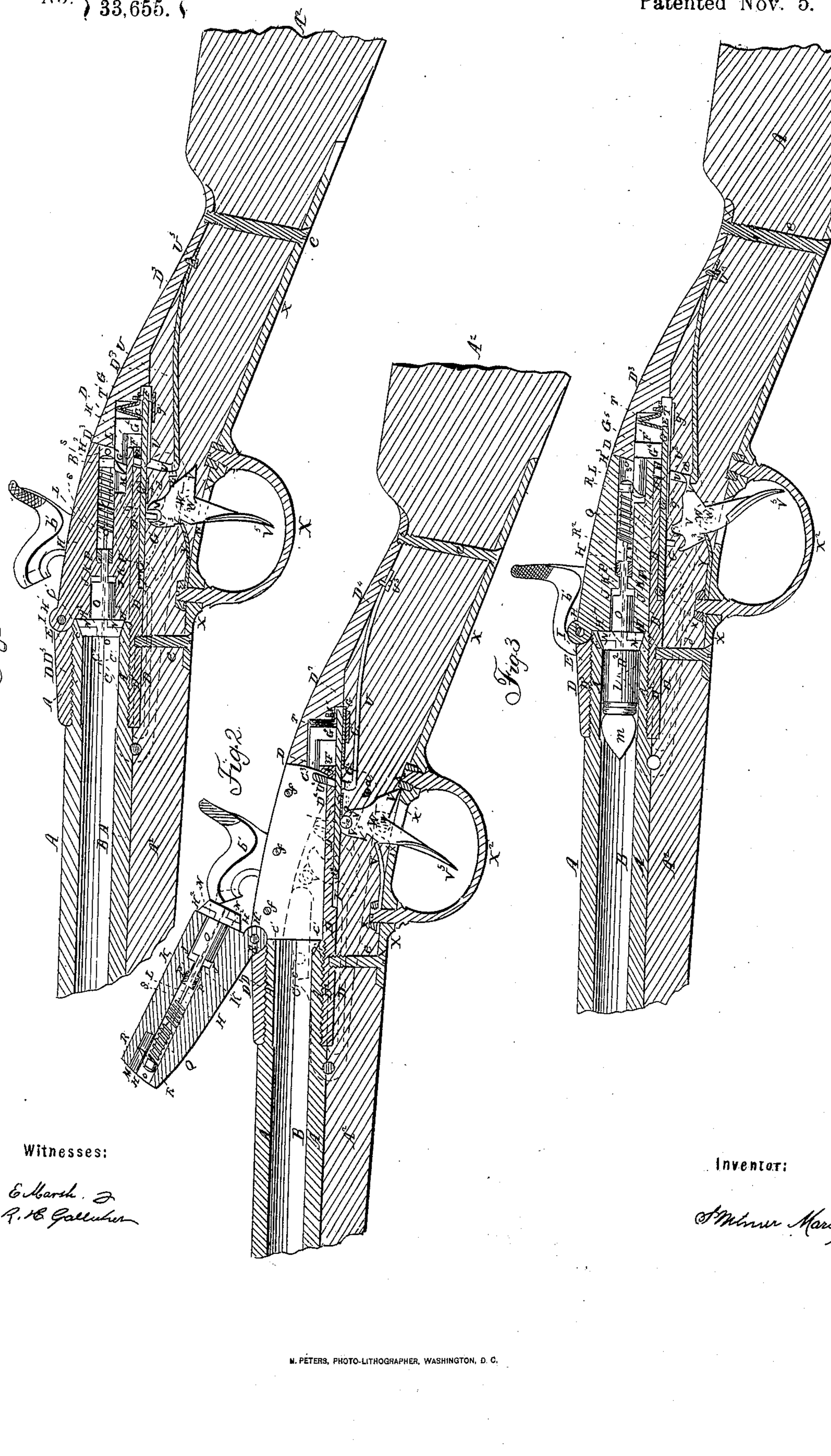
2 Sheets—Sheet 1.

S. W. MARSH.

Breech-Loading Fire-Arm.

No. { 2,651, / 33,655. }

Patented Nov. 5. 1861.



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2 Sheets—Sheet 2.

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UNITED STATES PATENT OFFICE.

S. W. MARSH, OF WASHINGTON, DISTRICT OF COLUMBIA.

IMPROVEMENT IN BREECH-LOADING FIRE-ARMS.

Specification forming part of Letters Patent No. **33,655**, dated November 5, 1861.

To all whom it may concern:

Be it known that I, S. WILMER MARSH, of Washington city, in the District of Columbia, have invented and made certain new and useful Improvements in Breech-Loading Fire-Arms; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification.

Figure 1 represents a longitudinal sectional view of my improvements in breech-loading fire-arms, showing the gate closed. Fig. 2 represents a longitudinal sectional view of my improvements in breech-loading fire-arms, showing the gate thrown up. Fig. 3 represents a longitudinal sectional view of my improvements in breech-loading fire-arms, showing the same in the act of being discharged. Fig. 4 represents a detached gate having peculiar-formed cavities therein and peculiar-formed appendages connected. Fig. 5 represents a plunger and swivel with a nut thereon. Fig. 6 represents a plunger having a nut thereon, the plunger having a longitudinal hole, of uniform diameter throughout, through its center and length. Fig. 7 represents a solid plunger with nut thereon. Fig. 8 represents a detached gate with another kind of appendages. Fig. 9 represents a plunger with a nut thereon, the plunger having a longitudinal hole, of varying diameter, through its center. Fig. 10 represents one form of needle to be used in various plungers. Fig. 11 represents a top view of a peculiar expanding ring. Fig. 12 represents a sectional view of the expanding ring. Fig. 13 represents a detached gate with a third kind of appendages. Fig. 14 represents a peculiar-formed solid plunger with nut thereon. Fig. 15 represents a top view of a bolt to hold the gate down. Fig. 16 represents a sectional view of the bolt. Fig. 17 represents another form of needle. Fig. 18 represents a detached gate with a fourth or modified kind of appendages. Fig. 19 represents another peculiar-formed plunger and swivel with nut thereon. Fig. 20 represents a top view of the swivel, Fig. 19. Fig. 21 represents another form of needle. Fig. 22 represents a detached gate with a fifth kind or modification of appendages. Fig. 23 represents a plunger with nut thereon, the plunger having a longitudinal hole, of varying diameter, through its center and length. Fig. 24 represents a detached gate with a sixth form or modification of appendages. Fig. 25 represents a metallic cartridge-case. Fig. 26 represents a detached sectional view of a gun barrel and breech part with another form of appendages. Fig. 27 represents a third peculiar-formed plunger and swivel. Fig. 28 represents a detached gate with another form or modification of appendages. Fig. 29 represents a fourth peculiar-formed plunger and swivel. Fig. 30 represents another kind or modification of bolt.

The nature of my improvements consists, more especially, in the peculiar construction of the breech part of a gun, the said breech part forming either a part of the barrel or being furnished with a jacket into which the barrel can be screwed, as desired; also, in the peculiar construction and form of the gate hinged and working on top, and the manner of opening and of securing the gate when closed, and of preventing premature explosion when the gun is charged, capped, and cocked while the gate is open; also, in the peculiar construction of a plunger, to be used either with or without a needle. When used with a needle, the plunger has a longitudinal hole through its center for the needle to work through, whereby cartridges having a detonating-wafer in the rear end thereof do not require a cap to be used on the cone, nor require the use of the lock and hammer, as the needle pierces the detonating-wafer and explodes it. The cap, lock, and hammer, however, can be used at the same time, if desired. When used without a needle, the plunger is solid, and requires the cap, lock, and hammer to be used as with ordinary fire-arms, and in both cases requires the use of the expanding ring. Also, in the peculiar construction of the bolt and of the trigger, whereby the gate is readily thrown up or held down securely and the needle is caused to enter the cartridge and explode it, or the hammer is caused to fall and explode the cap upon the cone.

Another peculiarity of my improvements is the ready convertibility from a breech-loading to a muzzle-loading gun by means of a screw or pin inserted horizontally into the left side of the stock of the gun. The end of the screw only is indicated at *d*, Fig. 1. By turning said screw with a screw-driver, the end *d*

thereof will enter sufficiently behind the jaw V^2 of the trigger V, which is thereby prevented from pressing back against the bolt G G G^2 G^3 G^4, so that the catch part G^5 of the bolt is checked, and cannot press out of the cavity M of the gate H, thus securely holding the gate H closed, and rendering it necessary when desired to load the gun at the muzzle. To release the gate, the screw or pin *d* is turned and withdrawn sufficiently.

