4 Sheets—Sheet 1.

M. V. B. HILL.

Cartridge-Loading Machine.

No. 203,731. **Patented May 14, 1878.**

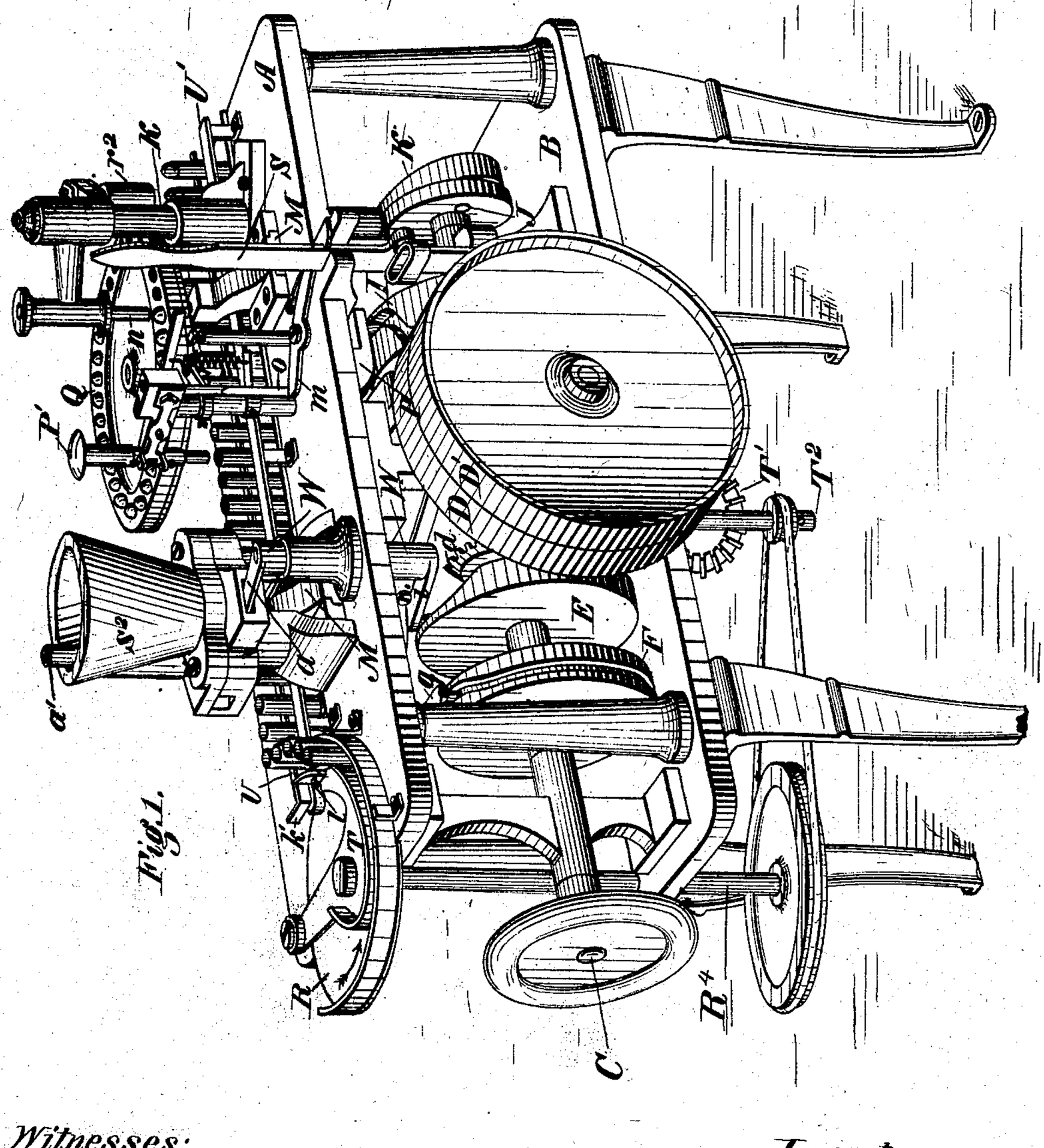

Fig. 1.

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Fig. 2.

