3 Sheets—Sheet 1.

W. R. LIVERMORE & A. H. RUSSELL.

Magazine-Gun.

No. 221,079. Patented Oct. 28, 1879.

Fig 1.

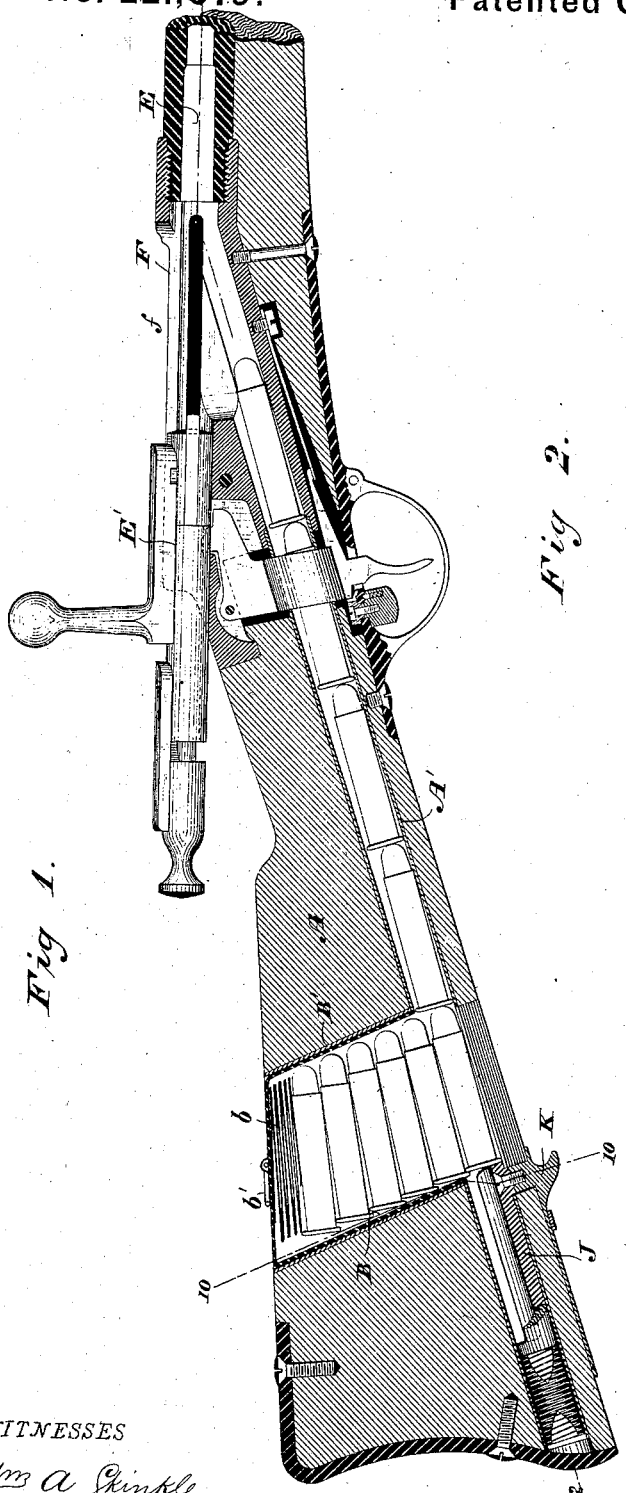
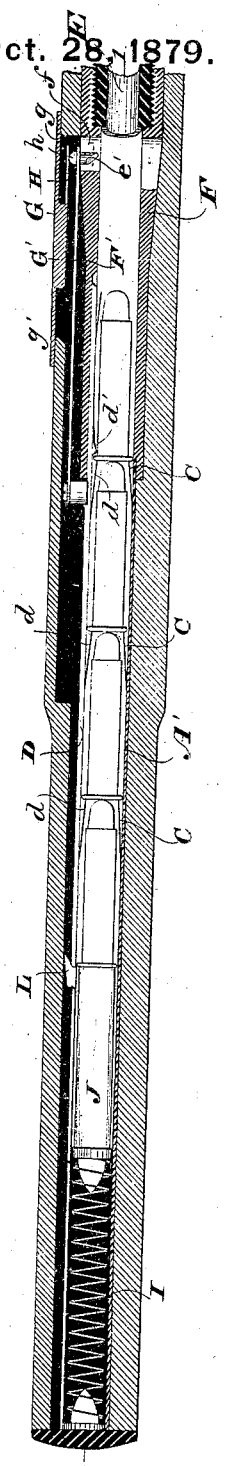


Fig 2.



