No. 692,138. Patented Jan. 28, 1902.

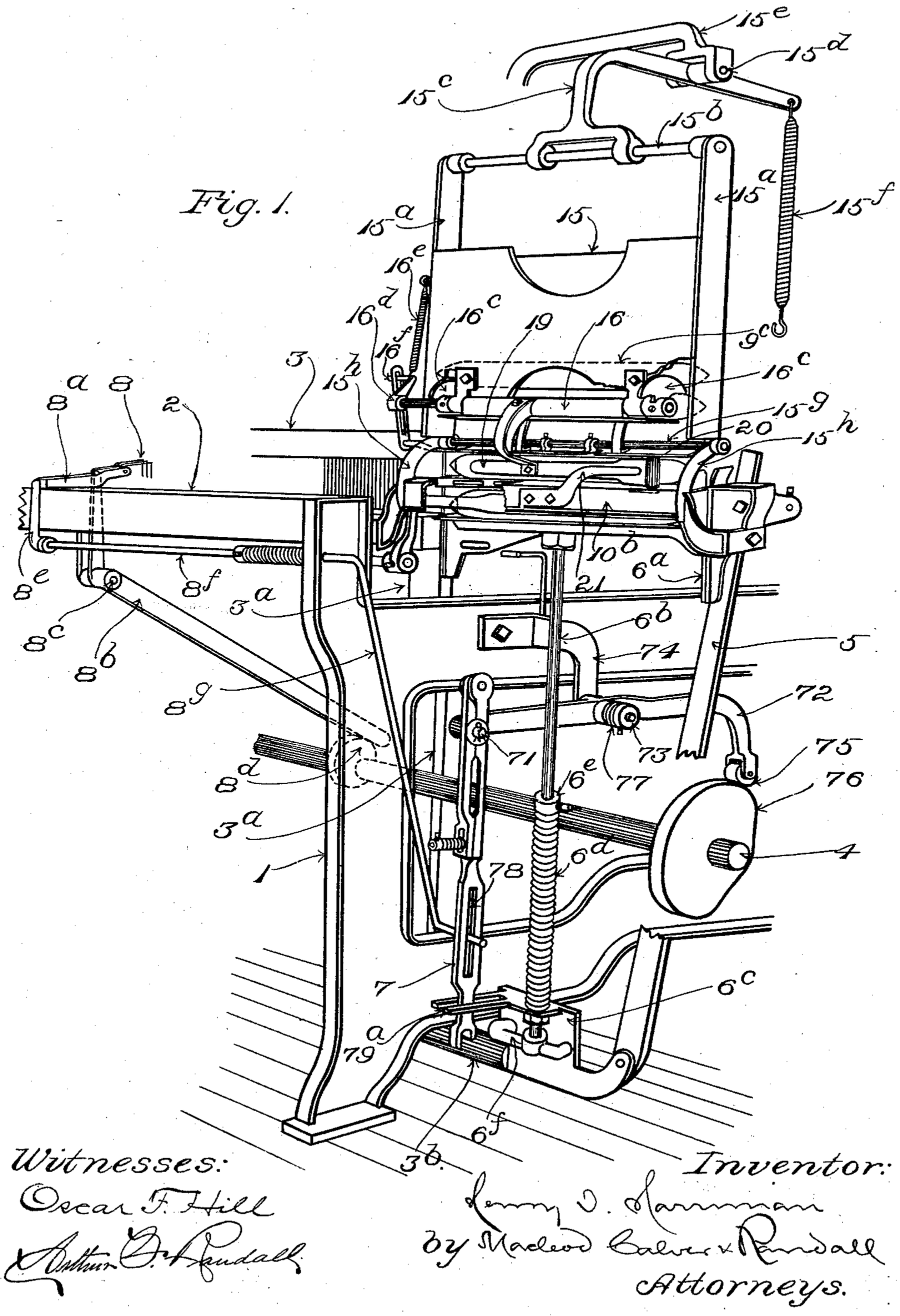
H. I. HARRIMAN.

WEFT REPLENISHING LOOM.

(Application filed Oct. 2, 1901.)

(No Model.) 5 Sheets—Sheet 1.

Fig. 1.



