No. 815,948. PATENTED MAR. 27, 1906.

N. FOERSTER.

AUTOMATIC FILLING REPLENISHING MECHANISM FOR LOOMS.

APPLICATION FILED JAN. 8, 1903. RENEWED AUG. 29, 1905.

3 SHEETS—SHEET 1.

FIG. 1.

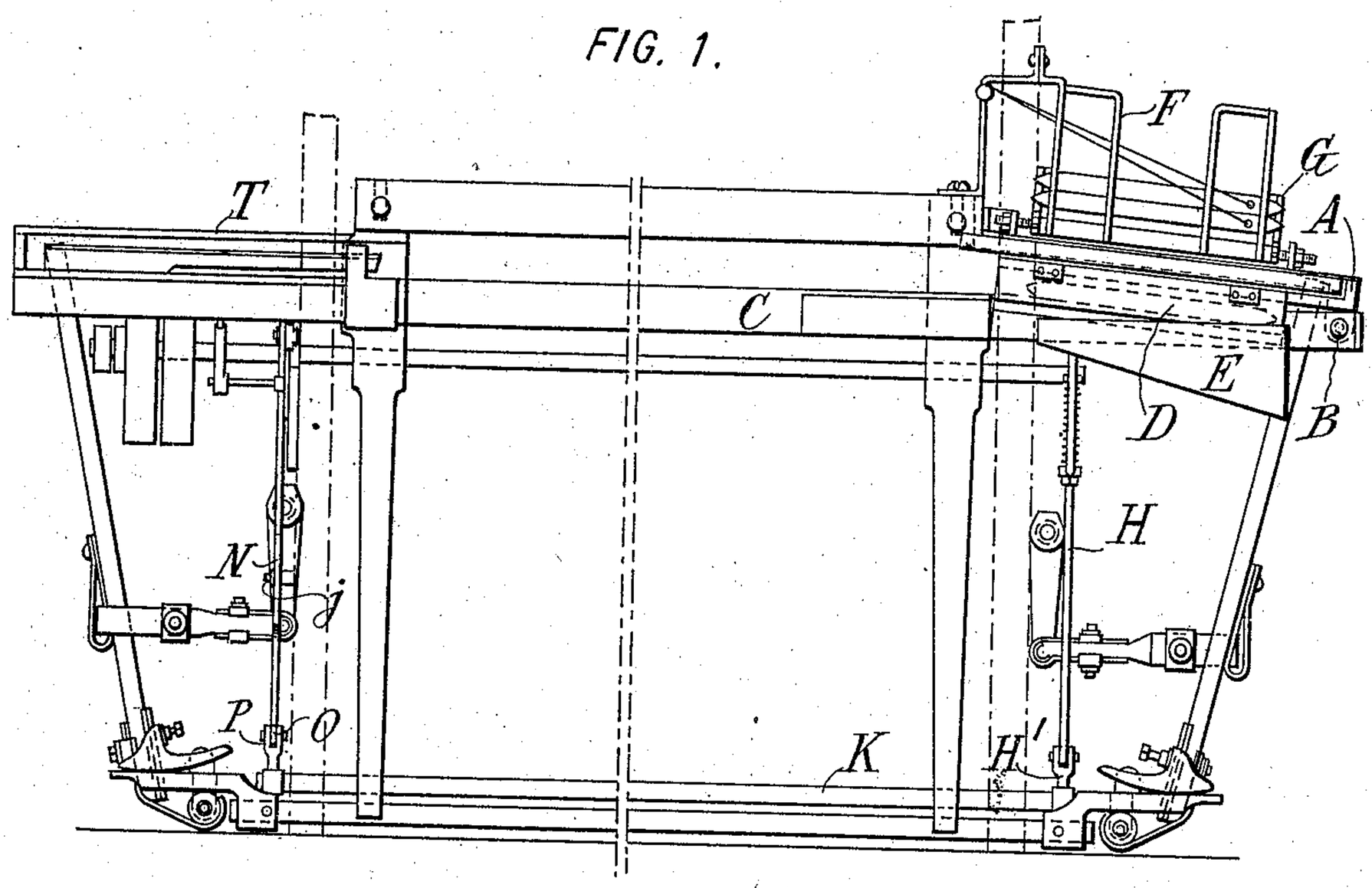


FIG. 2.