WITNESSES

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Fig 3.

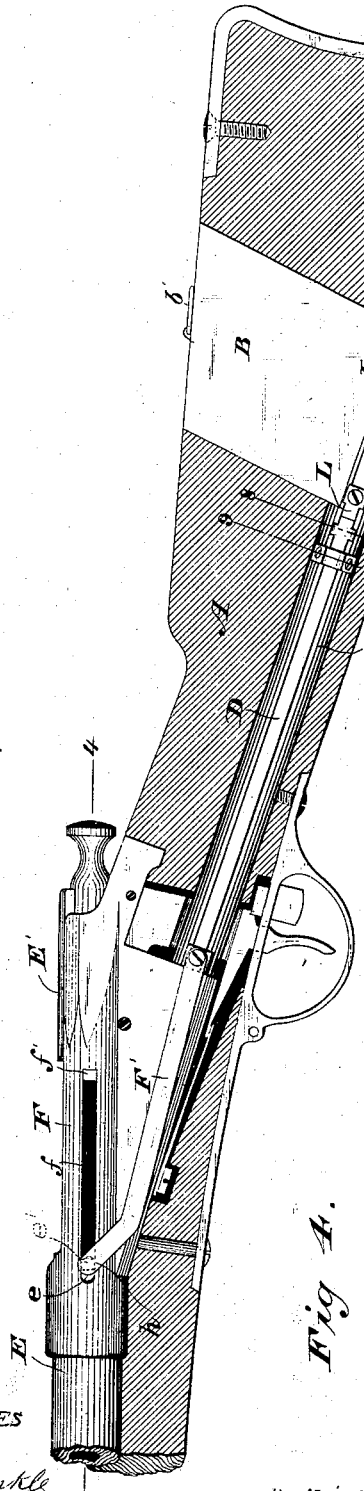
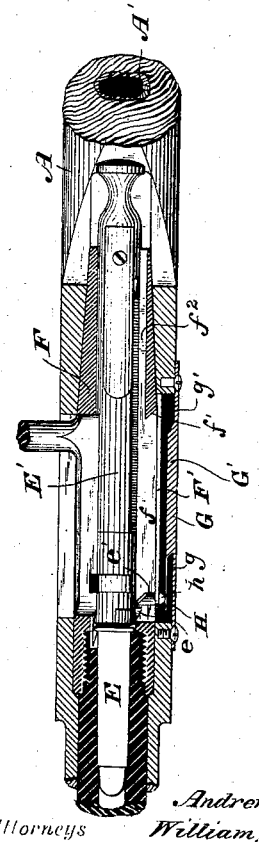


Fig 4.



