No. 734,007. PATENTED JULY 21, 1903.

E. A. THISSELL.

WEFT REPLENISHING MECHANISM FOR LOOMS.

APPLICATION FILED MAY 22, 1901.

NO MODEL. 5 SHEETS—SHEET 1.

Fig. 1.

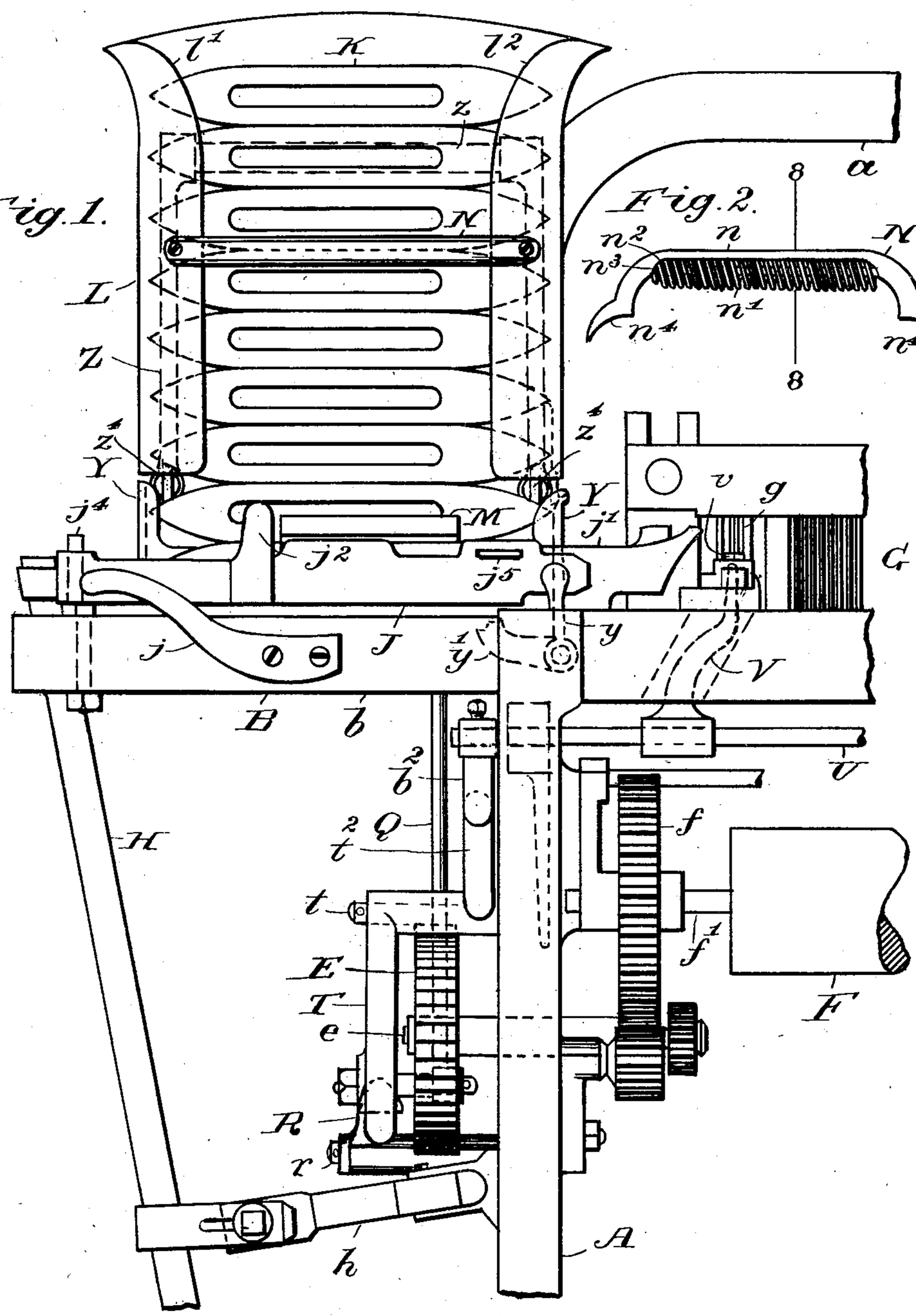

Fig. 2.

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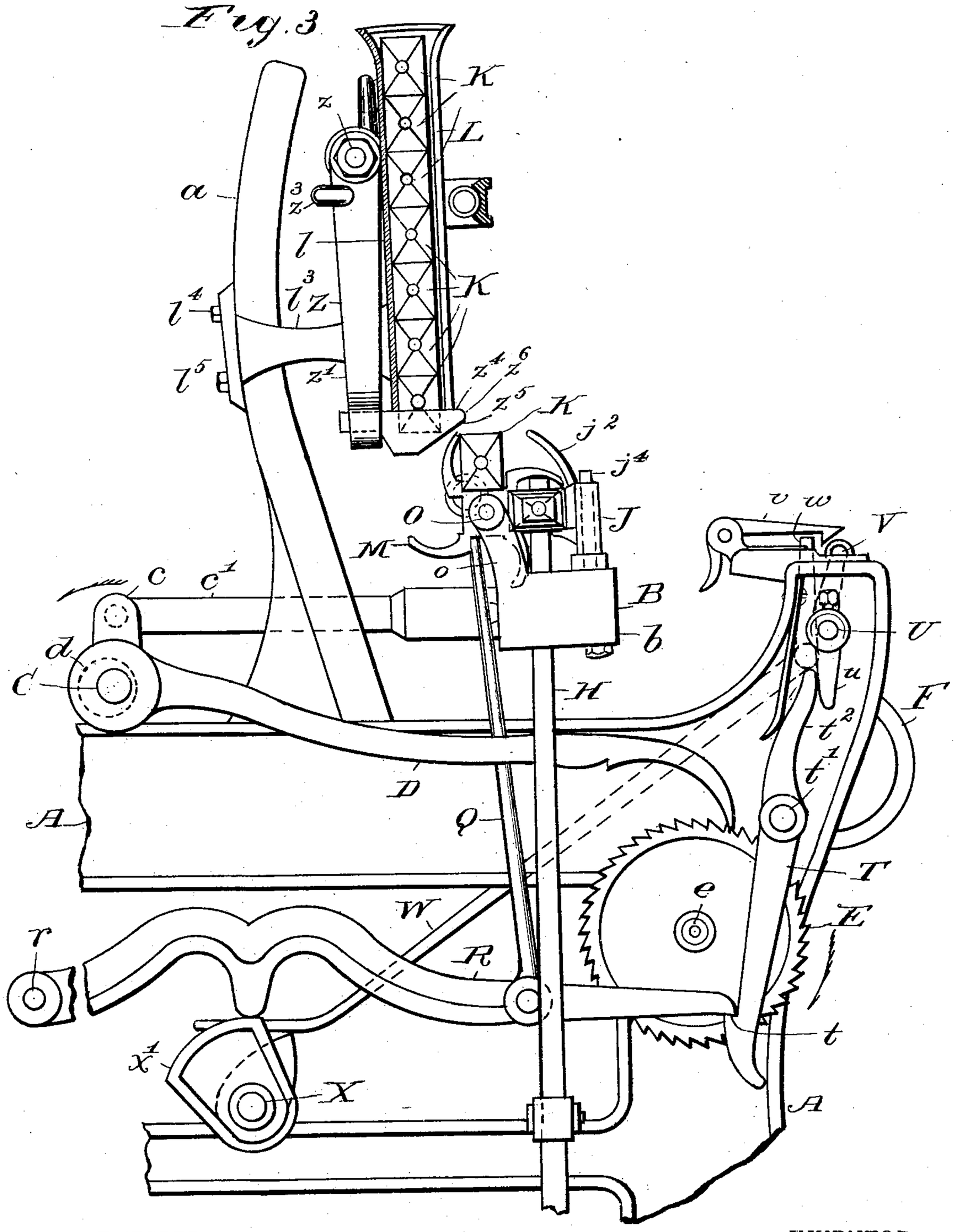
NO MODEL. 5 SHEETS—SHEET 2.