The construction of my improvements of breech-loading fire-arms is as follows:

At Figs. 1, 2, 3, A A indicate the barrel of the gun with screw-thread A′ on the breech end.

B indicates the bore of the barrel.

C indicates the cartridge-chamber or enlarged bore of the barrel, the rear end of the cartridge-chamber C being beveled, as at C′.

D D′ D′ D^2 D^3 D^4 represent a breech-connection. D indicates the jacket of the breech-connection, and has a screw-thread, D^5, therein, corresponding to the screw-thread A′ on the barrel, so that the barrel can be screwed into the jacket D, as at A′ D^5. D′ D′ indicate a bridge with a round or oval hole, D^2, through it. Said bridge is formed by a continuation of the lower part of the jacket D, and connects the jacket D with the bolt-seat D^3 and end D^4. On the side of the jacket D is connected the cone E, the vent-hole C^2, (dotted at Figs. 1, 2, 3, 26,) extending in through the side of the barrel A and jacket D, so as to enable the flame from the cap, when exploded on the cone E, to pass through the vent-hole and through the jacket D and barrel A into the cartridge-chamber C at C^2.

F F indicate a longitudinal channel in the bottom of the bridge D′ D′ D^2 and bolt-seat D^3 of the breech-connection, communicating with the cavity F′ F′ in the bolt-seat D^3. The longitudinal channel F F is of greater length (but of corresponding depth and breadth) than the longitudinal slide part G G of the bolt, Figs. 1, 2, 3, 15, 16. The cavity F′ F′ in the bolt-seat D^3, Figs. 1, 2, 3, extends upward from the channel F F, and is of the same length, diameter, and height as the standard G^4 and catch G^5 of the bolt, Figs. 1, 2, 3, 15, 16. The upper part of the cavity F′ F′, Figs. 1, 2, 3, where the catch G^5 of the bolt rests, communicates with the cavity M in the gate H, so as to allow the catch G^5 of the bolt to enter the cavity M in the gate H.

G G G^2 G^3 G^4 G^5, Figs. 1, 2, 3, 15, 16, represent a bolt formed of one piece of metal. At Figs. 15, 16, G G indicate the longitudinal slide of the bolt. On the bottom of the slide G G is a spur, G′, as shown at Figs. 1, 2, 3, 16, of desired form to fit between the jaws V′ V^2 of the trigger V, Figs. 1, 2, 3. Through the slide G G, Figs. 1, 2, 3, 15, 16, there is a round or oval hole, G^2, and slot G^3, as shown at G^2 G^3, Figs. 15, 16. The round or oval hole G^2, Figs. 1, 2, 3, 15, 16, is of the same diameter as the lower part, U′, of the elbow of the spring U, Figs. 1, 2, 3. The slot G^3, Figs. 1, 2, 3, 15, 16, is of less diameter than the hole G^2, and corresponds to the diameter of the upper part, U^2, of the elbow U′ of the spring U, Figs. 1, 2, 3. Extending upward from the slide G G is the standard G^4, supporting the catch G^5, as shown at G G G^4 G^5, Figs. 1, 2, 3, 16. The length, diameter, and height of the standard G^4 and catch G^5 must correspond to the size of the cavity F′ F′ in the bolt-seat D^3, Figs. 1, 2, 3. The bolt G G G^4 G^5, Figs. 1, 2, 3, is held in the channel F F and cavity F′ F′ by the metallic plates *g g′*, the metallic plates *g g′* being fastened to the bottom of the bridge D′ D′ D^2 and bolt-seat D^3 by screws.

At Figs. 1, 2, 3, H indicates a gate hinged to the jacket D at H′ by the hinge-pin I. The face H^2 of the gate H abuts against the breech of the barrel A and jacket D. The end H^3 of the gate H is slightly curved, to correspond to the front of the bolt-seat D^3.

J indicates a cavity in the gate H, extending from the face H^2, of a little greater diameter and an eighth of an inch longer than the length and diameter of the body of the plunger O, as shown at O^3, Fig. 6.

K indicates a cavity of a little greater diameter than the shank O^4 of the plunger O, as shown at Fig. 6, and is a quarter of an inch (more or less, as desired) in length. The cavity K, Figs. 1, 2, 3, connects the cavities J and L. The cavity L extends from the cavity K through the end H^3 of the gate H, and is of a little greater diameter than the circular nut P on the end of the shank O^4 of the plunger O, Figs. 1, 2, 3, 6.

M indicates a cavity in the end H^3 of the gate H, Figs. 1, 2, 3, of corresponding diameter to the catch G^5 of the bolt, and of sufficient depth to admit the movement forward of the catch G^5 of the bolt and the spur R′ of the needle, Fig. 17, and is connected at the top with the cavity L in the gate H, Figs. 1, 2, 3, so that the spur R′ of the needle can extend downwardly into the cavity M.

N, Figs. 1, 2, 3, indicates an expanding ring. At Fig. 12 is a sectional view of said ring.

N N′ indicate the edge of the smaller diameter of the ring.

N^2 N^2 indicate the greater diameter of the ring.

N^2 N^3 indicate the thickness of metal at the base.

N^4 indicates the diameter of the hole at the base.

N^5 N^5 indicate the outer beveled surface, extending from the edge N′ N′ to the base at N^2 N^2, corresponding to the bevel C′ of the cartridge-chamber C of the barrel A, Figs. 1, 2, 3.

N^6 N^6, Fig. 12, indicate the inside beveled surface, being the reverse of the outside, N^5 N^5, and extending from the top edge, N′ N′, to the base at N^3 N^3, and corresponding to the beveled head O^2 of the plunger O, Fig. 6, thereby forming at the base N^2 N^3 N^2 N^3, Fig. 12, the hole N^4 of much less diameter than at the top, N′ N′.

N^7 indicates a transverse cut through one side of the ring, extending from the top edge,

N′ N′, toward the base N^2 N^3 N^2 N^3 as far as desired. N^8 indicates another transverse cut, extending through the base toward the center as far as desired. These two transverse cuts are situated on one side of the circumference of the ring, but do not communicate.

N^9 N^9 indicate a cut through the metal, extending nearly around the circumference of the ring, terminating at each of the transverse cuts N^7 N^8, thus leaving sufficient metal, N^{10}, so as to avoid the entire severance of the ring, thereby enabling the ring to expand, as desired, the ring first being tempered a moderate spring-temper, to cause its closing when the cause of its expansion is removed.

O, Figs. 1, 2, 6, indicates a plunger, having a longitudinal hole, O′ O′, Fig. 6, of uniform diameter, extending through its center.

At Fig. 6, O^2 indicates the beveled head of the plunger O, Figs. 1, 2, 3, having a corresponding bevel to the inside bevel, N^6, of the ring N, Figs. 1, 2, 3, 12, as shown at N^6, Fig. 12. The body O^3, Fig. 6, of the plunger O, Figs. 1, 2, 3, 6, is of corresponding diameter to the hole N^4 of the ring N, Figs. 1, 2, 3, 11, 12, as shown at N^3, Fig. 11, and is of less length and diameter than the depth and diameter of the cavity J in the gate H, Figs. 1, 2, 3. The shank part O^4 of the plunger O, Figs. 1, 2, 3, 6, is an extension of the body O^3, Fig. 6, but of less diameter than the cavity K in the gate H, Figs. 1, 2, 3. This shank part is of greater length than the cavity K in the gate H, Figs. 1, 2, 3, so as to allow of its extending into the cavity L of the gate H, and has a screw-thread thereon for the purpose of screwing on the nut P by passing it into the cavity L of the gate H, Figs. 1, 2, 3. Therefore by inserting the shank O^4 and body O^3, Fig. 6, of the plunger O, Figs. 1, 2, 3, 6, through the ring N and into the cavities J K L of the gate H, Figs. 1, 2, 3, and then passing the nut P down the cavity L of the gate H, Figs. 1, 2, 3, and screwing it on the end of the shank O^4, Fig. 6, of the plunger O, Figs. 1, 2, 3, 6, until it bears against the shoulder in the cavity L, Figs. 1, 2, 3, formed by the smaller cavity K, the head O^2, Fig. 6, of the plunger O, Figs. 1, 2, 3, 6, is drawn down upon the inside bevel N^6 N^6, Fig. 12, of the ring, thus securing the ring N upon the face H^2 of the gate H, and preventing the plunger O from falling out of the gate H.