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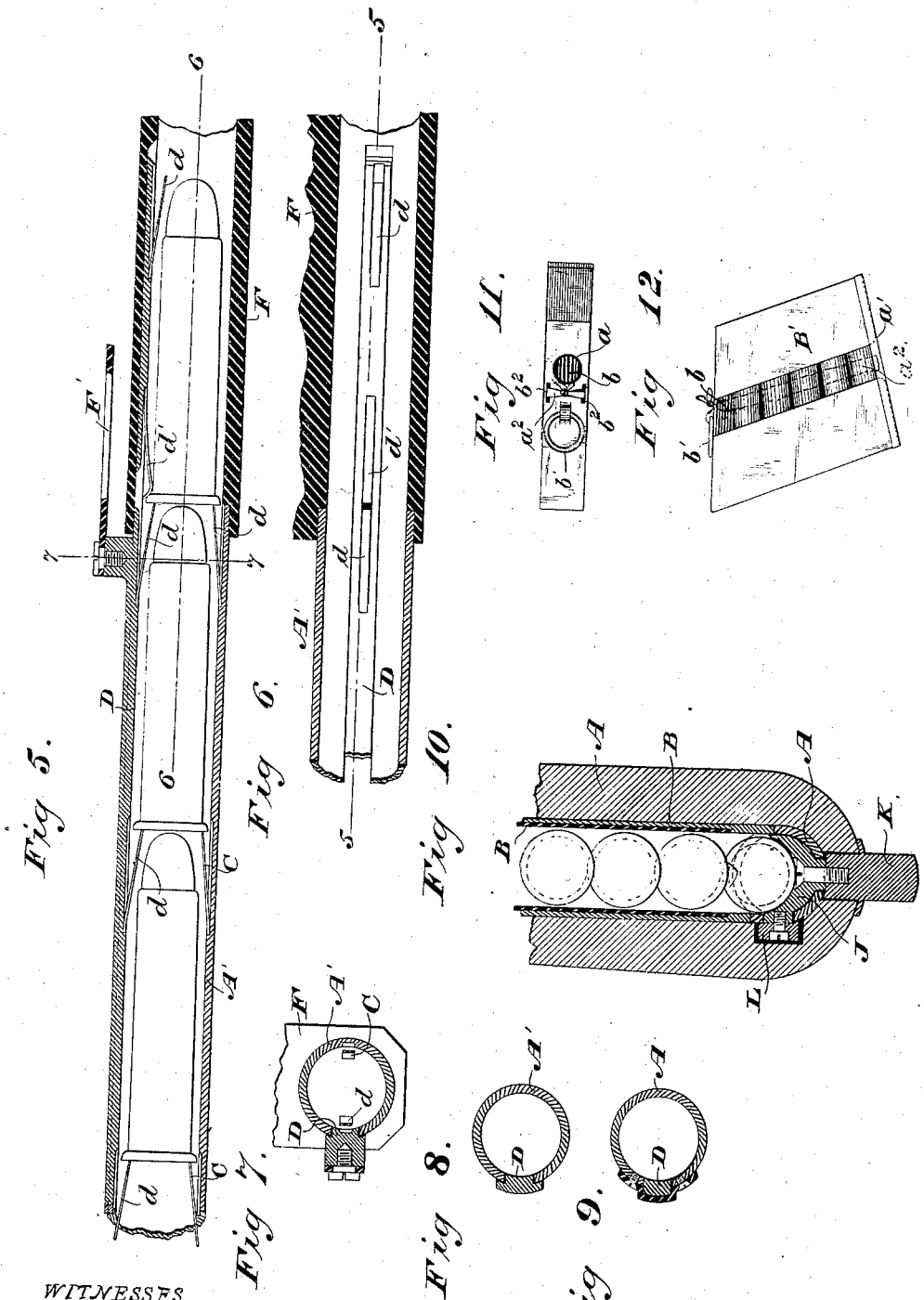

Fig 5.

Fig 6.

Fig 10.

Fig 11.

Fig 12.

Fig 7.

Fig 8.

Fig 9.

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UNITED STATES PATENT OFFICE.

WILLIAM R. LIVERMORE AND ANDREW H. RUSSELL, OF UNITED STATES ARMY.

IMPROVEMENT IN MAGAZINE-GUNS.

Specification forming part of Letters Patent No. **221,079**, dated October 28, 1879; application filed October 10, 1878.

To all whom it may concern:

Be it known that we, WILLIAM R. LIVERMORE and ANDREW H. RUSSELL, both of the United States Army, have jointly invented certain new and useful Improvements in Magazine-Guns, of which the following is a specification.

Our invention relates to improvements in breech-loading fire-arms of the class in which the cartridges are fed endwise, one at a time, from a magazine to the firing-chamber, fired, and the shells expelled.

Our object, mainly, is to provide a gun especially designed for the military service, adapted to the firing of any desired number of rounds while avoiding the necessity of carrying a heavy weight of fixed ammunition in the stock of the gun.

We provide the gun with a lateral magazine-chamber or transverse opening in the stock to receive the cartridges which pass sidewise to a longitudinal channel or feed-tube, along which they are fed endwise to the firing-chamber.

When the magazine-chamber is emptied it may quickly be filled to renew the supply of cartridges and enable any desired number of shots to be fired, and this without interfering with the longitudinal feeding devices or the cartridges in the feed-tube. We pack the cartridges in cases or packages adapted to be readily inserted in and removed from the magazine-chamber as occasion requires, said cases or holders being also adapted to be carried by belts or cartridge-boxes. These cartridge holders or cases are also constructed so that the cartridges may be taken from them one at a time to be fired singly or to replenish the magazine-chamber or a partially-depleted case in the magazine-chamber.

The subject-matter deemed novel is hereinafter specifically claimed.

In the accompanying drawings, which show so much of a breech-loading magazine-gun as is deemed necessary to illustrate our invention, we have shown our improvements as embodied in the best way now known to us. Obviously, however, some of our improvements may be used without the others, and the details of construction and some of the minor parts may be modified in various well-known ways without departing from the spirit of our invention.