Fig. 3.



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NO. MODEL. 5 SHEETS—SHEET 3.

Fig. 4.

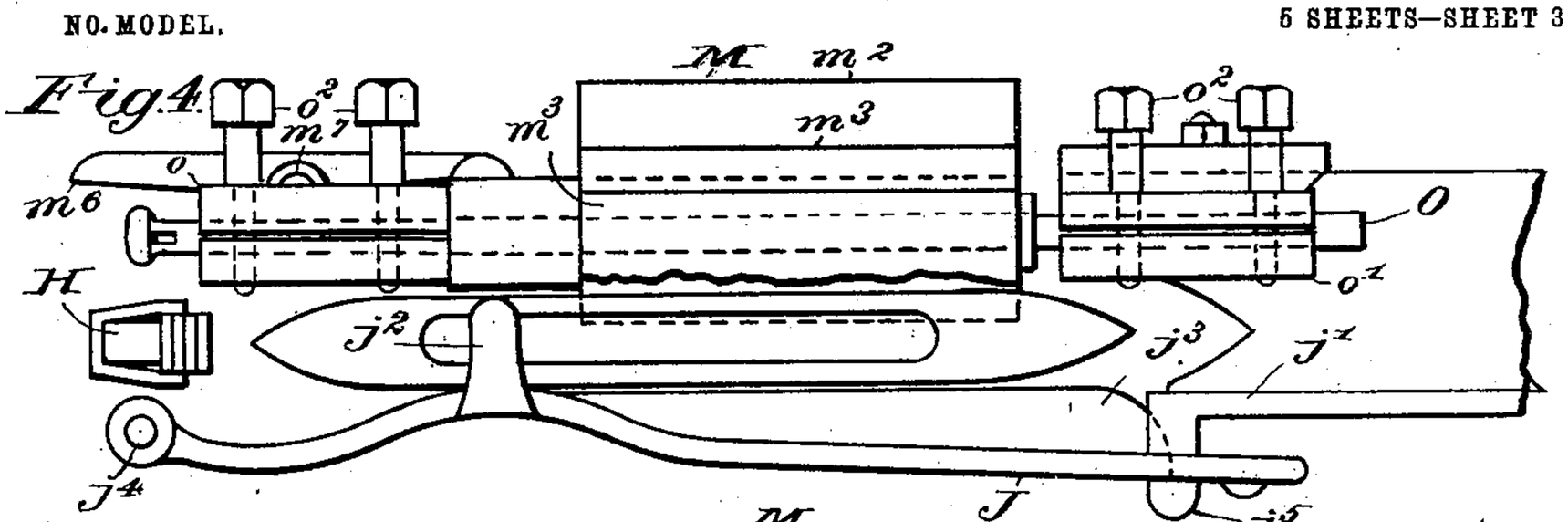


Fig. 5.

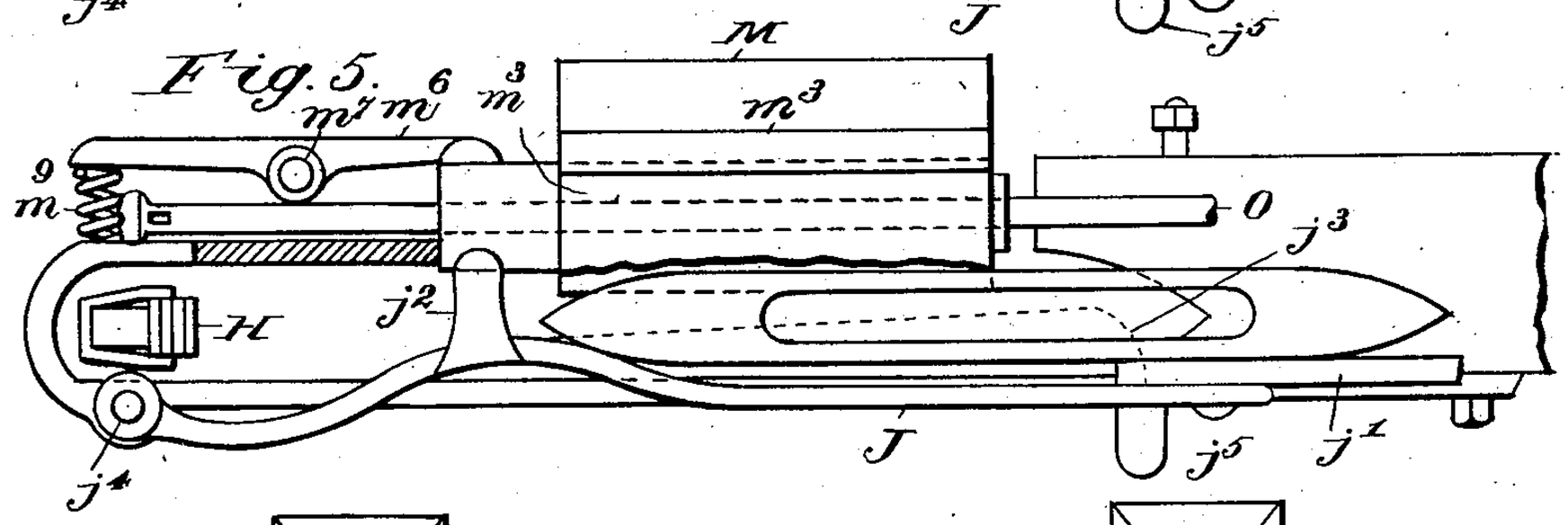


Fig. 6.

