(No Model.)

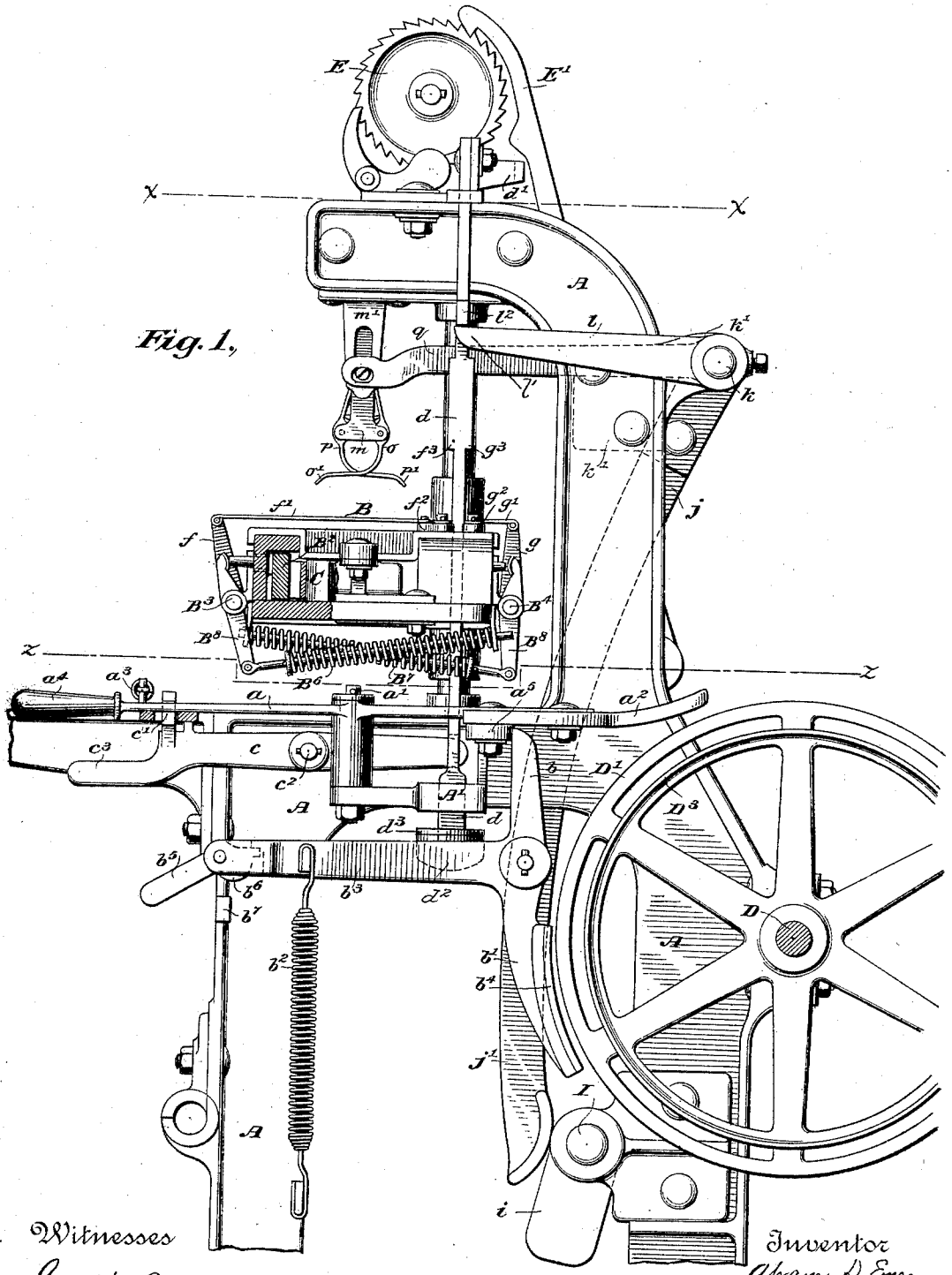
5 Sheets—Sheet 1.

A. D. EMERY.

STOPPING MECHANISM FOR LOOMS.

No. 503,461. Patented Aug. 15, 1893.

Fig. 1.