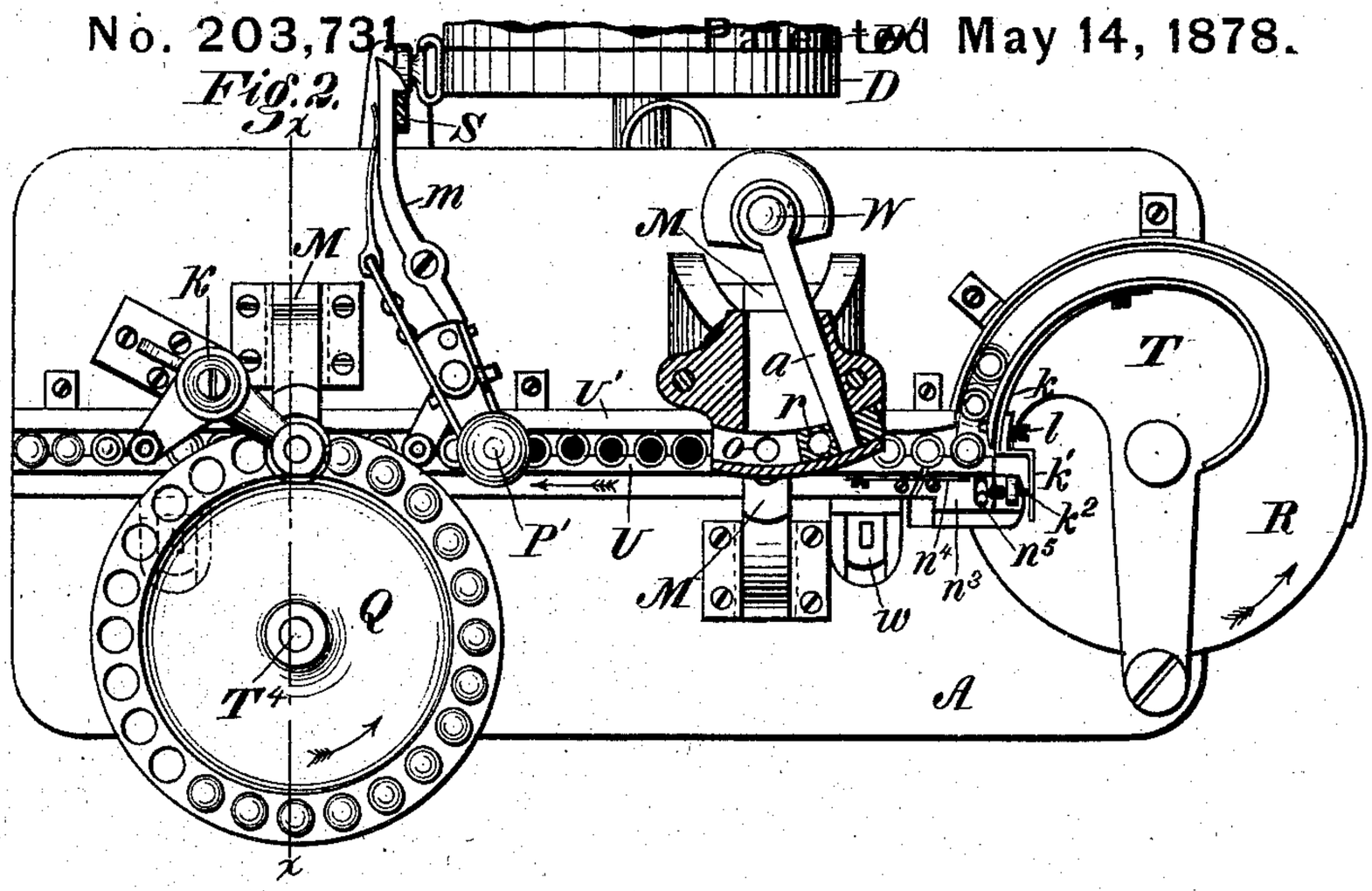

Fig. 3.

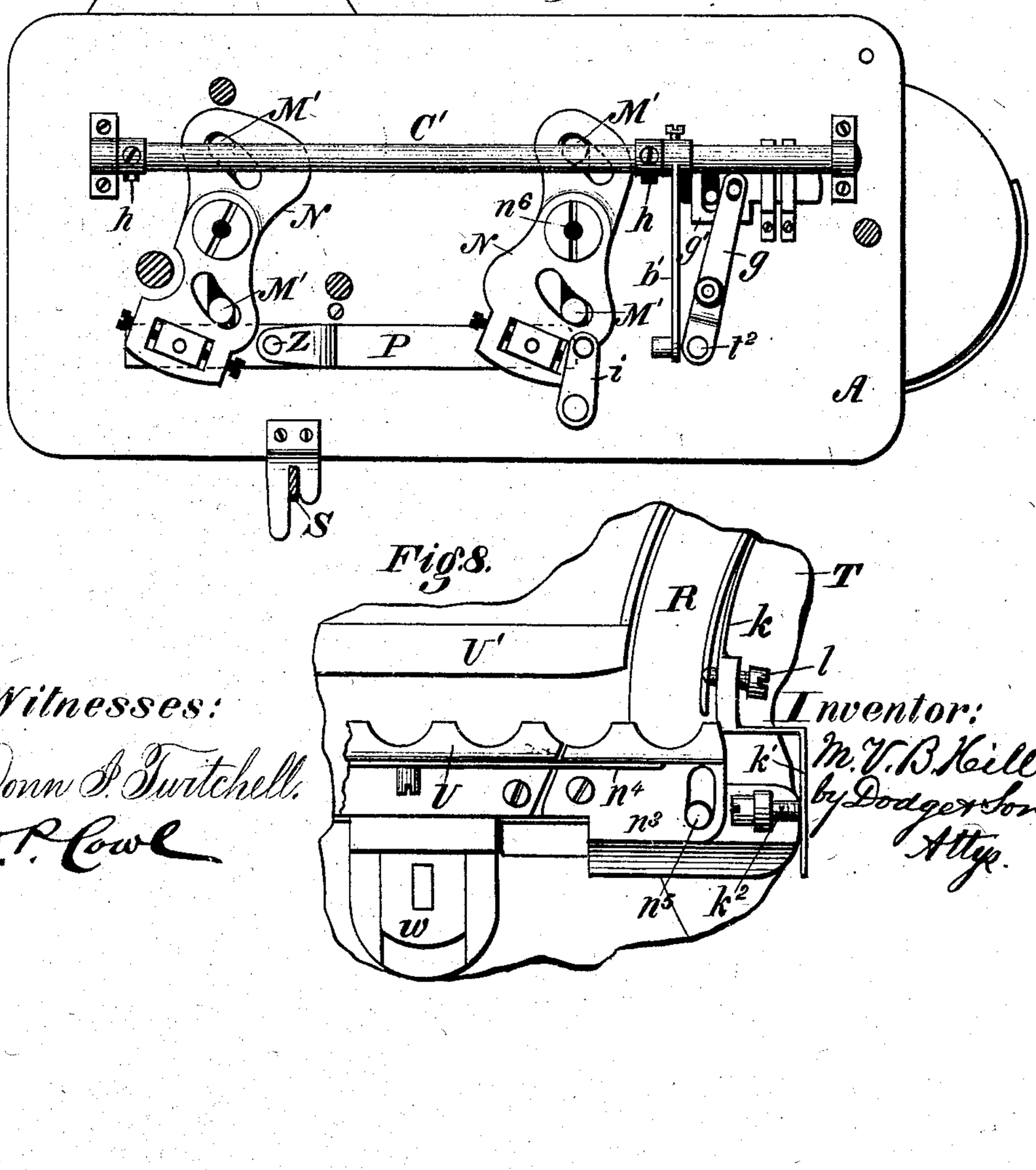

Fig. 8.

