(No Model.) 3 Sheets—Sheet 1.

A. D. EMERY & W. T. DONNELLY.

LOOM.

No. 503,472. Patented Aug. 15, 1893.

Fig. 1.

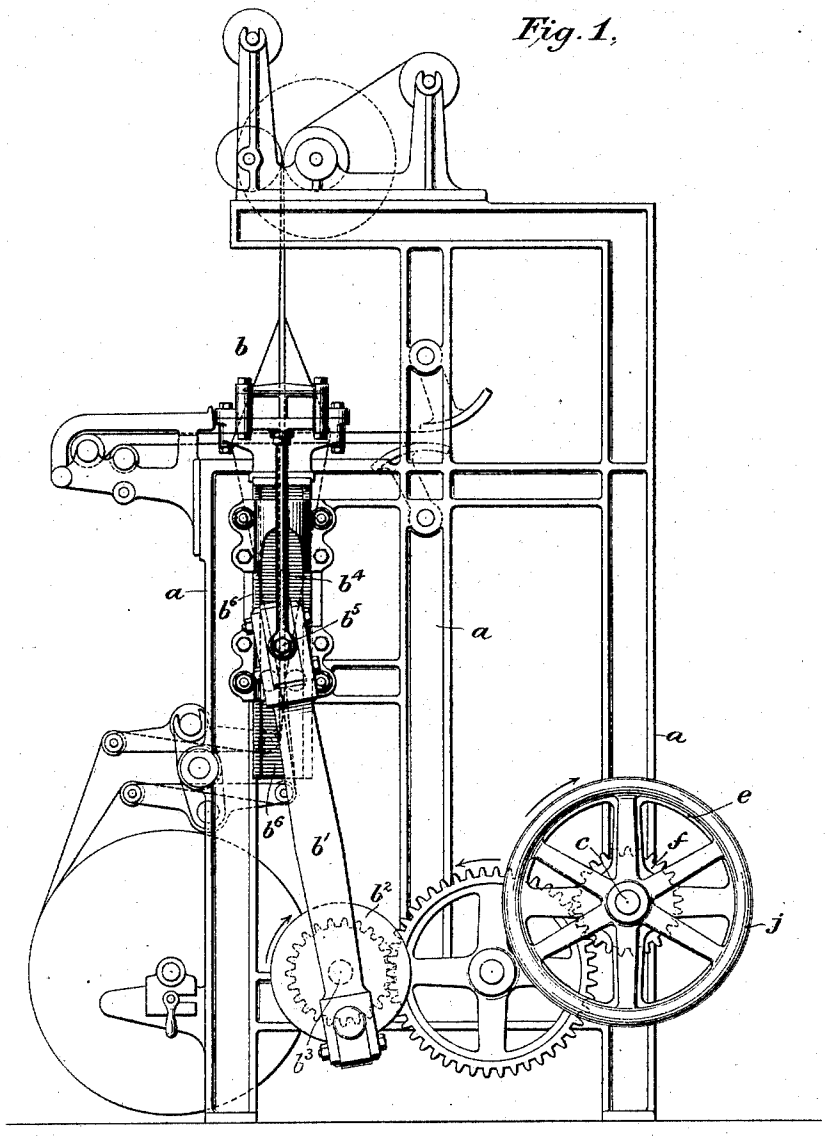

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Fig. 2.