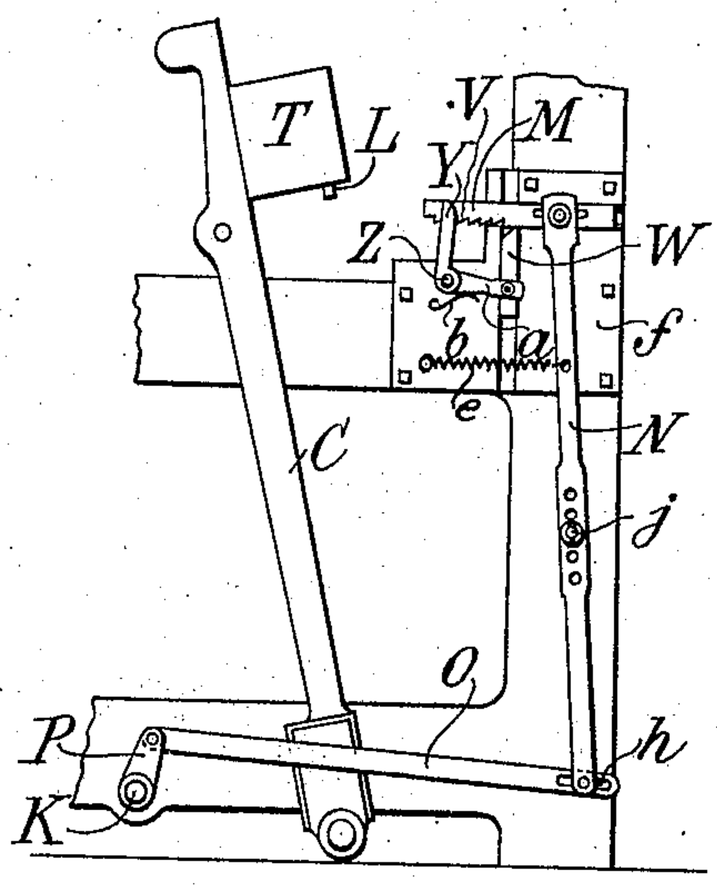


FIG. 3.

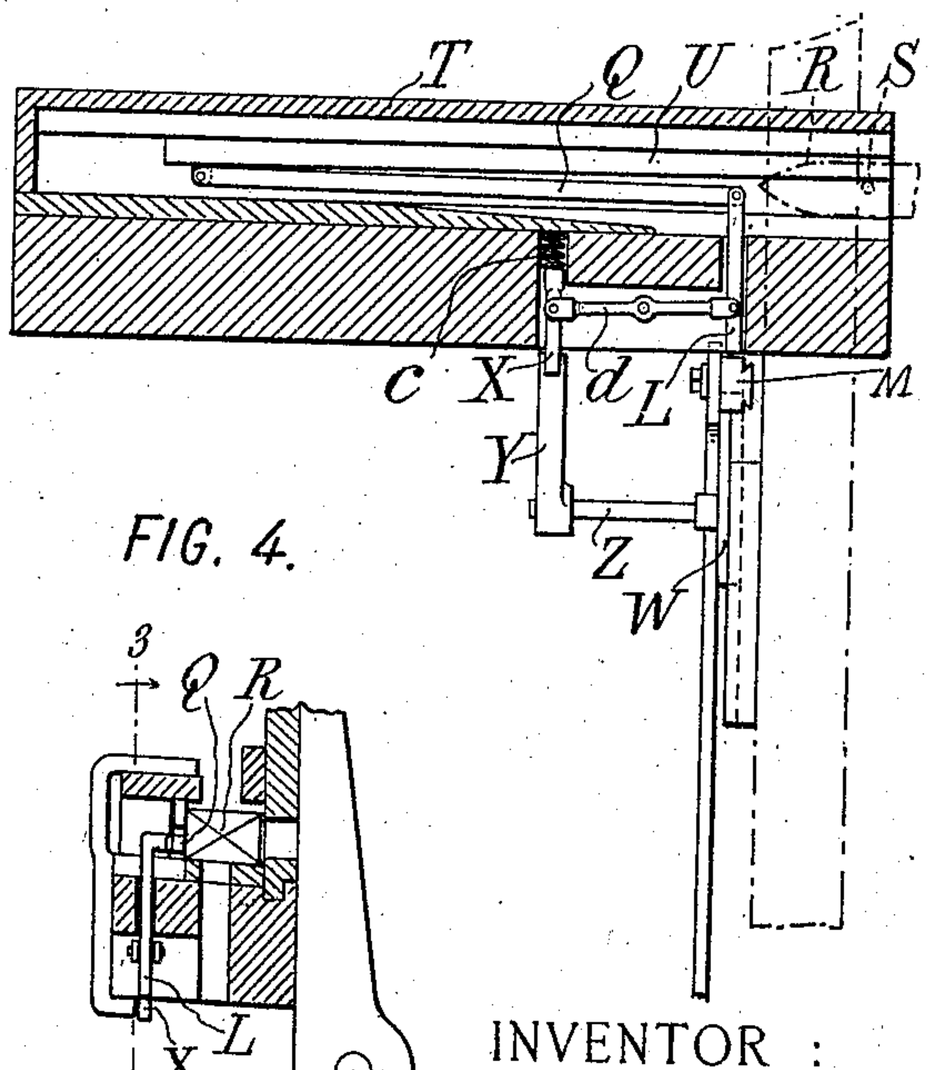


FIG. 4.

WITNESSES:
Fred Whitg
Thomas F. Wallace

INVENTOR:
Norbert Foerster,

By Attorneys,
Reuben C. Orasser & Co.

No. 815,948. PATENTED MAR. 27, 1906.

N. FOERSTER.

AUTOMATIC FILLING REPLENISHING MECHANISM FOR LOOMS.

APPLICATION FILED JAN. 8, 1903. RENEWED AUG. 29, 1905.

3 SHEETS—SHEET 2.

FIG. 5.