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Cartridge-Loading Machine.

No. 203,731. Patented May 14, 1878.

Fig. 4.

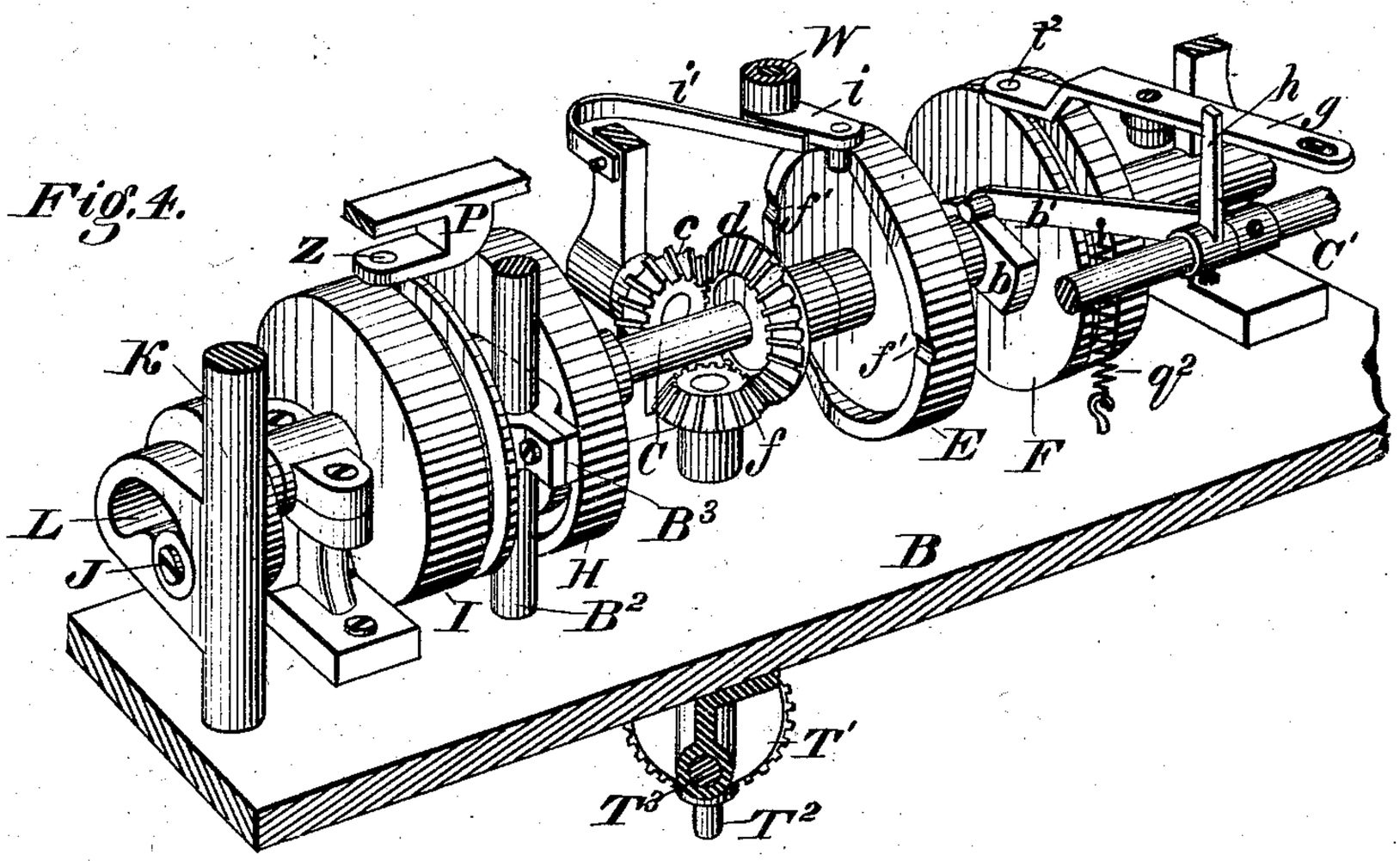

Fig. 5.