Figure 1 is a vertical longitudinal section through the stock of the arm in the plane of the line 1 1, Fig. 2, with parts broken away; Fig. 2, a longitudinal section on the line 2 2 of Fig. 1, showing the longitudinal feed-tube or passage and attachments with the cartridges in place. Fig. 3 is a view, partly in vertical longitudinal central section and partly in side elevation, the stock only being in section. Fig. 4 is a view, partly in plan and partly in horizontal longitudinal section, the receiver, breech-piece, or bolt-block and barrel being in section on the line 4 4 of Fig. 3. Fig. 5 is a horizontal longitudinal section on the line 5 5 of Fig. 6 through the breech-piece, the feed-tube, and reciprocating feed-bar or cartridge-pusher, the feed-bar being shown in its most advanced position, and its actuating-rod in the position to which it is moved when the breech-bolt, actuated by its controlling-lever, or locking-bolt is thrust forward and a cartridge forced from the reciver into the firing-chamber; Fig. 6, a vertical longitudinal section on the line 6 6 of Fig. 5. Fig. 7 is a vertical transverse section on the line 7 7 of Fig. 5. Figs. 8 and 9 are vertical transverse sections through the feed-tube on the lines 8 8 and 9 9, respectively, of Fig. 3. Fig. 10 is a similar section on the line 10 10 of Fig. 1, showing the arrangement of the cartridges in the magazine-chamber and the spring-plunger which plays beneath the chamber. Figs. 11 and 12 are, respectively, a plan and side elevation of one of the removable cartridge cases or holders which fit into the magazine-chamber.

The stock A of a suitable arm is slotted or bored out longitudinally and near the bottom, and provided with a feed-tube or channel, A′, intersected near its rear end by a transverse opening or magazine-chamber, B, the chamber opening into or terminating at bottom in the tube.

The feed channel or tube A′ leads to the breech-piece and receiver as usual, and the cartridges are fed endwise along the tube and conducted one at a time by proper feeding de-

vices to the receiver, as is well understood. The particular feeding devices we prefer to employ, and the manner of operating them, will hereinafter be described.

The cartridges are supplied one after another from the magazine-chamber in the breech to the feed-tube, so as to lie lengthwise thereof in line therewith, the cartridges being conducted sidewise along the magazine-chamber B. The cartridges are arranged in the transverse magazine-chamber (if placed directly therein) so that the flange of any one of the cartridges below the top one is overlapped by that of the cartridge next above. (See Figs. 1 and 10.)

By this relative arrangement or method of loading the chamber, the catching of one shell upon the other, as the lowermost shells of the series are successively brought in line with and fed forward along the feed-tube is avoided, as each shell of the lot as it becomes the lowermost one has its flange in advance of that next above, and no impediment is offered by its overlying cartridge to the forward feed along the tube A′.

We pack the cartridges in a series of cases or holders, B′, so that they may readily be carried by the soldier in a belt or box. These cases are of a size and shape to adapt them to fit properly in the magazine-chamber, and are open at the bottom so that the cartridges may successively pass sidewise therefrom to the feed-tube. A spring presses upon the top cartridge in the cases and acts as an extensible follower to feed the cartridges along and deliver them successively to the feed-tube A′.

More particular description of the removable cartridge case or holder B′ will hereinafter be given.

Instead of packing the cartridges in cases or holders they may be placed by hand, as required, directly in the magazine-chamber, with their butts or flanges lapped, as hereinbefore described; and when so supplied an expansible follower or feeding and steadying spring bears upon the top cartridge. This spring would have to be removably or adjustably secured—as, for instance, upon the under side of a sliding or hinged cover for the magazine-chamber, so that the cover and spring may be moved out of the way to inspect and replenish the chamber, and be adapted to be readily secured in proper position to cause the follower-spring to bear upon the cartridges, keep them in their proper relative positions and force the cartridges successively to the feeding-passage A′.

We prefer to use the cases or holders B′. These cases are preferably made of thin sheet-metal, such as copper, brass, or tin. They may, however, be made of any suitable material—such, for instance, as wire, pasteboard, &c., and the bottoms or open ends of the cases are closed, with paper pasted over the openings, or with some other easily torn and readily detachable material, so that the cases or packages of cartridges may easily and quickly be opened, and so that this protection or covering for the bottoms may be broken or forced away from the cases to leave the expansible follower or feeding and steadying spring *b* free to act.

