M. HERMSDORF.

RECOIL GUN.

APPLICATION FILED MAY 3, 1909.

987,462.

Patented Mar. 21, 1911.

3 SHEETS—SHEET 1.

Fig. 1.

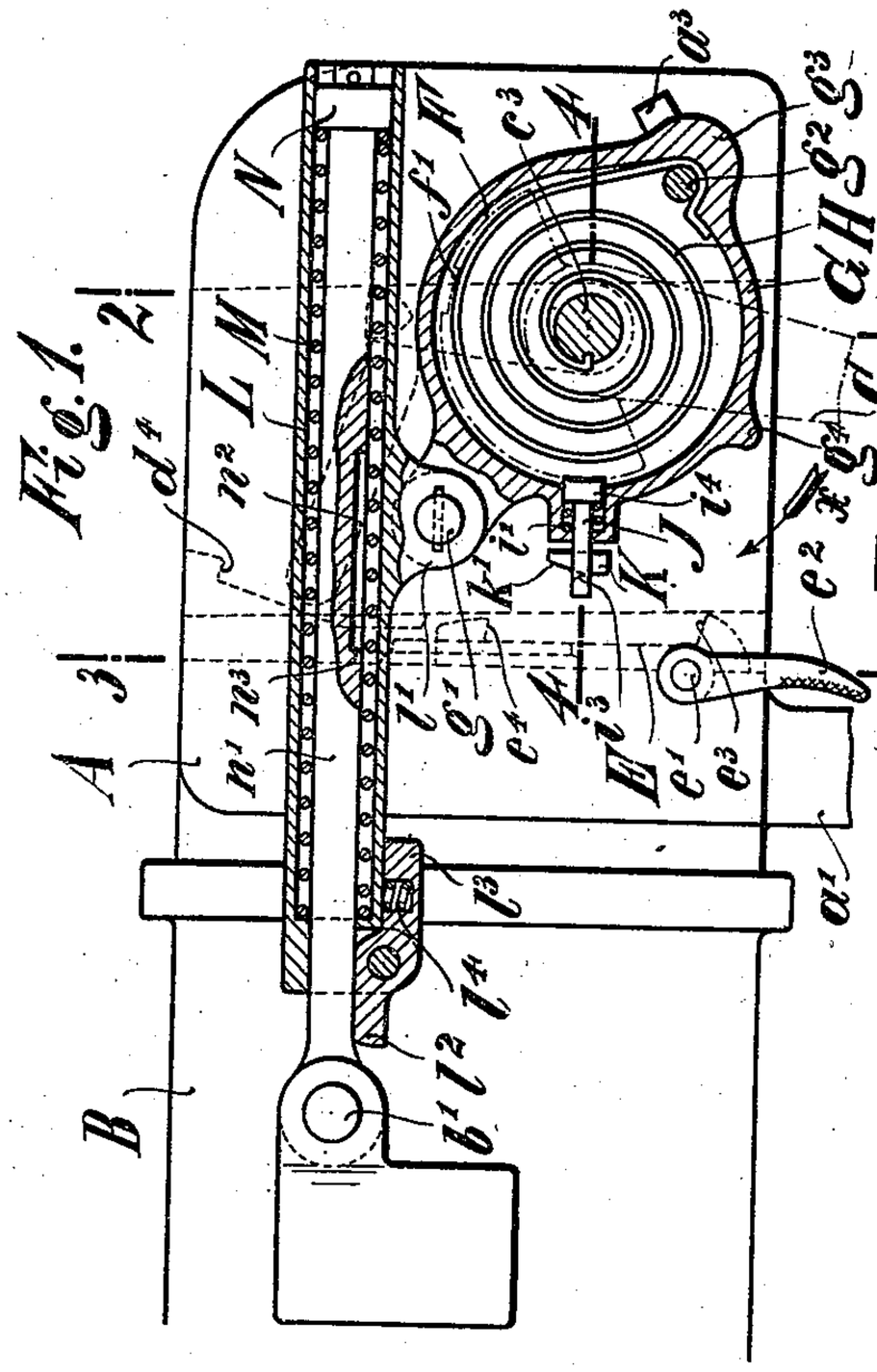


Fig. 5.

