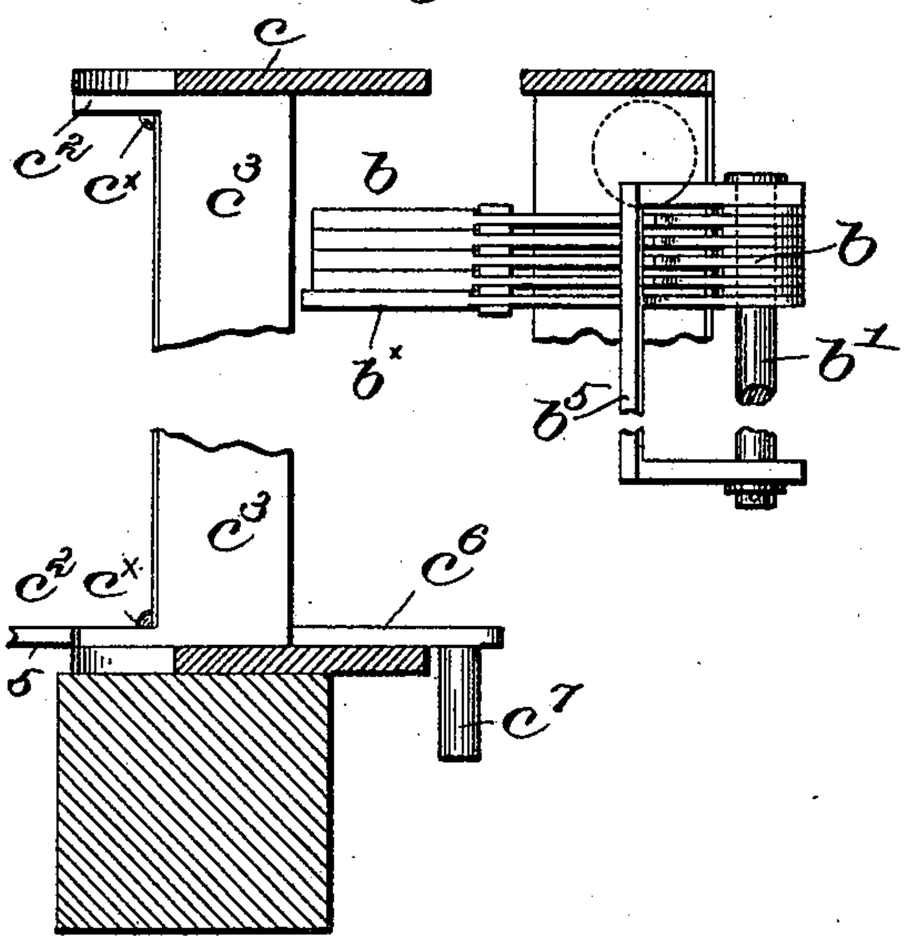

Fig: 2.