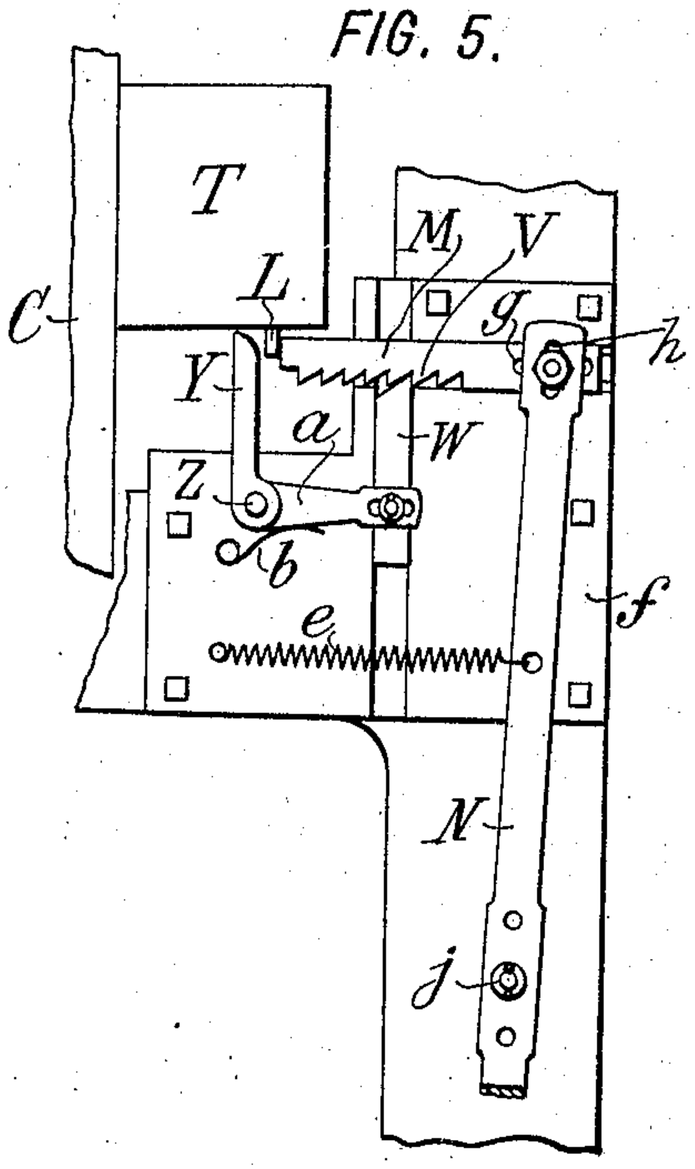


FIG. 6.

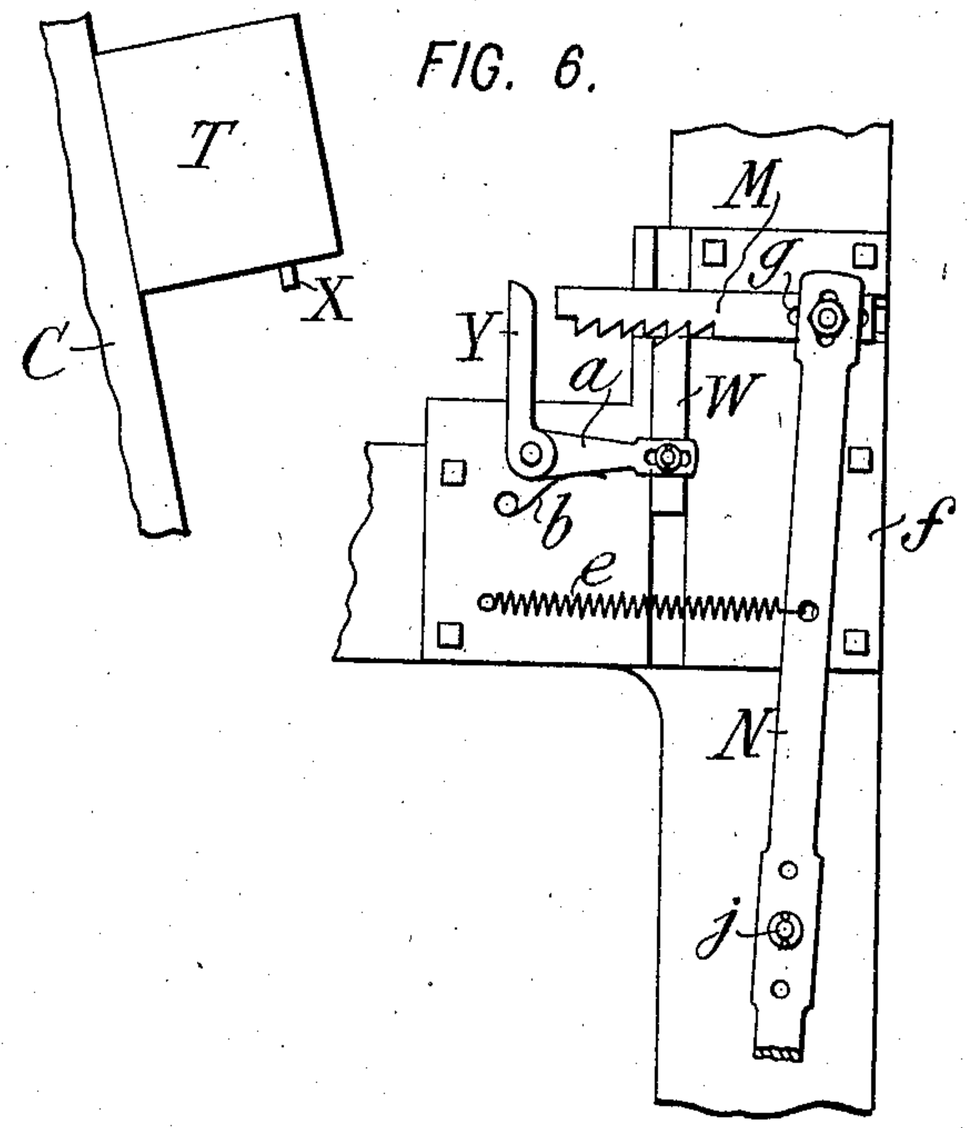


FIG. 7.