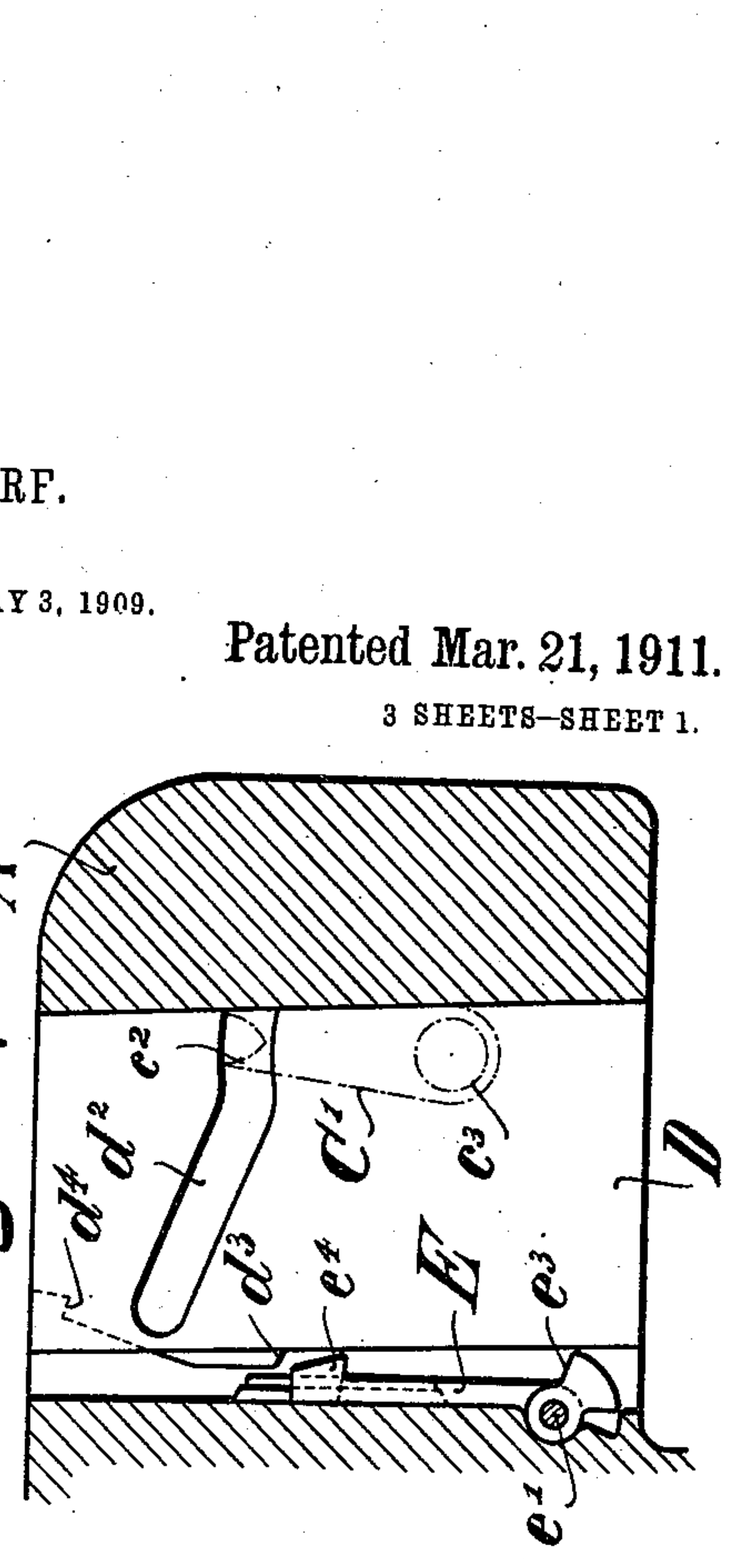


Fig. 4.

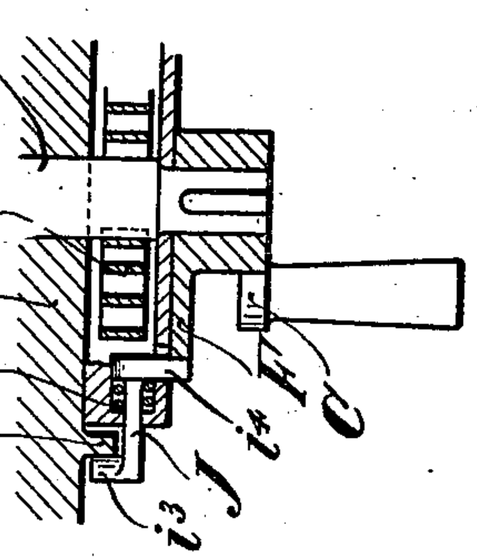


Fig. 2.