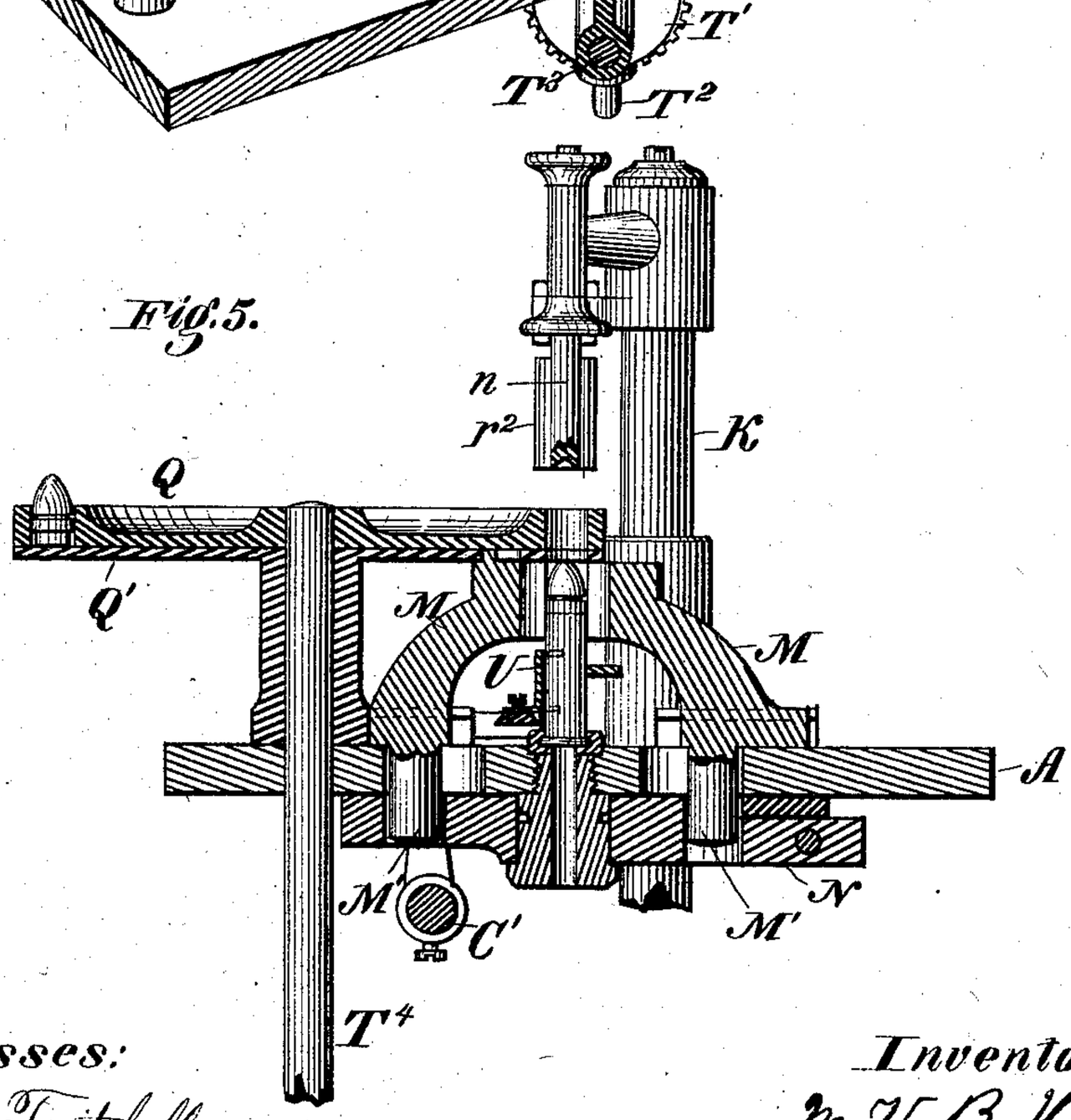

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Fig. 6.