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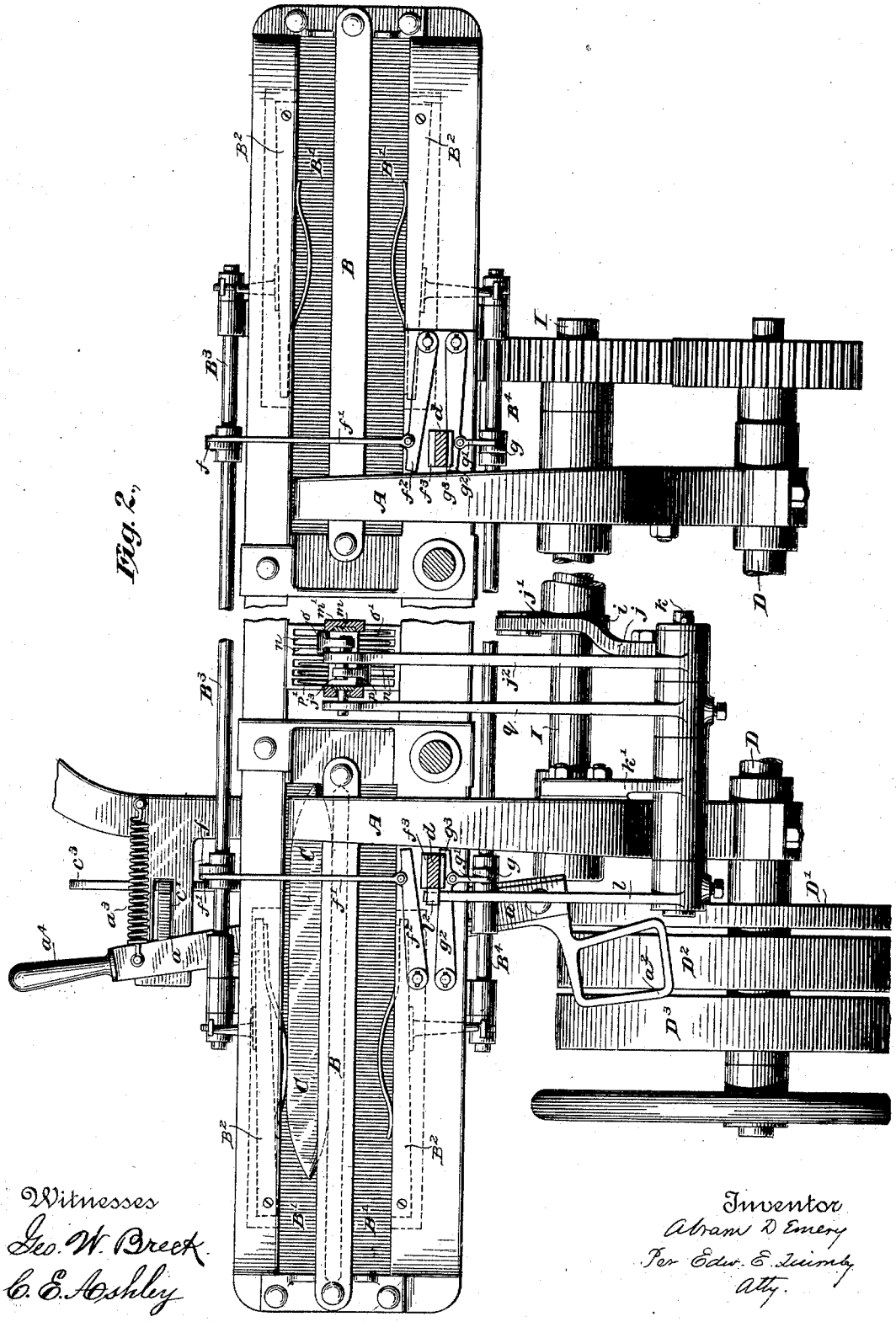
STOPPING MECHANISM FOR LOOMS.

No. 503,461. Patented Aug. 15, 1893.

Fig. 2.