In Figs. 11 and 12 a case or holder, B′, is shown as provided with a loop or ring, *b′*, at top, by which to handle it in removing it from and placing it in a suitable cartridge belt or box, and in placing it in and taking it from the chamber B. At one side, or at both sides, if desired, there is an opening extending from top to bottom, to expose the cartridges to view and facilitate their removal by hand, and at the top of the case there is provided an opening, *a*, to admit of the insertion of the finger or a pin or rod to bear upon the spring *b*, or upon the top cartridge when the case is in the magazine-chamber, and in this way, by downward pressure, cause the bottom cartridge to bear upon the paper or other weak covering *a′*, at the bottom of the case, and tear or force it open. We prefer to use tissue-paper, pasted over the bottom, as at *a′*, which is made of a strength or thickness sufficiently great to resist the force of the spring *b*, and yet not so strong as to prevent it from being easily ruptured or broken away by the pressure which may be readily applied by the thumb or finger, or a short rod inserted at the opening *a*.

The strength of the paper used to temporarily cover the open end, outlet, or bottom of the case will depend upon the strength of the spring *b*.

Another and preferable way of temporarily closing or partially closing the outlet or bottom of the case, and holding the cartridges in place until after the case is inserted in the chamber B, is as follows: (See Figs. 11 and 12.) Two openings or small elongated slots, b^2 b^2, are made through the top of each case near the edges of the case at the sides of the loop *b′*, and about over or in the plane of the side openings in the case. A string, or, preferably, a band or piece of tape, a^2, which will give a broader bearing on the bottom cartridge than would a round string, is passed around the bottom of the case, and has its ends passed through the holes b^2, and tied together in a slip knot or loop. The tape bears against the middle of the lowermost cartridge in the case, and is drawn tight before tying, so as to compress the spring *b*, and hold the cartridges temporarily, as shown in the drawings.

When a case has been placed in the transverse magazine-chamber B, it is only necessary to untie the knot in the cord, band, or tape, and pull upon one end to remove it, and leave the cartridges free to be acted on by the spring. In this way the possibility of clogging the feeding devices in the longitudinal feed-tube by bits of paper, which might be the result of employing the paper coverings for the cases, is avoided.

It is obvious that a broad strip of paper or band of cloth might be passed around the case B′, so as to temporarily close its bottom and

confine the cartridges until to be used. Such a strip might be made of a width as great as the width of the case and length of the cartridges, or of any less width desired, and the ends be temporarily held together by paste or otherwise. To open the case bottom and release the cartridges, so as to be free to be acted upon by the spring *b*, it would only be necessary to break the connection between the ends of the band or strip at the top of the case, and pull upon one end. In this way the bottom could be opened readily and quickly for the successive feeding out of the cartridges to the longitudinal tube A′.

Any suitable device for removably securing the cases B′ in the chamber B, may be employed, such as a slide, spring-catch, turn-button, &c.

If the cases are made (as they may be) to fit tightly in the chamber, and so as to spring slightly, it is obvious that they would bind sufficiently in the chamber to be retained in place by frictional contact between the cases and one or more walls of the chamber. A suitable spring in a recess or slot in the stock at the wall of the chamber would answer to retain the cases in place, if made of a strength sufficient to bear with pressure great enough to hold the case against accidental displacement. By the employment of these cartridge-cases or holders adapted to be used in connection with the magazine-chamber, it will be seen that a great number of shots may be fired in a short time with slight intermissions at intervals or during the times of removing exhausted cases and inserting fresh ones, and that one of the objections to a magazine-gun having capacity for firing a large number of shots, viz., the weight of the large number of cartridges, is obviated.

The front and rear walls of the lateral magazine-chamber B are parallel with each other, and the front wall (see Fig. 1) is preferably inclined slightly backward from the perpendicular, so as to form an obtuse angle with the feed-tube A′.

The shape of the cases B′ corresponds with that of the chamber. This chamber may be at a right angle with the tube A′, but we prefer to give the slight rearward inclination, as this oblique arrangement of the chamber and cases to the feed-tube facilitates the proper feeding of the cartridges to the tube.