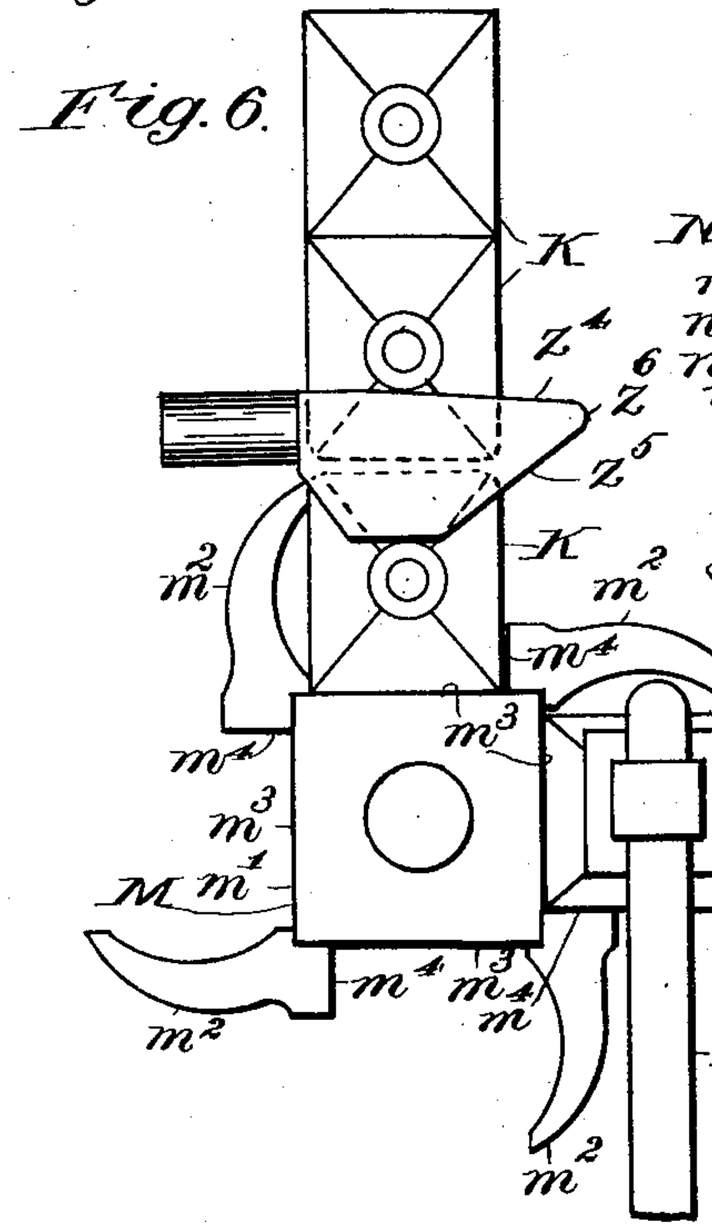


Fig. 8.

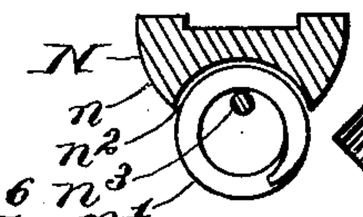


Fig. 9.

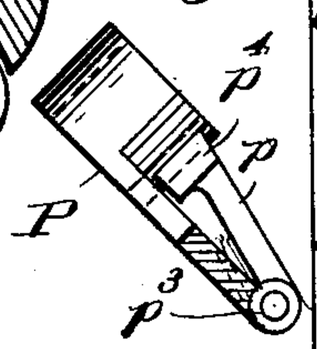
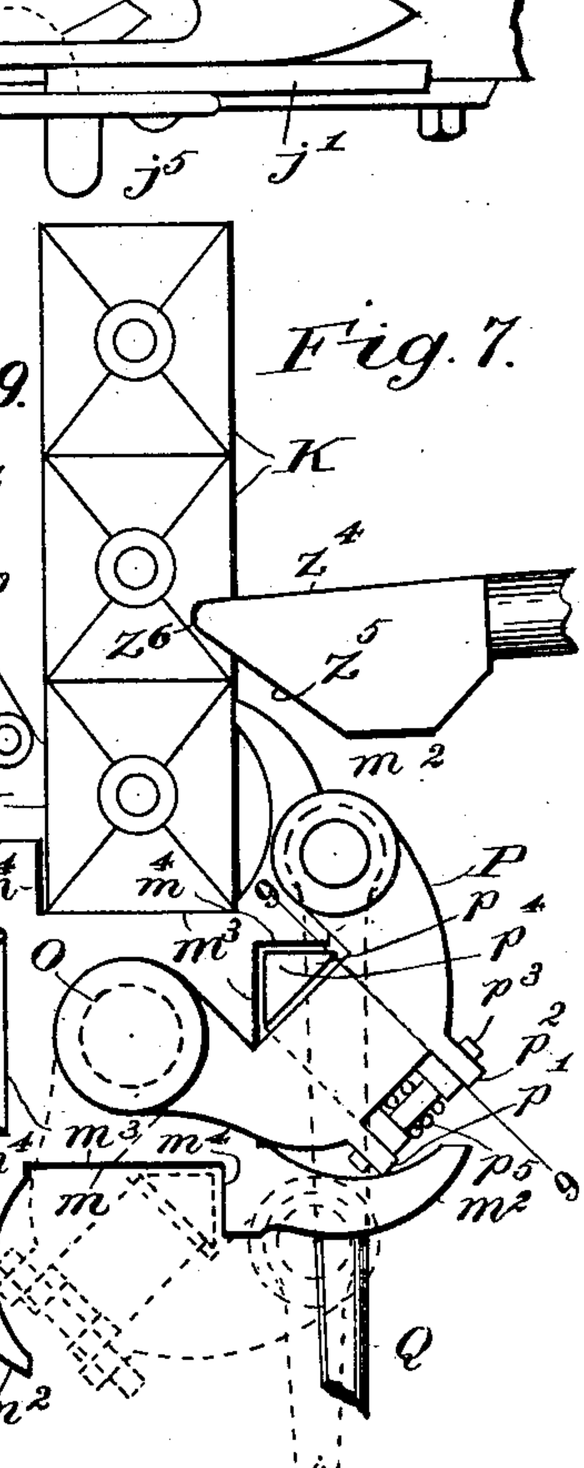


Fig. 7.



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NO MODEL. 5 SHEETS—SHEET 4.

Fig. 10.