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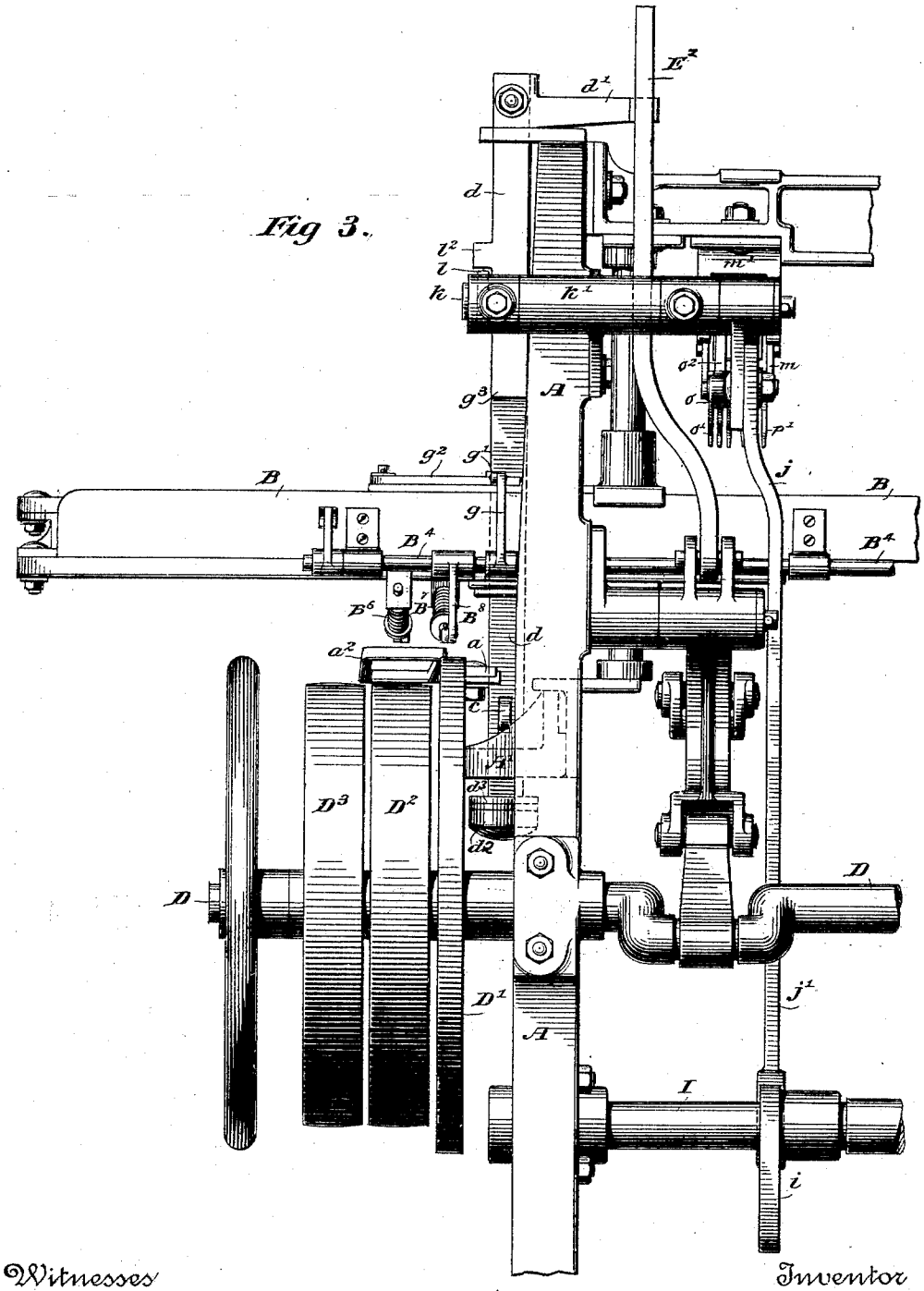
STOPPING MECHANISM FOR LOOMS.

No. 503,461. Patented Aug. 15, 1893.

Fig 3.



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STOPPING MECHANISM FOR LOOMS.

No. 503,461 Patented Aug. 15, 1893.