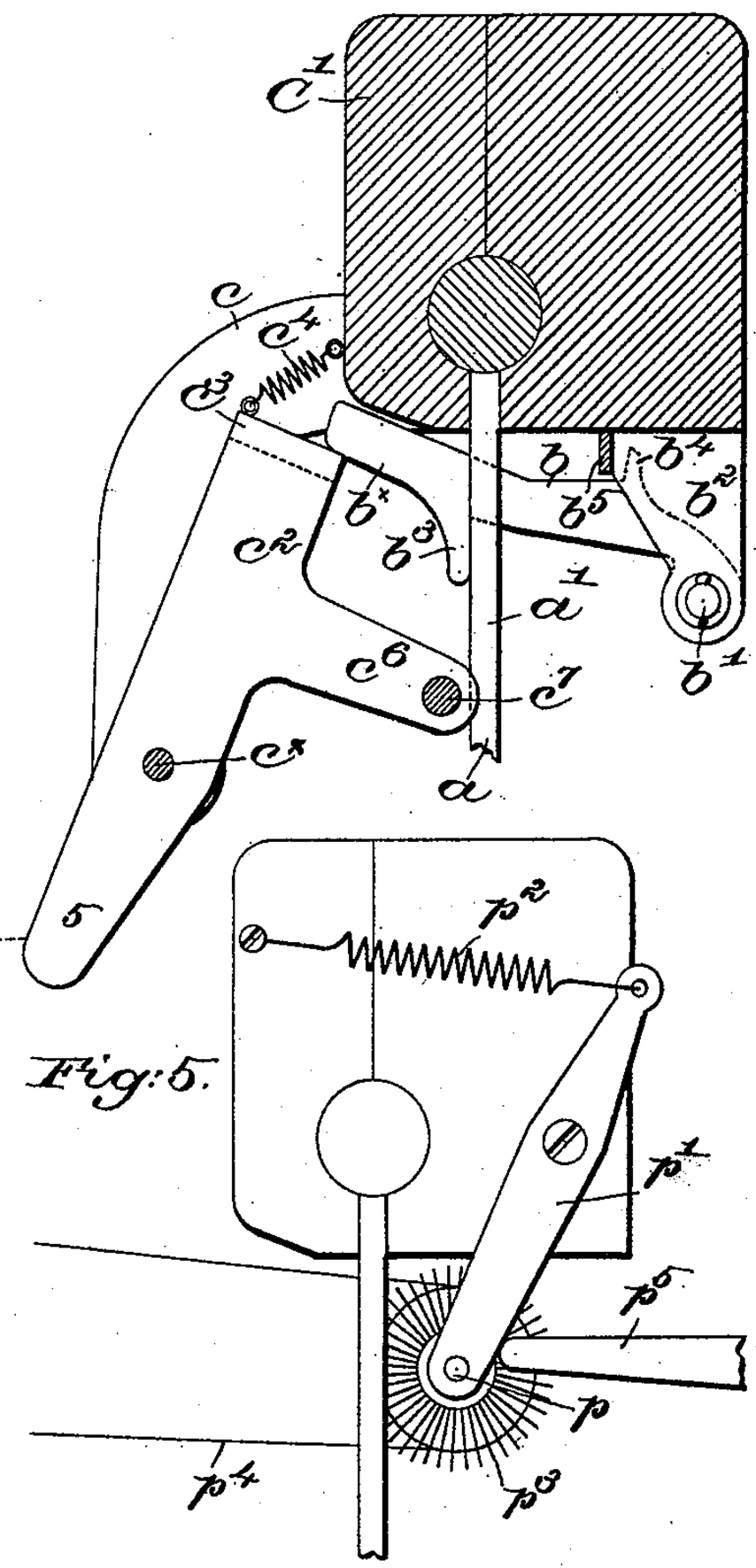

Fig: 5.

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(No Model.) 3 Sheets—Sheet 3.