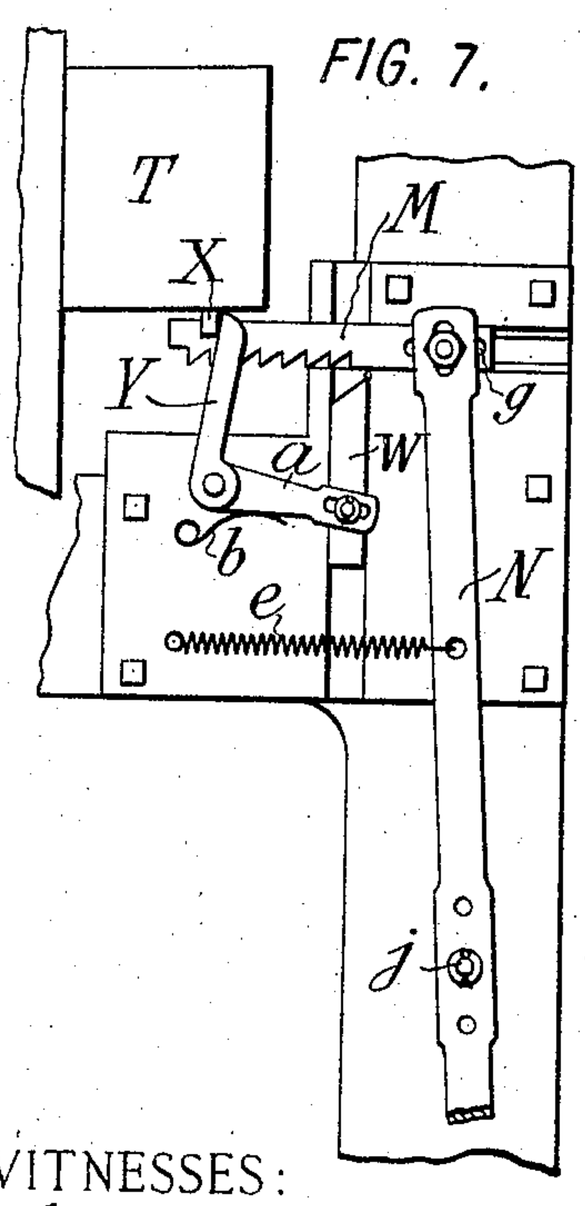
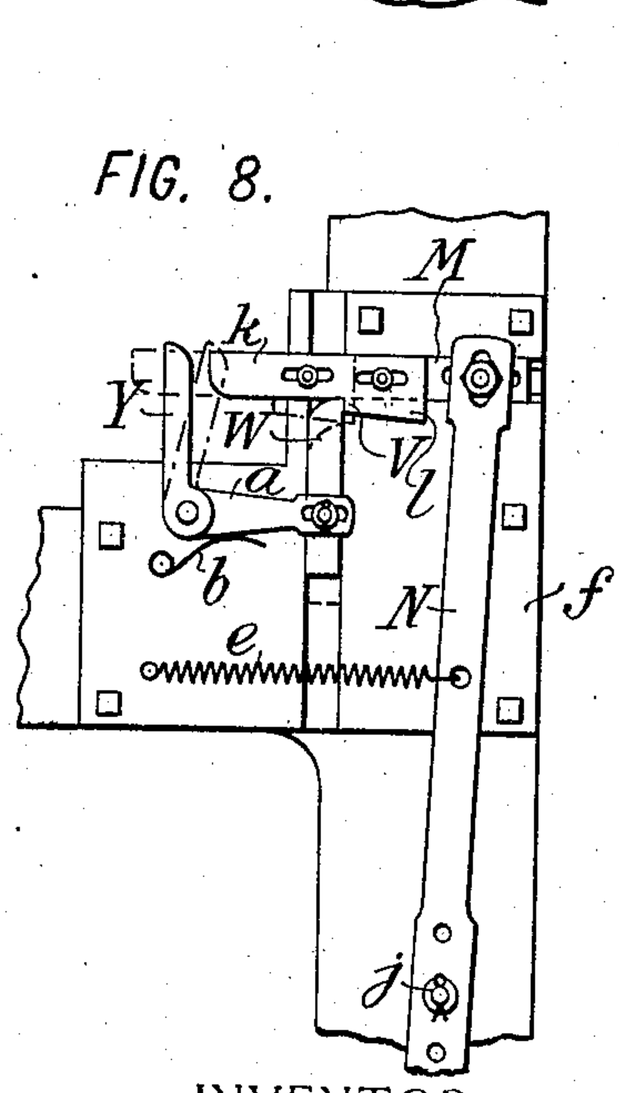


FIG. 8.



WITNESSES:

Fred Whitg

Thomas Wallace

INVENTOR:

Norbert Foerster,

By Attorneys,

Burton G. Organ & Co.

No. 815,948. PATENTED MAR. 27, 1906.

N. FOERSTER.

AUTOMATIC FILLING REPLENISHING MECHANISM FOR LOOMS.

APPLICATION FILED JAN. 8, 1903. RENEWED AUG. 29, 1905.

3 SHEETS—SHEET 3.

FIG. 9.