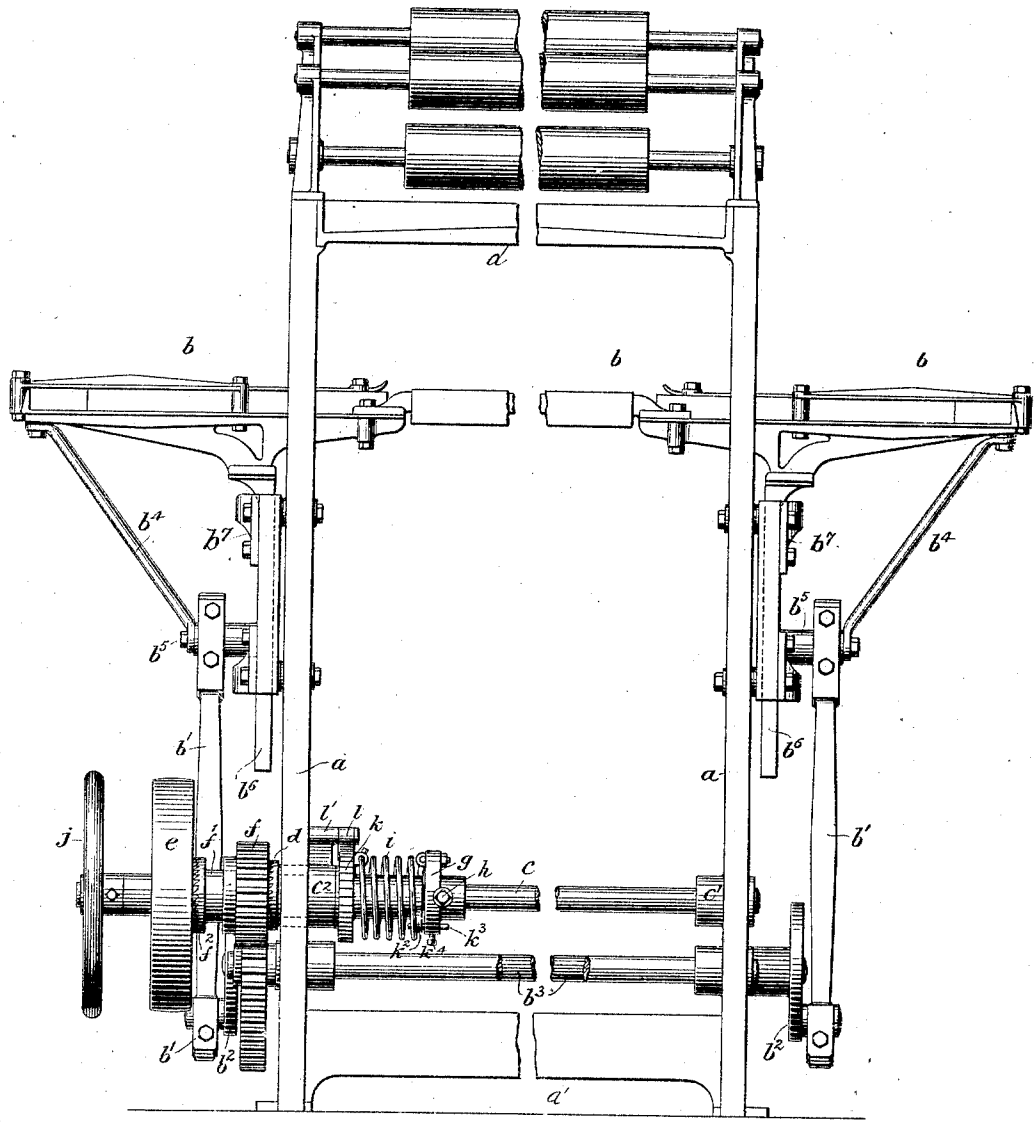

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Fig. 4.