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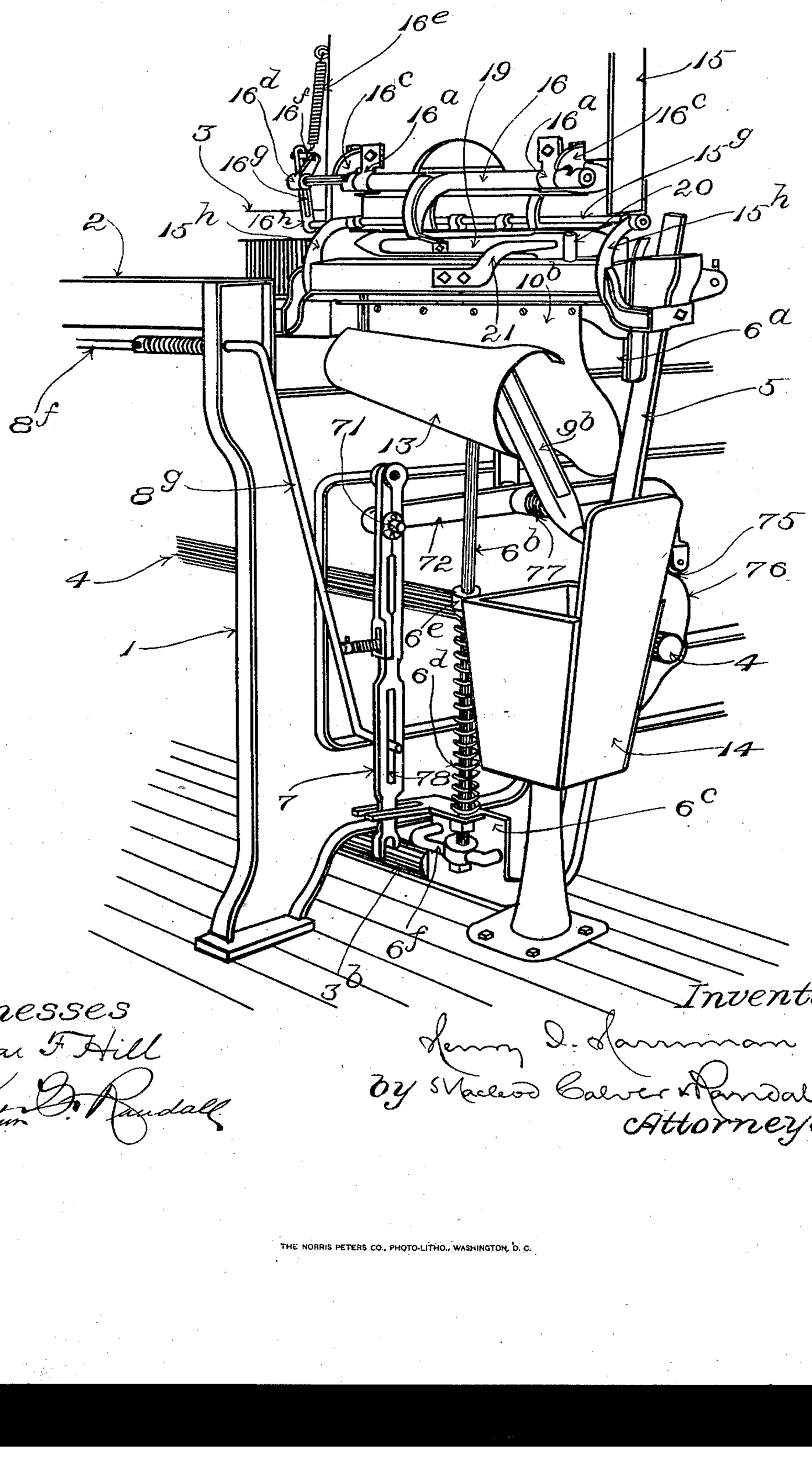
(No Model.) 5 Sheets—Sheet 2.

Fig. 2.



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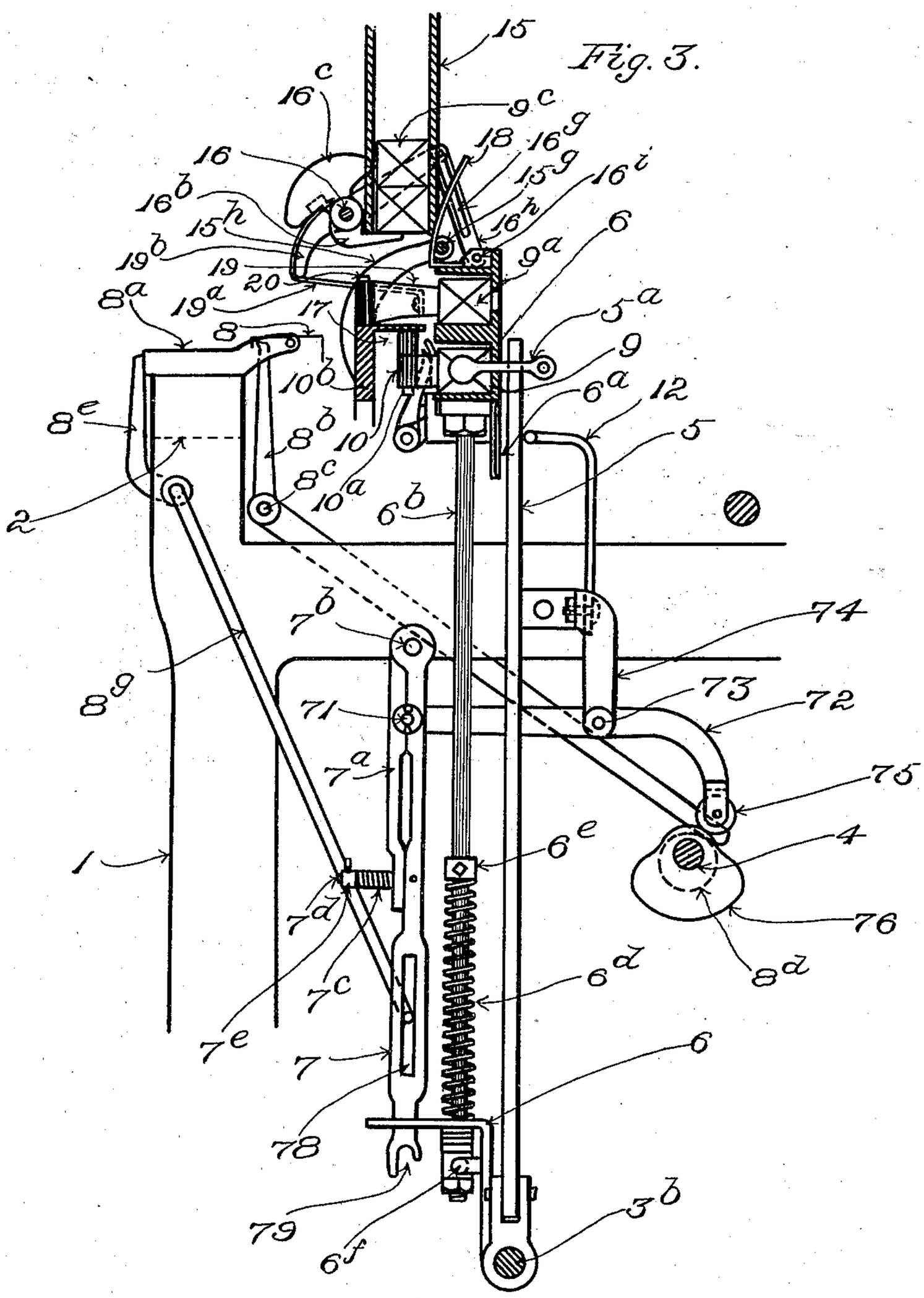
(No Model.) 5 Sheets—Sheet 3.