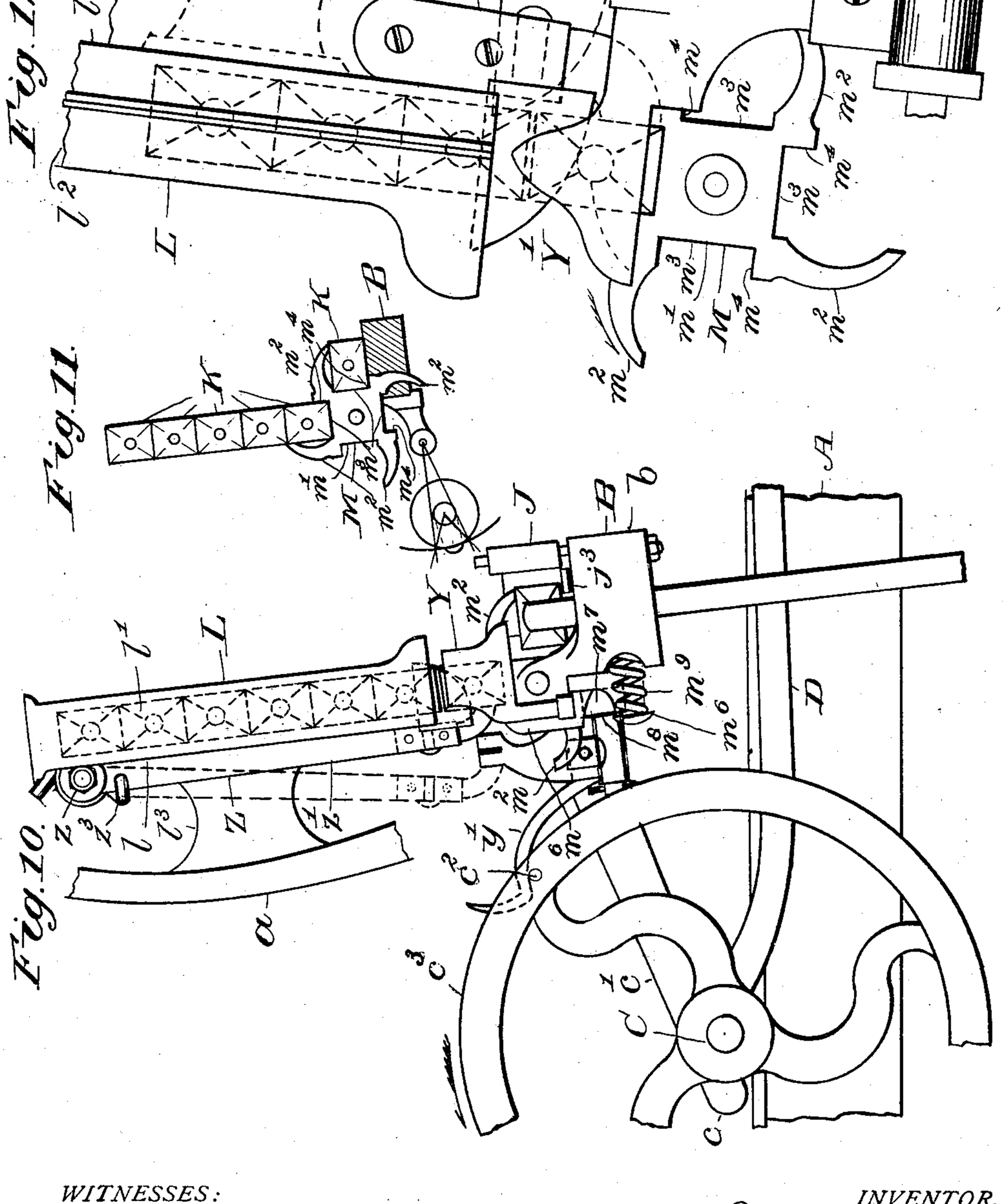

Fig. 11.

Fig. 12.

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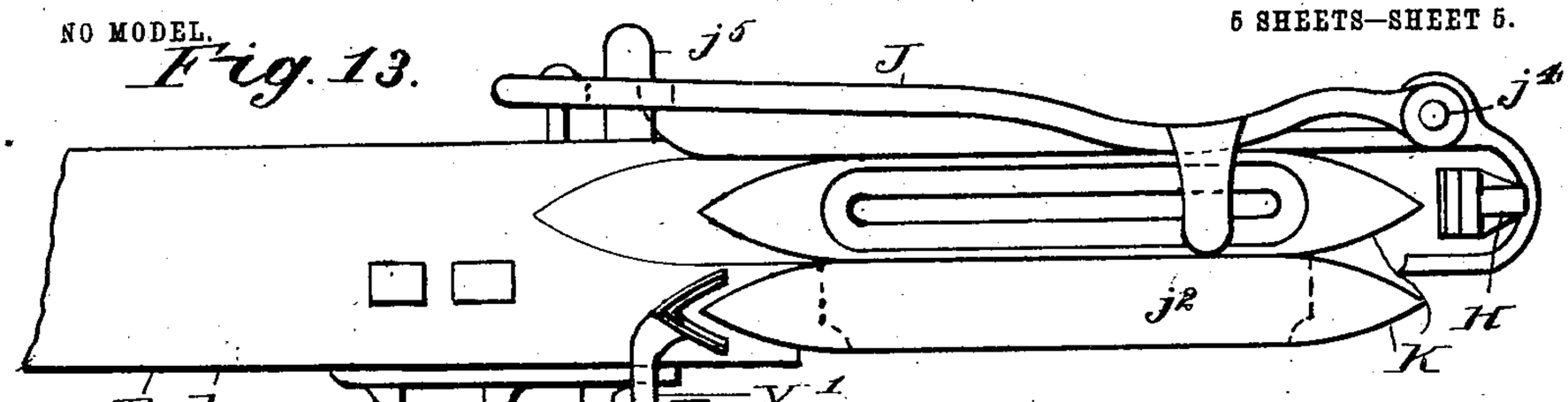
NO MODEL. 5 SHEETS—SHEET 5.

Fig. 13.