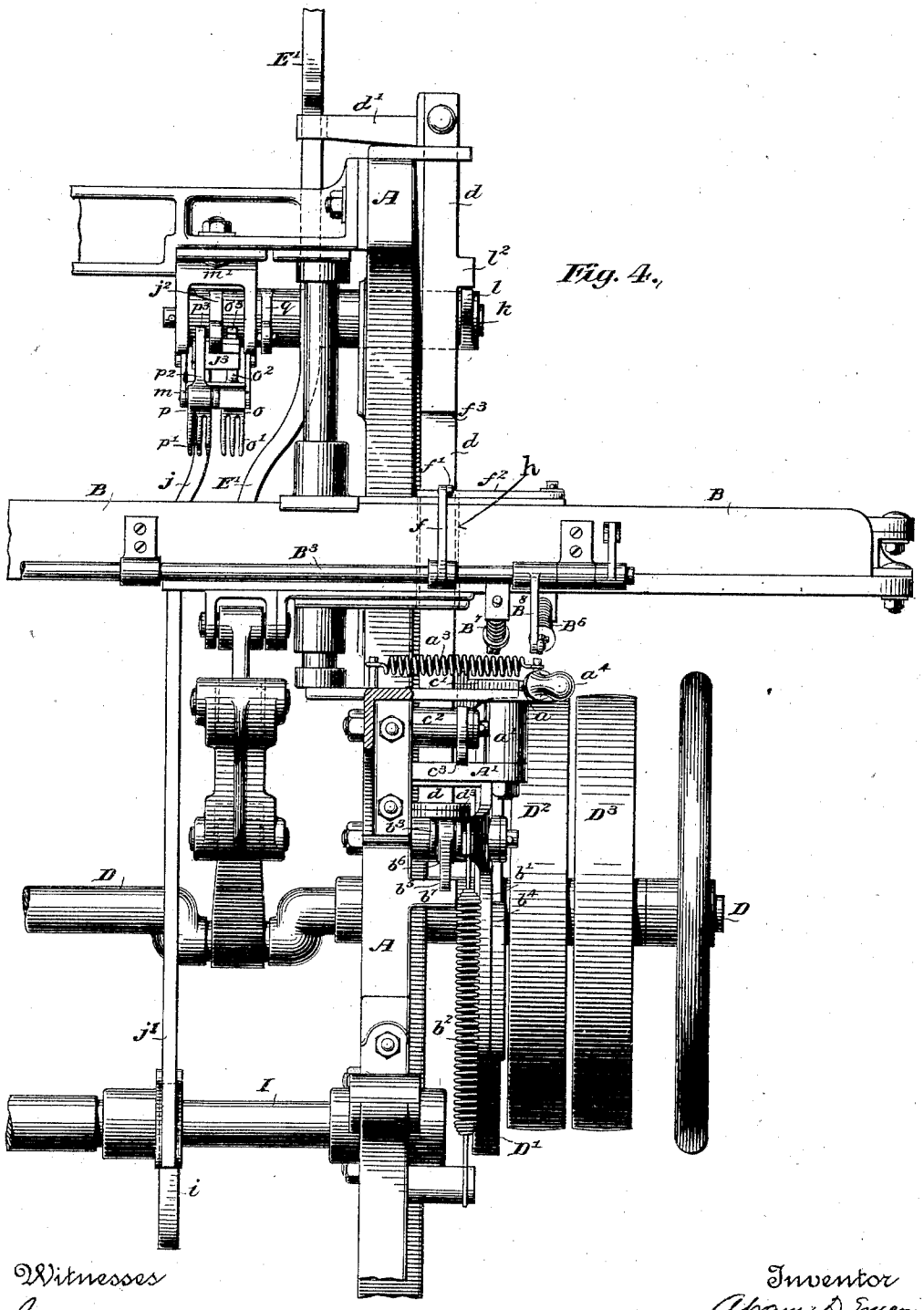

Fig. 4.

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STOPPING MECHANISM FOR LOOMS.

No. 503,461. Patented Aug. 15, 1893.

Fig. 5.

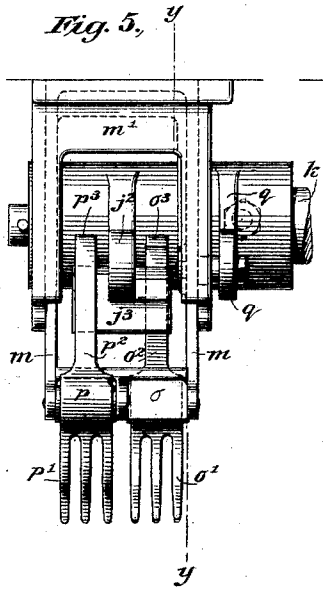


Fig. 6.

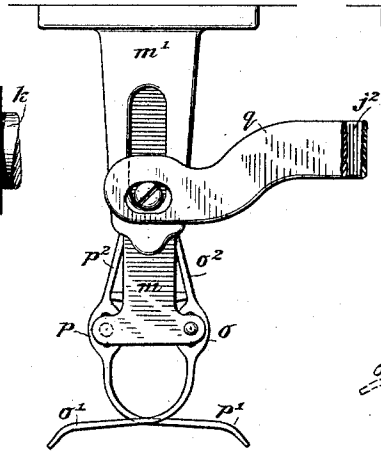


Fig. 7.