Fig. 3.



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(Application filed Oct. 2, 1901.)

(No Model.) 5 Sheets—Sheet 4.

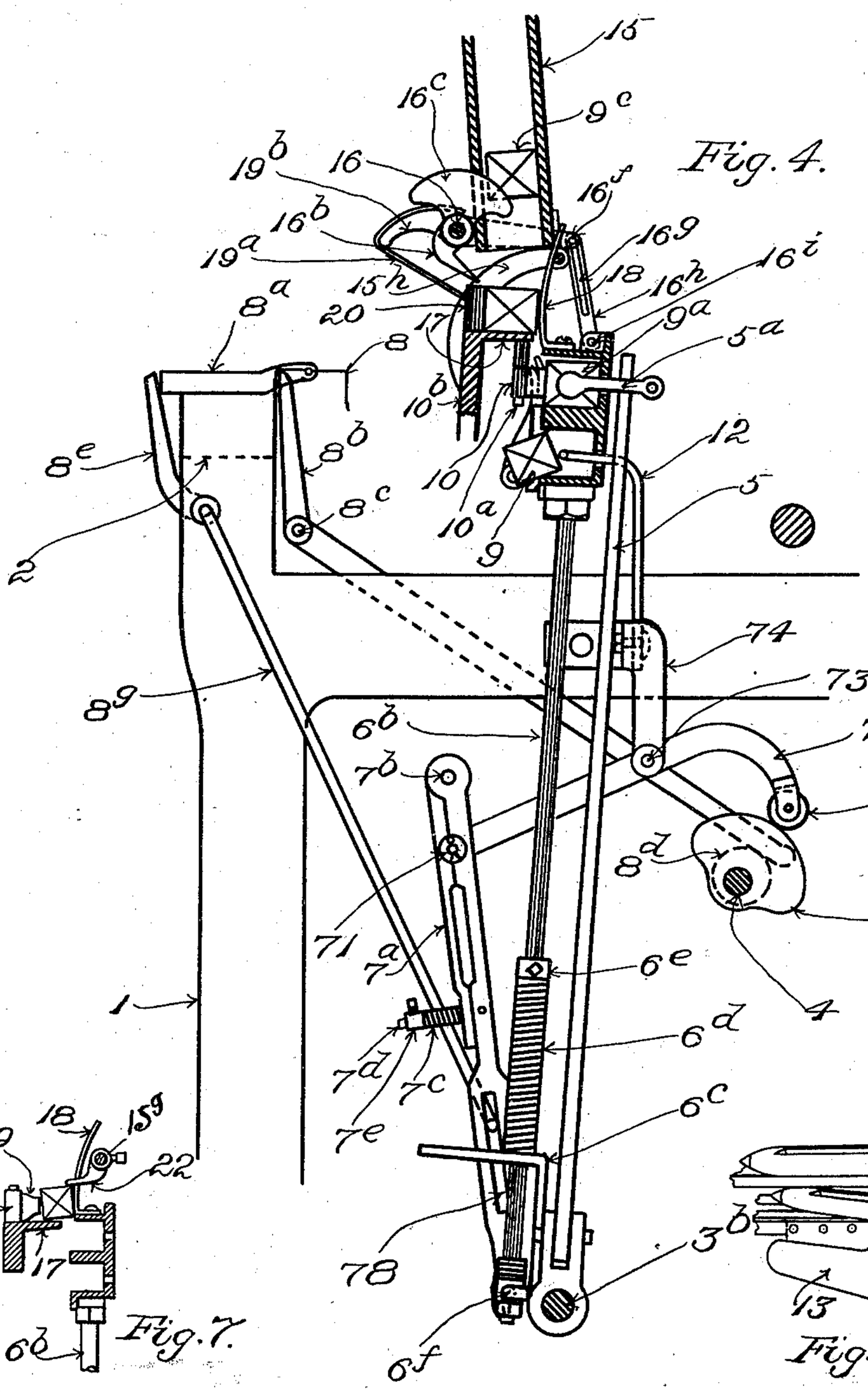

Fig. 4.

Fig. 7.

Fig. 6.