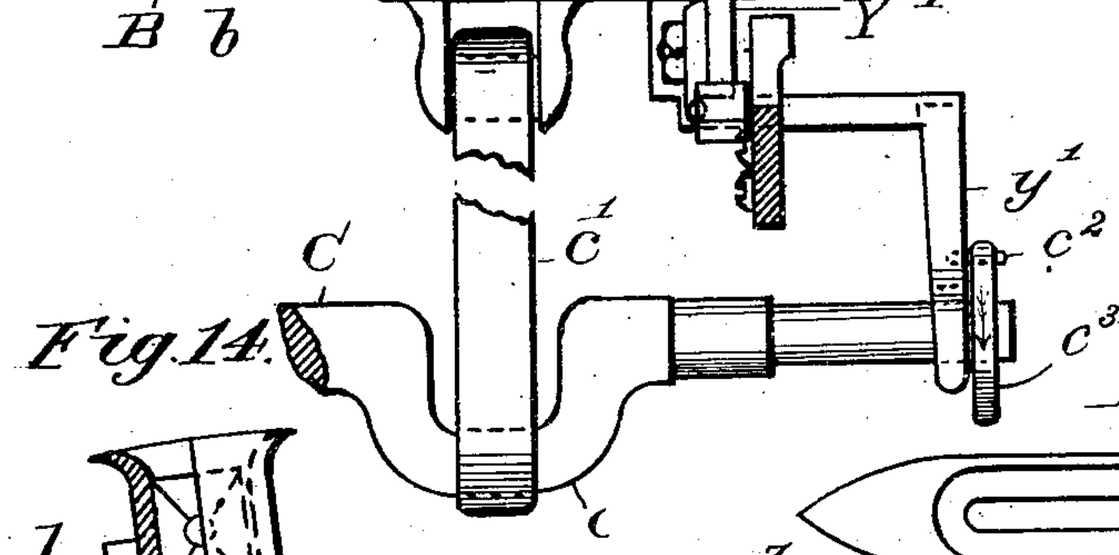
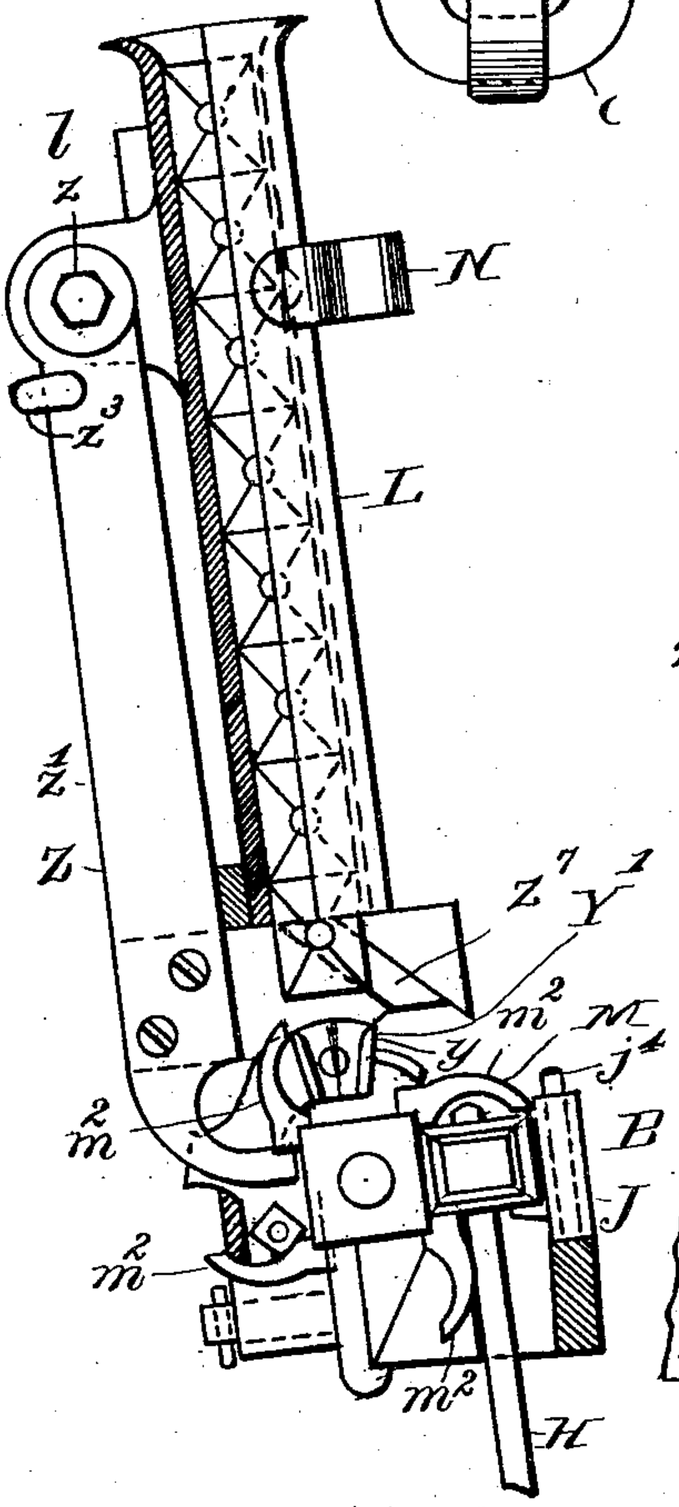
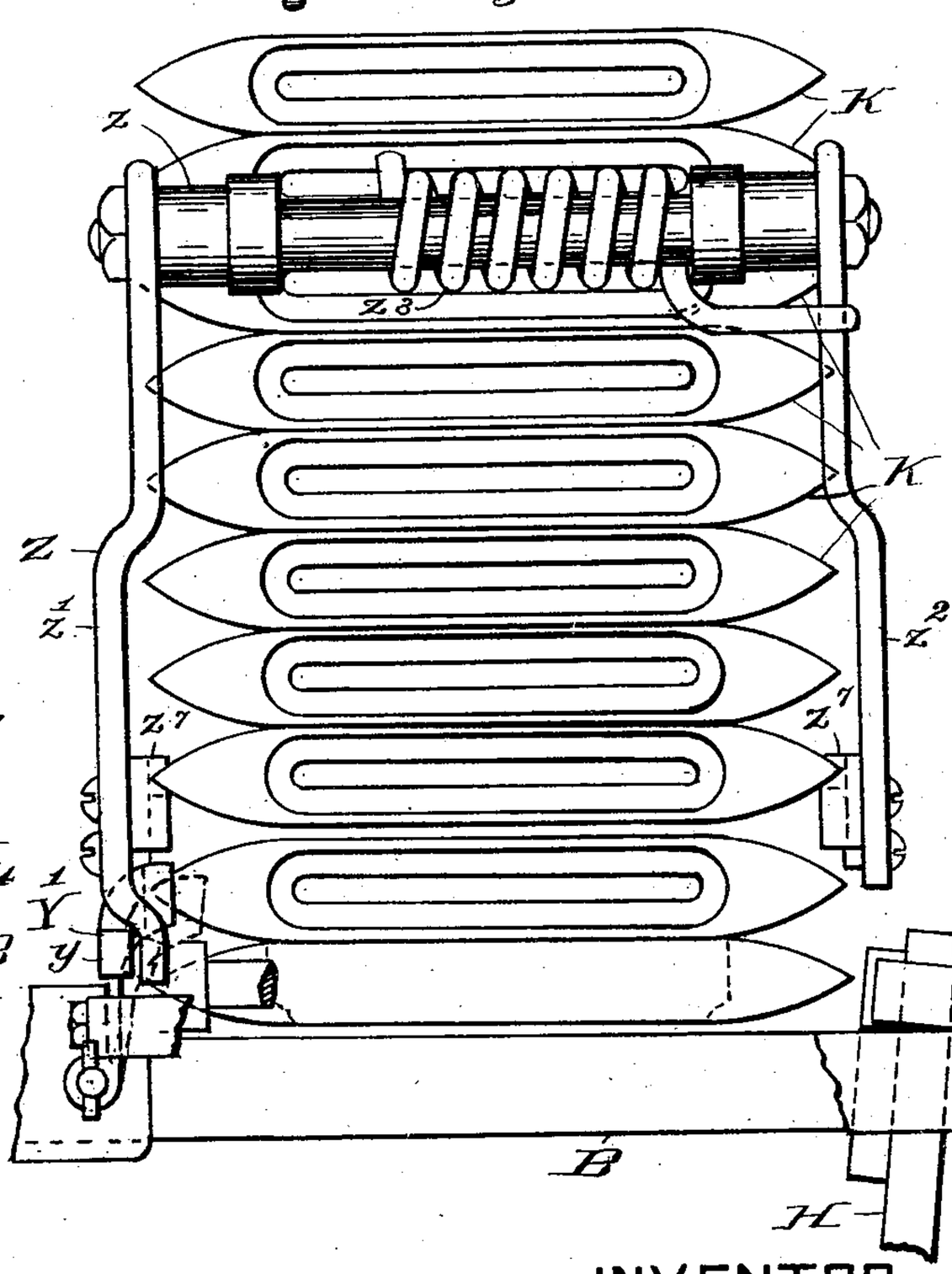


Fig. 14.

Fig. 15.





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No. 734,007. Patented July 21, 1903.

UNITED STATES PATENT OFFICE.

EARL A. THISSELL, OF LOWELL, MASSACHUSETTS.

WEFT-REPLENISHING MECHANISM FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 734,007, dated July 21, 1903.

Application filed May 22, 1901. Serial No. 61,351. (No model.)

To all whom it may concern:

Be it known that I, EARL A. THISSELL, a citizen of the United States, residing in Lowell, in the county of Middlesex and Commonwealth of Massachusetts, have invented a certain new and useful Improvement in Weft-Replenishing Mechanism for Looms, of which the following is a specification.

This invention relates to weft-replenishing mechanism for looms designed for continuous weaving; and it consists of the devices hereinafter described and claimed.

My invention comprises a rotary shuttle-changer adapted to take filled shuttles from a stationary magazine one at a time and simultaneously to reject the old shuttle and place a new one in the shuttle-box, the shuttle-changer with an improved binder together forming a shuttle-box.

Said invention also comprises a suitable guide carried on the lay-beam and adapted to direct a shuttle from the magazine into the shuttle-changer, means for preventing the shuttles from leaving the magazine except at the proper time, and means for forcing one shuttle at the proper time out of the magazine into the guide.

Provision is made for automatically operating the shuttle-changer when the filling is exhausted or when the filling is broken.