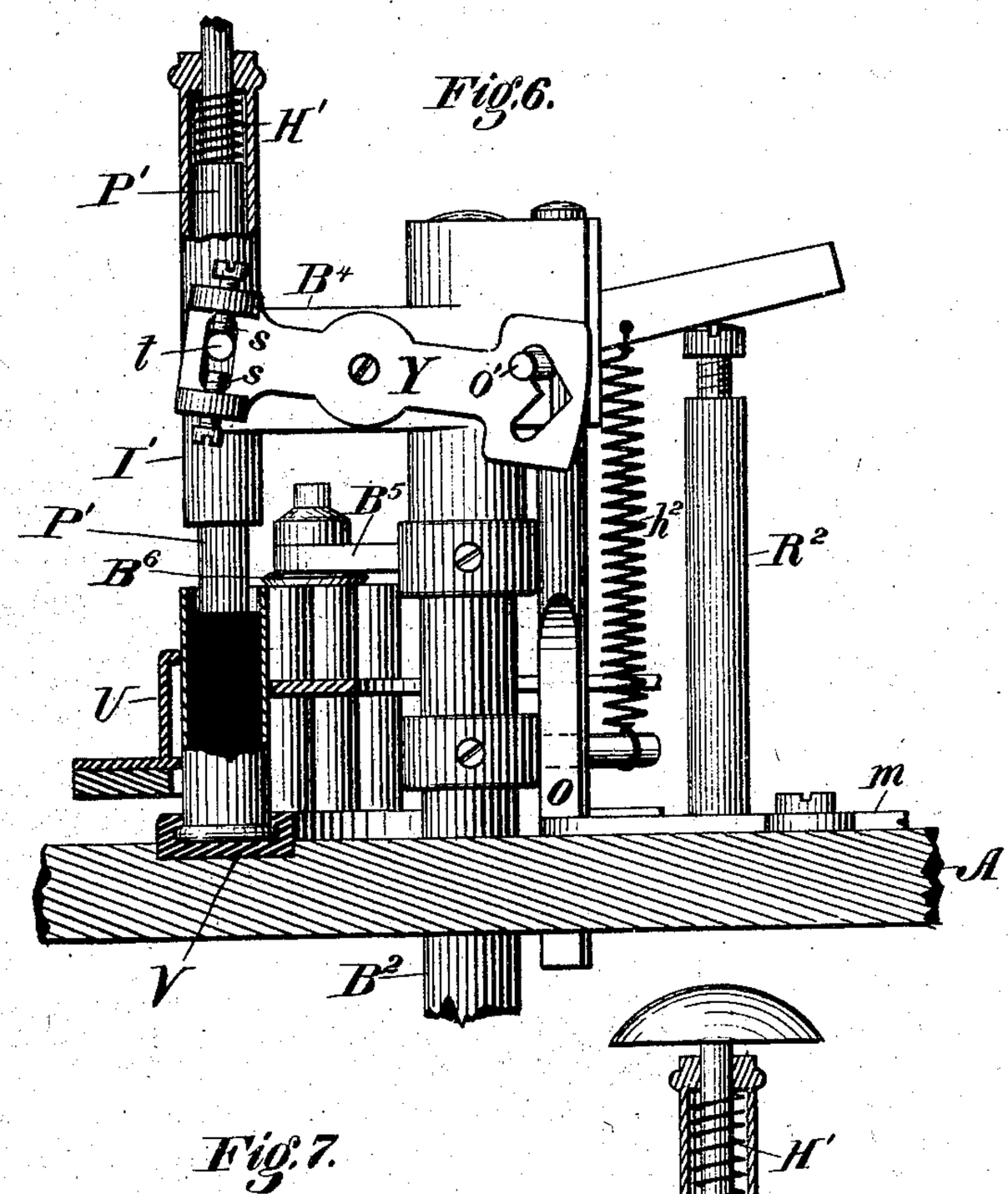
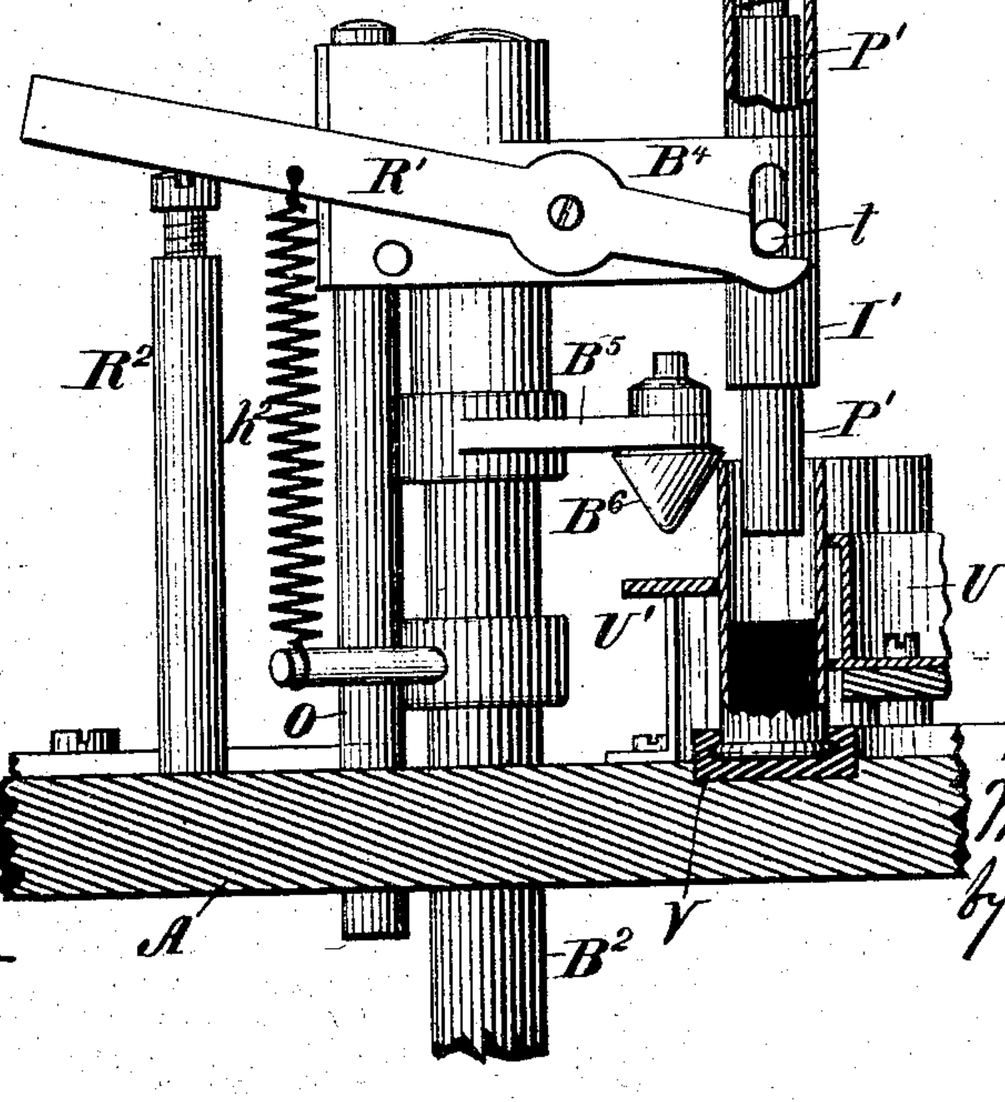


Fig. 7.



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UNITED STATES PATENT OFFICE.

MARTIN V. B. HILL, OF NEW HAVEN, CONNECTICUT, ASSIGNOR TO WINCHESTER REPEATING ARMS COMPANY, OF SAME PLACE.

IMPROVEMENT IN CARTRIDGE-LOADING MACHINES.

Specification forming part of Letters Patent No. **203,731**, dated May 14, 1878; application filed March 19, 1878.

To all whom it may concern:

Be it known that I, MARTIN VAN BUREN HILL, of New Haven, in the county of New Haven and State of Connecticut, have invented certain Improvements in Cartridge-Loading Machines, of which the following is a specification:

My invention relates to cartridge-loading machines; and it consists in so constructing and arranging the mechanical devices composing the machine as to feed the shells to a race or guideway, along which they are then moved at intervals in a right line, and made to pass successively under a powder-charger; then under a tester, which stops the machine in case there should be either too much or too little powder; then under a conical plunger, which opens and makes true the mouths of the shells; then under a dial and punch, that places the balls in the shells; and, finally, under a die, that crimps the shells upon the balls, all as hereinafter more fully described.

Figure 1 is a perspective view of a machine constructed to operate on the plan above stated. Fig. 2 is a top-plan view. Fig. 3 is an under-face view of the upper bed-plate with some of the moving parts attached. Fig. 4 is a perspective view of the lower bed-plate, showing the main shaft with its cam-wheels and other devices in their relative positions. Fig. 5 is a transverse vertical section on the line *x x* of Fig. 2, showing the manner of feeding the bullet to and placing it in the shell; Fig. 8, an enlarged view of a portion detached. Figs. 6 and 7 are views in elevation of the testing and automatic stop devices.