By reference to Figs. 1, 3, 11, and 12 it will be seen that the magazine-chamber B and the cartridge case or holder B′ are of corresponding form, the front backwardly-inclined end or wall of both chamber and case being shorter than the correspondingly-inclined rear end or wall, thus making the chamber and the case or holder deeper at rear than at front, to accommodate the cartridges with their flanges lapped. The top cartridges are canted or tilted on their points, and, as moved downward, the cartridges gradually assume a position parallel with the feed-tube A′. The holder B′ has an inclined bottom or outlet end, the inclination corresponding with that of the tube A′, as clearly shown by the drawings.

As first constructed—that is to say, preparatory to packing it with the cartridges—it is formed with an open bottom. Primarily considered, this holder may be described as having a closed top, inclined open bottom, and inclined ends of different lengths.

When the cartridges are placed in the holder its bottom is temporarily closed, as already fully explained.

The feed-tube A′ is provided with a series of cartridge-holding springs or fingers, C, at distances apart corresponding with or very slightly exceeding the length of the cartridges—that is, the distance between the point or forwardly-projecting free end of any one of these springs is at a distance from the point or free end of the next spring barely exceeding the length of a cartridge. The springs normally project inward, so that their ends shall be behind the cartridges, and hold or dog them so as to prevent retrograde movement, and when compressed by the contact of the cartridge as they are fed forward the springs yield, and lie in their seats or recesses in the tube, as will be understood by inspection of the drawings.

Opposite the series of springs C, and in line with them, the feed-tube is slotted, and a reciprocated push-bar or cartridge-feeder, D, working in suitable guides, plays in the slot. A series of yielding pushing fingers or springs, *d*, like those C, fixed to the opposite side of the tube, is mounted upon the push-bar, and these springs serve at each forward movement of the bar to feed forward the cartridges and present the forward cartridge in the tube to the receiver ready to be pushed into the firing-chamber E, as will presently be explained.

The impetus given the cartridges by the quick or sudden and forcible forward movement of the push-bar propels the foremost cartridge farther forward (so as to deliver it well into the receiver) than the positive action of the pusher would move it, and creates a tendency on the part of all the cartridges to move a greater distance than required.

A check-finger or curved-ended spring, *d′*, acting upon the flange of the cartridge next to that delivered to the receiver, serves to prevent it, and those following it, from moving too far, as will readily be understood from an inspection of Fig. 5. The force of this check-finger is readily overcome by the positive action on the cartridges of the pusher, and it is thus caused to yield to let the previously-acted-upon cartridge pass forward, and then spring back to check the next and the following cartridges.

A breech-bolt, E′, and its attachments, of usual construction—in this instance similar to that used in the well-known Hotchkiss gun, shown and described in United States Letters Patent of B. B. Hotchkiss, November 14, 1876, No. 184,285—serves to operate the car-

tridge-feeder or push-bar D. As the bolt, the lever or handle by which to operate and lock it in position, the trigger, and the trigger attachments and connections with the bolt are in all respects, except as hereinafter otherwise stated, like similar parts of the said Hotchkiss gun, no description of these devices not essential to an understanding of our invention need be given.

A longitudinal slot, *f*, is made in the side of the receiver F. This slot is of a length somewhat greater than that of a cartridge of the kind used with the gun. A short projection or lug, *e*, on the side of the bolt E′ near its front end, reciprocates in this slot with the movements of the bolt. This lug is beveled, rounded, or inclined on its front, from or near its base to its point, and is straight or plane surfaced on its rear side.

A push-bar, retracting-arm, or rod, F′, is pivoted at its head to the push-bar near its forward end, and inclines or bends upward at its outer or free end, where it is provided with a short projection or lug, *e′*, which plays to and fro in the receiver-slot *f*. This lug *e′* is inclined, beveled off, or curved on its rear side or face, (see Figs. 2 and 4,) and is straight or at a right angle with the retracting-rod F′ on its front side.

The receiver-slot *f* terminates for a portion of its depth at its rear end in an incline, *f′*. Beneath and in rear of this incline *f′* the slot is continued and opens inwardly, only being made of a depth great enough to allow of the retraction of the bolt E′ after the cam-faced lug *e* on its end passes to and in rear of the incline. (See Fig. 4.)

When the lug *e* reaches and enters the narrow partly-closed rear end of the slot, or, as it may be termed, the "passage" f^2, at and in rear of the incline *f′*, the lug is automatically disengaged from the lug *e′* on the pivoted rod of the push-bar, and this push-bar or cartridge-feeder D is propelled forward, as will hereinafter be explained.