In the accompanying drawings on five sheets, Figure 1 is a front elevation of the shuttle-changing side of the loom provided with my improvement; Fig. 2, a plan of the yarn-holder; Fig. 3, an outside elevation of the shuttle-changing end of the loom; Fig. 4, a plan of the picker-staff, picker, and shuttle-box, including the binder, shuttle-changer, and shuttle-box port or mouth, a wing of the changer being broken away to show a shuttle in position to be ejected, showing also the stands which support the shuttle-changer and a part of the lay-beam; Fig. 5, a similar view except that the shuttle is represented as entering the box, that the shuttle-changer stands are omitted, and that the shuttle-changer-retaining lever and its spring are shown in plan; Fig. 6, an outer side elevation of the parts shown in Figs. 4 and 5, with a series of shuttles as they are arranged in the magazine, the magazine being omitted, showing the device which retains the shuttle in the magazine and assists in pushing out the lower shuttle; Fig. 7, an inner side elevation of the parts shown in Fig. 6, together with the pawl which turns the shuttle-changer, the normal position of said pawl being shown in full lines and its position when about to turn the shuttle-changer being shown in dotted lines; Fig. 8, a vertical section of the yarn-holder on the line 8 8 in Fig. 2; Fig. 9, a section on the line 9 9 in Fig. 7, on a plane parallel with the axis of the shuttle-changer, of the pawl-lever and a plan of the pawl and a part of said lever; Fig. 10, an outer end elevation of the magazine, shuttle retaining and ejecting devices, shuttle-changer, lay-beam, picker-staff, binder, crank-shaft, and hand-wheel, link which connects the cam-shaft to the lay, and the means of operating said retaining and ejecting devices; Fig. 11, an outer end elevation of the shuttle-changer, shuttles, crank-shaft, and a vertical section of the lay-beam; Fig. 12, an inner end elevation of the magazine, shuttle-changer, and shuttle retaining and ejecting devices; Fig. 13, a plan of a part of the lay-beam at the shuttle-changing end, the picker and stick, the binder, a shuttle in its operative position, another shuttle in the position it occupies in the guides, the movable guide, the means of operating it, the crank-shaft, and the link connecting said shaft and the lay-beam; Fig. 14, an outer side elevation of the magazine, the shuttle ejector and retainer, the shuttle-changer, picker-stick, and picker, the movable guide, the magazine, and a part of the lay being in section; Fig. 15, a rear elevation of a part of the lay-beam, picker-stick, and picker, shuttle superimposed, as they would be in the magazines, (the magazine being omitted,) the retainer and ejector, and a part of the movable guide.

The frame A, arch *a*, lay B, lay-beam *b*, crank-shaft C, crank *c*, connected by a link *c'* to the lay, the take-up pawl D, operated by the eccentric *d* on the crank-shaft C to turn the take-up ratchet E on the ratchet-shaft *e*, which carries a gear (not shown) arranged behind and engaging the cloth-roll gear *f*, the latter being fast on the shaft *f'* of the cloth-roll F, the reed G, the picker-stick H, the picking-strap *h*, the binder-spring *j*,

and the shuttle box or port j' are of any usual construction and operation, except as hereinafter stated, and are employed in connection with the usual harness, let-off, and filling stop-motions.

The shuttle K is of the form commonly used in broad looms for weaving plain cloth or ginghams. The magazine L is a case having a back l and ends l' l^2 grooved on their adjacent faces in such a manner that said ends of the case will loosely hold the shuttles K placed therein. The magazine L is secured by a bracket l^3, which projects from the back thereof and is secured to the arch a, as by bolts l^4 l^5. The filled shuttles K are piled on each other in the magazine with the bottoms of the shuttles in front and the delivery side of the shuttle on top. Across the front of the magazine is secured the yarn-end holder N, which consists of a bar n, secured to the front of the magazine, and a spiral spring n', arranged in a longitudinal groove n^2, with which the back of said bar n is provided, said spring n' being closely wound and being retained in said groove by a rod n^3, which passes through said spring and is secured at its ends to the bar n, the end portions n^4 of the bar n being offset backwardly to allow the hand of the operator to pass between the shuttles in the magazine and the spring n'. When a yarn end is placed between two adjacent coils of the spring, it will be held with sufficient firmness to cause the yarn to be unwound from the bobbin as the shuttle descends in the magazine, Figs. 1, 2, 3, and 8.

The shuttle-changer M consists of a hub m' and two or more (preferably four) wings m^2. The faces m^3 of the hub are equal in number to the wings and are plain surfaces arranged parallel with the axis of the hub and are adapted to support the back of the shuttle. The wings m^2 are so arranged on the hub m' (which is square in cross-section) at the corners of the hub as to form between each wing and the next a shuttle-receiving channel, the wing in advance having a surface m^4 at right angles to the adjacent face m^3 of the hub and furnishing a bearing for the bottom of the shuttle and the top of the shuttle on both sides of its bobbin-chamber resting against the following wing when containing a shuttle not in use.

The shuttle-changer M is free to turn upon a shaft O, which is supported in the stands o, Figs. 3 and 4, and o', Fig. 4, secured to the lay-beam b. These stands are slit at o^3 longitudinally from the top into the eye, and the sides of the slit are drawn together by one or more clamp-screws o^2 to pinch the shaft O and to prevent it from longitudinal displacement. The shaft O and stands o o' thus strengthen and stiffen the lay-beam and enable it better to sustain the additional weight of the shuttle-changer. The shaft O is provided with a transverse hole to receive a handspike, screw-driver, or similar instrument to enable said shaft to be withdrawn from said stands (after loosening the clamp-screws) whenever it may be desirable to remove the shuttle-changer or the pawl-lever P and pawl p, hereinafter described. The pawl-lever P turns on the shaft O at the inner end of the shuttle-changer M and is provided with a hub to give said lever greater steadiness, said hub extending into a counterbore in the inner end of said shuttle-changer. The lever P is concave on its upper side to avoid contact with the lower rear corner or edge of the shuttle (see Fig. 7) and is convex on its lower edge to support the ears p' p^2, between which the pawl p is pivoted, the pivot p^3 being arranged at right angles to the shaft O. The free end or head p^4 of the pawl p engages the surface m^4 and is preferably shaped to fit in the angle made by this surface m^4 and the adjacent face m^3 of the hub of the shuttle-changer. The pawl is so pivoted that its weight will naturally throw its free end into engagement with the shuttle-changer; but for greater safety I use a spiral spring p^5, which throws said free end toward said changer and yields to allow said pawl to ride over the wing in the return movement of said pawl-lever. The free end of the lever P is jointed to the rod Q, the lower end of said rod being jointed to a lever R, pivoted at r near the back, the weight of said lever when unsupported being sufficient to swing said pawl-lever backward to engage a new angle or notch in the shuttle-changer. The front end of the lever R is normally supported on a shoulder or backward projection t on the lever T, pivoted between its ends at t' on the loom-frame A, Figs. 1 and 3, the upper arm t^2 of said lever T extending up in the rear of an arm u, which is fast on and extends down from the stop-motion rock-shaft U, said rock-shaft U having another arm which extends upward and engages the stop-motion slide V. On the slide V is pivoted the stop-motion fork v, tilted by the filling-thread in the usual manner, but provided on its front end with a hook which in the absence of the filling in front of the grid g of the reed G engages the upper end or hammer w of the lever W, the latter being oscillated at every other pick or forward swing of the lay by a tappet or wiper x, fast on the cam-shaft X, striking and raising the under side of the rear end of said lever W in the usual manner, so that when the filling is absent from in front of the grid g and the shaft U is rocked in the usual manner the arm u, striking the upper arm t^2 of the lever T, draws the projection t out from under the lever R and allows the latter to fall, drawing down the rod Q and causing the pawl p to engage a new notch on the shuttle-changer M. The further revolution of the cam-shaft X causes the cam x' to lift the lever R and turns the shuttle-changer M. When the shuttle-changer is thus turned an angular distance represented by a notch or ratchet-tooth, the shuttle in the shuttle-box is crowded downward out of said