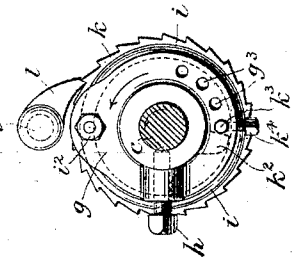
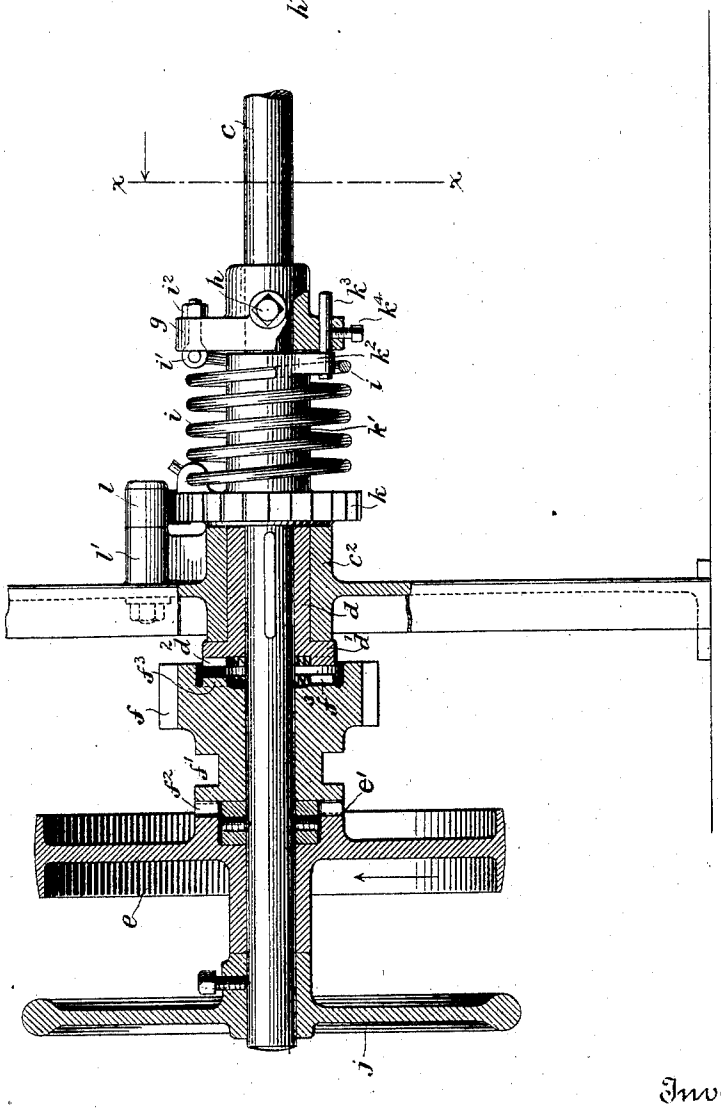


Fig. 3.



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UNITED STATES PATENT OFFICE.

ABRAM D. EMERY AND WILLIAM T. DONNELLY, OF TAUNTON, MASSACHUSETTS.

LOOM.

SPECIFICATION forming part of Letters Patent No. 503,472, dated August 15, 1893.

Application filed October 7, 1889. Renewed January 27, 1892. Again renewed December 1, 1892. Serial No. 453,699. (No model.)

To all whom it may concern:

Be it known that we, ABRAM D. EMERY and WILLIAM T. DONNELLY, of Taunton, Massachusetts, have invented certain Improvements in Looms, of which the following is a specification.

This invention relates to the stopping mechanism of the loom and consists of means, which, when the loom is stopped, are brought into operation for storing up a prescribed amount of energy derived from the loom gearing, which energy by re-acting effects a reverse movement of the loom gearing by which the loom mechanism is returned to the position, or substantially to the position which it occupied at the time of the initiation of the stopping movement. This is effected by mounting the driving pulley loosely upon a shaft which is normally prevented from partaking of the rotatory movement of the driving pulley by means of a spiral spring, one end of which is held stationary, while the other end is in rigid connection with said shaft; and by employing as the prime wheel of the loom gearing, a loose pinion adapted to slide upon said shaft, and provided upon its hub with a circumferential groove to receive the fork of a shifter; and also provided, upon the opposite ends of its hub, with clutch teeth; the teeth at one end being adapted for engagement with similar teeth upon the face of the driving pulley, for the purpose of driving the loom mechanism, and the teeth upon the other end being for the purpose of engaging similar teeth in a sleeve keyed to said shaft. The said pinion has a sufficient range of sliding movement to enable it, when shifted into full engagement with the said sleeve, to be entirely clear of engagement with the driving pulley. During the act of shifting, it is partially engaged by the teeth on the said sleeve before it is fully disengaged from the teeth on the driving pulley. Hence, during such partial engagement of said pinion with the said sleeve, and during the continued rotation of the loom gearing due to the momentum of the moving parts of the loom, the said shaft is made to partake of the rotatory movement of said pinion, and thus to wind up the said spring until the forward momentum of the said loom mechanism is expended, after which, by the resilient force of the spring, the shaft and prime wheel are rotated in the reverse direction until the moving parts of the loom are returned to substantially the same position as that which they occupied at the time when the prime wheel was shifted away from the driving pulley.