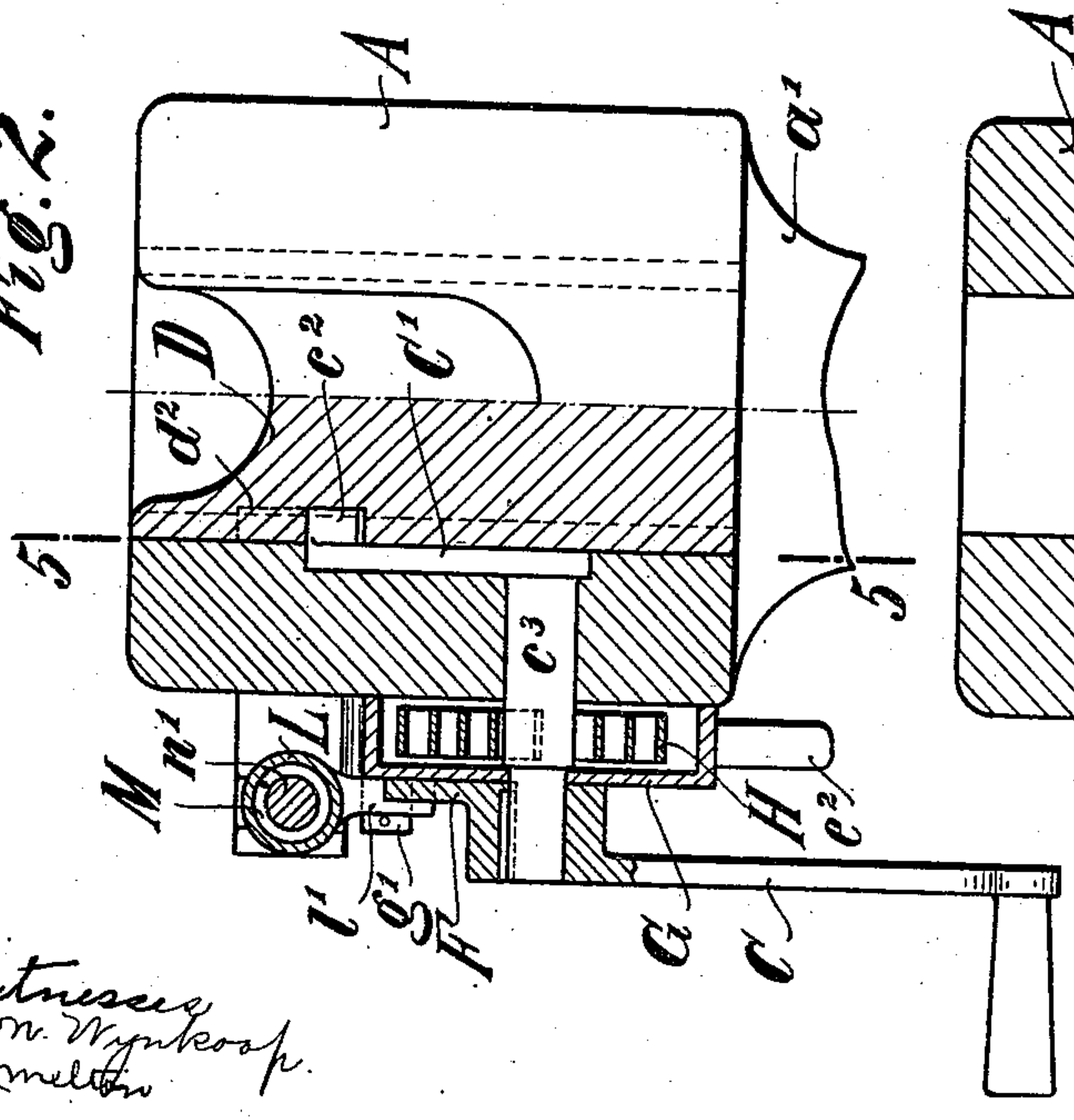
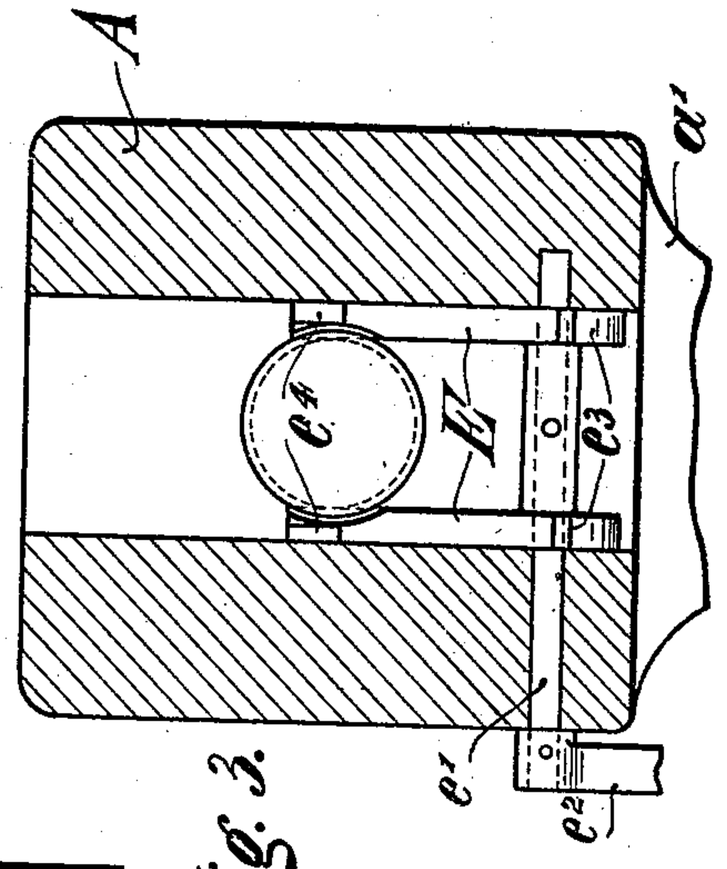


Fig. 3.



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3 SHEETS—SHEET 2.

Fig. 6.