Q, Figs. 1, 2, 3, indicates a spiral spring of desired length, its diameter being a little less than the diameter of the cavity L in the gate H.

R R′ R^2, Figs. 1, 2, 3, 17, indicate a needle, the shaft R^2 extending into the cavity L of the gate H, Figs. 1, 2, 3, and into the hole O′ of the plunger O, Figs. 1, 2, 3, 6, and surrounded by the spiral spring Q within the cavity L of the gate H, Figs. 1, 2, 3.

At Fig. 17, R indicates the head of the needle, the diameter of the head R corresponding to the diameter of the cavity L in the gate H, Figs. 1, 2, 3.

R′, Fig. 17, indicates a spur-like projection extending from the head R, said spur being flattened, so as to admit its passage through the slot connecting the cavities L and M in the gate H, Figs. 1, 2, 3.

R^2, Fig. 17, indicates the shaft of the needle R R′ R^2, Figs. 1, 2, 3, 17. The shaft R^2 is passed through the spiral spring Q, so as to let one end of the spiral spring Q press against the head R. The shaft R^2 is then passed into the cavity L of the gate H, and then into the hole O′ of the punger O until it reaches the surface of the head O^2 of the plunger O, Figs. 1, 2, 6. When the head R of the needle is inside of the cavity L of the gate H, the screw S′ is inserted through the right side of the gate H, near the end H^3, so that the point of the screw S will enter the cavity L of the gate H, Figs. 1, 2, 3, behind the head R of the needle, Fig. 17, as shown at H^3 L S, Figs. 1, 2, 3.

S′, Figs. 1, 2, 3, indicates one of two screws through the opposite sides of the gate H. The points of the screws S′ enter the cavity L a sixteenth of an inch, and are situated about a quarter of an inch in the rear of the nut P, the front of the spiral spring Q resting upon them, so as to prevent the spiral spring Q from pressing against the nut P or the end of the shank O^4, Fig. 6, of the plunger O, Figs. 1, 2, 3, 6.

T, Figs. 1, 2, 3, indicates an inverted-V-shaped spring, secured in the rear of the cavity F′ F′ in the bolt-seat D^3 of the breech-connection by the screw T′, and is intended to press forward the bolt, Fig. 16, so that the catch part G^5, Figs. 1, 2, 3, 16, will enter the cavity M in the gate H, Figs. 1, 2, 3, when the gate H is closed down, as shown at G^5 M, Figs. 1, 3.

U, Figs. 1, 2, 3, indicates a spring having an upright part or elbow, U′ U^2. The lower part, U′, of the elbow U′ U^2 is round or oval, to correspond to the hole D^2 through the bridge D′ D′ of the breech-connection, and the hole G^2 through the slide G G of the bolt, Figs. 1, 2, 3, 15, 16. The sides of the upper part, U^2, of the upright U′ U^2 are flattened, to correspond to the diameter of the slot G^3 in the slide G G of the bolt, Figs. 1, 2, 3, 15, 16, as far as the combined thickness of the metal of the bridge D′ D′ at the hole D^2 of the breech-connection and the slide G G of the bolt, as at G^3, Figs. 1, 2, 3, 15, 16. The spring U is secured to the bottom of the breech-connection at D^4 by the screw U^3, as shown at Figs. 1, 2, 3.

V, Figs. 1, 2, 3, indicates a trigger having two jaws, V′ V^2, so as to allow the spur G′ of the bolt to set between them. V^3 indicates a notch in the trigger V for the spring Y to press the trigger V upright after the part V^4 has raised the sear *a* of the lock by drawing the lower or finger part, V^5, of the trigger V back toward the butt of the stock A^2 A^2.

W indicates the standard on the top of the guard-plate X X. The standard W and the guard X X have a longitudinal slot through them, as at X′ X′, for the purpose of passing the trigger V up into its place. The screw W′ is then passed through the standard W and trigger V, and serves as an axis for the trigger V to work upon.

X^2 indicates the guard of the finger part V^5 of the trigger V, and is secured to the guard-plate X X by the nuts Z Z'.

Y indicates a spring secured on top of the guard-plate X X by the nut Z', the end of the spring Y being placed in the notch V^3 of the trigger V, for the purpose of forcing the trigger V upright after the pressure is withdrawn from the finger part V^5 of the trigger V.

a indicates the sear of the lock.

b' indicates the hammer of the lock.

A^2 A^2 represent the stock of the gun. The sides of the cavity in the stock A^2 A^2, wherein the breech-connection rests, are strengthened by two thin sheets of metal secured by screws, as at *f f f*, Fig. 2.

e indicates a screw that passes up through the rear end of the guard-plate X X and through the stock A^2 A^2 into the breech-connection at D^4, so as to secure all three together. *e'* indicates a screw passing up through the front end of the guard-plate X X into the stock A^2 A^2, for the purpose of holding the guard-plate X X to the stock A^2 A^2.

At Fig. 4 is represented a detached gate, H, with the parts "assembled," showing a solid plunger, O, and swivel-connection O' with nut P thereon, together with the expanding ring N. H' indicates the hinge-joint of the gate H, Figs. 1, 2, 3, corresponding to a female hinge-joint on the jacket D of the breech-connection, Figs. 1, 2, 3. J, Fig. 4, indicates a cavity of a little greater diameter than the body O^3 of the plunger O, Figs. 4, 5, the sides of the cavity J being parallel and of a little greater length than the body O^3 of the plunger O, Figs. 4, 5. The cavity K tapers from the cavity J to K', so as to correspond to the tapering sides of the swivel O', Figs. 4, 5. The sides of the cavity K' are parallel and oval or square, to correspond to the end of the swivel O'. The cavity K' connects the cavities K and L. The cavity L is the same diameter as the diameter of the nut P on the end of the swivel O', Figs. 4, 5. The cavity L extends from the cavity K' to the end, H^3, of the gate H. M indicates a cavity in the end H^3 of the gate H, of desired depth and of corresponding diameter to admit the catch G^5 of the bolt G G G^4 G^5, Figs. 1, 2, 3, 16.

Fig. 5 represents a solid plunger, O, and detached swivel-connection O' with a circular nut, P, thereon. O^2 indicates the head of the plunger O, beveled to correspond to the inside bevel, N^6 N^6, of the expanding ring N, Fig. 12, the diameter of the body O^3 of the plunger O, Fig. 5, being the same as the diameter of the hole N^4 of the expanding ring, Figs. 11, 12. The sides of the body O^3 of the plunger O, Fig. 5, are parallel, its length being less than the depth of the cavity J in the gate H, Fig. 4. O^4 O^5 O^6, Fig. 5, indicate the shank-continuation of the plunger O, which is of much less diameter than the body O^3. On the end of the shank O^4 O^5 O^6 is a ball, O^6, of suitable diameter, to work in the slot O^9 of the swivel O'. The shank O^4 O^5 O^6 is niched at O^4, so as to allow its passage through the opening O^8 of the swivel O'. At O^7 of the swivel O' the hole or slot O^9 is of less diameter than the ball O^6 on the shank O^4 O^5 O^6 of the plunger O, the hole O^9 being first drilled with a drill of a little greater diameter than the part O^5 of the shank O^4 O^5 O^6 of the plunger O, but of less diameter than the ball O^6, the lower part of the slot O^9 being then increased to a greater diameter than the ball O^6, so as to allow the ball to have free play therein. The slot O^8 is then cut through the top O^7 of the swivel O', to admit the niche part O^4 of the plunger O being passed through it, when the plunger O and swivel O', Fig. 5, being drawn in opposite directions longitudinally, the rim O^7 of the swivel O' prevents the ball O^6 of the plunger O from passing out of the slot O^9 of the swivel O', as shown in the cavities J K of the gate H, Fig. 4, at O^4 O^5 O^6 of the plunger O and O^7 O^8 O^9 of the swivel O'.