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

Figure 1 is a side elevation of a portion of the loom. Fig. 2 is a rear elevation thereof, with the central portions of the structure represented as broken out. Fig. 3 is a rear elevation partly in section, illustrating the driving mechanism in detail, and upon a larger scale than that in which it is shown in Figs. 1 and 2. Fig. 4 is a transverse section, taken through the plane indicated by the dotted line x x in Fig. 3.

The loom mechanism is represented as mounted upon side frames, a a, which are connected with each other by suitable horizontal girders, a' a'. The lay, b, overhangs the side frames of the loom, and is reciprocated in a vertical path by motion transmitted by the two connecting rods, b' b', from the crank plates b^2 b^2, affixed to the lay-driving countershaft, b^3. In order to prevent the overhanging ends of the lay from springing upward under the shock of the beat, they are respectively connected by the diagonal braces b^4 b^4, with the ends of the wrist pins, b^5 b^5, projecting laterally from the slides, b^6 b^6, which are affixed at their upper ends to the lay, and which constitute the vertical members of the reciprocating lay structure, and which are guided in their motions by the vertical guides, b^7 b^7. It will be seen that the diagonal braces, b^4 b^4, extend across the plane of motion of the lay; or, in other words, they extend across the plane of the thrust of the connecting rods, b^2 b^2. When the lay, in obedience to the upward thrust of the connecting rods, delivers the beat upon the fabric, the overhanging ends of the lay, under the shock of the beat, have a tendency to spring upward, but the diagonal braces hold the overhanging ends of the lay rigidly, and prevent them from yielding to this tendency. The rigid holding of

the ends of a lay which overhangs its vertical supports is of great importance, especially in quick-running looms of the character shown in the drawings, in which the lay reciprocates in a vertical path, because it insures the perfect horizontality of the reed which constitutes the floor of the raceway for the shuttle the straight driving of which is seriously interfered with if the overhanging ends of the lay are permitted to spring in a vertical direction. The necessity for bracing the lay in the manner and in the direction described is emphasized in looms of the character indicated in the drawings, in which a comparatively wide lay is employed in connection with mechanism for weaving two fabrics side by side, by the simultaneous shots of two shuttles through the parallel paths afforded by two separate sheds.

The driving and stopping mechanism, and the device for imparting to the moving parts of the loom a reverse movement, substantially equal in extent to the extent of their forward movement, during the operation of stopping the loom, consist of the shaft, *c*, having two bearings, one of which is in the box, *c'*, upon one of the side frames of the loom, and the other is in the box, c^2, upon the other side frame of the loom. The box, c^2, is of sufficient diameter to admit the sleeve, *d*, which is loosely splined upon the shaft, *c*. Upon its outer end, the sleeve, *d*, is provided with a flange, *d'*, from the outer face of which project the clutch teeth, d^2. The driving pulley, *e*, is loosely mounted upon the overhanging end of the shaft, *c*, and is provided with clutch teeth *e'* upon the face of its hub toward the loom frame.