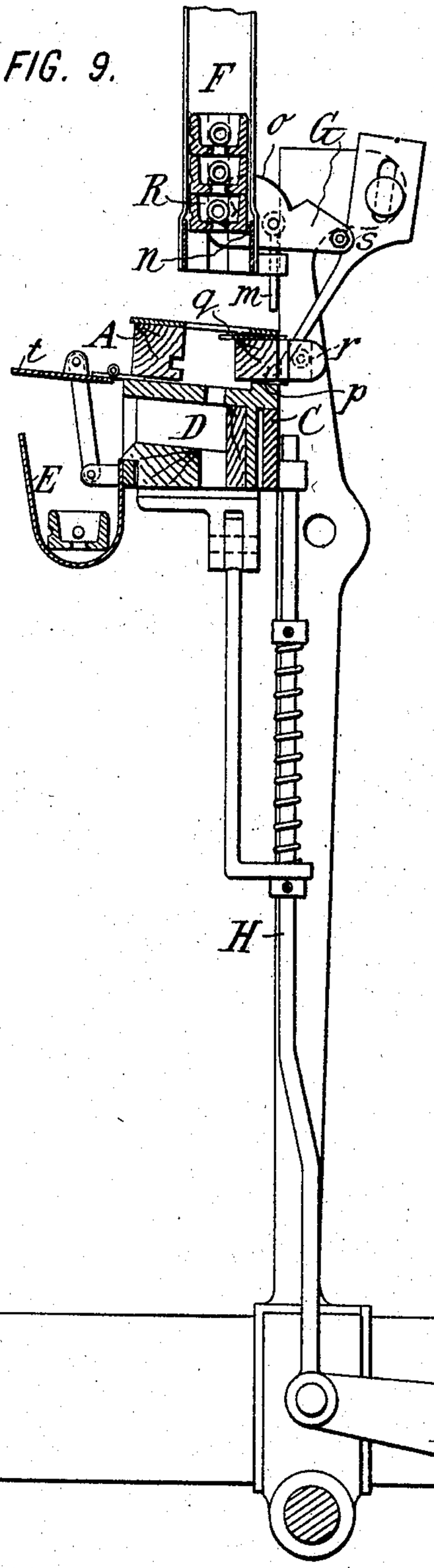
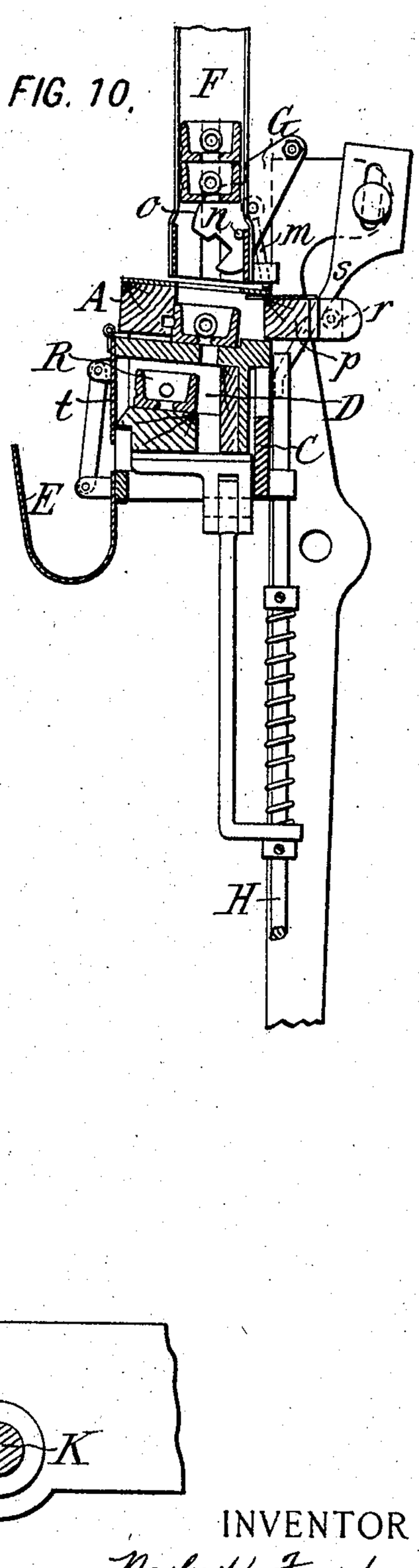


FIG. 10.



WITNESSES:

Fred White

Domingo A. Usina

INVENTOR:

Norbert Foerster,

By Attorneys,

Munn & Green & Co

UNITED STATES PATENT OFFICE.

NORBERT FOERSTER, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, OF TWO-FIFTHS TO AMERICAN TEXTILE SPECIALTY MACHINERY COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

AUTOMATIC FILLING-REPLENISHING MECHANISM FOR LOOMS.

No. 815,948. Specification of Letters Patent. Patented March 27, 1906.

Application filed January 8, 1903. Renewed August 29, 1905. Serial No. 276,321.

To all whom it may concern:

Be it known that I, NORBERT FOERSTER, a citizen of the United States, residing in the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Automatic Filling-Replenishing Mechanism for Looms, of which the following is a specification.