In "assembling" the several parts above described, and arranging them in the gate H, Fig. 4, the niche O^4 of the plunger O, Fig. 5, is passed into the slot O^8 of the swivel O, Fig. 5, the ball O^6 on the end of the shank O^5 of the plunger O, Fig. 5, is then within the slot O^9 of the swivel O'. The plunger O and swivel O' are then drawn in opposite directions until the ball O^6 is checked by the rim O^7. The plunger O and swivel O', Fig. 5, when attached together, as above described, are passed through the ring N and then through the cavities J K K' until the end of the swivel O' projects into the cavity L, when the nut P is inserted into the cavity L and passed up to the end of the swivel O', onto which it is screwed until it bears upon the shoulder formed by the cavity K', thereby holding the ring N, Figs. 4, 12, and plunger O with swivel O', Fig. 5, in their respective places upon the face H^2, and in the cavities J K K' L of the gate H, Fig. 4.

Fig. 7 represents a solid plunger, O, to be used in the gate H, Figs. 1, 2, 3, with the ring N, Figs. 1, 2, 3, 12, but without the needle R R' R^2 and spiral spring Q, Figs. 1, 2, 3. At O^2, Fig. 7, is indicated the head of the plunger O, beveled to correspond to the inside bevel, N^6 N^6, of the ring, Fig. 12. The body O^3 of the plunger O, Fig. 7, is of corresponding diameter to the hole N^4 of the ring N, Figs. 11, 12, and is of less length and diameter than the cavity J in the gate H, Figs. 1, 2, 3. The shank O^4 of the plunger O, Fig. 7, has a screw-thread on the end thereof for the nut P to be screwed on, and is of proper length and diameter to extend into the cavity L through the cavity K in the gate H, Figs. 1, 2, 3, when the body O^3 of the plunger O, Fig. 7, is in the cavity J of the gate H, and the head O^2 of the O, Fig. 7, is surrounded by the ring N, Figs. 1, 2, 3, 12, which it holds in its place upon the face H^2 of the gate H, as at Figs. 1, 2, 3.

Fig. 8 represents a detached gate, H, with the parts assembled by the plunger O and and circular nut P, Fig. 9, needle, Fig. 10, and

ring N, Figs. 8, 12. H′ indicates the hinge-joint of the gate H, Fig. 8. H^2 indicates the face of the gate H, and H^3 indicates the end of the gate H. J K indicate a cavity in the gate H, of requisite diameter and length to admit the body O^3 and shank O^4 of the plunger O, Fig. 9. L indicates a cavity in the gate H, Fig. 8, extending from the cavity K through the end H^3 of the gate H, of sufficient diameter to admit the passage in of the nut P on the end of the shank O^4 of the plunger O, Fig. 9. The cavity L in the gate H, Fig. 8, is connected with the cavity M by a slot of corresponding diameter to the spur R′ of the needle, Fig. 10. The cavity M in the gate H, Fig. 8, is of corresponding diameter to the catch part G^5 of the bolt, Figs. 1, 2, 3, 16, and is of proper depth to admit the movement forward of the spur R′ of the needle, Fig. 10, and the catch G^5 of the bolt, Fig. 16.

At Fig. 9, O indicates a plunger having a longitudinal bore, O^5 O^6, through its center. The head O^2 of the plunger O is beveled to correspond to the inside bevel, N^6, of the ring N, Figs. 8, 12. O^3 indicates the body of the plunger O, Fig. 9, the body O^3 being of a little less diameter and length than the cavity J in the gate H, Fig. 8. O^4 indicates the shank of the plunger O, Fig. 9, the shank O^4 being of a little less diameter than the cavity K in the gate H, Fig. 8, but of proper length to project into the cavity L of the gate H when the head O^2 of the plunger O, Fig. 9, is inside the ring N, Figs. 8, 12, and the body O^3 and shank O^4 of the plunger O, Fig. 9, are passed through the cavities J K of the gate H, Fig. 8. The nut P is screwed on the end of the shank O^4 in the cavity L until it bears upon the shoulder in the cavity L, formed by the cavity K in the gate H, Fig. 8. On the end of the shank O^4 of the plunger O, Fig. 9, is a screw-thread corresponding to the screw-threads inside the nut P. The nut P, Fig. 9, is of corresponding diameter to the diameter of the cavity L in the gate H, Fig. 8. The screw-threads in the nut P, Figs. 8, 9, extend only half the depth of the nut P, forming thereby the rim P′ P′, the other half, P^2 P^2, of the nut P having a small hole, P^3, through the center, corresponding in diameter to the diameter of the shaft R^2 of the needle, Fig. 10. Through the head O^2 and body O^3 of the plunger O, Fig. 9, is a longitudinal hole, O^6, of corresponding diameter to the shaft R^2 of the needle, Fig. 10. Through the shank O^4 of the plunger O, Fig. 9, is a longitudinal hole, O^5, extending from the hole O^6 through the end of the shank O^4. The hole O^5 is of corresponding diameter to the ring or collar R^3 on the shaft R^2 of the needle, Fig. 10.

At Fig. 10, R indicates the head of a needle having a spur, R′, with flattened sides extending from it. The diameter of the head R and the diameter and length of the spur R′ correspond to the diameter of the cavity L and the diameter and height of the combined cavities L M and connecting-slot in the gate H, Fig. 8. The head R of the needle, Fig. 10, has a small hole with screw-thread therein corresponding to the screw-thread on the shaft R^2. The shaft R^2 is of uniform diameter throughout its length, and corresponds to the diameter of the hole O^6 through the head O^2 and body O^3 of the plunger O, Fig. 9, and the hole P^3 through the center P^2 of the nut P on the end of the shank O^4 of the plunger O, Figs. 8, 9, and has a screw-thread upon the end in rear of the ring or collar R^3, corresponding to the screw-thread in the head R. The ring or collar R^3 is permanently attached around the shaft R^2, and is of the same diameter as the hole O^5 through the shank O^4 of the plunger O, Fig. 9.

To "assemble" the parts of the gate H, Fig. 8, the plunger O, Figs. 8, 9, is passed through the ring N, Figs. 8, 12, until the head O^2 of the plunger O, Figs. 8, 9, is surrounded by the ring N, Figs. 8, 12, when the shank O^4 and body O^3 of the plunger O, Figs. 8, 9, are passed down into the cavities J K L of the gate H, Fig. 8, until the end of the shank O^4 of the plunger O, Figs. 8, 9, is protruding into the cavity L of the gate H, Fig. 8, through the cavity K, and the ring N, Figs. 8, 12, is secured upon the face H^2 of the gate H, Fig. 8, by the beveled head O^2 of the plunger O, Figs. 8, 9. The head R, with spur R′ of the needle, Fig. 10, is then screwed off the shaft R^2 of the needle, and the shaft R^2 of the needle is passed through the spiral spring Q, of the same diameter as the hole O^5 in the shank O^4 of the plunger O, Fig. 9. The shaft R^2 of the needle, with spiral spring Q surrounding it and pressing against the front of the ring or collar R^3, is then inserted into the hole O^5 O^6 in the shank O^4 and body O^3 and head O^2 of the plunger O, Fig. 9, until the point of the shaft R^2 of the needle, Fig. 10, is even with the surface of the head O^2 of the plunger O, Figs. 8, 9, and the spiral spring Q presses against the shoulder in the hole O^5, formed by the hole O^6 in the plunger O, Figs. 8, 9. The part of the shaft R^2 having the screw-thread on remains in the cavity L, while the ring or collar R^3 is in the hole O^5 of shank O^4 of the plunger O. The nut P is then inserted into the cavity L of the gate H until it presses the shaft R^2 of the needle in its place, when the nut P is screwed onto the end of the shank O^4 of the plunger O until it bears against the shoulder in the cavity L, formed by the cavity K. The head R and spur R′ of the needle is passed into the cavity L of the gate H, pressing the shaft R^2 of the needle, that projects into the cavity L of the gate H, through the hole P^3 of the nut P forward, so that the point of the shaft R^2 of the needle will be forced out through the head O^2 of the plunger O, Figs. 8, 9, thereby enabling the screwing around of the shaft R^2 of the needle, so that the end in the cavity L can be screwed into the head R of the needle, while the spur R′ of the needle is in the slot and cavity M of the gate H, Fig. 8.

Fig. 13 represents a detached gate, H, assembled with the plunger O and nut P, Fig.