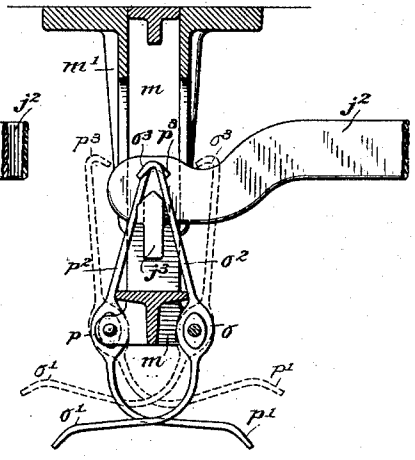
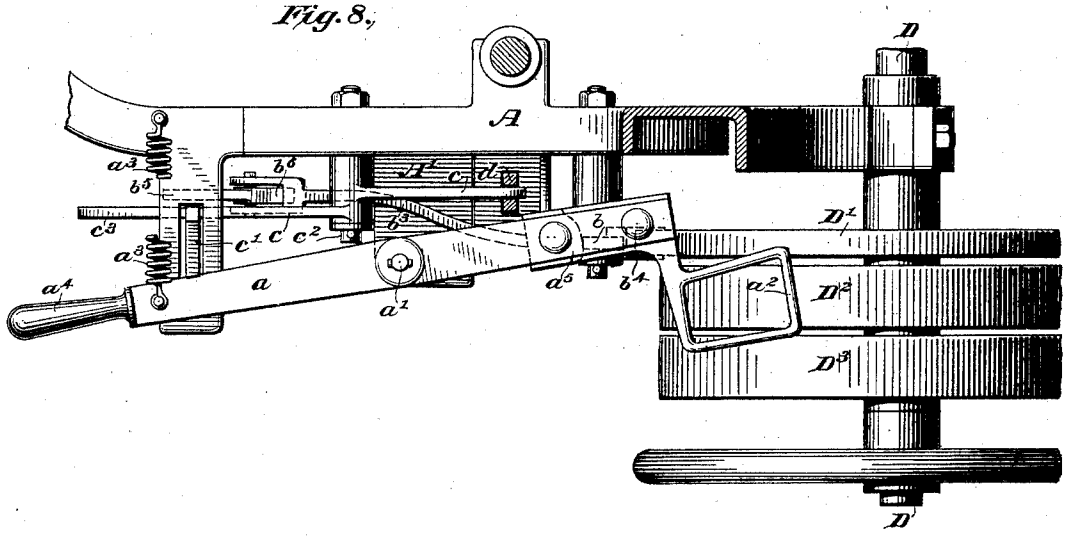


Fig. 8.



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UNITED STATES PATENT OFFICE.

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STOPPING MECHANISM FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 503,461, dated August 15, 1893.

Application filed February 7, 1891. Renewed December 1, 1892. Serial No. 453,688. (No model.)

To all whom it may concern:

Be it known that I, ABRAM D. EMERY, of Taunton, Massachusetts, have invented certain Improvements in Stopping Mechanism for Looms, of which the following is a specification.

This invention, in addition to covering certain improvements designed to facilitate the manual starting and stopping of a loom, also relates to mechanism for automatically stopping the loom if a shuttle fails to box properly or if a weft thread breaks. The said mechanism embraces a main train of stopping devices consisting of a spring operated belt shifter, a spring operated brake and a tripping rod having a prescribed capacity of vertical movement, and two affluent trains of devices, one governed by a shuttle and the other by a weft fork, either of which when set in action operates to lift the said tripping rod and to thereby release the belt shifter to the action of its operating spring and resultantly to release the brake to the action of its operating spring. By the operation of one of the said affluent trains of devices the failure of a shuttle to box properly permits a lifting pawl carried upon the lay to remain in position to engage a shoulder or tappet upon the tripping rod, and to thereby make the tripping rod partake of the upward movement of the lay until the loom is stopped by the shifting of the belt and the application of the brake, or, if the loom is not thus brought fully to rest, then until the tripping rod has reached the limit of its upward movement, in which case it acts as a chock which arrests the further upward movement of the lay. By the operation of the other of the said affluent trains of devices, the breaking of a weft thread permits a weft fork to remain in a position in which it acts as a link, and transmits from a lever which is continuously vibrated by means of a cam on the cam shaft, motion to vibrate a radius arm or wiper which by engaging another tappet affixed to the tripping rod lifts the tripping rod and releases the belt shifter and brake, as in the other case, to the action of their operating springs. When the tripping rod is thus lifted by motion derived from the cam shaft, it does not act as a chock to arrest the upward movement of the lay, which may therefore complete its beating movement. I do not claim this latter mechanism specifically in this application, as it forms the subject-matter of another application, filed by me December 4, 1891, serially numbered 413,967. No harm will thereby ensue because the tripping rod, when lifted in consequence of either of the casualties referred to, disengages from the take-up mechanism its actuating pawl.

The improvements are herein shown as applied to a loom weaving two fabrics at the same time by the employment of two simultaneously operated shuttles and of two weft forks.

While one feature of the present invention consists in the organization of stopping mechanism so related to two shuttles and two weft forks as to effect the automatic stopping of the loom if either shuttle fails to box properly, or if either weft thread breaks, it will be perceived that the improvements are equally applicable to a loom for weaving a single fabric, in which case there will be only one shuttle and one weft fork present.