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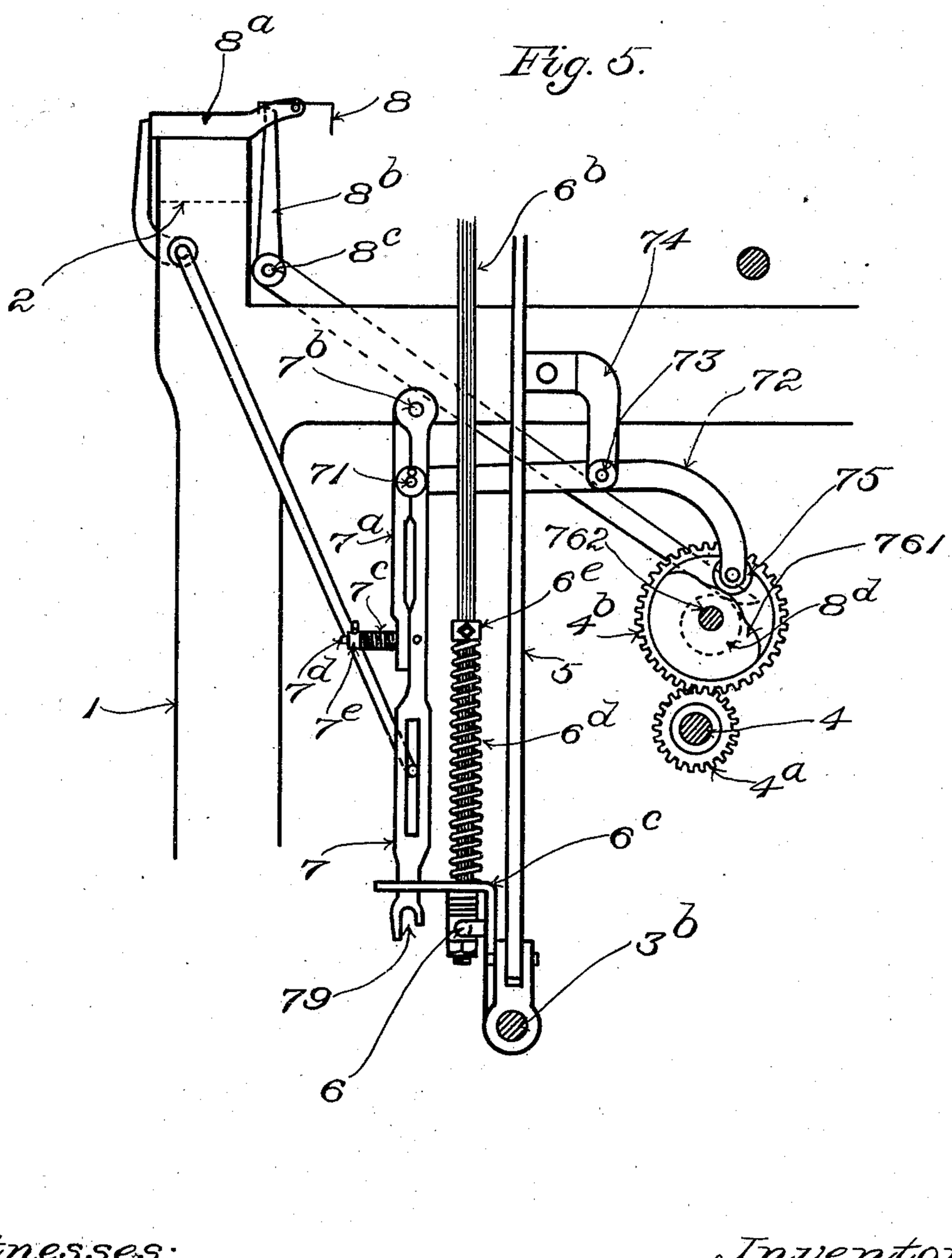
(Application filed Oct. 2, 1901.)

(No Model.) 5 Sheets—Sheet 5.

Fig. 5.



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UNITED STATES PATENT OFFICE.

HENRY I. HARRIMAN, OF NEW YORK, N. Y., ASSIGNOR TO THE AMERICAN LOOM COMPANY, OF READVILLE, MASSACHUSETTS, A CORPORATION OF NEW JERSEY.

WEFT-REPLENISHING LOOM.

SPECIFICATION forming part of Letters Patent No. 692,138, dated January 28, 1902.

Application filed October 2, 1901. Serial No. 77,285. (No model.)

To all whom it may concern:

Be it known that I, HENRY I. HARRIMAN, a citizen of the United States, residing at New York, in the county of New York, State of New York, have invented a certain new and useful Improvement in Weft-Replenishing Looms, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention has relation to the mechanism which is employed in looms for the purpose of replenishing automatically the weft or filling that is being incorporated into the web or fabric being woven.

More especially the invention relates to mechanism of the general kind in which replenishment of the working weft-supply is effected by replacing the spent or failed working shuttle on the lay by a reserve shuttle.

The invention consists in various improvements in mechanism such as is referred to above, and first will be described with reference to the accompanying drawings, in which latter the said improvements are shown embodied in the best forms yet devised by me.

In the drawings, Figure 1 shows in perspective the invention applied to part of a loom, the shuttle chute and receptacle being omitted. Fig. 2 is a perspective of a portion of what is represented in Fig. 1, omitting, however, the upper part of the magazine for reserve shuttles and showing the shuttle chute and receptacle. Fig. 3 is a sectional view showing the parts positioned as during the normal working of the loom. Fig. 4 is a view similar to Fig. 3, showing the action in effecting a change of shuttles. Fig. 5 shows a modification. Fig. 6 is a detail view showing the fixed cam for pushing the outer end of the shuttle from the working cell of the shuttle-box during the movement of the said shuttle-box. Fig. 7 is a detail view, in vertical section, showing the shuttle-box, shuttle-support, and adjacent parts.