In constructing my improved machine I provide a frame, which may be of any suitable form, though, for convenience in arranging the mechanism, I have shown it constructed of two horizontal bed-plates, A and B, placed one above the other, connected by suitable posts or standards, and the whole supported on legs of such a length as to bring the upper plate A, on which the work is performed, at a suitable height for the attendant. Between the two bed-plates A and B is mounted the main operating-shaft C, on which are secured the four cam-wheels, I, H, E, and F, as shown in Fig. 4, this shaft being driven from a counter-shaft carrying a fast and loose pulley, D and D′, and imparting motion to the main shaft C by means of bevel-gear wheels *c* and *d*, also shown in Fig. 4. On the end of shaft C there is also a crank, J, working in a curved slot, L, formed in an arm projecting from a vertical shaft or rod, K, by which an intermittent up-and-down motion is imparted to it for placing and crimping the bullets in the shells, as hereinafter explained. At the point where the bevel-gear *d* is secured to the main shaft I locate a vertical shaft, T^2, which projects downward through the lower plate B, as shown in Fig. 4, carrying on its upper end a bevel-gear wheel, *f*, engaging with bevel-wheel *d*, and below the plate B another bevel-wheel, (not shown,) which engages with a wheel, T^1, on a horizontal shaft, T^3, which, by means of a worm-gear on its opposite end, imparts motion to a vertical shaft, T^4, (shown in Fig. 5,) and which carries at its upper end, above the plate A, a perforated disk, Q, in which the bullets are placed, and the location of which is shown in Figs. 1 and 2, there being under the plate Q a stationary plate, Q′, on which the bullets rest as they are moved around until they are brought over the shell, where there is a hole through the stationary plate, through which the bullets are successively forced down into the open mouth of the shell below by means of a plunger, *n*, secured to and operated by the vertically-moving rod K, as shown in Figs. 1 and 5.

Upon the lower end of this vertical shaft T^2, as shown in Fig. 1, there is a pulley, from which extends a cord or band to a vertical shaft, R^4, which carries at its upper end a rotating smooth disk, R, on which the empty shells are placed to be carried to the feed-rack U, hereinafter described.

Above the plate A are arranged devices which automatically move and load the shells. The first operation is charging the shell with the proper quantity of powder. The powder is fed down through a tube, *a′*, Fig. 1, through a strong metal shield, S^2, to a reciprocating slide, *r*, Fig. 2, which has a hole that receives the proper quantity for the charge. This slide is operated by an arm, *a*, Figs. 1 and 2, this arm being connected to a vertical shaft, W, on the lower end of which is another arm, *i*, which

is held by a spring against the face of the cam-wheel E, Figs. 1 and 4, by which the slide is made to move to and fro at the proper intervals. As it moves from under the tube *a'* it cuts off the flow of the powder through the tube, and as it arrives over a hole, *o*, Fig. 2, the powder in the slide falls through said hole into the shell below.

By examining Fig. 4 it will be seen that the cam-face of the wheel E is provided with a series of notches, *f'*, which operate upon the slide *r* to give it a vibrating or shaking motion, which is for the purpose of agitating the powder in the slide, and thereby preventing it from clogging therein, and so as to cause the powder to always settle to the same degree, and thus insure uniformity of quantity delivered to each shell. As the shells are fed along from the charger, by means which will be hereinafter described, they are brought under the automatic testing and stop devices, (shown enlarged in Figs. 6 and 7,) they being views from opposite sides, respectively. These are secured to a vertically-moving rod, B^2, which, as shown in Fig. 4, is operated by a rigid yoke or arm, B^3, which engages in and is operated by an eccentric or cam groove in the side of wheel H, the groove, of course, being of such form or eccentricity as to move the rod B^2 at the proper times. Upon the rod B^2, at its upper end, is secured an arm, B^4, having a tubular sleeve, I', at its outer end, and in which is placed a plunger, P', having a spiral spring, H', at its upper portion, arranged to press the plunger down. A pin, *t*, passes through this plunger P', and projects through a slot at each side in the sleeve I', as shown in Fig. 7. Upon the side of the arm B^4, as seen in Fig. 6, is pivoted a lever, Y, which has a slot in its outer end to fit over the pin *t*, and is provided with set-screws *s s*, as shown, by which it can be adjusted in relation to the pin *t*. At its opposite end this lever is provided with a V-shaped slot, in which rests the end of a pin, *o'*, which projects laterally from a rod, *o*, mounted loosely in the arm B^4, and which extends down alongside of rod B^2, and has its lower end working through a hole in the plate A. As shown in Fig. 6, this rod *o* has its face made flat for a portion of its length, and against this flat face rests the end of a spring-lever catch, *m*, which, as shown in Fig. 1, is pivoted to the bed-plate A in such a position that its opposite end will engage with and hold in position the belt-shifter S, which has a spring arranged to bear against it, so that when released it will fly outward and shift the belt from the fast pulley D to the loose pulley D'.

On the opposite side of the arm B^4, as shown in Fig. 7, is pivoted another lever, R^1, the inner end of which is brought under the pin *t* on that side of the plunger P', and is held against it by a spring, h^2. Under the outer end of this lever R^1 is set a stud, R^2, with a set-screw in ts upper end, the parts being so arranged that as the shaft B^2 descends the lever R^1 will strike upon the set-screw, which will overcome the spring h^2 and force the opposite end of the lever away from the pin *t*, which will permit the spiral spring H' to force the plunger down. The result of this construction and arrangement of devices is that, if there be too much powder in the shell, as indicated in Fig. 6, the plunger P' will strike thereon, and be held while the rod B^2 continues to descend, and this stoppage of the plunger will tilt the lever Y, the inclined slot in the opposite end of which, acting on the pin *o'*, will partially rotate the flat-faced rod *o*, causing the latter, as it turns, to force back the spring-catch *m*, thereby releasing the belt-shifter S, which at once shifts the belt to the loose pulley D' and stops the machine. If, on the other hand, there be too little powder in the shell, as indicated in Fig. 7, then, as the plunger descends, the outer end of lever R^1 strikes upon the stud R^2, throwing its opposite end away from the pin *t*, when the pressure of the spring H' at the upper end of the plunger forces the latter down, and by means of pin *t* moves the lever Y in the opposite direction from what it was before moved, thereby turning the flat-faced rod *o* in the reverse direction by means of its pin *o'*, working on the other incline of the V-slot, and thus operates the spring-catch *m* and shifts the belt, as before.