The prime wheel of the gearing for driving the loom is a pinion, *f*, the hub of which is provided with a circumferential groove, *f'*, for receiving the fork of a shifter, and which is loosely mounted upon the shaft, *c*, and has upon the opposite ends of its hub clutch teeth, f^2, and f^3, so that when the said pinion is shifted against the driving pulley, the teeth, f^2, engage the teeth on the driving pulley, whereby the motion of the driving pulley is transmitted to the pinion, *f*, and thence to the loom gearing. When it is desired to stop the motion of the loom, the pinion, *f*, is shifted out of engagement with the pulley, *e*, and its clutch teeth, f^3, thrown into engagement with the clutch teeth, d^2, of the sleeve, *d*, whereby the rotatory movement of the pinion, *f*, due to the momentum of the moving parts of the loom, is communicated to the shaft, *c*, and to the crank plate, *g*, secured to the shaft *c*, by the set screw, *h*. A spiral spring, *i*, has one end fastened to the crank plate, *g*, by the clamping eye bolt, *i'*, and nut, i^2. The opposite end of the spiral spring, *i*, may for the present be assumed to be fastened to a stationary part of the loom structure. The rotation of the shaft, *c*, as described, by winding up the spring, *i*, causes it to oppose a gradually increasing elastic resistance which soon overcomes the momentum of the moving parts of the loom and brings them to rest; after which, by the exertion of the increased resilient force thus stored up in it, the spring in unwinding imparts a reverse rotatory movement to the shaft, *c*, and pinion, *f*, and thereby returns the moving parts of the loom approximately to the positions they occupied at the time when the pinion, *f*, was shifted away from the driving pulley.

In order to insure the storing up of sufficient force in the spring, *i*, to effect this result, the distance between the driving pulley and the sleeve, *d*, is purposely made such that the clutch teeth, f^3, upon the pinion, *f*, commence to engage the clutch teeth, d^2, upon the sleeve, *d*, before the clutch teeth, f^2, are fully released from the clutch teeth on the driving pulley.

So far as concerns the storing up in the spring, *i*, of the force due to the momentum of the moving parts of the loom, after the disengagement of the pinion, *f*, from the driving pulley, so that by the reflex action of the spring the moving parts of the loom will be moved backward, it would suffice to have the spring, *i*, permanently affixed at one end to the frame of the loom; but it may occasionally be necessary to move the loom mechanism backward, by power applied to the hand wheel, *j*, affixed to the extreme end of the shaft, *c*. Hence the end of the spring *i*, opposite that fastened to the crank-plate, *g*, is secured to a ratchet wheel, *k*, loosely mounted upon the shaft, *c*, and prevented from rotating in one direction by the detent, *l*, pivoted to the stud, *l'*, affixed to the frame of the loom. The ratchet wheel hub, *k'*, which extends through the spiral spring, *i*, and abuts against the face of the crank plate, *g*, is provided with a radial lug, k^2, for engaging the side of the stop-pin, k^3, inserted transversely through the crank plate, *g*, and rigidly held in its seat therein by means of the set screw, k^4. The crank plate, *g*, is provided with a series, g^3, of transverse holes, into either one of which the stop-pin, k^3, may be inserted. The resilient force of the spring, *i*, is exerted in a direction tending to make it uncoil. It is held from uncoiling by the abutting of the lug, k^2, against the stop-pin, k^3, inserted through the crank-pin, *g*, to which one end of the spring is affixed, and by the engagement of the detent, *l*, with the ratchet wheel, *k*, to which the other end of the spring, *i*, is connected; hence the tension of the spring, *i*, may be varied by changing the stop-pin, k^3, from one of the series of holes, g^3, to another.

In the drawings, the spring, *i*, is represented as being under its highest tension, owing to the insertion of the stop-pin, k^3, through the last one of the series of holes, g^3, in the crank-plate, *g*. By removing the stop-pin, k^3, and placing it one, two, or more holes farther back, the spring, *i*, will be permitted to uncoil to the desired extent.