14, and ring N, Figs. 12, 13. H′ indicates the hinge-joint of the gate H. The sides of the cavity J in the gate H taper from the face H^2 of the gate H to the cavity K, the diameter of the cavity J at the face H^2 of the gate H being a little greater than the diameter of the hole N^4 in the ring N, Figs. 11, 12, 13, so as to admit the body O^3 of the plunger O, Figs. 13, 14, to have room to move sidewise when the head O^2 of the plunger O, Figs. 13, 14, is in the ring N, Fig. 13, and the ring N is resting upon the face H^2 of the gate H. K indicates a continuation of the cavity J, the sides of the cavity K being parallel and the diameter being a little greater than the diameter of the shank O^4 of the plunger O, Figs. 13, 14. The cavity L is of a little greater diameter than the nut P on the end of the shank O^4 of the plunger O, Figs. 13, 14, and extends through the end H^3 of the gate H up to the cavity K. The cavity M extends into the end H^3 of the gate H below the cavity L, and is of proper depth and diameter to admit the catch G^5 of the bolt, Fig. 16, to move therein as desired.

At Fig. 14, O^2 O^3 indicate the head and body of a solid plunger, O, the sides of the head O^2 and body O^3 tapering to correspond to the inside bevel, N^6 N^6, of the ring N, Figs. 12, 13, the diameter of the top of the head O^2 being the same as the diameter of the hole through the ring N, Figs. 12, 13, at the top edge, N′ N′, Fig. 12. O^4 indicates the shank of the plunger O, Figs. 13, 14. The sides, being parallel, extend from the tapered body O^3. On the end of the shank O^4 is a nut, P, of a little less diameter than the diameter of the cavity L in the gate H, Fig. 13.

To assemble the parts of the gate H, Fig. 13, the nut P is screwed off the shank O^4 of the plunger O, and the plunger O is inserted through the ring N and passed through the cavities J K of the gate H until the ring N rests upon the face H^2 of the gate H, while the the end of the shank O^4 of the plunger O is inserted through the cavity K into the cavity L of the gate H, when the nut P is inserted into the cavity L of the gate H and screwed onto the end of the shank O^4 of the plunger O, Figs. 13, 14, until it bears against the shoulder in the cavity L, formed by the cavity K in the gate H, Fig. 13, thereby holding the ring N, Figs. 12, 13, and plunger O, Figs. 13, 14, in their places on and in the gate H, Fig. 13.

Fig. 18 represents a detached gate, H, assembled with the expanding ring N, Figs. 12, 18, and plunger O, with hook O′, Figs. 18, 19. J, Fig. 18, indicates a cavity of uniform diameter, extending from the face H^2 of the gate H, of a little greater diameter and length than the body O^3 of the plunger O, Figs. 18, 19. The sides of the cavity K taper, so as to correspond to the tapering sides of the hook O′, Figs. 18, 19. At the end of the cavity K in gate H, Fig. 18, where it enters the cavity L, the sides are oval or square, so as to prevent the hook O′, Figs. 18, 19, from turning round while screwing on the nut P, Figs. 18, 19. L indicates a cavity extending from the tapering cavity K through the end H^3 of the gate H, Fig. 18. The diameter of the cavity L is a little greater than the diameter of the nut P, Figs. 18, 19, on the end of the hook O′, Figs. 18, 19. M, Fig. 18, indicates a cavity in the gate H at H^3, of proper diameter and depth to admit the catch G^5 of the bolt, Fig. 16.

At Fig. 19, O indicates a solid plunger, and O′ indicates a swivel-hook. The head O^2 of the plunger O is beveled to correspond to the inside bevel, N^6 N^6, of the ring N, Figs. 12, 18. The sides of the body O^3 of the plunger O, Fig. 19, are parallel and extend from the head O^2 to the shank O^4. The shank O^4 is of less diameter than the body O^3. Through the shank O^4 is a slot, O^5, leaving the bottom O^6 of the shank O^4 solid, so as to admit and hold the lips O^7 of the hook O′, the slot O^5 being long enough to admit the lips O^7 of the hook O′ to play up and down. The hook O′ is formed by splitting a piece of metal and turning the ends O^7 to form lips, as shown at O^7, Fig. 20, thereby leaving the space O^8, Fig. 19, between the two sides, so that the end O^6 of the shank O^4 of the plunger O can slip up and down therein when the lips O^7 are secured in the slot O^5, as shown at O^5 O^6 O^7 O^8 in the cavities J K of the gate H, Fig. 18. On the solid end of the hook O′ is a screw-thread corresponding to the screw-thread in the nut P, Figs. 18, 19.

To assemble the parts of the gate H, Fig. 18, the plunger O, Fig. 19, is passed through the ring N, Figs. 12, 18, until the sides of the head O^2 of the plunger O, Figs. 18, 19, bear upon the inside bevel, N^6 N^6, of the ring N, Figs. 12, 18. The lips O^7 of the hook O′, Figs. 19, 20, are then opened or separated, and the link end O^6 of the shank O^4 of the plunger O, Fig. 19, is passed between the lips O^7 of the hook O′ until the points of the lips O^7 are interlocked in the slot O^5 in the shank O^4 of the plunger O. When the lips O^7 of the hook O′ are closed in the slot O^5, the nut P is taken off the end of the hook O′, and the hook O′ and plunger O, held by the hook O′, are passed through the cavities J K into the cavity L of the gate H, when the nut P is passed into the cavity L and is screwed upon the end of the hook O′ until it bears against the shoulder in the cavity L, formed by the cavity K, the head O^2 of the plunger O, Figs. 18, 19, being thereby drawn into the ring N, Figs. 12, 18. The nut P, when secured on the end of the hook O′ in the cavity L, holds the hook O′, plunger O, and ring N in their respective places in and upon the gate H, Fig. 18.

At Fig. 21, R indicates the head of a needle with a fine screw-thread therein. The head R is the same diameter as the cavity L in the gate H, Fig. 22. The spur R′ has flat sides, and is of corresponding diameter to the slot connecting the cavities L and M in the gate H, Fig. 22. R^2 indicates the shaft of the needle, the shaft R^2 having a fine screw-thread thereon extending from the end where the head R is screwed on up to the small round

nut or collar R^3, which is also screwed on. The shaft R^2 continues of uniform diameter until it reaches the shoulder at R^4, when the diameter increases, and it continues with parallel sides to the point at R^5.

Fig. 22 represents a detached gate with the parts assembled, the expanding ring N, Fig. 12, with needle, Fig. 21, surrounded by a spiral spring, Q, and plunger O, Fig. 23. J indicates a cavity extending from the face H^2 of the gate H, Fig. 22, to the cavity K, and is of a little greater length and diameter than the body O^3 of the plunger O, Fig. 23. The cavity K extends from the cavity J to the cavity L, and is of a little greater diameter than the shank O^4 of the plunger O, Fig. 23. The cavity L extends from the cavity K through the end H^3 of the gate H, Fig. 22, and is of a little greater diameter than the nut P on the end of the shank O^4 of the plunger O, Fig. 23. The cavity M extends into the end H^3 of the gate H, and is connected at the top with the cavity L by a slot to admit the passage of the spur R′ of the needle, Fig. 21.

At Fig. 23, O indicates a plunger having a longitudinal hole, O^5 O^6 O^7, through its center, the head O^2 having beveled sides to correspond to the inside bevel, N^6, of the ring N, Figs. 12, 22. The body O^3 of the plunger O, Fig. 23, extending from the head O^2 with parallel sides to the shank O^4, is of a little less length and diameter than the cavity J in the gate H, Fig. 22. The shank O^4 of the plunger O, Fig. 23, has parallel sides, and extends from the body O^3 a requisite length for the end with the screw-thread on for the nut P to project into the cavity L of the gate H, Fig. 22, when the head O^2 of the plunger O, Fig. 23, is inserted in and is surrounded by the ring N, Figs. 12, 22. The longitudinal hole O^5 in the head O^2 and body O^3 of the plunger O, Fig. 23, is of the same length and diameter as the shaft of the needle, Fig. 21, from R^4 to R^5. The hole O^6 extends from the hole O^5 to the hole O^7, and is of the same diameter as the shaft R^2 of the needle, Fig. 21. The hole O^6 is of any desired length, and connects the holes O^5 and O^7, Fig. 23. The hole O^7 extends from the hole O^6 through the shank O^4 of the plunger O, its diameter being a little greater than the diameter of the ring or collar R^3 on the shaft R^2 of the needle, Fig. 21, and of the spiral spring Q, Fig. 22, surrounding the shaft R^2 of the needle, Fig. 21, in the plunger O in the gate H, Fig. 22. The circular nut P on the shank O^4 of the plunger O, Fig. 23, is of a little less diameter than the cavity L in the gate H, Fig. 22.