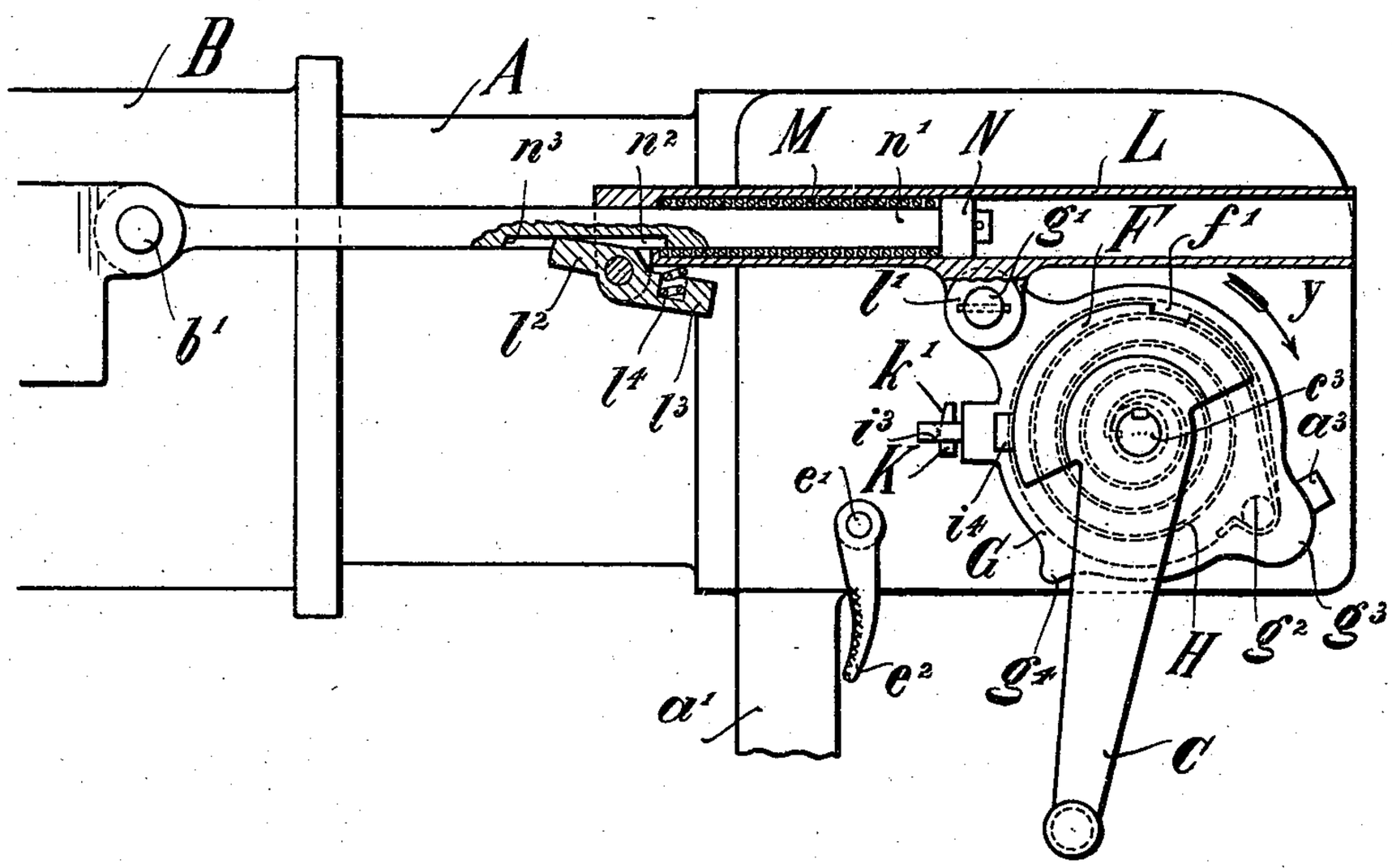
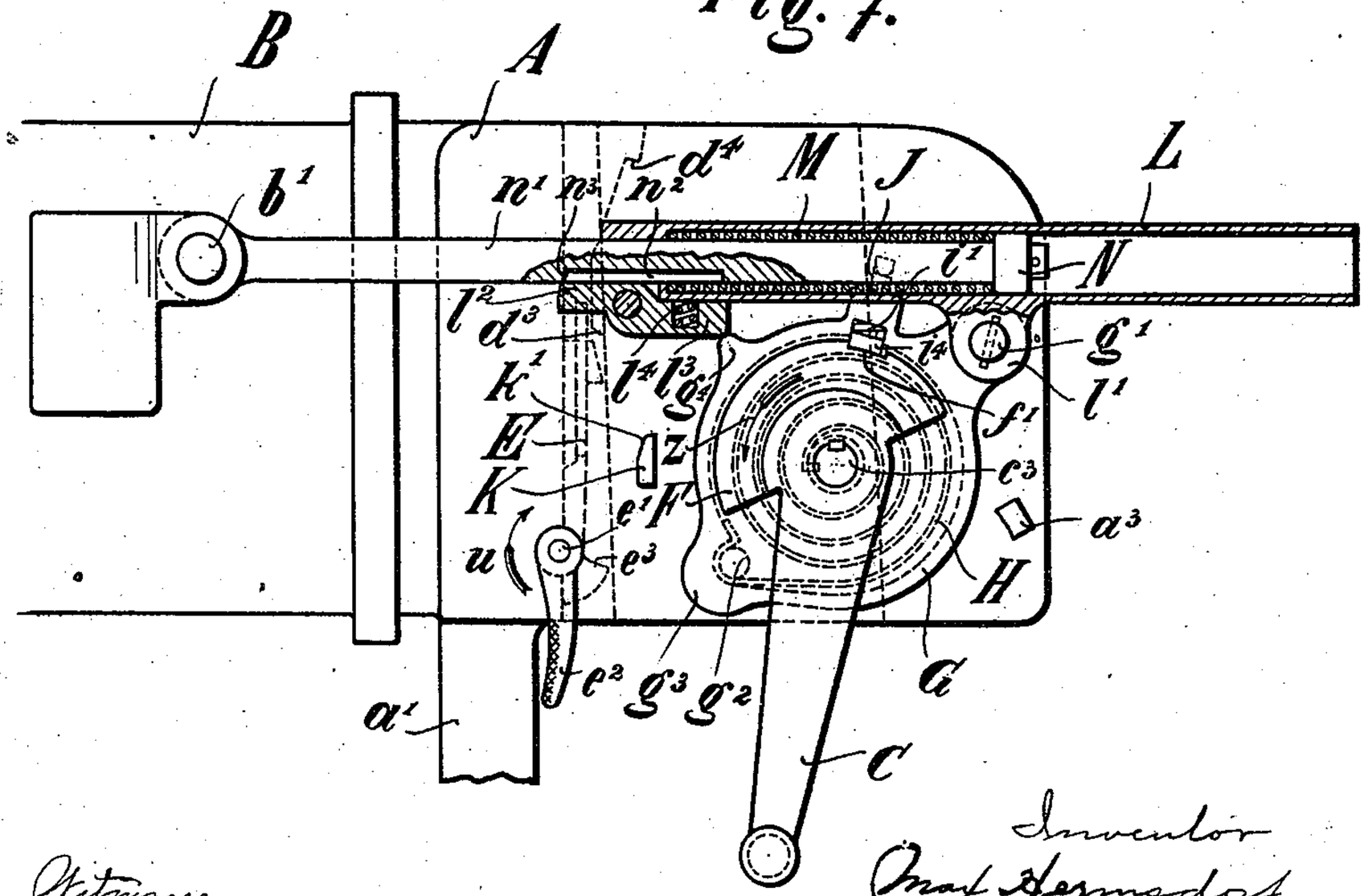