The detent, *l*, holds the ratchet wheel, *k*, stationary while the spring, *i*, is being wound up by the force derived from the forward

movement of the loom gearing, as has been described, and also during the reflex action of the spring after the forward movement of the loom gearing has been arrested. As will be seen, the shaft *c* may be turned backward by means of the hand wheel, *j*, without interference by the detent, *l*, under which the teeth of the ratchet wheel, *k*, slide freely when the shaft is so moved. The shaft *c* remains stationary excepting during the short interval when the clutch teeth, f^2, on the pinion, *f*, retain their engagement with the clutch teeth on the driving pulley, while the clutch teeth f^3 are entering into engagement with the clutch teeth, d^2, on the sleeve, *d*, and during the continued forward movement of the loom mechanism, due to its momentum after the pinion, *f*, has been fully disengaged from the driving pulley.

It is to be understood that the invention is not limited to stopping mechanism of the exact construction herein shown and described, and that the drawings are to be regarded merely as illustrating a convenient and simple mode of carrying into effect the part of the invention which consists in automatically storing up energy derived from the forward movement of the loom gearing during the operation of stopping the loom for the purpose of opposing a gradually-increasing elastic resistance thereto and then effecting a prescribed extent of immediately-following reverse movement of the loom mechanism.

What is claimed as the invention is—

1. In a loom, the combination of the driving pinion, the shaft upon which said driving pinion is loosely mounted, a spring connected at one end to said shaft, and at the other end to a stationary part of the loom structure, means for gearing said driving pinion to and ungearing the same from its prime mover, and means for gearing said pinion to said shaft at the moment when the said pinion is ungeared from its prime mover, as and for the purposes set forth.

2. In a loom, the combination, as herein set forth, of a driving pulley, a shaft upon which said driving pulley is loosely mounted, a sleeve splined to said shaft; a spring, at one end connected to said shaft, and at the other end connected to a stationary part of the loom structure; a driving pinion, loosely mounted upon said shaft between said pulley and said sleeve and provided upon the opposite faces of its hub with clutch teeth, adapted to engage similar clutch teeth in the opposed faces of said driving pulley and the said sleeve respectively, the axial length of the hub of said driving pinion being such that when unshifted for the purpose of ungearing it from said driving pulley, its clutch teeth at one end partially engage the clutch teeth of said sleeve before the clutch teeth at its opposite end are fully disengaged from the teeth of said driving pulley.

3. In a loom, the combination of a driving pulley and a driving pinion, both loosely mounted on the same shaft; a sleeve splined to said shaft, the said driving pinion having clutch teeth upon the opposite faces of its hub, and the said driving pulley and the said sleeve having similar clutch teeth, respectively, on those of their faces which are toward the said driving pinion; a crank-plate fast on said shaft, a spring surrounding said shaft and having one of its ends secured to said crank-plate and its opposite end sustained by a stationary part of the loom structure, and means for varying the tensional stress of said spring upon said crank-plate.

4. In a loom, the combination of a driving pulley and a driving pinion, both loosely mounted on the same shaft; a sleeve splined to said shaft, the said driving pinion having clutch teeth upon the opposite faces of its hub, and the said driving pulley and the said sleeve having similar clutch teeth, respectively, on those of their faces which are toward said driving pinion; a ratchet wheel loose on said shaft; a detent for preventing said ratchet wheel from partaking of the forward movement of said shaft; a crank-plate fast on said shaft, a spring having its ends attached to said ratchet wheel and said crank-plate, respectively, and a hand wheel affixed to said shaft for manually effecting the backward rotatory movement of said shaft and the parts attached thereto.

In testimony whereof we have hereunto set our hands this 20th day of September, A. D. 1889.

ABRAM D. EMERY.
WM. T. DONNELLY.

Witnesses:
H. J. FULLER,
WALTER T. EMERY.