The accompanying drawings representing the improvements, and so much of the loom as is necessary to illustrate their construction and mode of operation, are as follows:

Figure 1 is an end view of a portion of the loom showing the starting and stopping mechanism in side elevation. Fig. 2 is a horizontal section taken through the plane indicated by the dotted line x x on Fig. 1, affording a top view of the starting and stopping mechanism parts being broken away. Fig. 3 is a rear elevation of the starting and stopping mechanism and adjacent parts of the loom. Fig. 4 is a front elevation of the starting and stopping mechanism and adjacent parts of the loom. Figs. 5 and 6 are respectively front and side elevations of the weft forks and the immediately adjoining parts of the structure in which the weft forks are arranged. Fig. 7 is a vertical section taken through the plane indicated by the dotted lines y y on Fig. 5. Fig. 8 is a horizontal section taken through a part of the plane indicated by the dotted line z z on Fig. 1, affording a top view of the belt shifter and adjacent parts.

The drawings represent portions of the frame A of a vertical loom employing a lay B wide enough to afford parallel paths for two

simultaneously driven shuttles, one of which, C, is shown in Fig. 2. Motion to reciprocate the lay is derived from the crank shaft D to which is affixed a tight brake wheel D′, a tight driving pulley D^2, and a loose pulley D^3. The main train of starting and stopping mechanism embraces the belt shifter *a* which is a lever centrally pivoted upon the vertical pin *a′*. The perforated rear end a^2 of the shifter is adapted to embrace the driving belt. Its front end is connected to the contracting spiral spring a^3 and is provided with a handle a^4 by means of which the shifter is manually swayed upon its vertical axis, against the resisting pull of its spring a^3 when it is desired to shift the driving belt from the loose pulley D^3 to the driving pulley D^2 and thereby start the loom. When the shifter is thus swayed a wiper cam a^5, attached to its under side bears upon and rocks backward the upright arm *b* of the T-shaped brake lever *b′* against the downward pull of the brake spring b^2 upon the horizontal arm b^3, and thus rocks the brake shoe b^4 clear of the brake wheel D′. If, while the belt is off the driving wheel, it is desired to move the loom by hand, the brake is taken off by pushing up the radius arm b^5, affixed to the hub of the eccentric b^6, which is loosely pivoted upon the forward end of the horizontal arm b^3. The periphery of the eccentric is thus brought into contact with the stationary shoulder b^7, projecting from the frame of the loom, and the front end of the horizontal arm b^3 of the brake lever is thereby elevated sufficiently to clear the brake shoe from the brake wheel. As soon as the belt shifter has been moved far enough to throw the belt on the driving pulley the forward end of the manually operative stopping lever *c* rises and interposes between the belt shifter and the frame of the loom, the chock plate *c′*, which is affixed to the stopping lever *c*, and which when thus interposed between the belt shifter and the frame of the loom holds out the forward end of the belt shifter against the pull of its spring a^3 and thus permits the driving belt to remain in engagement with the driving pulley. The stopping lever is loosely pivoted upon the horizontal pin c^2. At its forward end it is provided with the handle c^3, by means of which its forward end can be manually depressed when it is desired to remove the chock plate *c′*, and thus release the belt shifter to the action of its spring and when cam b^6 is out of action to resultantly release the brake to the action of the brake spring, for the purpose of manually stopping the loom. The rear end of the stopping lever extends through a slot in the vertical tripping rod *d*. The lower portion of the tripping rod is adapted to slide in a vertical bearing formed in the arm A′, which is affixed to and projects laterally from the frame of the loom. It is the weight of the tripping rod *d*, which by pressing downward upon the rear end of the stopping lever *c* raises the front end of the stopping lever when the belt shifter is swayed outward to start the loom. When the forward end of the stopping lever *c* is manually depressed, the tripping rod *d* is elevated and a tappet *d′*, affixed to the upper portion of the tripping rod presses against and thereby throws out of engagement with the ratchet wheel E (which is the prime wheel of the take-up mechauism) the pawl E′, by which the take-up mechanism is actuated. The tripping rod *d* has a limited range of upward movement. At its lower end it is affixed to a collar d^2, upon the top of which is a cushion in the form of a washer d^3 of leather, or of other elastic or semi-elastic material for cushioning the blow when the collision of the upper surface of the washer d^3 against the under surface of the arm A′ arrests the upward movement of the tripping rod, and hence arrests the further upward movement of the lay. This completes the description of the main train of starting and stopping mechanism.

One of the affluent trains of stopping mechanism, which for present convenience may be designated the shuttle train, performs its function by communicating to the tripping rod *d* the upward movement of the lay. In the duplex loom, like that shown in the drawings, the shuttle train is duplicated in order that the failure of either shuttle to box properly at the conclusion of its excursion in either direction may automatically stop the loom.