box by the wing immediately above it and the next following wing puts in a new shuttle, a wing in all cases forming the top of the shuttle-box and a face m^3 of the hub the back of the shuttle-box and the front face of each wing being concaved from end to end to admit the top of the picker-stick, as shown in Figs. 6 and 7. The front of the shuttle-box is formed by the binder J, which differs from binders in common use only in being provided on its upper edge with a finger j^2, which is curved upward and backward, as shown in Figs. 1, 3, 4, 5, and 6, to prevent the shuttle being thrown by the shuttle-changer over the top of the binder and in being provided at its lower edge with a backwardly-extending horizontal ledge j^3, which with the surface m^4, above referred to, form the shuttle-race of the shuttle-box or the bottom of said box. The position of the finger j^2 is between the outer end of the hub m' and the wings, as shown in Figs. 4 and 5. The binder is pivoted on the binder-stud j^4, is directed horizontally by the binder-guide j^5, which projects from the front of the mouthpiece j', and is closed by the binder-spring j, all in the usual manner. When the shuttle is home and the binder is swung forward, as shown in Fig. 4, the shuttle is supported on the back or surface m^4, above described, of the wing next in advance and is pressed back against the next following hub-surface m^3 of the shuttle-changer, as shown in Fig. 7; but when the shuttle is entering or leaving the box and the binder is swinging backward the ledge supports the shuttle until the latter gets onto the main race, of which said ledge forms a continuation. The shuttle-changer is prevented from being accidentally turned by a retaining-lever m^6, Figs. 4, 5, and 10, pivoted at m^7 on a bracket m^8, Fig. 4, secured to the back of the lay-beam, the outer end of said lever m^6 being forced backward by a spring m^9, causing the inner end of said lever to press against the back face m^3 of the hub m' of said shuttle-changer between the outer end of said hub and the wings, said lever yielding sufficiently to allow the shuttle-changer to be turned by the above-described action of the pawl-lever P. The rotation of the shuttle-changer takes place when the lay is forward, and a new shuttle is introduced into the shuttle-changer when said lay is next at the rear limit of its stroke, the hub m' being then directly under and sufficiently below the magazine L to allow the uppermost wing m^2 to pass freely under said magazine. Two guides Y Y′ (see Figs. 1, 10, and 12) are arranged to form with their inner faces continuations of the inner faces of the sides of the magazine L when the lay is back and serve to direct a shuttle from said magazine into the top of the shuttle-changer, the outer one, Y, of said guides being rigidly secured on the lay and the other, Y′, of said guides being secured on one arm of a lever, y, pivoted on the back of the lay-beam, the other arm, y', of said lever being bent outward and tending by its weight to throw said guide Y′ toward the other guide, Y, when there is no shuttle between them.

A shuttle retainer and ejector Z, consisting of a horizontal rock-shaft z, provided with two equal parallel downhanging arms z' z^2, is pivoted on the back of the magazine L, said arms reaching just below the bottom of the magazine and being normally held against said back by a spring z^3. The lower ends of the arms z' z^2 are bent forward to reach under the magazine and terminate in end portions, which are on their upper surfaces at z^4 at about right angles to the direction in which the shuttles descend in the magazine and on their lower surfaces at z^5 are inclined downward and backward, so that their front ends z^6 are vertically narrow enough to pass between the lower shuttle in the magazine and the shuttle next above. When the guides Y Y′ are empty and the lay swings back, the guide Y′, having swung toward the guide Y, strikes the lower end of the arm z^2 and swings said arm and the arm z' backward, leaving the shuttles in the magazine unsupported, which shuttles then descend until the outer end of the lower one of said shuttles is on the hub of the shuttle-changer, in front of the uppermost wing m^2 thereof, and the other end of said shuttle rests on the guide Y′. Immediately afterward a pin c^2, which projects from a hand-wheel c^3, (see Fig. 10,) lifts the arm y' and throws the guide Y′ away from the guide Y and out of contact with the arm z^2 and allows the ends of the arms z' z^2 to swing forward, the inclines z^5 crowding the lower shuttle down into place in the shuttle-changer and the surfaces z^4 lifting the shuttles still remaining in the magazine to their proper places.

In Fig. 13 the hand-wheel c^3 is represented as relatively much smaller than in Fig. 10; but it will be understood that the necessary amount of movement of the guide Y′ may be obtained by a smaller angle of rotation of a large hand-wheel or a greater angle of rotation of a small hand-wheel while the pin c^2 is in contact with the arm y'. The hand-wheel is represented as larger than usual in Fig. 10 and smaller than usual in Fig. 13 relatively to the other parts; but in the latter case the arm y' is represented as relatively longer.

The shuttle-retainer above described is adapted for a slowly-moving loom, such as is used in weaving woolen. Where greater speed is required, the inner faces of the lower ends of the arms z' z^2 of the shuttle-retainer are provided with parallel grooves z^7, Figs. 14 and 15, which receive the tips of the lower shuttle in the magazine and are inclined downward and forward in such a manner that the backward movement of the retainer forces down the shuttle engaged by said groove, while the upper surfaces of said arms support the shuttle next above until the retainer returns to normal position.

When the loom is in operation and the filling of the operating-shuttle breaks or becomes exhausted, the filling stop-motion fork engages the weft-hammer, which moves the stop-motion slide forward and rocks the stop-motion rock-shaft in the usual manner. This causes the lever T to be disengaged from the lever R, which falls by its own weight, drawing down the rod Q and pawl-lever and causing the pawl to move backward one notch on the shuttle-changer. The lever R is raised by the rotation of the cam-shaft, carrying the pawl forward and turning the shuttle forward one notch. When the shuttle-changer turns, the binder-ledge being then out from under the shuttle to be expelled, Fig. 4, said shuttle is carried below the binder and being unsupported falls, and the following shuttle is carried down behind the binder into picking position and an empty space of the shuttle-changer is brought uppermost. This change takes place when the lay is in its forward position. The guides being no longer held apart by a shuttle, the movable guide approaches the fixed guide and at the next backward stroke of the lay strikes and throws back the shuttle-retainer, whereupon the lowermost shuttle in the magazine falls and rests with its outer end on the hub of the shuttle-changer and its inner end on the movable guide, which is immediately moved away from the fixed guide by the lifting of its arm by the pin on the hand-wheel, as above described, allowing the shuttle-retainer to swing forward and crowd said shuttle down between said guides.

I claim as my invention—

1. The combination of the rotary shuttle-changer, and a binder, provided with a race-section, together arranged to form a shuttle-box.

2. The combination of the rotary shuttle-changer and the binder, each provided with a race-section and together arranged to form a shuttle-box.

3. The combination of a lay, a shuttle-changer rotary thereon, and a single binder swinging on a vertical axis on said lay, said changer and binder being adapted to form a shuttle-box.

4. The combination of a lay, a shuttle-changer supported thereon and rotary about a horizontal axis, a binder-stud rigidly supported on said lay at right angles to the axis of said changer and a binder swinging on said stud.

5. The combination of a lay, a shuttle-changer rotary thereon and having a plurality of shuttle-recesses, a single binder, swinging on a vertical stud secured directly to said lay, and said stud, said binder being adapted to form with each of said recesses a shuttle-box.