In the patent of Brun, Brun, and Bicking, No. 714,665, December 2, 1902, there is described a loom provided with a lay having a fixed shuttle-box on one side and on the other side a pivotally-arranged shuttle-box, a receptacle for holding a supply of full shuttles, and an adjustable auxiliary box for catching the exhausted shuttle to be discharged, in combination with certain mechanism for moving the pivoted shuttle-box toward the supply-receptacle, supplying a new shuttle to the box, and discharging the exhausted shuttle on the lay. In the loom shown in that patent a spring is utilized to move the pivoted shuttle-box in one direction and a cam to move it in the opposite direction. I provide an improved mechanism in which the movement of the lay itself is transmitted to the operating mechanism to move such a pivoted shuttle-box, so that the replenishing movement of the shuttle-box or its return to running position takes place synchronously with the movement of the lay. By providing for the upward or replenishing movement of the pivoted shuttle-box synchronously with the movement of the lay I eliminate the strong spring used for that purpose in the patented loom referred to, the movement being effected more slowly and with less jar to the loom, and I avoid also the necessity of a cam, using considerable power for returning the pivoted shuttle-box to its running position against the upward pressure of the spring referred to. I thus provide a loom which runs more quietly and which requires less power. The synchronizing of the movement of the pivoted shuttle-box with that of the lay also insures that the replenishing movement shall commence and terminate with the lay in proper position for the movement of the shuttle across it.

It is common in this art to provide for a continuous operation of the loom by various mechanisms.

My invention aims to provide an operating mechanism which has various advantages when used with any suitable one of these types of what may be generically termed "filling-replenishing" mechanisms. The principal elements of this operating mechanism are an actuator carried by the lay for actuating the mechanism and normally in inoperative position and a detector carried by the shuttle adapted to detect the exhaustion of the thread to a predetermined extent and upon such exhaustion of the thread to cause the movement of the actuator to operative position. My invention provides also a restorer carried by the lay for causing the restoration of the operating mechanism to its normal position, which restorer is caused to move to its inoperative position by said detector.

The accompanying drawings illustrate a loom provided with mechanism embodying my invention.

Figure 1 is a front view of the lay and connected parts, the position of the frame of the machine being indicated merely in dotted lines. Fig. 2 is an elevation of the left-hand end of Fig. 1. Fig. 3 is an enlarged section of the fixed shuttle-box on the plane of the actuator and restorer approximately on the line 3 3 in Fig. 4. Fig. 4 is a transverse section of the same box on the plane of the actuator. Figs. 5, 6, and 7 are views of a portion of the mechanism shown in Fig. 2, on a larger scale, illustrating successive positions of the mechanism. Fig. 8 is a view similar to Fig. 5 of another form of the invention. Figs. 9 and 10 are end views, partly in section, of the right-hand end of Fig. 1, illustrating especially the movements of the shuttle-box.

Referring to the embodiment shown in the drawings, at the right of Fig. 1 is shown a pivoted shuttle-box A, pivoted at B to the lay C. Below the shuttle-box A and moving therewith is a receptacle D, which receives the exhaust-shuttle and on the forward beat of the lay throws it into a chute E, out of which it slides endwise into any suitable receptacle. A supply-receptacle for the full

shuttles is shown at F and is attached in fixed position to the lay. Arms G hold the shuttles in the supply-receptacle and drop them one by one into the shuttle-box A when the latter is swung up to the under side of the receptacle. The movement of the pivoted shuttle-box may be secured by means of a rod H, connected at its lower end to the crank H′ on a shaft K, running transversely of the machine. All these parts are described in detail in the patent referred to. Upon the exhaustion of the thread in the running shuttle the shaft K is rocked in a direction to throw the shuttle-box A up against the under side of the receptacle F, and this upward movement releases the lowest shuttle in the receptacle, which shuttle drops into the shuttle-box. At the same time the auxiliary box D is thrown up into position, so that it catches the exhausted running shuttle on its return movement. During the next beating-up movement of the lay the shaft K is rocked in the opposite direction to pull down the arms G and the shuttle-box A to the level of the lay, so that the picker-stick shoots the fresh shuttle from the box A across the lay.

My invention provides an improved mechanism for obtaining these movements or, in fact, for operating any other similar or suitable filling-replenishing mechanism. According to the embodiment shown the shaft K is rocked to obtain the replenishing movement by the engagement of an actuator—such, for example, as the pin L, carried by the lay—with a slide M, which engagement rocks a lever N, the movement of which is transmitted, by means of a link O and crank P, to the shaft K. The actuator L is shown as a pin projecting through the bottom of the lay and extending up into the shuttle-box, its upper end being pivotally connected to a lever Q. The shuttle R is provided with a detector S, arranged to normally lie entirely within the shuttle, but to project out of the side of the shuttle when the thread therein is exhausted to a predetermined point. When the thread is nearly exhausted, the shuttle, with the detector S projecting from its side, enters the fixed shuttle-box T, and the detector entering between the lever Q and the guide U, fixed above it in the manner shown in Fig. 3, presses down the lever Q, and with it the actuator L, into operative position. Various styles of detectors are known which might be adapted for the purpose.