It will be seen that each shuttle-box B′ has inserted through one of its side walls the usual laterally yielding cheek piece B^2, the outward thrust of which, when the shuttle boxes properly, rocks either the horizontal rock shaft B^3, mounted upon the front side of the lay, or the horizontal rock shaft B^4, mounted upon the rear side of the lay, or when both shuttles box properly, rocks both of the rock shafts B^3 and B^4. When both shuttles box properly the crank arm *f*, affixed to and projecting upward from the rock shaft B^3, is swung forward and the radius arm *g*, affixed and projecting upward from the rock shaft B^4, is swung backward, overcoming the force of the expanding spiral springs B^6 B^7, which respectively deliver their thrust upon the downwardly extending crank arms B^8 B^8, affixed, respectively, to the rock shafts B^3 and B^4. By means of the link *f′* the outward motion of the radius arm *f* is communicated to the lifting pawl f^2 which is pivoted to the top of the lay and which, when the outward movement of the crank arm *f* is communicated to it, is withdrawn from its normal position in which it partially closes the front portion of the vertical slot *h* Fig. 4 in the lay through which the tripping rod extends. Similarly, a link *g′* imparts to the lifting pawl g^2 the backward movement of the crank arm *g* and thereby swings the lifting pawl g^2 backward from its normal position in which it partially closes the rear portion of the slot *h*. If either or both shuttles fail to box properly, one or both of the lifting pawls f^2 and g^2, as the case may be, is per-

mitted to remain in the position in which it extends across the slot h, so that, as the lay rises, its motion is communicated to the tripping rod by the collision of the lifting toe, or lifting toes, against one or both of the shoulders f^3, g^3, with which the tripping rod is provided. These shoulders may either be tappets projecting laterally from the tripping rod, or, as shown, they may consist of the lower ends of the thickened upper portion of the lifting rod. By such lifting of the tripping rod, the belt shifter is released to the action of its spring and the brake is resultantly released to the action of the brake spring. If the brake does not fully stop the movement of the loom, the lay continues to rise until the elastic washer d^3 is brought into collision with the under side of the arm A′ and the tripping rod is then brought into operation as a chock which arrests the further upward movement of the lay. The other affluent train of automatic stopping mechanism, which is withheld from operation if the weft thread is present and is brought into operation if the weft thread breaks, may for present convenience be designated the weft train. It embraces a wiper cam i, mounted upon the cam shaft I, and a bell-crank lever j, the longer arm j' of which is pushed forward and swings backward by its own gravity in the course of each revolution of the cam i. The shorter arm j^2 is provided near its free end with a transverse pin j^3, the axis of which is parallel with the shaft k, upon which the bell-crank lever j is loosely mounted. The shaft k is journaled in a box k', bolted to the frame of the loom. The end of the shaft k opposite that upon which the bell-crank lever j is loosely mounted has affixed to it a radius arm l, the free end l' of which projects under the tappet l^2, affixed to the tripping rod d. The forward end of the short arm j^2, of the bell-crank lever j, carrying the transverse pin j^3, projects into the rectangular opening in the vertically sliding carriage m, mounted in the bracket m', affixed to and projecting downward from the upper horizontal member A′ of the loom frame in vertical alignment with the path of motion of the weft fork grate n, extending across the central portion of the lay B. As in the loom shown in the drawings, there are two parallel raceways. The carriage m has pivoted to it at its lower extremity two weft forks o and p. In the case of an ordinary loom weaving a single fabric and hence employing only one raceway, of course only one weft fork will be needed. It will be seen that the three tined lower portion o' of the weft fork o bends laterally forward underneath the carriage m, and that the three tined lower portion p' of the weft form p bends laterally backward underneath the carriage m. The upper portions or stems o^2 and p^2 of the weft forks above their points of pivotal attachment to the carriage m incline in convergent planes and are respectively provided at their upper extremities with the hooks o^3 and p^3 which, when the weft forks are subject to the influence of gravity, hook over the outwardly projecting portions of the pin j^3, inserted through the arm j^2. As the lay rises during the normal operation of the loom, the two weft threads extending across the grate n are brought into collision with the tined lower portions of the weft forks and tip the weft forks out of the positions in which they are represented in solid lines on Fig. 7 into the positions in which they are represented in dotted lines in the said figure, in which case, as will be seen, the hooks o^3 and p^3 are thrown in opposite directions away from the path of movement of the transverse pin j^3, which is consequently permitted to make its vibrating movement without imparting movement to the carriage m. If, however, either or both of the weft threads are broken at the conclusion of the excursion of either or both shuttles toward the end of the lay adjoining the stopping mechanism, then the tined lower ends of the weft forks enter the spaces between the bars of the weft fork grate as the lay rises, and the weft forks obeying the influence of gravity remain in the positions in which they are represented in solid lines in Fig. 7, with their hooked upper ends extending across the path of motion of the transverse pin j^3. In such case the upward movement of the pin j^3, is communicated to the carriage m. By means of radius arm q the forward end of which is pivotally connected to the carriage m, and the rear end of which is fastened to the shaft k, the upward movement of the carriage m rocks the shaft k, and communicates a similar upward movement to the radius arm l, which by collision with the tappet l^2, lifts the tripping rod d and thereby releases the belt shifter and brake to the operation of their respective springs and thus automatically stops the loom. It will thus be seen that in an ordinary loom containing the present improvement, the weft fork, or, in a duplex loom like that shown in the drawings, either weft fork will serve as a link which maintains the continuity of the lever system by which motion is transmitted from the cam to lift the tripping rod and thereby set in action the main train of stopping mechanism, if its weft thread breaks, and it will also be seen that if the loom is working normally the weft threads will, as the lay rises, tilt the weft forks immediately on them and thus break the connection of said lever system and thereby prevent the transmission from the cam of the motion which when transmitted sets in action the main train of stopping mechanism.