To assemble the parts of the gate H, Fig. 22, the head R and spur R′ and ring or collar R^3 of the needle, Fig. 21, are screwed off, when the small end of the shaft R^2 of the needle, Fig. 21, is passed down the hole O^5 O^6 O^7 of the plunger O, Fig. 23, until the point R^5 of the shaft R^2 of the needle, Fig. 21, is even with the top of the head O^2 of the plunger O, Fig. 23. The small end of the shaft R^2 of the needle, Fig. 21, having a screw-thread thereon, will then project out of the end of the shank O^4 of the plunger O, Fig. 23. The spiral spring Q, Fig. 22, is then slipped on the projecting end of the shaft R^2 of the needle, Fig. 21, and is pressed up into the hole O^7 of the plunger O, Fig. 22, until it reaches the shoulder formed by the hole O^6. The ring or collar R^3 on the needle, Fig. 21, is then screwed on the shaft R^2 of the needle until it enters the hole O^7 in the plunger O, Fig. 23, and abuts against the spiral spring Q, as shown in the gate H, Fig. 22. The plunger O, Fig. 23, with the shaft R^2 of the needle, Fig. 21, and spiral spring Q, Fig. 22, is then passed into the ring N, Figs. 12, 22, and cavities J K L of the gate H, Fig. 22, until the ring N rests upon the face H^2 of the gate H, and the screw-thread end of the shaft R^2 of the needle, Fig. 21, and the shank O^4 of the plunger O, Fig. 23, project into the cavity L of the gate H, Fig. 22, when the nut P, Fig. 23, is inserted into the cavity L, the end of the shaft R^2 of the needle, Fig. 21, passing through it. The nut P is then screwed on the end of the shank O^4 of the plunger O, Fig. 23, until it bears against the shoulder formed by the cavity K in the cavity L in the gate H. The head R and spur R′ of the needle, Fig. 21, are then inserted into the cavity L and slot and cavity M in the gate H, and pressed forward against the end of the shaft R^2 of the needle, thereby contracting the spiral spring Q, Fig. 22, and pushing the point R^5 of the shaft of the needle, Fig. 21, out through the head O^2 of the plunger O, Fig. 23, when the point R^5 of the needle, Fig. 21, is screwed around, thereby causing the small end of the shaft of the needle that is in the cavity L to advance into the head R of the needle, Fig. 21, while the spur R′ of the needle rests in the cavity M and slot connecting the cavities L and M. When the pressure is withdrawn from the head R of the needle, the spiral spring Q, bearing upon the ring or collar R^3 on the shaft R^2 of the needle, forces the shaft of the needle back, so that the point R^5 of the shaft of the needle is even with the surface of the head O^2 of the plunger O, and the head R of the needle is retained within the cavity L.

Fig. 24 represents a detached gate with the parts assembled, showing the needle, Fig. 17, surrounded by a spiral spring, Q. J indicates a longitudinal hole of corresponding diameter to the shaft R^3 of the needle, Fig. 17, and extending from the face H^2 of the gate H to the cavity K. K indicates a cavity of a little greater diameter than the head R of the needle, Fig. 17, and extending from the hole J through the end H^3 of the gate H. The rear part, L, of the cavity K is connected with the cavity M by a slot of proper diameter to admit the passage of the spur R′ of the head R of the needle, Fig. 17. The cavity M in the gate H is of corresponding diameter to the catch G^5 of the bolt, Fig. 16, and of desired depth to allow the movement of the spur R′

of the needle, Fig. 17, and the catch G^5 of the bolt, Fig. 16, to enter as far as required.

To assemble the parts of the gate H, Fig. 24, the spiral spring Q is passed into the cavity K L until it reaches the shoulder formed by the small hole J. The point of the shaft R^2 of the needle, Fig. 17, is then inserted into the cavity K L and passed through the spiral spring Q into the hole J until it is even with the face H^2 of the gate, and the rear end of the spiral spring Q bears against the head R of the needle while the spur R′ is in the cavity M and slot connecting the cavities L and M. The screw *s′* is then screwed through the side near the end H^3 of the gate until its point projects into the cavity L in rear of the head R of the needle, Fig. 17, so as to prevent the spiral spring Q from forcing the needle out of the gate.

Fig. 25 represents a metallic cartridge-case of corresponding diameter to the bore of the chamber C of the barrel A A, Figs. 1, 2, 3. N^{10}, Fig. 25, indicates the base. N^{12} N^{12} indicate the beveled sides corresponding to the bevel C′ of the end of the cartridge-chamber C, Figs. 1, 2, 3. N^{13} N^{13} indicate the parallel sides of equal diameter to the chamber C of the barrel A A, Figs. 1, 2, 3. N^{14}, Fig. 25, indicates the bore into which the detonating wafer, powder, and ball are inserted. N^{15} indicates a vent-hole through the bottom or base N^{11}, extending into the bore N^{14}, to allow the passage of the point of the shaft R^2 of the needle, Fig. 17, into the detonating-wafer set into the bottom of the bore N^{14}.

At Fig. 26 are represented the barrel A A B C C′ and breech-connection D D D′ D′ D^2 D^3 D^4 D^5, Figs. 1, 2, 3, with the cap-cone E in dots in the cone-seat on the side of the jacket D D, E, and T, detached from the stock A^2 A^2 and trigger V, Figs. 1, 2, 3. F F, Fig. 26, indicate a channel in the bottom of the bridge D′ D′ D^2 and bolt-seat D^3 of the breech-connection, of greater length but of same breadth and depth as the slide part G G of the bolt, Fig. 30. Extending upward from the channel F F, Fig. 26, into the bolt-seat D^3, is a perpendicular cavity, F′ F′, of the same diameter as the sides of the standard G^4 of the bolt, Fig. 30. The height of the cavity F′ F′, Fig. 26, corresponds to the height of the standard G^4 from the slide part G G to the shoulder at G^5, Fig. 30. The cavity F′ F′, Fig. 26, is of sufficient length to permit the standard G^4, Fig. 30, to move backward and forward when the slide part G G is in the channel F F, Fig. 26. F^2 F^2, Fig. 26, indicate a longitudinal hole through the center of the bolt-seat D^3, the bottom of the said hole F^2 F^2 being connected by the cavity F′ F′ with the channel F F. The diameter of the hole F^2 F^2 corresponds to the diameter of the catch part G^6 of the bolt, Fig. 30, which is another form or arrangement of the device represented in Figs. 1, 2, 3, 15, and 16, being formed of two separate parts, instead of an individual or one single piece.

At G G G′ G^2 G^3 G^4 G^5 G^6 G^7, Fig. 26, is represented a bolt, as shown at Fig. 30. G G indicates the slide part of the bolt, which is of less length than the channel F F, Fig. 26, but of the same breadth and depth as the channel F F, Fig. 26. On the bottom of the slide G G, Figs. 26, 30, is a spur, G′, formed to fit between the jaws V′ V^2 of the trigger V, Figs. 1, 2, 3. Through the slide G G, Figs. 26, 30, there is a round or oval hole, G^2, and slot G^3, as shown at G^2 G^3, Fig. 25. The standard G^4 of the bolt, Fig. 30, is of the same diameter as the diameter of the cavity F′ F′ in the bolt-seat D^3, Fig. 26. The height of the standard G^4, Fig. 30, from the slide part G G to the shoulder at the top G^5, is the same as the height of the ends of the cavity F′ F′ from the channel F F to the longitudinal hole F^2 F^2, Fig. 26. The top G^5 of the standard G^4 of the bolt, Figs. 26, 30, is of less diameter than the lower part, G^4, and is of the same length as the depth of the hole G^7 in the catch G^6 of the bolt, Figs. 26, 30. Therefore when the catch G^6 of the bolt, Figs. 26, 30, is passed into the longitudinal hole F^2 of the bolt-seat D^3, Fig. 26, and the standard G^4, Fig. 30, is inserted into the cavity F′ F′, Fig. 26, until the top G^5, Fig. 30, of the standard G^4 enters the hole G^7 in the catch G^6, and the slide G G rests in the channel F F, Fig. 26, the metallic plates *g g′* are secured to the bottom of the bridge D′ D′ D^2 and bolt-seat D^3 by screws, to retain the slide part G G and standard G^4 in their places, and to permit their own movement, and thereby that of the catch part G^6, whenever a pressure is applied upon the front or back of the spur G′, Fig. 26, by the jaws V′ V^2 of the trigger V, as at G′ V′ V^2, Figs. 1, 2, 3.