Fig. 7.



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3 SHEETS—SHEET 3.

Fig. 8.

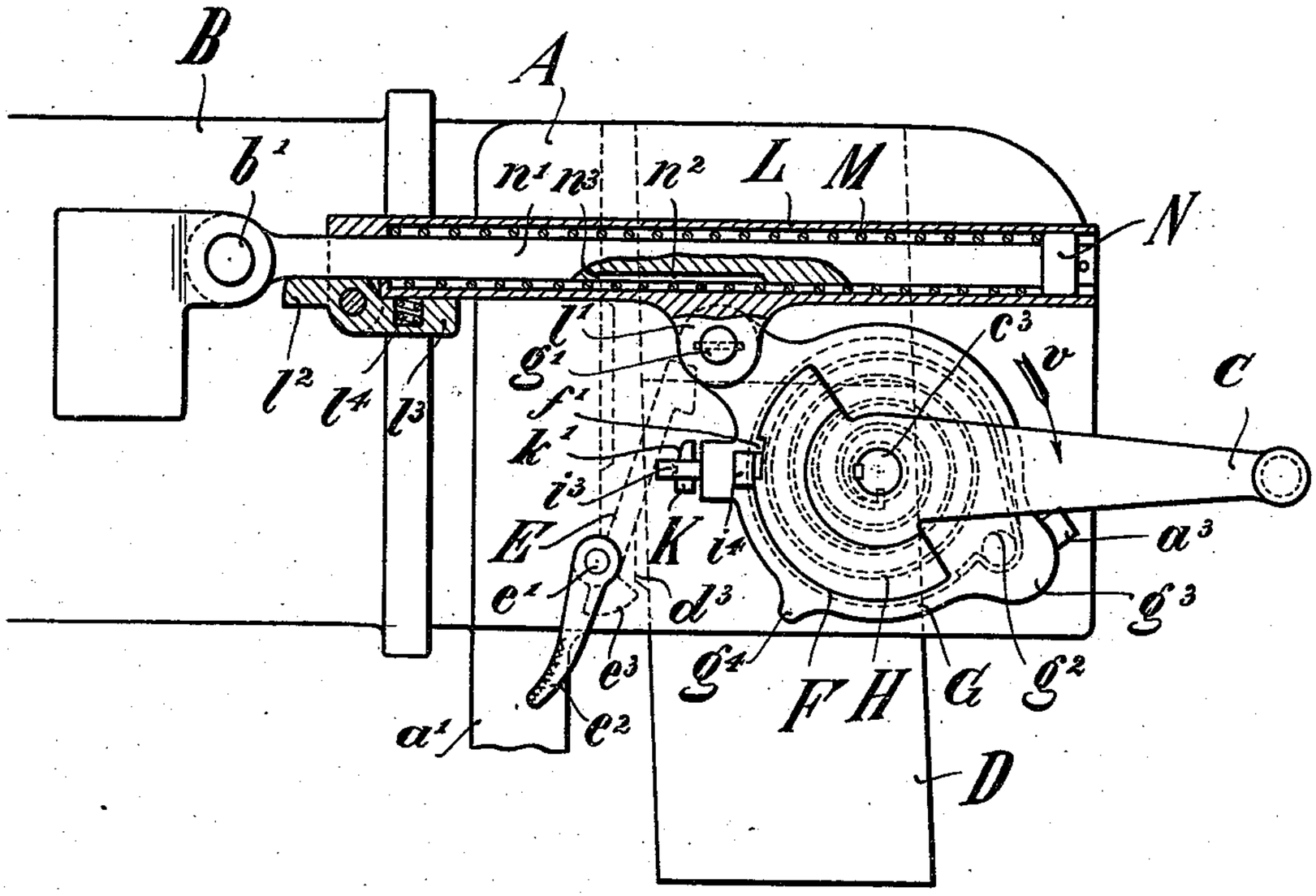
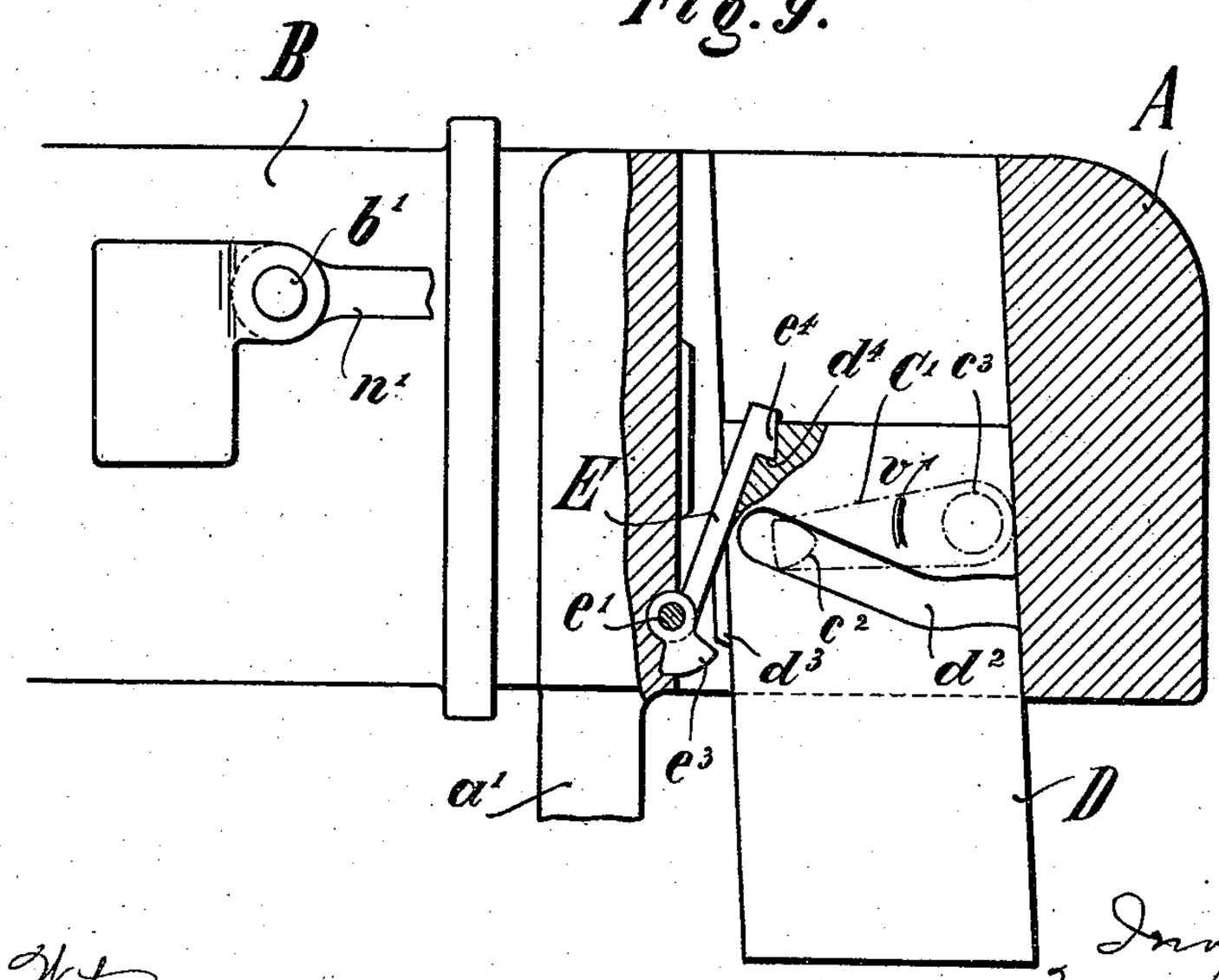