It will be understood that the two springs H' and h^2 and the set-screws *s s* will be so adjusted that, when the plunger is arranged to just reach the top of the powder when the shell has the proper quantity, the pin *o'* will stand, as shown in Fig. 1, at the apex of the V-shaped slot in the lever Y, in which case the flat face of the rod *o* will be in line with the face of the spring-catch *m*, and, of course, will not operate upon it at all.

If the shell contains the proper quantity of powder, it will then pass along and be brought under the conical plunger B^6, which, as shown in Figs. 6 and 7, is carried by another rigid adjustable arm, B^5, secured to the same vertical rod B^2. This conical plunger B^6, as it enters the mouth of the shell, will restore it to a perfectly circular form in case it has become bruised or misshapen from any cause, and thus fit it to receive the bullet; and, if desired, this plunger B^6 can be so adjusted that it will enlarge slightly the mouth of the shell by flaring it outward all around, thus insuring the more ready entrance of the bullet, and preventing the latter from catching or scraping on the edge of the mouth of the shell, as will sometimes occur in the ordinary loading-machines.

As the shell is moved along it is next brought under the bullet-carrying dial Q, Fig. 5, when the rod K descends, carrying with it the punch *n*, which forces the bullet through the hole in plate Q' and down into the mouth of the shell, as shown in Fig. 5. As it is moved still farther along, the shell,

with the bullet in it, is brought under the tubular plunger or crimping-die r^2, which is secured by an arm to the same rod K, and therefore moves at the same time with the punch n. This crimping-die or plunger r^2 is made hollow and slightly conical, so that as it is forced down upon the upper end of the shell it compresses the same tightly upon the bullet, thus securing the two firmly together. The cartridge, as it is moved along, is held by its flange in a grooved guide-plate, V, as shown in Figs. 6 and 7, and is thus held down while the rod K rises, and thus draws the crimping-die off of it.

These complete all the operations of loading the cartridge.

I now proceed to describe the manner in which the shells are fed along in a right line to bring them under the various devices which operate upon them, as above described.

In the first place, I arrange on the bed A a grooved passage or way, V, which may be made separate from or a part of the bed-plate A, as preferred. This, as shown in Figs. 6 and 7, is of the proper width to permit the cartridges, when placed on end, to slide freely along therein, it having on each side inwardly-projecting lips, which engage over the flanges of the shells, and prevent them from falling over or getting misplaced.

As shown in Figs. 1 and 2, I locate at the end of the machine, on a level with this grooved way V, a smooth rotating plate, R, or friction-dial, on which the shells are placed, heads down. Around the outer edge of this dial is a raised flange, and inside of this is arranged another flanged plate or guide, T, thus forming a passage-way, into which the shells are carried by the dial, so as to cause them to stand in a single row between the outer and inner guides, as shown in Figs. 1 and 2, this friction-dial being a well-known device, except as to the additional features to be hereinafter described, its object being to deliver the shells in proper order to the device which feeds or carries them along in a right line under the various tools, as above described.

This feeding device is made to operate on the principle of the four-motion feed used on sewing-machines, and is constructed as follows: As shown in Fig. 7, there is a plate, U′, arranged parallel with the grooved way V, of a suitable height for the shells to rest against its edge. On the opposite side, and parallel with this, is arranged a plate, U, which has at its upper and lower edges inwardly-projecting flanges, which have semicircular notches cut in them of suitable size to fit the shells, as shown in Figs. 1 and 5. This latter plate or feed-rack U is mounted so as to slide endwise in a set of blocks, w, which blocks are themselves arranged to slide in suitable guides in a direction at right angles to the movements of the plate U. The plate U is moved to and fro by a lever, g, Fig. 3, which has one end connected to a block, g', secured to the under side of plate A in suitable guides, this plate g' being connected to the feed-plate U by bolts or screws working through a slot in the bed-plate. The opposite end of this lever g has a stud, t^2, which engages in a cam-groove in the wheel F, Fig. 4, the groove being so curved or shaped as to impart movement to the plate U at the proper intervals. In order to give this plate a to-and-fro motion at right angles to that already described, a shaft, C′, Fig. 3, is mounted in suitable bearings under the bed-plate A, and has an arm, b', carrying a laterally-projecting stud or pin at its outer end, which bears on a cam, b, Fig. 4, to which it is held by a spring, q^2. To this shaft C′ two arms, h, are secured, Figs. 3 and 4, which project up through slots in the bed-plate A, and are connected to the slides w, Fig. 2, on which the feed-plate U rests.

It will thus be seen that the wheel F, through the medium of lever g, moves the feed-rack U to and fro longitudinally, and that the cam b, through the medium of the rock-shaft C′, with its arms h, imparts to it a to-and-fro motion at right angles to its other movement, the result of which is that the feed plate or rack U is moved first backward from the guideway V, then longitudinally toward the friction-dial R, then forward toward the guideway, which is supposed to be filled with shells, then longitudinally away from the dial R, carrying the shells along with it in the race or guideway, and so on continuously, thus feeding the shells along one step at a time by successive movements.

By shaping the cams and cam-grooves properly it is obvious that the feed may be so controlled and operated as to leave the shells stationary during the greater part of the time, in order to give time for the several tools and devices to operate upon them, as described.