6. The combination of a rotary shuttle-changer, having a plurality of shuttle-recesses, and a single binder arranged and adapted to form with each recess a shuttle-box and to hold a working shuttle with its axis parallel with the axis of said shuttle-changer and in the same horizontal plane therewith.

7. The combination of a rotary shuttle-changer, having a plurality of shuttle-recesses, and a single binder arranged in front of said changer and adapted to form with each recess a shuttle-box and to hold a working shuttle with its axis parallel with the axis of said shuttle-changer and in the same horizontal plane therewith.

8. The combination of a lay, a shuttle-changer rotary about a horizontal axis thereon, and provided with a plurality of shuttle-recesses, and a single binder arranged to swing on a vertical axis and adapted to form with each shuttle-recess, a shuttle-box.

9. The combination of a lay, a shuttle-changer rotary thereon and provided with an angular hub having a series of flat faces, each adapted to form the back of a shuttle-box and provided with an equal series of wings each adapted to form the top of a shuttle-box and provided also on each of said faces with an equal number of race-sections, a stud vertically secured on said lay, and a binder pivoted on said stud and adapted to hold a shuttle against any one of said faces and on the corresponding race-section.

10. The combination of a loom-frame, a lay, a stationary shuttle-magazine having means for supporting a series of shuttles, a rotary shuttle-changer, arranged on said lay, and means arranged between and separate from said magazine and said shuttle-changer for guiding a shuttle from said magazine to said shuttle-changer.

11. The combination of a loom-frame, a lay, a stationary shuttle-magazine, a rotary shuttle-changer, arranged on said lay and means arranged between and separate from said magazine and shuttle-changer and movable with respect to said magazine, for guiding a shuttle from said magazine to said shuttle-changer.

12. The combination of a loom-frame, a lay, a stationary shuttle-magazine, a rotary shuttle-changer, arranged on said lay, and means, carried by said lay and arranged between and separate from said magazine and said shuttle-changer, for guiding a shuttle from said magazine to said shuttle-changer.

13. The combination of the loom-frame, a lay-beam, a stationary shuttle-magazine, two guides, one guide being stationary on said beam, and the other guide being movable on said beam, and means of causing said movable guide to approach said stationary guide to grasp a shuttle placed between said guides.

14. The combination of the loom-frame, a lay-beam, a crank-shaft, a stud, carried by said shaft, a stationary shuttle-magazine, two guides, supported on said lay-beam, one guide being stationary on said beam and the other

guide being movable thereon, means of causing said movable guide to approach said stationary guide, said movable guide being adapted to be moved away from said stationary guide by said stud.

15. The combination of a loom-frame, a lay-beam, a crank-shaft, a stud, carried by said shaft, a stationary shuttle-magazine, two guides, supported on said lay-beam, one guide being stationary on said beam and the other guide being pivoted thereon to move toward and from said stationary guide and having a weighted arm, adapted to be struck by said stud to rock said movable guide away from said stationary guide, to admit a shuttle between said guides.

16. The combination of a loom-frame, a crank-shaft, a hand-wheel fast thereon, a stud carried by said wheel, a lay-beam, a stationary shuttle-magazine, a rotary shuttle-changer, arranged on said lay-beam, two guides, supported on said lay-beam and adapted to receive a shuttle, one of said guides being stationary on said beam, and the other of said guides being pivoted on said beam and having a weighted arm, adapted to rock said last-named guide toward said stationary guide, said arm being adapted to be struck by said stud, to rock said movable guide away from said stationary guide, to admit a shuttle between said guides.

17. The combination of a loom-frame, a lay-beam, a stationary shuttle-magazine, a shuttle-changer, supported on said lay-beam, a movable shuttle-retainer, normally extending under said magazine to support shuttles therein, and guides, supported on said lay-beam, one of said guides being stationary and the other guide being movable toward and from said stationary guide and normally prevented from approaching said stationary guide by a shuttle held between said guides and adapted in the absence of a shuttle between said guides to move said shuttle-retainer and allow a shuttle to fall from the bottom of said magazine.

18. The combination of a loom-frame, a lay-beam, a stationary shuttle-magazine, a shuttle-changer, supported on said lay-beam, a movable shuttle-retainer, normally extending under said magazine to support shuttles therein, guides supported on said lay-beam, one of said guides being stationary and the other guide being movable toward and from said stationary guide and normally prevented from approaching said stationary guide by a shuttle held between said guides and adapted in the absence of a shuttle between said guides to move said shuttle-retainer and allow a shuttle to fall from the bottom of said magazine and a spring to restore said retainer to normal position.

19. The combination of a lay-beam, a stationary shuttle-magazine, having a shuttle-discharging opening, a movable shuttle-retainer, normally preventing the discharge of a shuttle from said opening, and a rotary shuttle-changer, carried by said lay-beam.

20. The combination of a lay-beam, a shuttle-magazine, having a shuttle-discharging opening, a movable shuttle-retainer, normally preventing the discharge of a shuttle from said opening, and guides, carried on said lay-beam and adapted to receive a shuttle from said magazine, said shuttle-retainer having inclines to crowd a shuttle discharged from said magazine into said guides.

21. The combination of the lay, a stationary bottomless magazine, a movable shuttle-retainer, normally preventing the falling of a shuttle from said magazine, and a rotary shuttle-changer, carried by said lay.

22. The combination of a lay-beam, a stationary shuttle-magazine, having a shuttle-discharging opening and a movable shuttle-retainer, normally preventing the discharge of a shuttle from said opening, and guides, carried on said lay-beam and adapted to receive a shuttle from said magazine, said shuttle-retainer having inclines to crowd a shuttle discharged from said magazine into said guides.

23. The combination of a shuttle-magazine adapted to contain a series of superimposed shuttles and having a discharge-opening, a lay-beam and guides, arranged on said beam and carried by the swing of said lay-beam, under said magazine, a reciprocating shuttle-retainer, having supporting-surfaces for the lower shuttle of the series, and having inclined grooves to receive ends of said lower shuttle and to force said lower shuttle into said guides.

24. The combination of a stationary shuttle-magazine adapted to contain a series of superimposed shuttles and having a discharge-opening, a lay-beam, and guides, arranged on said beam and carried by the backward swing of said lay-beam under said magazine, a reciprocating shuttle-retainer, having supporting-surfaces for the lower shuttle of the series and having inclined grooves to receive ends of said lower shuttle and to force said lower shuttle into said guides.

25. The combination of a loom-frame, a lay-beam, a stationary magazine, having a shuttle-discharging opening, a shuttle-retainer, normally closing said opening, a shuttle-changer, guides, arranged on said lay, one of said guides being movable toward the other of said guides, but normally prevented from such movement by a shuttle between said guides and adapted in the absence of said shuttle between said guides to move said retainer to permit the discharge of a shuttle from said magazine and means of moving said movable guide to allow said shuttle to be introduced between said guides.

26. The combination of the cam-shaft, a lever raised thereby, a rotary shuttle-changer, provided with notches, a pawl-lever concentric with said shuttle-changer, a pawl, carried

by said pawl-lever and adapted to engage said notches one at a time; a rod connecting said levers, a latch, adapted to engage said first-named lever and normally to hold the same in a raised position, and mechanism controlled by the presence or absence of the filling to disengage said latch and said first-named lever upon the absence of the filling.

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

EARL A. THISSELL.

Witnesses:

ALBERT M. MOORE,

KIRKLEY HYDE.