Fig. 9.



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UNITED STATES PATENT OFFICE.

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RECOIL-GUN.

987,462. Specification of Letters Patent. **Patented Mar. 21, 1911.**

Application filed May 3, 1909. Serial No. 493,700.

To all whom it may concern:

Be it known that I, MAX HERMSDORF, a subject of the Emperor of Germany, and a resident of 16 Goethestrasse, Essen-on-the-Ruhr, Germany, have invented certain new and useful Improvements in Recoil-Guns, of which the following is a specification.

The present invention relates to the type of recoil guns which has, in addition to the recuperator, two accumulators of which one opens and the other closes the breech-closure.

The invention consists in arranging the accumulators in such a manner that the recoiling gun-barrel stores energy in one of the accumulators and the counter-recoiling gun-barrel stores energy in the other accumulator.

One embodiment of the invention is shown in the accompanying drawings, by way of example.

Figure 1 is a side view, partly in section, of the parts of the gun to which the invention relates, the several parts being shown in the positions which they assume when the gun-barrel is in firing position and the closure is closed, Fig. 2 is a rear view of Fig. 1, partly in section on line 2—2, Fig. 1, Fig. 3 is a section on line 3—3, Fig. 1, looking from the right. Fig. 4 is a section on line 4—4, Fig. 1, looking from above. Fig. 5 is a section on line 5—5, Fig. 2, looking from the left. Fig. 6 is a side view corresponding to that shown in Fig. 1, but showing the parts in the positions which they assume when the gun-barrel has completed its recoil. Fig. 7 is a side view corresponding to that shown in Fig. 1, but showing the parts in the positions which they assume when the gun-barrel has completed its counter-recoil and the closure has not yet been opened. Fig. 8 is a view corresponding to Fig. 7 but showing the closure opened, and, Fig. 9 is a view corresponding to Fig. 8 with some parts broken away.