In order to prevent the shells from being fed from the dial R into the guideway in advance of the movements of the feed-rack U, and to insure the rack U taking hold of them one at a time, I add the devices shown in Fig. 1 and enlarged in Fig. 8. In the first place, I secure to the face of the flange on the guide-plate T, on the frictional dial, a spring, k, which carries at its free end a screw, l, the point of which projects through a hole in the flange, and thus serves to stop and hold the shells just back of the mouth of the guideway. An arm, k^1, is secured to the end of the spring k, as shown, so as to project opposite the end of the feed-rack U, where it is struck by the end of a screw, k^2, which is secured in a stud attached to the feed-rack, so that every time the feed-rack moves toward the dial R it forces back the stop or screw l, and lets a shell pass on opposite the mouth of the guideway.

At that end the rack U is cut asunder, as shown more clearly in Fig. 8, and the outer end or section n^3 is pivoted to the other part, and held up by a spring, n^4, its outer end having a slotted flange working on a pin, n^5, as shown, the result being that as the rack is

shoved over toward the dial R this hinged section, which has a single notch to engage with one cartridge, is free to yield, so as to pass by a shell that may happen to be in the way, and thus insure its taking hold of the first shell of the row, and as it moves back carry the shell along with it into the race or guideway. By these means the shells are fed along in the most perfect order, it only being necessary for the attendant to place them on the dial R.

The feed rack or plate U may be secured to its bottom plate by screws, so that it can be adjusted as desired, or so that it can be removed and replaced by another to fit different-sized shells; and in like manner the guideway V may be made removable, so as to be replaced by another or others to fit different-sized shells, and thus adapt the machine to fill cartridges of various sizes, all the tools and devices which operate upon them being also made adjustable.

In order to hold the shells upright and true while receiving the powder, and also while receiving the bullet, I arrange at these points a pair of sliding jaws or clamps, M, one set of which is shown in section in Fig. 5, both sets being shown in position in Figs. 1 and 2. These jaws, at their upper ends, have their vertical inner faces made concave, so that when brought together they will clasp the mouth or upper end of the shell firmly between them, and at the same time form a tube or passage from the under side of the powder-charge and the bullet-charging plate down to the shell. As seen in Figs. 1 and 2 these jaws M are fitted to move in suitable guides, and from their under faces each has a stud, M′, projecting down through slots in the plate A, and engaging in inclined slots in the ends of a pivoted plate, N, on the under side of bed-plate A, as shown in plan in Fig. 3 and in section in Fig. 5. As shown in Fig. 3, these two plates N are connected by a bar or rod, P, which has a stud, Z, projecting from its face, and which engages in a cam-groove in the face of wheel I, as shown in Fig. 4, and by which means the jaws M are closed and opened at suitable intervals, they opening in time to permit a shell to enter as it is fed to them, then closing upon and holding it until charged, when they again open, letting the filled shell pass on and a fresh one enter.

In the bed-plate A, under the powder-charging device, is a hole, n^6, Fig. 3, through which any stray grains of powder may pass and be caught in a cup or small box suspended underneath, thus preventing it from being wasted or getting into the machinery.

It will, of course, be understood that the various parts will be so arranged and adjusted as to time the movements of the several devices, and thus cause them to operate consecutively upon the shells as they are brought successively under them.

One advantage of this over the ordinary dial-machines is that by feeding the shells along in a right line they are kept for a much longer time under the eye of the operator, whereby he is better enabled to detect any defect. Another advantage is that it affords a better means for arranging the several tools or devices which operate upon the shells or cartridges, and the moving parts, all being driven from the one main shaft, are not liable to become disarranged or mistimed in relation to each other in their movements.

Having thus fully described my invention, what I claim is—

1. In combination with the friction-dial R, provided with guides for directing the shells, the spring-stop Z, arranged to be operated by the reciprocating feed-rack U, substantially as described.

2. The feed-rack U, in combination with operating devices, substantially such as described, whereby there is imparted to said rack the four-motion movement for the purpose of feeding the cartridges intermittently along in a right line.

3. In combination with the feed-rack U, the supporting bar or plate U′, for holding the shells and assisting to guide them in their movements, as set forth.

4. The hinged section n^3, secured to the end of the feed-rack U, and provided with a spring to allow it to yield, substantially as and for the purpose set forth.

5. The sliding jaws M, in combination with the pivoted plates N, provided with the cam slots or grooves, said plates being connected by a bar, P, operated by the cam-wheel I, substantially as described.

6. The automatic testing and stop device, consisting of the vertically-reciprocating rod B^1, carrying the plunger P′, with its spring H′, lever R^1, with its spring h^1 and stop R^2, the lever Y, provided with the V-shaped slot, and the flat-faced rod O, with its pin o', connected to the belt-shifter S by the spring-catch m or equivalent device, all constructed and arranged to operate substantially as set forth.

7. In a cartridge-loading machine, the reciprocating conical punch B^6, arranged in relation to the cartridge-feeding devices substantially as described, whereby it is caused to enter the mouths of the shells as they are brought under it, substantially as and for the purpose set forth.

8. In combination with the reciprocating crimping-die r^2, the guide V, provided with the T-shaped groove, whereby the shells are guided and held when the crimping-die is withdrawn from the shell, as set forth.

9. The combination, in a cartridge-loading machine, of a stationary powder charger or hopper, a feed apparatus or device for bringing the cartridge-shells successively under the powder-charger, and a plate or equivalent means for supporting the shells while being filled, said plate or supporting device being

provided with an opening or hole, n^6, for the passage of the waste powder, substantially as described.

10. A cartridge-loading machine provided with a race, way, or guide, and a feeding mechanism, constructed to operate substantially as described, whereby the shells are fed along in a right line, substantially as and for the purpose set forth.

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