Having reference to the drawings, a portion of one side frame of a loom is shown at 1. The breast-beam is designated 2, only a portion thereof being shown. A portion of the lay is shown at 3, one of the lay-swords being indicated at 3^a and the lay rock-shaft at 3^b. Part of the cam-shaft of the loom is shown at 4. The picker-stick at the change end of the loom is shown at 5 and the corresponding picker at 5^a.

In carrying my invention into effect I employ a multiple-celled shifting shuttle-box 6. The said shuttle-box may in practice vary in its construction and in the manner in which it is mounted and arranged to be moved. Preferably, though not necessarily, in all embodiments of the invention it is fitted to slide vertically in guideways 6^a 6^a on the outwardly-projecting part of the lay at the change end of the loom and is connected with the upper end of a box-rod 6^b, which latter at its lower end passes through a hole in a plate or stand 6^c, carried by the lay rock-shaft 3^b. The shuttle-box 6 has a working cell, which normally stands in line with the shuttle-race of the lay, and a spare cell. In the present case the lower cell of the said shuttle-box is the working cell and the upper one is the spare cell. In connection with the shifting shuttle-box I provide actuating means whereby in order to effect replenishment of the working weft-supply the shuttle-box is shifted for the purpose of effecting the discharge of the working shuttle and bringing a reserve shuttle into action and then is returned to normal position. The means and manner of effecting the actuation of the shuttle-box in the attainment of the desired results may vary in practice. Preferably I arrange to support the shuttle-box in its normal position (shown in Fig. 3) in a yielding manner through the employment of a spring or its equivalent. Usually for this purpose I employ a spiral spring 6^d, surrounding the lower portion of the box-rod 6^b and compressed between a collar 6^e on the said box-rod and the top of the plate or stand 6^c. When it is required to shift the shuttle-box to effect the change of shuttles, the shuttle-box is depressed by the means which is provided for the purpose, the spring yielding to permit the depression to take place, after which the spring operates to restore the shuttle-box to its normal position. The illustrated means of depressing the shuttle-box may be employed, if desired. The said means comprises an actuator 7, the latter being pivotally connected, as at 71, to one arm of a lever 72. The said lever is pivoted at 73 upon

a bracket or stand 74, which is affixed to the loom-frame and is provided with an antifriction-roll 75, bearing against the periphery of a cam 76 upon the cam-shaft 4 of the loom. A suitable spring, as at 77, Figs. 1 and 2, is caused to engage said lever 72 and actuate the same in opposition to the cam 76, the said spring holding the roll 75 pressed against the surface of the said cam. The actuator 7 ordinarily reciprocates without communicating movement to the shuttle-box, its normal path of movement being one in which its notched or forked working end 79 cannot engage with the cross-bar 6^f, attached to the lower end of box-rod 6^b. The said actuator is under the operative control of the mechanism or devices with which the loom is furnished for ascertaining or indicating the condition of the working weft-supply.

Various forms and arrangements of weft-indicator devices are known, some thereof being operative to ascertain breakage or exhaustion of the weft-supply in process of being woven in, and others thereof being operative when the weft-supply within the working shuttle on the lay becomes reduced in quantity to the predetermined minimum prior to complete exhaustion thereof. It is not material to the invention which form or arrangement of weft-indicator devices or mechanism may be employed. Ordinarily in practice I employ the usual weft-fork mechanism, which is represented in the drawings, the same comprising the weft-fork 8, its movable support or slide 8^a, the gooseneck 8^b, pivoted at 8^c and actuated by a cam or eccentric 8^d upon the cam-shaft 4, the arm 8^e, against which the weft-fork slide 8^a acts when the latter is forced forward through the engagement of the gooseneck 8^b with the tail of the weft-fork, and the stop-motion rod 8^f, having the arm 8^e affixed thereto and extending crosswise of the loom adjacent the breast-beam 2. As a convenient means of determining the path along which the engaging portion of the reciprocating actuator 7 shall move the stop-rod 8^f is furnished with an arm 8^g, extending downwardly and rearwardly and having its free extremity bent and entered into the slot 78, extending lengthwise of actuator 7. In the normal position of the weft-fork slide 8^a, arm 8^e, and stop-motion rod 8^f the arm 8^g serves to guide the actuator 7 in its movements, so that said actuator will not engage with the cross-bar 6^f, carried by the box-rod. When, however, the gooseneck engages with the tail of the weft-fork, advancing the weft-fork slide and rocking the stop-motion rod 8^f, the rearward movement of arm 8^g swings the actuator into line with cross-bar 6^f, so that in the next descent of the actuator the forked or notched working end 79 thereof engages with the said cross-bar, and thereby occasions the depression of the shuttle-box from the normal position of the latter into the "change" position.

With the object in view of obviating breakage in case the shuttle-box should be held from descending by a caught shuttle or other cause provisions are made for allowing the parts to yield. Thus the actuator is made with a separable socket or bearing for the reception of the pivotal pin 71, which connects the actuator with the lever 72. The cap 7^a of the said socket or bearing is pivoted to the body or main portion of the actuator at 7^b, and the cap and body are compressed together, so as to close said socket or bearing upon the said pivotal pin by means of a spiral spring 7^c. The said spring is fitted upon a pin 7^d, projecting from the body of the actuator and passing through a hole in the cap 7^a, the spring being compressed between the cap and a collar 7^e upon pin 7^d. When the shuttle-box is prevented by any cause from being depressed by the engagement of the actuator with the cross-bar 6^f of the box-rod, the cap 7^a yields, allowing the pivotal pin 71 to move independently of the actuator. The lower end of the actuator works in a slot 79^a in the plate 6^e, and thereby is guided in its movements.