The gun-barrel A is mounted to slide in the cradle B and is connected, through the medium of its horn a^1, with the recoil-brake (not shown) and with the recuperator (not shown). The recoil-brake and the recuperator may be of any suitable known construction. The closure is a vertical wedge-closure. The closure is opened and closed through the medium of an operating lever CC^1 which has its shaft c^3 journaled in the breech of the gun-barrel (Fig. 2). The arm C^1 of the operating lever is provided with a heart-shaped lug c^2 which engages in a curved groove d^2 in the breech block D (Figs. 2, 5 and 9). The ejector E is mounted on a shaft e^1 (Figs. 3, 5 and 9) which is journaled in the breech of the gun-barrel. The ejector is provided with noses e^3 which are capable of coöperating with strikers d^3 on the breech-block D in such a manner that the ejector is swung outwardly at the end of the downward movement of the breech-block (Figs. 8 and 9). On the end of the ejector-shaft e^1, which projects outside of the breech, is secured a lever e^2. By turning the lever e^2 the ejector can be swung by hand when the closure is opened. The upper ends of the ejector are provided with hook-shaped projections e^4 (see especially Figs. 5 and 9) which can swing into notches d^4 in the breech-block D (Fig. 9) when the ejector is swung out from its position of rest.

The devices so far described are of well-known type and therefore need not be described in detail.

That end of the nave of the arm C of the operating lever which is toward the breech is provided with a sector-shaped disk F which is provided with a notch f^1 (Figs. 6 and 8). A drum G (see especially Figs. 1, 2 and 4) is rotatably mounted on the shaft c^3 of the operating lever between the disk F and the breech. In the interior of the drum G is located a volute spring H which has its inner end engaging in a slot in the shaft c^3 of the operating lever and which has its outer end passing around a pin g^2 provided in the interior of the drum (Fig. 1). The spring H which serves for closing the closure is under initial tension and is arranged in such a manner that it tends to turn the shaft c^3 of the operating lever in the direction of the arrow x (Fig. 1) and tends to turn the drum G in the opposite direction. When the spring H is in the position of rest the drum lies with a projection g^3 against a stop a^3 on the breech (Figs. 1 and 6) while the position of the shaft c^3 of the operating lever is such that the arm C^1 of the operating lever lies against the rear wall of the breech-opening (Figs. 1 and 5). A locking device is interposed between the shaft c^3 of the operating lever and the drum G. One part

of the locking device is formed by a bolt J which is under the action of a spring i^1 (Figs. 1 and 4) and which is capable of movement in the wall of the drum G in a direction radially to the axis of the shaft c^3. The bolt J is provided with a lateral arm i^4 which projects through a slot in the plane side-wall of the drum. The notch f^1 in the disk F forms the other part of the locking device. The spring i^1 is arranged in such a manner that it forces the arm i^4 of the bolt J against the cylindrical circumference of the disk F or against the bottom of the notch f^1. However, when the parts are in the position shown in Figs. 1, 4 and 6, the bolt J cannot move under the action of its spring i^1, because, in that position, an arm i^3 of the bolt J, which extends toward the breech, lies against a stop K which is arranged on the breech and is provided with an inclined face k^1. Through the medium of a bolt g^1 the drum G is jointed to a projection l^1 on a cylinder L which is closed at one end.

In the cylinder L is located a piston N which has its piston-rod n^1 passing through the closed end of the cylinder and jointed to the cradle B through the medium of a bolt b^1. In the cylinder L is further located a helical spring M which serves for opening the closure. One end of the spring M abuts against the closed end of the cylinder L and the other end abuts against the piston N. On that end of the cylinder which is toward the cradle is arranged a latch l^2l^3 which is formed as a two-armed lever and which is adapted to coöperate with a groove n^2 in the piston-rod n^1. A spring l^4 forces the arm l^2 of the latch against the piston-rod n^1 or against the bottom of the groove n^2. To move the latch l^2l^3 out of groove n^2 when it engages therein (Fig. 6) a nose g^4 is provided on the drum G.

Directly before the gun is fired the several parts assume the positions shown in Figs. 1 to 5. After the gun is fired the gun-barrel recoils in the cradle B and due to the connection between the cylinder L and the drum G the cylinder is carried along by the gun-barrel while the piston N is held stationary by the cradle B. Tension is therefore imparted to the opening spring M. Toward the end of the recoil-movement of the gun-barrel the arm l^2 of the latch l^2l^3 snaps into the groove n^2 in the piston-rod n^1 and slides along the bottom of the groove until the recoil is completed. At the end of the recoil the parts assume the relative position shown in Fig. 6. The location and the length of the groove n^2 are selected in such a manner that, on the one hand, the arm l^2 of the latch can snap into the groove also when the recoil is somewhat shorter than normal and, on the other hand, it can remain in engagement with the groove when the recoil is a little longer than normal, which may be the case when the gun is fired at great elevations.

On counter-recoil the cylinder L first moves forwardly with the gun-barrel and the spring M expands until the arm l^2 of the latch l^2l^3 comes into engagement with the front end-wall n^3 of the groove n^2 of the piston-rod n^1. As soon as this engagement is effected the cylinder L is held stationary by the piston rod n^1 which abuts against the cradle. The spring M is therefore held against further expansion and, during the further counter-recoil of the gun-barrel, the cylinder L forms a fixed abutment for the drum G which consequently is turned in the direction of the arrow y (Fig. 6) during the entire further counter-recoil and tension is thereby imparted to the closing spring H. When the drum G commences to turn the arm i^3 of the bolt J leaves the stop K of the gun-barrel. During the further turning movement of the drum G the arm i^4 of the bolt J slides on the cylindrical circumference of the disk F and at the end of the turning movement it snaps into the notch f^1 in the disk F, and thereby couples the drum G to the shaft c^3 of the operating lever so that the spring H is prevented from expanding. While the drum turns the cylinder L and the parts which it contains swing about the bolt b^1.