What is claimed as the invention is—

1. Loom-stopping mechanism, embracing a spring-operated belt shifter, a spring-operated brake, a vertically-sliding tripping rod for releasing said belt shifter and brake to the action of their respective springs, and a tappet upon the said tripping-rod, in combination with take-up mechanism a pawl for actuating said take-up mechanism, so arranged with re-

lation to said tappet that the upward motion of the said tripping rod disengages the said pawl from the prime wheel of the take-up mechanism, and hence stops the take-up whenever the belt shifter and brake are released to the action of their springs.

2. Loom-stopping mechanism, embracing a spring-operated belt shifter, a spring-operated brake, and a vertically sliding tripping rod, in combination with a manually-operative stopping lever engaged by the said tripping rod, and provided with a chock for holding the said belt shifter out of action during the normal operation of the loom, and a handle, forming a part of the said stopping lever, for facilitating the manual operation of the same for the purpose of releasing the said belt shifter and brake to the action of their respective springs, and thereby stopping the loom.

3. A spring-operated belt shifter, a spring-operated brake, a tripping rod to release said shifter and brake, a fixed arm, through which the tripping rod slides, and a collar, affixed to the tripping rod, for arresting the upward movement of the tripping rod by collision with the said arm, in combination with a train of devices mounted upon the lay and embracing a lifting pawl for engaging and lifting said tripping rod if the shuttle fails to box properly, for the purpose of enabling the said tripping rod, by the collision of the said collar with the said arm, to act as a chock and arrest the continued upward movement of the lay after the initial portion of such movement, by having been communicated to the said tripping rod, has caused the said belt shifter and brake to be released to the action of their respective springs.

4. A spring-actuated belt shifter, a spring-actuated brake, a cam connected with and operated by the belt shifter to throw and hold the brake out of action while the belt is on the driving pulley, a vertically-movable tripping rod, a vertically-reciprocating lay, a lifting pawl on said lay, means to throw said pawl into and out of engagement with the tripping rod, and a chock for holding the belt-shifter against the action of its spring, the said chock being operatively connected with the tripping rod.

5. A spring-operated belt shifter, a spring-operated brake, a cam operatively connected with the belt-shifter to throw and hold the brake out of action while the loom is in operation, a sliding tripping rod, a reciprocating lay, a lifting device on said lay, means to throw said device into and out of engagement with the tripping rod, and means for locking the belt-shifter in its adjusted position, said means being both manually operative and operatively connected with the tripping rod for releasing the belt-shifter and its connections to the action of its spring and thereby the brake mechanism to the action of its spring.

6. The combination of a main train of spring-operative stopping mechanism, a stopping lever provided with a projection near one end, a vertically-sliding tripping rod supported on the other end, whereby the projection is normally held in the path of movement of the stopping mechanism, a reciprocating lay and means carried thereon adapted to lift the tripping rod when a shuttle fails to box and thereby releasing the stopping mechanism, substantially as described.

7. The combination of a main train of spring-operated stopping mechanism a manually-operative stopping lever provided with a projection near one end, a vertically-movable tripping rod connected to the opposite end, whereby the projection is normally held in the path of the stopping mechanism, a vertically-reciprocating lay, a pawl carried thereby and adapted to engage and lift said tripping rod when the shuttle fails to box, substantially as described.

8. The combination of a spring-operated belt shifter, a spring-operated brake, a vertically movable tripping rod for releasing said belt-shifter and brake to the action of their respective springs, with a vertically-reciprocating lay carrying a lifting pawl, means to throw said pawl into engagement with said tripping rod, whereby the belt-shifter and brake are released and a stop for limiting the upward movement of said tripping rod and lay, substantially as described.

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