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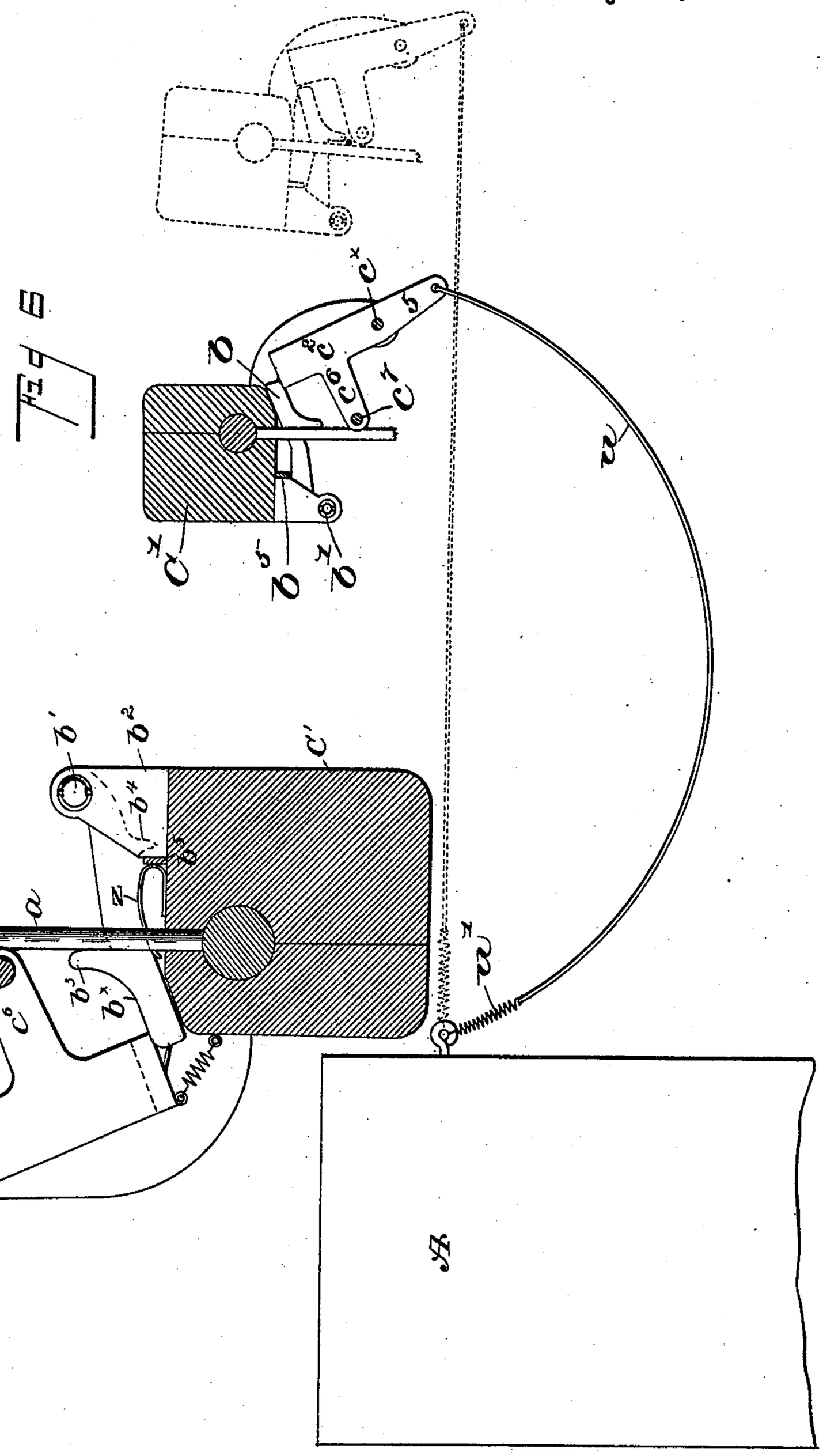
WARP STOP MOTION FOR LOOMS.

No. 498,194. Patented May 23, 1893.



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by Crosby & Gregory
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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. 498,194, dated May 23, 1893.

Application filed February 29, 1892. Renewed May 1, 1893. Serial No. 472,613. (No model.)

To all whom it may concern:

Be it known that I, OBERLIN SMITH, of Bridgeton, county of Cumberland, and 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 and figures on the drawings representing like parts.

This invention relates to warp stop motions for looms, and is supplemental to that shown and described in application Serial No. 424,248, filed by me March 8, 1892, the object of this invention being primarily to effect the stopping of the loom upon the breakage of a warp thread by mechanism purely mechanical instead of by means of an electro-mechanical mechanism as shown in the said application. In the application referred to, a series of pivoted warp detectors have their free ends to be acted upon and moved by the warp threads provided such warp threads are unbroken; but should a warp thread be broken the warp detector which should have been moved by it will fail to be moved, and such failure will cause the closure of an electric circuit which through suitable electro-mechanical mechanism will act to stop the loom.