At Fig. 26, H indicates a gate hinged to the jacket D by the hinge-pin I. The face H^2 of the gate H abuts against the breech of the barrel A A and jacket D D. The end H^3 of the gate H is slightly curved, to correspond to the front of the bolt-seat D^3. J indicates a cavity of uniform diameter extending from the face H^2 into the gate H as far as required, to admit the plunger O and swivel O′, Fig. 27. K^2, Fig. 26, indicates a cavity in the top of the gate H, corresponding in diameter to the head of the screw L′, the lower part, K^3, of the cavity K^2 being smaller, with a screw-thread therein corresponding to the diameter and screw-thread of the screw L′. The point of the screw L′ is rounded, so as to move back the swivel O′ when forced down upon the oblique end of the slot O^9, Figs. 4, 5, of the swivel O′. M, Fig. 26, indicates a cavity in the gate H, of proper depth and diameter in the end H^3 of the gate H to admit the entrance into it of the catch G^6 of the bolt. N indicates the ring, Fig. 12, and is held upon the face H^2 of the gate H by the plunger O, which is held in the cavity J of the gate H by the swivel O′ being held back in the cavity J by the screw L′ bearing upon the oblique end of the slot O^9 in the swivel O′.

At Fig. 27, O indicates a plunger with swivel

O′ detached. O^2 indicates the head of the plunger O, the sides of the head O^2 being beveled to correspond to the inside bevel, N^6 N^6, of the ring N, Figs. 12, 26. O^3 indicates the body of the plunger O, Fig. 27, the diameter of the body O^3 being the same as the diameter of the hole N^4 of the ring N, Figs. 11, 12, 26, but less than the diameter of the cavity J in the gate H, Fig. 26, the length of the body O^3 of the plunger O, Fig. 27, being half an inch, more or less, according to the depth of the cavity J in the gate H, Fig. 26. O^4, Fig. 27, indicates the shank of the plunger O. The shank O^4 is of less diameter than the body O^3 and of any desired length, with a slot, O^5, extending from the body O^3 nearly the whole length of the shank O^4, thereby forming a solid portion of metal, as at O^6, connecting the two sides of the shank O^4, formed by the slot O^5. The swivel O′ is of the same diameter as the cavity J in the gate H, Fig. 26, and of such length as to allow a space between its end and the end of the cavity J, as at O′ J, Fig. 26. The swivel O′, Fig. 27, has a longitudinal cavity, O^7, of the same length but of greater diameter than the shank O^4 of the plunger O. The plunger O being passed through the ring N, Figs. 12, 26, the shank O^4 of the plunger O, Fig. 27, is inserted into the cavity O^7 of the swivel O′ when the pin O^{10} is passed through one side O^8 of the swivel O′, and through the slot O^5 in the shank O^4 of the plunger O, and then through the other side O^8 of the swivel O′, thereby securing the plunger O and the swivel O′ together, when the swivel O′, Fig. 27, is inserted into the cavity J of the gate H, Fig. 26, and the screw L′ is screwed into the cavity K^2 K^3 of the gate H until the point of the screw L′ presses upon the oblique or rear end of the slot O^9 of the swivel O′, the screw L′ thereby forcing the swivel O′, with the plunger O attached, back into cavity J of the gate H, while the ring N is held upon the face H^2 of the gate H by the head O^2, Fig. 27, of the plunger O, Figs. 26, 27.

At Fig. 26, T^2 indicates a spiral spring set in the rear of the slide G G of the bolt, Figs. 26, 30, in the channel F F in the bolt-seat D^3, Fig. 26, the spiral spring T^2 being intended for the purpose of pressing forward the bolt G G G^4 G^6, Figs. 26, 30, when the gate H is shut down, so that the catch part G^6 of the bolt, Figs. 26, 30, will be pressed into the cavity M of the gate H, as shown at G^6 M, Fig. 26. The spring U U′ U^2 U^3, Fig. 26, is the same and operates the same as the spring U U′ U^2 U^3, Figs. 1, 2, 3.

Fig. 28 represents a detached gate, H, with the parts assembled by the ring N, Figs. 12, 28, and plunger O with swivel O′, Figs. 28, 29. At Fig. 28, H′ indicates the hinge-joint of the gate H. H^2 indicates the face of the gate H. H^3 indicates the end of the gate H. J indicates a cavity of uniform diameter extending into the gate H from the face H^2 as far as required. K^2 K^3 indicate a cavity in the gate H for the screw L′, the upper part, K^2, of the cavity K^2 K^3 being of greater diameter than the lower part, K^3, so as to admit the head of the screw L′. The lower part, K^3, of the cavity K^2 K^3 has a screw-thread therein corresponding to the screw-thread on the screw L′. L′ indicates a screw, the point being rounded or beveled off, so as to bear obliquely upon the front edge, O^9, of the swivel O′. M indicates a cavity extending into the end H^3 of the gate H, of corresponding diameter to the catch G^5 of the bolt, Figs. 1, 2, 3, 16, and G^6, Figs. 26, 30, and of sufficient depth to admit of its entering as far as required. N, Fig. 28, indicates the ring N, Fig. 12, and is held upon the face H^2 of the gate H, Fig. 28, by the plunger O, which is held in the cavity J of the gate H by the swivel O′ being held back in the cavity J of the gate H, by the point of the screw L′ bearing upon the round or front edge, O^9, of the swivel O′.

At Fig. 29, O represents a plunger with a swivel, O′, detached. O^2 indicates the head of the plunger O, the sides of the head O^2 of the plunger O being beveled to correspond to the inside bevel, N^6 N^6, of the ring N, Figs. 12, 28. O^3 indicates the body of the plunger O, Fig. 29, the diameter of the body O^3 being the same as the diameter of the hole N^4 of the ring N, Figs. 11, 12, 28, but of less diameter than the diameter of the cavity J in the gate H, Fig. 28. The length of the body O^3 of the plunger O, Fig. 29, is half an inch more or less, according to the depth of the cavity J in the gate H, Fig. 28. O^4, Fig. 29, indicates the shank of the plunger O, Figs. 28, 29. The shank O^4 is of less diameter than the body O^3 of the plunger O and the hole O^7 through the swivel O′, and of sufficient length to project throughout the length of the swivel O′. The shank O^4 has a slot, O^5, of desired length cut through it, commencing near the end O^6, and extending up toward the body O^3, the end O^6, remaining solid, holds the two sides of the slot O^5 together. The swivel O′ is of the same diameter as the cavity J in the gate H, Fig. 28, and of desired length, so as to allow a space between it and the rear of the cavity J, as at O′ J, Fig. 28. The swivel O′, Fig. 29, has a cavity, O^7, throughout its length. The said cavity O^7 is of greater diameter than the shank O^4 of the plunger O. The plunger O being passed through the ring N, Figs. 12, 28, the shank O^4 of the plunger O, Figs. 28, 29, is inserted into the cavity O^7 at O^9 of the swivel O′, and is pushed through the cavity O^7 of the swivel O′ until the end O^6 of the shank O^4 of the plunger O projects through the swivel O′, when the pin O^{10} is pressed through one side O^8 of the swivel O′, and through the slot O^5 of the shank O^4 of the plunger O, and then through the opposite side at O^8 of the swivel O′, thereby securing the plunger O and swivel O′ together. The swivel O′, with plunger O attached, as above described, is then inserted into the cavity J of the gate H, Fig. 28, and the screw L′ is screwed into the cavity K^2 K^3 of the gate H until the point of the screw L′ bears upon the round or oblique edge O^9 of

the swivel O′, the screw L′ thereby forcing the swivel O′, with the plunger O, back into the gate H until the ring N, Figs. 12, 28, bears upon the face H^2 of the gate H in consequence of the head O^2 of the plunger O, Figs. 28, 29, being retained within the ring N, Figs. 12, 28, by the bevel N^6 N^6 inside the ring N.