The stock is recessed or cut away at the side of the receiver or breech-chamber F, in which the bolt works, and a plate or cover-piece and guideway, G, for the rod F′, is secured to the stock at the side of the receiver so as to form a passage or way for the rod to work in. (See Figs. 2 and 4.)

Upon the inside of the plate G there is a rib or projection, G′, between recesses or thin portions *g g′*. A plate-spring, H, projecting from the front end of the inwardly-projecting rib or thickened central portion G′ of the plate G, normally keeps the lug *e′* of the retracting rod F′ (when the heel or head of the lug is in contact with the spring H, as in Fig. 4) in the proper position to be engaged by the bolt-lug *e*, so that the arm F′ for retracting the cartridge-feeder is moved backward by the rearward movement of the bolt.

When retracted the heel or head *h* of the lug, or any suitable equivalent thereof, such as an independent shoulder or short projection on the outside of the arm F′ near its front end, passes along in contact with the spring H and the rib G′ to the recess *g′*, into which it is forced by the yielding of the rod F′ when its lug comes against the incline *f′*. This leaves the rod F′ free to admit of the forward thrust of the feed-bar D to carry a cartridge to the receiver and leave the lug *e′* in the position shown in Fig. 4.

When the bolt E′ is thrust forward to secure the cartridge in the firing-chamber, its lug *e* passes by the lug of the retracting-arm, the spring H yielding to admit of this operation.

The cartridge to be fired being secured, and the parts left in the position shown by Fig. 4, the empty shell after firing is extracted and thrown out in a well-known way, by the retraction of the bolt when the above-described operation is repeated.

The push-bar or cartridge-feeder D is thrust forward automatically when the lug *e′* of the retracting-arm F′ is released, as above explained, by any suitable means.

The specific devices we prefer to employ and their operations are as follows: A spring, I, in the rear end of the longitudinal feed tube or channel actuates a pushing head or plunger, J, which works to and fro in the feed-tube, the bottom of which is slotted longitudinally to form a way, in which a suitable stud, catch-arm, or finger-piece, K, secured to the plunger is reciprocated. A vertical slot is also made in the under side of the stock to accommodate the plunger-actuating finger. The retrograde movement of the plunger against the force of the spring is given it either by hand or by the feed-bar, according to circumstances. Normally, the spring I holds the plunger in its advanced position, as in Figs. 2 and 3, and when in this position the rearmost cartridge of those in the longitudinal feed-tube A′, if this tube is full, lies upon the plunger, which is of a concave or semicircular form, so as to provide a receptacle or holder for the cartridge.

When there are cartridges in the magazine-chamber B, or in a case or holder, B′, therein, the bottom cartridge rests in the plunger. The play or length of reciprocation of the plunger is governed either by the slot in the feed-tube or the slot in the stock, in which the finger K works, or by both said slots. The plunger, when moved forward by the spring, acts upon the feed-bar D, if in its retracted position, and when the feed-bar is in its advanced position, as it always is when the bolt is locked, the plunger may be worked by hand to replenish or fill up the longitudinal feed-tube without acting on the feed-bar. That the plunger may thus be operated by hand it is unconnected with the feed-bar—that is to say, it is adapted to abut against the feed-bar, but is not joined with it.

When the bolt F is in the advanced or locked position the feed-bar is in its advanced position, so that a nose, L, Figs. 2, 3, and 10, upon the side of the front end of the plunger shall,

when the plunger is in its most advanced position, abut against or approach very near to the heel or rear end of the push-bar D.

We prefer to limit the forward movement of the plunger, so as to stop it just before the nose L would strike the feed-bar were its movement continued. In this way we avoid any unnecessary strain on the bar or its spring-fingers, as well as prevent the possibility of deranging the position of such cartridges as may be in the partially-filled tube when the feeding is done by hand-working of the plunger.

By limiting the play of the plunger to that portion of the tube A′ beneath and in rear of the magazine-chamber or lateral cartridge-supplying chamber B, and also forming this plunger separate from and unconnected with the push-bar D, and its attached feeding devices, which operate only on the cartridges in front of the magazine-chamber and plunger, this plunger may be worked without obstruction from or interfering with the push-bar and its connections, thus enabling the user of the gun (when the breech-bolt is locked) readily to fill up the tube A′, if wholly or partially empty, from the magazine B, and also enable him at any time, by the failure of the plunger to move forward, to ascertain when the tube A′ is full.

From the above description the construction of the various parts and the operation of our improvements will readily be understood.