The pivoted shuttle-box being thrown to the replenishing position and the auxiliary box D to position for receiving the exhausted shuttle, they should be held in this position while the lay swings back and the shuttle is shot from the fixed shuttle-box. In order to hold them in position, the bar M is provided on its under side with one or more teeth V, and a sliding pawl W is arranged to engage the same and hold the bar M in its forward position, so as to hold the pivoted shuttle-box up. Then when the lay has swung back and the exhausted shuttle has been shot out of it the actuator is automatically restored to its inoperative position, and a restorer—such, for example, as a pin X—is moved into operative position to engage on the next forward beat of the lay an arm Y on the outer end of a small shaft Z, which at its inner end has a horizontal arm *a* engaging the pawl W. A spring *b*, acting on the under side of the arm *a*, serves to hold the pawl W up to its work. The pin X moves in a vertical bore in the lay and is normally pressed downward to operative position by means of a spring *c*, which spring also through the lever *d*, connecting the pins L and X, serves to hold up the pin L in inoperative position. When the pin L is pressed down to operative position, then the pin X is thrown up to the inoperative position, and as soon as the exhausted shuttle passes out of the shuttle-box the spring *c* restores the pin X to its normal operative position and the pin L to its normal inoperative position. The four successive positions of the parts are shown in Figs. 2, 5, 6, and 7. With the lay in the rearward position, Fig. 2, the nearly-exhausted shuttle enters the box T and depresses the pin L. The lay then moves forward, Fig. 5, the pin L engaging the slide M and swinging the lever N and the shaft K to move the pivoted shuttle-box A up. The pawl W engages the toothed edge of the slide M and holds the parts in this position. The lay then swings back, Fig. 6, the shuttle is shot out of it, and the restoring-pin X is projected downward. On the next forward beat, Fig. 7, the pin X strikes the arm Y, withdrawing the pawl W. The weight of the boxes A and D at the opposite side of the machine then throws them downward, rocking the shaft K and swinging the lever N back to its normal position. Ordinarily the weight of the boxes A and D will be sufficient to effect this restoring movement; but for very rapidly operating looms I may employ in addition a spring *e*, attached at any suitable point—as, for example, to the upper portion of the lever N and to a fixed point on the machine—for hastening the restoring movements of the parts.

I propose to arrange the slide M, pawl W, and shaft Z upon a plate *f*, which may be attached, as by bolts, to a suitable point in the frame of the machine. My invention is designed largely to be applied to looms already in use, and the mounting of these parts on a separate plate facilitates such application. It is then necessary in addition to apply the shaft K and connections and the suitable shuttle-boxes and shuttle-supply receptacle. In order to adapt the extension for application to machines having different lengths of beat, I prefer to connect the slide M ad-

justably to the lever N, as by means of a slot *g*, a similar slot *h* being provided in the link O for connecting the lower end of the lever N with the shaft K; also, in order to permit of adjusting the mechanism so that the movement shall commence at an earlier or later point in the forward beat of the lay I may arrange the pivot *j* of the lever N at any one of a number of the holes indicated, thus varying the amount of movement of the upper end of the lever N utilized in effecting a given movement of the pivoted shuttle-box.

Instead of providing a series of teeth on the under side of the slide M and making the entire slide adjustable I may provide an end piece *k* therefor, Fig. 8, having a single tooth V, and this end piece *k* is adjustable, as by the slotted connection shown, on the slide M. The plate *f* may then be mounted in such position that for the extreme forward position of the lay the bar M, with its end piece *k*, will be moved just far enough for the pawl W to engage the tooth V. A modification which may be used with this device or with the slide M (shown in the other figures) consists in providing a downwardly-inclined portion *l* in the rear of the last tooth V, so that when the arm Y is struck by the restoring-pin and the pawl W depressed the rearward movement of the lever N, carrying with it the slide M, will cause the inclined portion *l* to press the pawl W still farther down and to move the arm Y out of the reach of the restoring-pin X, so as to avoid its being struck by this pin at each beat of the lay.

The movements of the shuttle-box A in the replenishing of the filling are illustrated in detail in Figs. 9 and 10. As the actuator L swings forward from the position of Fig. 2 to that of Fig. 5 and swings the arm P on the shaft backward the forwardly-projecting arm H′ at the opposite end of the shaft swings upward and carries with it the rod H, as explained. This rod is attached at its upper end to the free end of the pivoted structure comprising the running shuttle-box A and the auxiliary shuttle-box D. As this swings upward the shuttle-box strikes a pin *m*, depending from the releasing forked arms G, which is pivoted at *n*, moving it from the position of Fig. 9 to that of Fig. 10 and letting down the lowest shuttle in the box, the curved edge *o* of the forked arms serving to hold up the remaining shuttles. Simultaneously with the upward movement of the shuttle-box the movable tongue *p*, carrying the cover-plate *q*, which ordinarily partly closes the top opening of the box, is withdrawn by a roller *r* on its outer end traveling along a cam *s*, attached to the lay. When the shuttle-boxes have been moved up to the position of Fig. 10, the box D is in the position of the regular running box and receives the exhausted shuttle R as it returns from the opposite side of the lay. A door *t* is pivotally attached to the exhausted shuttle-box and is connected by an arm and link, as shown, to a fixed portion of the lay, so that when the shuttle-box is in its normal lowered position the door *t* is held open, Fig. 9, and the exhausted shuttle is thrown out by the movement of the lay; but when the shuttle-boxes are in the elevated position, Fig. 10, the movement of the shuttle-box relatively to the fixed portion of the lay has caused the door *t* to close, so that the shuttle cannot jump out of the box. This mechanism is described in detail in the patent of Brun, Brun, and Bicking, above referred to, and need not be here described in further detail.

Though I have described with great particularity of detail certain embodiments of my invention, yet I am not to be understood as limiting the invention to the specific mechanisms described. Various modifications of the same in the details and in the combination and arrangement of the parts are possible to those skilled in the art without departure from my invention.

What I claim is—

1. In a loom, a device for automatically exchanging the shuttles, comprising in combination with the lay a shuttle-box on one side thereof and fixed thereto and on the other side of the lay a pivotally-arranged shuttle-box, a receptacle for holding a supply of full shuttles, an adjustable auxiliary box for catching the exhausted shuttle to be exchanged, mechanism for moving said pivoted shuttle-box toward and from the supply-receptacle and means for transmitting the movement of the lay to said mechanism to move said shuttle-box in one of said directions synchronously with the movement of the lay.