This present invention comprehends a series of pivoted warp detectors having their free ends adapted to be acted upon and moved from their normal into their abnormal positions by the warp threads provided such threads are unbroken, as in the said application; but in this present invention, the stopping of the loom is not effected by the closure of an electric circuit by any detector which fails to be moved by a warp thread as in the said application, but rather by means of a feeler which is moved toward the series of detectors, and if the latter are all raised, as they should be by the warp threads if the latter are unbroken, the feeler will pass beneath their raised ends; but should any detector fail to be moved by reason of a broken warp thread, the movement of the feeler toward the series of detectors will be stopped by such detector, and will act through suitable mechanical mechanism to stop the loom. The normal position of the feeler is preferably beneath and sustaining the warp detectors, to thereby relieve the warp threads from the friction and weight of the same the feeler being acted upon by a suitable abutment as the lay reaches the end of its backward movement and withdrawn from beneath the detectors to permit the latter to be sustained by the raised warp threads, the feeler being returned to its normal position beneath the detectors as the lay begins its forward movement. If, however, a warp thread which should have been moved into the upper plane of the shed, is broken, it will fail to catch and support its detector when the latter is dropped by the withdrawal of the feeler from beneath the series at the backward movement of the lay, such detector being permitted to fall to its lowermost position where it will prevent the return of the feeler to its normal position beneath the series of raised detectors and the feeler remaining in its abnormal position during the forward movement of the lay will act through suitable mechanism to effect the stopping of the loom. The feeler thus constitutes not only a device to effect the stopping of the loom when a warp detector has failed to be moved to its abnormal position by a warp thread, but also serves as a sustaining device to relieve the warp threads from the weight and friction of the detectors. The warp detectors are preferably arranged between the dents of the reed, and to maintain the spaces between the said reed-dents free from lint which would clog the spaces and prevent the free movement of the detectors, I have provided a suitable lint clearing device to keep the spaces free from lint, dust, &c.

One part of this invention therefore consists in the combination in a warp stop-motion for looms, of a series of pivoted warp detectors having their free ends adapted to be acted upon and moved by the warp-threads, of a feeler adapted to normally sustain the weight of the said detectors and to be moved from beneath the latter at predetermined times to permit one or any of them to drop if unsupported by a warp-thread, substantially as will be

described. Also in the combination in a warp-stop motion for looms, of a lay, a series of reed dents carried thereby, warp detectors arranged between the said reed dents, a spring-controlled feeler on the lay, and an actuating abutment to move the said feeler away from the detectors, to operate, as will be described. Also in the combination in a warp-stop motion for looms; of a lay; a series of reed-dents carried thereby; warp detectors arranged in the spaces between the said reed-dents; and a lint clearing device to clear of lint the spaces between said the reed-dents, as will be described.

Other features of this invention, together with the more specific details of construction will be hereinafter described and pointed out in the claims.

Figure 1 represents in end elevation, a sufficient portion of a loom to enable this invention to be understood; Fig. 2, an enlarged section of the lay-cap, reed dents, detectors and feeler, the latter being in its normal position beneath and supporting the detectors, and one form of lint clearing device to be described; Fig. 3, a view similar to Fig. 2 showing the feeler as moved from beneath the detectors by the actuating abutment, one of the detectors being represented as in its lowermost position owing to a broken warp-thread; Fig. 4, a section taken on the irregular dotted line x—x Fig. 3; Fig. 5, a view illustrating a different form of lint clearing device; Fig. 6, a modification to be described, and Fig. 7 shows my invention applied to the lower end of a reed space.

Referring to the drawings A, represents a portion of the end frame of a loom; B the lay or crank shaft; C the lay; $C^{\times}$ 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 actuated by the lever C^{14}, pivoted at C^{15}, and having its outer end in engagement with the shipper C^{5}, and D, D′, 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 be herein further described.

Referring to Fig. 2, C′ represents the usual lay-cap which, together with the lay C, shown in Fig. 1, holds the usual reed-dents a, arranged to leave reed-spaces a', through which are extended, the free ends of the warp detectors b, pivoted as herein represented in front of the reed-dents on a rod b' extended lengthwise of the lay and supported in suitable brackets b^{2} at or near each end thereof, see Fig. 3, the extended ends $b^{\times}$ of the said detectors beyond and back of the reed-dents being made thicker so as to contact with each other, but at the same time slide freely one by the other. The thickened ends $b^{\times}$ of the warp detectors are provided with warp supporting lugs b^{3}, preferably grooved to receive the warp-threads w, when the latter are raised into the upper plane of the shed.