It will be seen that if the gun is entirely empty, or if the longitudinal feed-tube needs replenishing, the cartridges may be supplied without manipulating the breech-bolt E′, the thrust of the cartridges one upon another by actuating the plunger serving to feed them forward without the necessity of employing the feed-fingers of the thrust-bar.

The feed-bar, when worked by the bolt, necessarily operates the plunger by abutting against it to retract it, while the working of the plunger by its spring shoots forward the feed-bar at the proper instant after said bar has been properly retracted by the bolt. The working of the plunger does not, however, necessarily actuate the feed-bar, as has been explained with reference to hand-working.

We do not wish to be understood as confining ourselves to the identical devices for feeding the cartridges specifically described, nor to the adaptation of our improvements to the Hotchkiss system, our invention, obviously, being applicable to many of the systems of breech-loading fire-arms now in use. Our improvements may, for instance, readily be applied to the Spencer magazine-gun.

We claim as of our own invention—

1. The gun-stock having the lateral magazine-chamber near the butt, the longitudinal feed-tube intersected by said chamber, and the plunger in the rear end of the feed-tube and working beneath and in rear of the magazine-chamber only, these members being and operating substantially as hereinbefore set forth, so as to supply cartridges to the feed-tube without interfering with the feeding devices thereof, as described.

2. The combination, substantially as hereinbefore set forth, of the gun-stock, having the longitudinal feed-tube, the feeding devices operating upon the cartridges therein, the lateral magazine-chamber intersecting the feed-tube at or near its rear end, and the plunger operating upon the cartridges supplied from the magazine-chamber in rear of the feeding devices which operate upon the cartridges in the feed-tube, and unconnected with said feeding-devices, for the purpose set forth.

3. The combination, substantially as hereinbefore set forth, of the gun-stock, provided with the longitudinal feed-tube, the reciprocating push-bar operating the cartridge-feeding devices in the feed-tube, the breech-bolt acting upon an attachment or connection of the push-bar to retract and release it, and the plunger acted upon by the push-bar when retracted, serving to propel it forward, and having the capacity of operating independently of the push-bar and its connections when in their advanced position, for the purpose described.

4. The combination, substantially as hereinbefore set forth, of the slotted receiver, the breech-bolt having the lug or projection reciprocating in line with the receiver-slot, as the breech-bolt is operated, the reciprocating push-bar actuating the cartridge-feeding devices in the feed-tube, the actuating-arm of the push-bar operated upon by the breech-bolt lug to first retract the push-bar and then release it prior to the completion of the rearward movement of the bolt, and the spring-plunger to throw forward the push-bar when released during the finish of the retraction of the breech-bolt.

5. The combination, substantially as hereinbefore set forth, of the slotted receiver, the incline at the rear end of the slot, the breech-bolt, its lug, the push-bar or cartridge-feeder working in the longitudinal feed-tube, its pivoted actuating-arm, and the lug thereon.

6. The combination of the actuating-arm of the feed-bar or cartridge-feeder having the inclined lug thereon adapted to work in the receiver-slot and to be acted on by the bolt, and the plate or cover having a central ridge or thickened portion and recessed at the ends of said ridge, and the spring against which the front end of the actuating-bar bears when in its advanced position, these members being constructed and operating substantially as hereinbefore set forth.

7. The combination, substantially as hereinbefore set forth, of the longitudinal feed-tube, spring-fingers, or equivalent devices to prevent retrograde movement of the cartridges therein, the spring-plunger, and its finger-piece projecting through slots in the feed-tube and stock.

8. The combination, substantially as hereinbefore set forth, of the longitudinal feed-tube, the push-bar or cartridge-feeder retracted as the breech is opened by devices substantially

such as described, the spring-plunger, and its nose, against which the rear end of the push-bar abuts when retracted.

9. The side-slotted cartridge case or holder B′, shaped corresponding with the magazine-chamber B in the gun-stock, substantially as and for the purpose set forth.

10. As a new article of manufacture, the prepared package of cartridges, consisting of the case or holder B′, formed with the inclined bottom, the inclined front and rear ends or walls of different lengths, the permanently-closed top, the spring, and the temporarily-closed bottom provided with the removable binder for the cartridges, essentially as shown and described.

In testimony whereof we have hereunto subscribed our names.

W. R. LIVERMORE.
ANDREW H. RUSSELL.

Witnesses:
OLIVER TAFF,
NICHOLAS MARTENS.