The cells of the shuttle-box are each open at one side thereof for the purpose of permitting a fresh shuttle to be introduced by a transverse movement into the upper or spare cell and of permitting the working shuttle to escape or be ejected transversely from the lower or working cell. In Fig. 3 the working shuttle is designated 9, and the reserve shuttle contained in the spare cell is designated 9^a. A shuttle-binder is shown at 10, Figs. 3 and 4. It is mounted in usual manner upon a pivot-pin 10^a, the latter being connected with a cross-bar 10^b, forming part of the lay and extending across in front of the shuttle-box. In the normal position of the shuttle-box (shown in Fig. 3) the said binder closes the open side of the working cell of the shuttle-box and coacts with the working shuttle 9 entering the said cell. The depression of the shuttle-box carries the spare cell of the latter into position opposite the binder, and the binder then closes the open side of the spare cell and coacts with the shuttle in the said cell. The depression of the shuttle-box also carries the lower or working cell below the binder, and thereby renders the shuttle 9 therein free to be thrown or ejected from the said lower cell.

If desired, the shuttle in the lower cell of the depressed shuttle-box may be left to be thrown from the said cell by the change in the direction of movement of the lay in its continued vibration. In some cases, however, I provide a cam 11, Fig. 6, carried by the outer portion of the lay, against which the outer portion or tip of the said shuttle is carried by the descent of the shuttle-box. By the said cam the outer end of the shuttle is borne forwardly. Preferably, also, I employ an ejector 12, Figs. 3 and 4, entering the lower cell in the depressed position of the shuttle-box and acting against the shuttle therein. This ejector is arranged

to act against the inner portion of the shuttle. It usually is fixed to the stand or bracket 74 or other suitable support on the loom-frame, as shown in Figs. 3 and 4, and as the lay swings rearward passes into the lower cell of the depressed shuttle-box, pushing the inner end of the shuttle 9 therefrom. (See Fig. 4.)

As the shuttle drops from the working cell of the shuttle-box it falls into a chute 13, Fig. 2, attached to the lower side of the shuttle-box. The bottom of the said chute is inclined, so that the shuttle slides therefrom, as at 9^b, Fig. 2, so as to discharge the said shuttle into a receptacle 14.

At 15 is represented a magazine for reserve shuttles. Preferably the said magazine is caused to move in unison with the lay in order to facilitate the feeding of shuttles from the said magazine and in order to afford more time for the performance of the feeding operations. Preferably, also, the said magazine is supported independently of the lay in order to relieve the lay from the burden of carrying the weight of the magazine and its contents. To this latter end the end pieces 15^a of the said magazine are extended upwardly above the body of the latter and are connected by a cross-rod 15^b. The said rod is fitted to bearings which are provided in the forked forward arm of a lever 15^c, the said lever being pivoted at 15^d to a stand or bracket 15^e, which is attached to the loom-frame or some other fixed support. With the rear arm of the lever 15^c is connected the contracting spiral spring 15^f. The said spring supports more or less completely the weight of the magazine and its contents and yields to accommodate the movements of the magazine as it swings in unison with the lay. In consequence of mounting the magazine to swing upon an overhead pivotal axis 15^b the movements of the upper portion of the body of the magazine are so slight as not to interfere with the introduction of shuttles into the open top of the magazine while the loom is running. For the purpose of causing the magazine to swing in unison with the lay a rod 15^g, connected with the lower end of the magazine, is fitted to bearings in brackets 15^h 15^h, projecting upward from the lay.

For the delivery of the reserve shuttles 9^c, which are contained within the magazine 15, I provide escapement devices comprising, essentially, a rock-shaft 16, which is mounted in bearings 16^a on the lower end of the magazine and provided with one or more supports 16^b to pass in beneath the bottom shuttle in the magazine, as in Fig. 3, and support the said shuttle and the others which are above the same and also provided with shuttle-segregating arms 16^c 16^c, which normally occupy an outstanding position, as in Fig. 3, clear of the shuttles 9^c within the hopper. When the escapement rock-shaft 16 is turned to lower the shuttle-support 16^b into the position occupied by it in Fig. 4, the said segregating-arms 16^c 16^c are caused to pass in between the bottom shuttle and the one next above the same, as shown in the said figure, thereby supporting the latter while the bottom shuttle is allowed to pass from the open mouth at the lower end of the magazine.

For the purpose of holding the escapement devices in position to retain the bottom shuttle within the hopper, as in Fig. 3, an arm 16^d on the escapement rock-shaft 16 has connected therewith one end of a contracting spiral spring 16^e, the other end of the said spring being connected with a portion of the magazine. In order to operate the escapement devices so as to cause them to assume the positions shown in Fig. 4 for the delivery of a shuttle, the said arm 16^d is furnished with a pin 16^f, working in a slot 16^g in a link 16^h, that is connected pivotally at 16^i to the upper part of the shuttle-box. The descent of the shuttle-box causes the escapement rock-shaft to be turned through contact of the upper end of slot 16^g in link 16^h with the pin 16^f on the arm 16^d of the said rock-shaft, thereby feeding the bottom shuttle from the magazine. In the rise of the shuttle-box the spring 16^e returns the escapement devices to their normal positions. The slot 16^g in link 16^h obviates tendency to breakage in case the escapement devices in returning to their normal position during the rise of the shuttle-box should become obstructed by a misplaced shuttle or other cause. The said slot enables the link in such case to rise relative to the pin 16^f on the arm 16^d of the escapement rock-shaft, leaving the escapement devices in whatever position they may have been forced to retain in consequence of a shuttle being caught between the support 15^h and the shuttle-box or of any other obstruction.