The lay-cap C′, at or near its opposite ends, is provided with brackets c to which are pivoted at $c^{\times}$ the down-turned ends c^{2} of the bar c^{3} extended lengthwise across the lay and which constitutes the feeler, said feeler being normally retained in its position Fig. 2, beneath the raised ends of the detectors by a spring c^{4}, attached to the feeler and to the lay-cap. One of the down-turned ends c^{2} of the feeler has a projecting arm c^{6} provided with a laterally-extended stud or projection c^{7} which, when the feeler is in its lowermost position Fig. 2, will, upon the forward movement of the lay, strike the down-turned end of a warp-fork f, in the present instance pivoted at f' on the weft-slide bar C^{7} to turn the said fork on its pivot, and lift its hooked end f^{2} out of the path of movement of the weft-hammer C^{8}; but when the said feeler is in its abnormal position Fig. 3, the said stud c^{7} will, upon the forward movement of the lay, pass above the warp-fork and fail to turn the same upon its pivot, leaving its hooked end f^{2} directly in the path of movement of the weft-hammer C^{8} to be engaged by the latter as it moves forward.

The feeler c^{3} carrying the stud c^{7} is in the present instance provided with a downwardly extended arm 5 which as the lay reaches the limit of its backward movement, is struck by an abutment m, said projection acting through the arm 5 to move the feeler from beneath the ends of the detectors supported by it into its position Fig. 3, permitting the detectors to be sustained in their elevated positions by the warp threads raised by the harness motion into the upper plane of the shed.

If all the warp threads are perfect and unbroken, said threads will support the detectors in substantially the same position in which they were sustained by the feeler, so that as the lay begins its forward movement and leaves the abutment m, the feeler will be drawn forward beneath the detectors by the spring c^{4} to take the weight of the detectors from the warp threads and to move the stud c^{7} into its lowermost position, where it will engage the warp fork and turn the same upon its pivot to prevent the stopping of the loom. If, however, a warp thread is broken, the detector in the particular reed space through which the broken warp thread is passed will fail to be sustained when released by the feeler, and will fall to its lowermost position until arrested by its stop b^{4}, as represented in Fig. 3, so that when the lay begins its forward movement and leaves the abutment m, the spring c^{4} will be unable to draw the feeler forward into its normal position beneath the raised detectors sustained by the unbroken threads, for the said feeler will strike the end of

the detector which has been permitted to drop by the broken thread, thus retaining the feeler in its abnormal position with the stud c^7 in its elevated position, and at the next forward movement of the lay the stud will pass above the warp fork without engaging and turning the same upon its pivot, and thus effect the stopping of the loom.