2. In a loom, a device for automatically exchanging the shuttles, comprising in combination with the lay a shuttle-box on one side thereof and fixed thereto and on the other side of a lay a pivotally-arranged shuttle-box, a receptacle for holding a supply of full shuttles, an adjustable auxiliary box for catching the exhausted shuttle to be exchanged, mechanism for conveying the shuttle-box pivoted to the lay toward the supply-receptacle to receive a new shuttle and for moving said auxiliary box into the operative position of said movable shuttle-box, in order to catch the exhausted shuttle coming out of the shuttle-box fixed to the lay, and means for transmitting the movement of the lay to said mechanism to operate the same upon exhaustion of the thread of the working shuttle to a predetermined extent.

3. In a loom, a device for automatically exchanging the shuttles, comprising in combination with the lay a shuttle-box on one side thereof and fixed thereto and on the other side of the lay a pivotally-arranged shuttle-box, a receptacle for holding a sup-

ply of full shuttles, an adjustable auxiliary box for catching the exhausted shuttle to be exchanged, mechanism for conveying the shuttle-box pivoted to the lay toward the supply-receptacle to receive a new shuttle and for moving said auxiliary box into the operative position of said movable shuttle-box, in order to catch the exhausted shuttle coming out of the shuttle-box fixed to the lay, an actuator carried by the lay and arranged to transmit the movement of the lay to said mechanism, said actuator being normally in inoperative position, and a detector carried by the shuttle adapted on exhaustion of the thread of the shuttle to a predetermined extent to cause a movement of said actuator to operative position.

4. In a loom, a device for automatically exchanging the shuttles, comprising in combination with the lay a shuttle-box on one side thereof and fixed thereto and on the other side of the lay a pivotally-arranged shuttle-box, a receptacle for holding a supply of full shuttles, an adjustable auxiliary box for catching the exhausted shuttle to be exchanged, mechanism for conveying the shuttle-box pivoted to the lay toward the supply-receptacle to receive a new shuttle and for moving said auxiliary box into the operative position of said movable shuttle-box, in order to catch the exhausted shuttle coming out of the shuttle-box fixed to the lay, a restorer carried by the lay for causing the restoration of said mechanism to its normal position, and a detector carried by the shuttle adapted on exhaustion of the thread of the shuttle to a predetermined extent to cause a movement of said restorer to inoperative position.

5. In an automatic filling-replenishing mechanism for looms, the combination of an actuator carried by the lay adapted to transmit the movement of the lay to said mechanism to operate the same by said movement, a spring holding said actuator normally in inoperative position, and a detector carried by the shuttle and adapted on exhaustion of the thread to a predetermined extent to move and hold said actuator in operative position, said spring returning said actuator to its normal inoperative position upon its release from said detector.

6. In an automatic filling-replenishing mechanism for looms, the combination of means for actuating the mechanism, a restorer carried by the lay for causing the restoration of said mechanism to its normal position, and a detector carried by the shuttle adapted on exhaustion of the thread of the shuttle to a predetermined extent to cause a movement of said restorer to inoperative position.

7. In an automatic filling-replenishing mechanism for looms, the combination of an actuator carried by the lay for actuating the mechanism and normally in inoperative position, a restorer carried by the lay for causing the restoration of the mechanism to its normal position, and a detector carried by the shuttle adapted on exhaustion of the thread of the shuttle to a predetermined extent to cause a movement of said actuator to operative position and of said restorer to inoperative position.

8. In an automatic filling-replenishing mechanism for looms, the combination of an actuator carried by the lay and normally in inoperative position, a restorer carried by the lay and normally in operative position, a slide in the path of said actuator when the latter is in its operative position, a pawl arranged to engage said slide and hold it in the position to which it is moved by said actuator, means for withdrawing said pawl when said restorer is in its operative position, and a detector carried by the shuttle adapted on exhaustion of the thread of the shuttle to a predetermined extent to cause a movement of said actuator to said operative position, and of said restorer to said inoperative position.

9. In an automatic filling-replenishing mechanism for looms, the combination of an actuator carried by the lay for actuating the mechanism and normally in inoperative position, a restorer carried by the lay for causing the restoration of the mechanism to its normal position, said actuator and restorer being connected to each other so that when one is in its operative position the other is in its inoperative position, and vice versa, a spring for maintaining said restorer in its normal position, and a detector carried by the shuttle adapted on exhaustion of the thread of the shuttle to a predetermined extent to move said actuator to operative position.

10. In an automatic filling-replenishing mechanism for looms, the combination of an actuating-pin extending through the bottom of the shuttle-box, a restoring-pin extending through the bottom of the shuttle-box and connected by a lever to said actuating-pin, means operated on exhaustion of the thread of the shuttle to a predetermined extent to project said actuating-pin downward and said restoring-pin upward, means for normally holding said restoring-pin downward and said actuating-pin upward, means in the path of said actuating-pin when it is down for actuating the filling-replenishing mechanism, means for retaining the same in replenishing position, and means in the path of said restoring-pin when it is down for releasing said retaining means to permit the restoration of the parts to their normal position.

11. In an automatic filling-replenishing mechanism for looms, the combination of means for actuating the mechanism, a restorer carried by the lay for causing the restoration of the mechanism to its normal po-

sition, said restorer being normally in operative position, an arm in position to be struck by said restorer to cause the restoration of the mechanism, and means operated upon the restoration of the mechanism for withdrawing said arm out of position for being struck by said restorer.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

NORBERT FOERSTER.

Witnesses:

FRED WHITE,

DOMINGO A. USINA.