In the operation of my improvements, the gate H is thrown upward and over by pressing forward toward the muzzle of the gun the finger part V^5 of the trigger V, as shown at Fig. 2. The jaw V′ of the trigger V presses against the front of the spur G′ on the bottom of the slide G G of the bolt, Figs. 1, 2, 3, 26, thereby causing the bolt to move back toward the butt of the stock A^2 A^2, contracting the spring T, Figs. 1, 2, 3, as shown at T, Fig. 2, and freeing the cavity M of the gate H, Figs. 1, 2, 3, of the catch part G^5 of the bolt. The jaw V′ of the trigger V, Figs. 1, 2, 3, having moved back the bolt G G G^2 G^3 G^4 G^5 by pressing against the spur G′, as at G′ V′, Fig. 2, the round or oval hole G^2 through the slide part G G of the bolt, Figs. 1, 2, 3, is brought under the hole D^2 through the bridge D′ D′ of the breech-connection, freeing the shoulders of the round or oval part U′ of the elbow U′ U^2 of the spring U from the restraint caused by the slot G^3 through the slide G G, and enabling the elbow U′ U^2 of the spring U to be forced up through the hole G^2 through the slide G G of the bolt and hole D^2 through the bridge D′ D′ of the breech-connection with sufficient force to throw the gate H upward and over, so as to expose the breech of the chamber C of the barrel A A, Figs. 1, 2, 3, as shown at Fig. 2. While at the gate H is thrown up, the round or oval part U′ of the elbow U′ U^2 of the spring U continues projecting into the cavity in the stock A^2 A^2 left vacant by the gate H. The round or oval part U′ of the elbow U′ U^2 of the spring U, when thus projecting through the hole D^2 of the bridge D′ D′ and hole G^2 of the slide G G of the bolt, as shown at Fig. 2, prevents the spring T or jaw V^2 of the trigger V from pressing forward the bolt, in consequence of the diameter of the slot G^3 of the slide G G of the bolt being less than the diameter of the round or oval part U′ of the spring U, thereby also preventing the trigger V at V^4, Figs. 1, 2, 3, from raising the sear *a* of the lock, so as to cause the hammer *b′* to fall, as shown at Fig. 2. The charge or cartridge being inserted into the cartridge-chamber C, the gate H is thrown back into its place, the ring N fitting into the beveled end C′ of the chamber C. The gate H presses down the elbow U′ U^2 of the spring U until the top part, U^2, of the spring U is within the hole D^2 of the bridge D′ D′, and hole G^2 of the slide G G of the bolt. The shoulders of the top U^2 of the elbow U′ of the spring U being then below the bottom of the slide G G of the bolt, the spring T presses forward the bolt so that the catch G^5 of the bolt is pressed into the cavity M of the gate H, as shown at Fig. 1.

If the cartridge is charged with detonating matter, no percussion-cap is necessary to be used upon the cone E; nor is it necessary to raise the hammer *b′* of the lock, as the catch G^5 of the bolt G G G^2 G^3 G^4 G^5 presses forward the needle R through the plunger O, by pressing against the spur R′ of the needle R, when the jaw V^2 of the trigger V drives forward the bolt by pressing against the back of the spur G′ of the bolt, by the finger part V^5 of the trigger V being drawn back toward the butt of the stock A^2 A^2, as shown at Fig. 3, the point of the shaft R^2 of the needle R being thereby forced through the detonating-wafer into the powder *l* of the cartridge *l m*, causing it to explode. The explosion of the cartridge *l m* forces the plunger O back, so as to cause the ring N to expand at the breech *c′*, thereby preventing any escape of gaseous matter at the breech. The spiral spring Q expands again as soon as the pressure is withdrawn from the finger part V^5 of the trigger V, Fig. 3, and causes the needle R R′ R^2 to resume its original position, as shown at Fig. 1.

If cartridges are used without having detonating matter in the end thereof, then the ordinary percussion-caps are used upon the cone E, the hammer *b′* being raised, the part V^4 of the trigger V, Figs. 1, 2, 3, raises the sear *a* of the lock, as shown at Fig. 3, causing the hammer *b′* to fall upon and explode the cap upon the cone E, forcing the fire from the cap through the vent-hole of the cone E, and through the vent-hole through the jacket D and barrel A into the cartridge-chamber C at C^2, Figs. 1, 2, 3. In this use of the gun it is not necessary to detach the needle R R′ R^2 from the gate, as the trigger V at V^4 raises the sear *a* of the lock, while the needle is pressed forward by the catch G^5 of the bolt G G G^2 G^3 G^4 G^5, as shown at Fig. 3.

By drawing out the hinge-pin I, the gate H, Figs. 1, 2, 3, 26, can be withdrawn from the breech-connection, and any one of the detached gates, H, with their parts assembled, as shown at Figs. 4, 8, 13, 18, 22, 24, 28, can be substituted.

The advantages which I claim for my improvements are as follows: The breech-connection, as shown at D D D′ D′ D^2 D^3 D^4 D^5, Figs. 1, 2, 3, 26, may be made either a part of a gun-barrel or attachable thereto by screw-threads, as shown at A′ D^5, Figs. 1, 2, 3, 26, in the latter case making the altering of ordinary muzzle-loading fire-arms to my plan a simple and cheap operation, as the only change necessary is the withdrawal of the breech-screw from the old barrel and the substitution of the screw-thread A′ on the breech end of the barrel, so as to screw the barrel into the jacket, as at A′ D^5, and the countersinking of the breech-bore of the barrel, as at C′, to correspond to the beveled sides N^5 N^5 of the ring N, Fig. 12. The breech-connection is then let into the old stock, the lock and mountings of the old stock remaining the same, with the exception of the trigger, which is replaced by that shown at V V′ V^2 V^3 V^4 V^5, Figs. 1, 2, 3.

The expanding ring, Fig. 12, and plunger, Fig. 6, and its several modifications, as shown and described, operating, as they do, one within the other, prevent any escape of gaseous matter, and permit the use of different kinds of fixed ammunition or the use of loose powder and ball, either by inserting at the muzzle or breech.

The mode of securing the gate down before the charge can be exploded is quite simple and effectual, the trigger having always to move forward the bolt into the gate before the needle or the sear of the lock can move, so as to cause the discharge.

The facility of using the gun as muzzle or breech loader is a great advantage, and the simple means by aid of the screw *d* preventing or admitting the gate being thrown up at the option of the gunner overcomes an objection heretofore urged against breech-loading guns by military men.

Having described the nature, construction, operation, and advantages of my improvements, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The construction of a gun-barrel, or part of a gun-barrel, having a hinge-joint, as shown at I, upon the fixed breech-connection D D D′ D′ D^2 D^3 D^4 D^5, Figs. 1, 26, with the channel F F, Figs. 1, 26, and cavities F′ F′, Fig. 1, and the cavities F′ F′ F^2 F^2, Fig. 26, within the fixed breech-connection, substantially as described and set forth.

2. The peculiar construction of the gates H, formed with the cavities J K K′ L M, Figs. 1, 4, 8, 13, 18, 22, 24, and of the gates H, hinged at I, formed with the cavities J K^2 K^3 M, Figs. 26, 28, and operating substantially as shown at Figs. 1, 2, 3, 26, as hereinbefore described and set forth.

3. The adjustable plungers O, whether made solid, as represented in Fig. 7, or perforated longitudinally for the introduction of a needle, as shown in Figs. 1, 2, 3, and 6, and their equivalents, Figs. 5, 9, 14, 19, 23, 27, and 29, constructed and operating substantially as specified.

4. The bolts represented in Figs. 15, 16, and 30, constructed and operating substantially as set forth.

5. The spring U, Figs. 1, 2, 3, and 26, constructed, arranged, and operating substantially as specified.

6. The peculiar or equivalent form of needle-head R R′, as represented in Figs. 10, 17, and 21, constructed and operating as and for the purpose described.

7. The peculiarly-formed trigger V, Figs. 1, 2, and 3, constructed, arranged, and operating as set forth.

8. The combination of the nut P, or its equivalent screw, L′, with the plungers O, for the purpose set forth.

9. In combination with a fixed breech-connection, the springs T, Figs. 1, 2, and 3, and T^2, Fig. 26, constructed, arranged, and operating as and for the purpose described.

10. The screw or pin *d* or its equivalent, in combination with the trigger V and bolts, Figs. 16 and 30, constructed, arranged, and operating as described.

11. The combination, in a fire-arm, of a perforated plunger with a needle, substantially in the manner and for the purpose described.

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