In the preferred embodiment of the invention the shuttle which is delivered from the magazine is deposited upon a support on the lay constituted by a shelf 17, located above the binder 10. (See Fig. 4.) The delivery takes place while the shuttle-box is in its depressed position. For the purpose of preventing the shuttle from catching upon the top of the shuttle-box in passing to the said support 17 guides 18 are provided, these guides bridging the gap between the top of the shuttle-box and the lower end of the magazine. The said guides are herein constituted by steel strips attached to the top of the shuttle-box and projecting upwardly past the lower edge of the rear side of the magazine. They practically constitute continuations of the rear wall of the magazine and guide the shuttle in its descent from the mouth of the magazine to the support 17.

For the purpose of transferring the shuttle from support 17 to the spare or feeder cell of the shuttle-box a pusher or injector is provided. The said pusher or injector is herein constituted by an arm 19, pivoted at 20 upon cross-bar 10^b and arranged to swing horizon-

tally across the support 17. A spring 21 acts upon the said pusher or injector, and when permitted to move the latter presses it rearwardly. The pusher or injector is connected, as by a strap 19^a, to an arm 19^b upon the escapement rock-shaft 16. When the said rock-shaft is operated and caused to assume the position which is represented in Fig. 4 to cause a shuttle to be fed from magazine 15 to support 17, the pusher or injector is drawn forwardly out of the path of the descending shuttle. As soon as the rock-shaft 16 is permitted to return toward its normal position the pusher or injector is released to the action of its spring, which latter presses it rearwardly against the shuttle which has been delivered to the support 17. Thereby the said shuttle is pressed rearwardly against the guides 18. As soon as the shuttle-box has risen so as to present the spare cell in position to receive the fresh shuttle the latter is pushed off the support 17 into the spare cell by the action of the pusher or injector. (See Fig. 3.) For the purpose of preventing the shuttle while resting on support 17 from being canted or tilted upward sidewise in consequence of the friction of the guides 18 against the same one or more detents 22, Fig. 7, are attached to the rod 15^g. These detents permit the shuttle to descend to the support 17; but as soon as spring 21 is permitted to act the said spring operates the pusher or injector to carry the shuttle partly under the detents, which thereupon are operative to prevent the rear side of the shuttle from rising. On the return of the shuttle-box to its normal position the pusher or injector carries the shuttle from the support 17 into the spare or feeder cell.

Fig. 5 of the drawings shows a modification in which the cam (there designated 761) by means of which the lever 72, carrying the actuator 7, is operated instead of being fast upon the cam-shaft 4 is mounted upon a separate shaft or stud 762 and is driven from the said cam-shaft at half the speed of the latter by means of gears 4^a and 4^b. This arrangement is contemplated for use more especially in cases in which a positively-acting ejector is dispensed with. It causes the shuttle-box to dwell in change position in order thereby to insure ample opportunity for the escape of the shuttle from the working cell at the change in the direction of the movement of the lay. In this modification the cam or eccentric 8^d, by means of which the gooseneck 8^b is actuated, is mounted upon the same shaft or stud 762 and rotates in unison with the cam 761. When thus driven, the cam or eccentric 8 will operate the gooseneck only once in every four picks; but in some classes of weaving this is not particularly objectionable.

I claim as my invention—

1. In a weft-replenishing loom, in combination, the lay, a magazine for reserve shuttles moving in unison with the lay, a multiple shuttle-box also moving in unison with the lay and having a working cell and a feeder-cell, weft-indicator devices, mechanism under operative control of said weft-indicator devices whereby said shuttle-box is shifted to carry the working cell into discharging position and the feeder-cell into position to bring its contained reserve shuttle into action and then is returned to its normal position, and means to feed a reserve shuttle from said magazine into the empty feeder-cell in the normal position of the shuttle-box, substantially as described.

2. In a weft-replenishing loom, in combination, the lay, a magazine for reserve shuttles supported independently of the lay and moving in unison with the latter, a multiple shuttle-box also moving in unison with the lay and having a working cell and a feeder-cell, weft-indicator devices, mechanism under operative control of said weft-indicator devices whereby said shuttle-box is shifted to carry the working cell into discharging position and the feeder-cell into position to bring its contained reserve shuttle into action and then is returned to its normal position, and means to feed a reserve shuttle from said magazine into the empty feeder-cell in the normal position of the shuttle-box, substantially as described.

3. In a weft-replenishing loom, in combination, the lay, a magazine for reserve shuttles, the support upon the lay to which a reserve shuttle from said magazine is fed, the multiple shuttle-box having a working cell and a spare cell, an injector by which the reserve shuttle on the said support upon the lay is transferred from the latter to the shuttle-box, weft-indicator devices, and mechanism under operative control of said weft-indicator devices whereby said shuttle-box is shifted to effect the discharge of the working shuttle and bring the reserve shuttle into action and then is returned to normal position, substantially as described.