In the present instance of my invention, each reed-space is presumed to contain at least two warp threads which are alternately moved into the upper and lower planes of the shed at each shed, and assuming the lay to be in its forward position Fig. 2, as when beating in the weft, with the feeler c^3 in its normal position beneath and supporting the detectors, the operation of the stop-motion is as follows: As the lay begins its backward movement, the warp threads are moved by the usual heddle frames D, D′, to form the upper and lower planes of a shed for the passage of a shuttle, and if all the threads which should be moved into the upper plane of the shed are unbroken, all of the detectors *b*, as the lay moves backward, will just before the lay reaches the end of its movement, encounter the raised warp threads and be lifted slightly from the feeler, being thereby moved into their abnormal positions Fig. 2. Just before the lay reaches the end of its backward movement, the abutment *m* will strike the arm 5 of the feeler and will move the latter to withdraw it from the detectors and to move it into its position Fig. 3, thus permitting the detectors to be sustained entirely by the raised warp-threads, said feeler being returned to its normal position beneath the raised detectors by the spring c^4 as soon as the lay begins its forward or beating-in movement and leaves the abutment *m*, the stud c^7 on the arm c^6 of the feeler being thereby returned to its normal lowermost position where it will strike the down-turned end of the warp fork *f* and turn the same into its elevated position Fig. 4, with its hooked end f^2 out of the path of movement of the weft-hammer C^8, and if the weft-fork C^6 is also turned on its pivot by the weft-thread in usual manner the weft-hammer C^8 upon its next forward movement will fail to move the slide bar C^7 to effect the stopping of the loom. As the lay again moves backward, those warp threads which formed the lower plane of the former shed will now be moved to form the upper plane of a new shed, and the warp detectors *b* will ride upon these raised threads as previously described, provided such threads are unbroken, and will be lifted slightly from the feeler c^3 which previously supported them; but should one of the warp threads which should have been moved into the upper plane of the shed be broken, the warp detector in the reed-space through which said warp-thread passes, will fail to be thus acted upon by said warp thread, and will remain resting upon the feeler c^3. As the lay approaches the end of its backward movement the abutment *m* strikes the arm 5, and withdraws the feeler from beneath the detector, all of the detectors acted upon by the unbroken warp threads remaining supported by such threads in their abnormal positions, but the particular detector which is in the reed-space through which the broken warp thread passes upon the withdrawal of the feeler is left without a support and will immediately drop to its lowermost position as indicated in Fig. 3 with its end lying in the path of movement of the feeler c^3, so that as the lay begins its second forward or beating-in movement and leaves the abutment *m*, the spring c^4 will be prevented from drawing the feeler forward into its normal position, said feeler striking the end of the detector *b* which is down, thus retaining the feeler in its abnormal position Fig. 3 with the stud c^7 in its elevated position where it will pass above the warp-fork and fail to turn the same on its pivot, leaving its hooked end f^2 down in the path of movement of the weft-hammer C^8, so that the latter as it moves forward, will engage said hook and move it and its slide-bar C^7 forward or to the right Fig. 1, causing it to act upon the arm f^3 of the rock shaft f^4, to turn the latter and through its arm f^5 act upon and move the shipper C^5 to the left to disengage it from the notch in the holding-plate C^4 and permit the said shipper to be moved to effect the stopping of the loom. Upon the mending of the broken warp thread the detector which effected the stopping of the loom will upon the next succeeding backward movement of the lay, be acted upon with the others and sustained in its elevated position when the feeler is moved from beneath it by the abutment *m*, thus permitting the feeler to be again moved into its normal position beneath the detectors when the lay begins its forward movement and permit the continued operation of the loom until the same is stopped by the breakage of another warp thread, the operation in any case being the same.

It will be seen that the feeler normally sustains the weight of the detectors of the series, thus preventing undue wear or breakage of the warp threads by the sliding action of the detectors were the latter supported solely by the threads, but that the feeler is automatically withdrawn from beneath the detectors momentarily at the end of each backward movement of the lay to permit one or more of the detectors to drop should a warp thread or threads be broken, the feeler being thereafter again moved forward beneath the detectors to sustain the latter if all have been retained in their elevated or abnormal positions by the warp threads, said forward movement however being obstructed if one or more of the detectors have been permitted to drop by reason of a broken thread or threads, so that while the feeler normally acts as a sustaining device for the warp detectors, it acts by its

movement toward and from the detectors to stop the loom if a feeler has not been properly acted upon by a warp thread.

While I have herein shown and described my stop-motion as applied to the lay-cap and adapted to stop the loom upon a breakage of a thread only when it is or should be moved into the upper plane of the shed, still I desire it to be understood that the invention may be applied equally well to the lay to stop the loom upon the breakage of a warp thread when it is or should be moved into the lower plane of the shed, as illustrated by Fig. 7, wherein the construction is essentially the same as in Figs. 2 and 3 with the addition of a spring z to press the detector upward against the warp thread or threads.

Lint or dust if permitted to collect on the reed-dents in the reed-spaces would interfere with the free movement of the warp-detectors, and to obviate such difficulty, I have provided, as shown, a lint clearing device shown in Figs. 1 and 3 as a conduit o which extends the entire length of the reed, and is provided with a longitudinal slit or opening o', see Fig. 3, through which air under pressure supplied through the pipe o^2 may be discharged upon or between the reed-dents to keep the same always free from any lint or dust thus insuring unobstructed movement of the warp-detectors at all times.

In lieu of the air conduit o, shown in Figs. 1 and 3, as the lint clearing device, I may employ a rotating brush, such for instance as represented in Fig. 5, referring to which, p represents a rod or shaft extending across the lay in front of the reed-dents and supported in swinging arms p' pivoted to the lay cap and normally acted upon by a spring p^2 to normally move the shaft away from the reed-dents, said shaft carrying one or more circular brushes p^3, rotation of the shaft by a suitable belt p^4 causing the said brushes to be revolved. As the lay reaches the limit of its forward movement, the abutment p^5 on the loom frame will strike one of the arms p' and move the shaft p carrying the rotating brushes forward or up to the reed causing the brushes to enter the reed-spaces and by their rotative movement clean or free the same from any lint or dust, the brushes being withdrawn from the reed-dents by the spring p^2 as soon as the lay moves back away from the abutment p^5.

This invention is not limited to the particular construction of the various parts herein shown, nor to the exact arrangement of coacting parts shown, as it is evident that the same may be varied without departing from the spirit and scope of this invention.

In lieu of the fixed abutment m for withdrawing the feeler from beneath the warp detectors, I may employ a cord or other flexible or yielding connection u, as in Fig. 6 connecting the arm 5 of the feeler with the front of the loom frame or some part connected thereto which cord or connection is normally slack, but will be drawn taut by the lay as it moves to its rearmost position, the connection when drawn taut then acting to pull the feeler from beneath the detectors in the manner in which it is withdrawn by the abutment as described.

A flexible connection gives a more noiseless and flexible movement than the rigid abutment. It is also evident that as many feelers may be employed as there are independent series of detectors in use, each feeler co-operating with its own series of detectors only.

In the modification Fig. 6 a spring u' may be interposed in the flexible connection if desired.

The gist of this invention lies in the arrangement of a detector at one end of a reed space and the combination with it of a feeler normally actuated to keep the detector from contact with the warp, except at a predetermined time during which the feeler is moved to release the series of detectors and permit them to contact with the warp threads, the extent of movement of the detectors being determined by the condition of the warp threads.

I claim—

1. A loom containing the following instrumentalities, viz:—a series of reed dents, a series of pivoted warp detectors, a feeler to normally sustain said pivoted detectors, and means to withdraw the feeler from beneath the detectors at predetermined times to permit the same to move to their normal positions if not sustained by the warp threads, substantially as described.

2. A loom containing the following instrumentalities, viz: a series of reed-dents; a series of warp-detectors; a spring-controlled feeler to normally sustain said detectors, and means to withdraw the feeler from beneath the detectors to permit the detectors to move to their abnormal positions if not sustained by the warp-threads, substantially as described.

3. A lay; a series of reed-dents carried thereby, warp-detectors arranged between the said reed-dents; a feeler movable toward and from the said warp-detectors; a spring to move the said feeler in one direction; and an abutment to move it in an opposite direction; and a stopping mechanism controlled by the said feeler, substantially as described.

4. In a warp-stop-motion for looms, the combination of the following instrumentalities, viz:—a lay; a series of reed-dents carried thereby; pivoted warp detectors having their free ends entering the spaces between the said reed-dents; a spring-controlled feeler; an actuating abutment therefor; and a warp-fork, the position of which is controlled by the feeler, substantially as described.

5. In a warp-stop-motion for looms, the combination of the following instrumentalities, viz:—a lay; a series of reed dents carried thereby; warp-detectors arranged between the said reed-dents; a spring-controlled feeler c^3; an abutment to withdraw the same from beneath the warp-detectors; a stud c^7; and a

warp-fork actuated by the same when in one position only, substantially as described.

6. In a warp stop motion for looms, a lay, a series of reed dents carried thereby, a series of warp detectors pivoted at one end in a vertical plane outside the reed dents, and extended between the reed dents and provided at the side of the reed dents opposite said pivots with thickened thread supports to bear upon the warp threads, substantially as described.

7. In a warp stop motion for looms, a lay, a series of reed dents carried thereby, and a series of pivoted warp detectors *b* having thread supports and shoulders located between their pivotal points and the thread supports, and a feeler co-operating with said detectors, substantially as described.

8. In a warp-stop-motion for looms, the combination with a series of reed-dents; and warp detectors arranged between said reed-dents; of a lint clearing device to clear the reed spaces from lint, dust, &c., substantially as described.

9. In a warp-stop-motion for looms, the combination with a lay; a series of reed-dents carried thereby; and warp detectors arranged between said reed-dents; of a lint clearing device to clear the reed-spaces from lint, dust &c., 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,
ENOS PAULLIN.