4. In a weft-replenishing loom, in combination, the lay, a magazine for reserve shuttles, the support upon the lay to which a reserve shuttle from said magazine is fed, the multiple shuttle-box having a working cell and a feeder-cell, means to transfer the reserve shuttle from said support into the empty feeder-cell in the normal position of the shuttle-box, weft-indicator devices, and mechanism under operative control of said weft-indicator devices whereby said shuttle-box is shifted to carry the working cell into discharging position and the feeder-cell into position to bring its contained reserve shuttle into action and then is returned to its normal position, substantially as described.

5. In a weft-replenishing loom, in combination, the lay, the magazine for reserve shuttles moving in unison with the lay, the support on

the lay to which a reserve shuttle is fed from the said magazine, the multiple shuttle-box also moving in unison with the lay and having the working cell and a spare cell, the injector by which the reserve shuttle on the said support on the lay is transferred from the support to the shuttle-box, weft-indicator devices, and mechanism under operative control of the said weft-indicator devices whereby said shuttle-box is shifted to effect the discharge of the working shuttle and bring the reserve shuttle into action, substantially as described.

6. In a weft-replenishing loom in combination, the lay, the magazine for reserve shuttles moving in unison with the lay, the support on the lay to which a reserve shuttle is fed from the said magazine, the multiple shuttle-box also moving in unison with the lay and having the working cell and the feeder-cell, the injector by which the reserve shuttle on the said support on the lay is transferred from the support to the feeder-cell, weft-indicator devices, and mechanism under operative control of said weft-indicator devices whereby said shuttle-box is shifted to carry the working cell into discharging position and the feeder-cell into position to bring its contained reserve shuttle into action and then is returned to its normal position, substantially as described.

7. In a weft-replenishing loom, in combination, the lay, a magazine for reserve shuttles, the support upon the lay to which a reserve shuttle from said magazine is fed, the multiple shuttle-box having a working cell and a feeder-cell, means to transfer the reserve shuttle from said support into the empty feeder-cell in the normal position of the shuttle-box, weft-indicator devices, mechanism under operative control of said weft-indicator devices whereby said shuttle-box is shifted to carry the working cell into discharging position and the feeder-cell into position to bring its contained reserve shuttle into action and then is returned to its normal position, and an ejector entering the working cell in the discharging position of the latter to eject the shuttle therefrom, substantially as described.

8. In a weft-replenishing loom, in combination, the shifting shuttle-box, means to feed a reserve shuttle to said shuttle-box, weft-indicator devices, mechanism under operative control of the said weft-indicator devices whereby said shuttle-box is shifted in effecting the weft replenishment, a deflector operating in connection with the outer tip of the shuttle to be ejected, and an ejector acting against the inner tip of the said shuttle, substantially as described.

9. In a weft-replenishing loom, in combination, the lay, the shifting shuttle-box, weft-indicator devices, box-shifting mechanism under operative control of the said weft-indicator devices, and a fixed ejector entering the shuttle-box in the swinging movement of the lay in the discharging position of the shuttle-box to eject the shuttle therefrom, substantially as described.

10. In a weft-replenishing loom, in combination, the lay, the shifting shuttle-box moving in unison with the lay, the magazine supported independently of the lay and moving in unison with the latter, the support on the lay to receive a reserve shuttle from said magazine, the means actuated from said shuttle-box for feeding a reserve shuttle from said magazine to said support, the injector operatively connected with said feeding means and acting to transfer the reserve shuttle from said support to the shuttle-box, weft-indicator devices, and mechanism under operative control of the said weft-indicator devices whereby said shuttle-box is shifted to effect the discharge of the working shuttle and bring the reserve shuttle into action, substantially as described.

11. In a weft-replenishing loom, in combination, the multiple shuttle-box, the feeding means operatively connected with the said shuttle-box and actuated by the movement of the latter to feed a reserve shuttle to the shuttle-box, the reciprocatory actuator, means to operate the same, and weft-indicator devices whereby the said actuator is caused to operate said shuttle-box to occasion a change of shuttles, substantially as described.

12. In a weft-replenishing loom, in combination, the lay, the support on the lay for a reserve shuttle, the multiple shuttle-box, the magazine for reserve shuttles, feeding means whereby to feed a shuttle from said magazine to said support and an injector whereby to shift said shuttle from the support to the shuttle-box, both operatively connected with said shuttle-box and actuated by the movement of the latter, the actuator, means to reciprocate said actuator, and weft-indicator devices whereby the said actuator is caused to operate the shuttle-box to occasion a change of shuttles, substantially as described.

13. In a weft-replenishing loom, in combination, the lay, the magazine supported independently of the lay and swinging in unison therewith, the shifting shuttle-box, the support on the lay to receive a shuttle from the said magazine, and a shuttle-guide connected with said shuttle-box and bridging the space between the shuttle-box and the adjacent portion of the magazine, substantially as described.

14. In a weft-replenishing loom, in combination, the lay, the magazine supported independently of the lay and swinging in unison therewith, the shifting shuttle-box, the support on the lay to receive a shuttle from the said magazine, a shuttle-guide connected with said shuttle-box and bridging the space between the shuttle-box and the adjacent portion of the magazine, and a detent to prevent

canting or rocking of the shuttle on said support as the shuttle-box rises, substantially as described.

15. In a weft-replenishing loom, in combination, the lay, the magazine swinging in unison with the lay, the spring-supported mounting for the magazine, shuttle-changing instrumentalities, and weft-indicator devices in operative control of the said shuttle-changing instrumentalities, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY I. HARRIMAN.

Witnesses:

CHAS. F. RANDALL,

LEPINE HALL RICE.