Directly before the turning movement of the drum G is completed the nose g^4 of the drum hits the arm l^3 of the latch l^2l^3 and turns the latch in such a manner that the arm l^2 of the latch passes out of the groove n^2 in the piston-rod. The parts then assume the relative position shown in Fig. 7 and the gun-barrel is again in the firing position. The opening spring M now expands and pushes the cylinder L over the piston N toward the cradle B and the drum G and the shaft c^3 of the operating lever which is coupled thereto are consequently turned in the direction of the arrow z (Fig. 7) to the position shown in Fig. 8 and the breech-block is moved downwardly through the medium of the arm C^1 of the operating lever, that is the closure is opened. While this takes place, the closing spring H remains under tension because the drum G is coupled to the shaft c^3 of the operating lever by the locking device i^4 f^1. Toward the end of its downward movement the breech-block hits with its strikers d^3 against the noses e^3 of the ejector E and thereby causes the ejector to be turned suddenly in the direction of the arrow u (Fig. 7) so that the ejector throws out the empty cartridge-shell. While the ejector turns in this manner the projections e^4 on the ejector swing into the notches d^4 in the breech-block. Toward the end of the last-named turning movement of the drum G, which causes the closure to be

opened, the arm i^3 of the bolt J hits the inclined face k^1 of the stop K and slides along the same and the arm i^4 of the bolt J is thereby withdrawn from the notch f^1 in the disk F. The withdrawal of the arm i^4 from the notch f^1 takes place at the same time as the projections e^4 of the ejector enter the notches d^4 in the breech-block. As soon as the arm i^4 has left the notch f^1 the closing spring H becomes liberated and tends to turn the shaft c^3 of the operating lever in the direction of the arrow v (Figs. 8 and 9) and consequently tends to elevate the breech-block through the medium of the arm C^1 of the operating lever. However, this operation is immediately arrested, that is the closure remains open, as the bottom of the notches d^4 abut against the projections e^4 on the ejector. The several parts then assume the position shown in Figs. 8 and 9.

When loading takes place, the ejector E is turned back into its original position (Figs. 1 and 5) by the rim of the cartridge-shell, and the projections e^4 on the ejector are thereby moved out of engagement with the notches d^4 in the breech-block. There is now nothing to prevent the closing spring H from expanding. The shaft c^3 of the operating lever is turned by the expanding closing spring H in the direction of the arrow v (Figs. 8 and 9) and the arm C^1 of the operating lever effects the closing of the closure. When the closure is closed, the parts again assume the position shown in Figs. 1 to 5. If the open closure is to be closed without loading the ejector E is turned back to its initial position by means of the lever e^2 (Fig. 8) thus causing the projections e^4 of the ejector to move out of engagement with the notches d^4 in the breech-block.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent, is:—

1. A recoil-operated gun having independently of its recuperator two accumulators one of which is adapted to open and the other of which is adapted to close the breech-closure, and connections through which said accumulators are directly tensioned by and on the recoil and counter-recoil movements respectively of the gun-barrel.

2. In a recoil gun, the combination with the gun-barrel and its breech-closure, and independently of its recuperator, of an accumulator adapted to open the closure, a second accumulator adapted to close the closure, means whereby energy is stored in one of said accumulators directly by the gun-barrel on recoil, and means whereby energy is stored in the other accumulator directly by the gun-barrel on counter-recoil.

3. In a recoil gun, the combination with the gun-barrel and its breech-closure, and independently of its recuperator of an accumulator adapted to open the closure, a second accumulator adapted to close the closure, means whereby energy is stored in one of said accumulators directly by the gun-barrel on recoil, and means whereby energy is stored in the other accumulator directly by the gun-barrel on counter-recoil, one of said accumulators having its motor formed by a helical spring and the other accumulator having its motor formed by a volute spring.

4. In a recoil gun, the combination with the gun-barrel and its breech-closure, and independently of its recuperator of an accumulator adapted to open the closure, a second accumulator adapted to close the closure, means whereby one of the accumulators is tensioned directly by the gun-barrel on recoil, and means whereby the other accumulator is tensioned directly by the gun-barrel on counter-recoil, one of the accumulators being connected to a fixed part of the gun and each accumulator comprising two parts which are moved relatively to each other when the accumulator is tensioned and the accumulators being arranged in such a manner that when tension is being imparted to one accumulator it has one of its parts supported by the other accumulator.

5. In a recoil gun, the combination with the gun-barrel and its breech-closure, of an accumulator adapted to open the closure, a second accumulator adapted to close the closure, means whereby one of the accumulators is tensioned by the gun-barrel on recoil, and means whereby the other accumulator is tensioned by the gun-barrel on counter-recoil, one of the accumulators comprising a cylinder and a helical spring having one end abutting said cylinder and the other accumulator comprising a drum jointed to said cylinder and a volute spring having one end attached to said drum.

6. In a recoil gun, the combination with the gun-barrel and its breech-closure, of an accumulator adapted to open the closure, a second accumulator adapted to close the closure, means whereby one of the accumulators is tensioned by the gun-barrel on recoil, and means whereby the other accumulator is tensioned by the gun-barrel on counter-recoil, one of the accumulators comprising a cylinder and a helical spring having one end abutting said cylinder and the other accumulator comprising a drum jointed to said cylinder and a volute spring having one end attached to said drum, said springs, drum and cylinder being arranged in such a manner that the cylinder is carried along by the drum on recoil to tension the helical spring and the drum is rotated by the cylinder on counter-recoil to tension the volute spring.

7. In a recoil gun, the combination with the gun-barrel and its breech-closure, of an

accumulator adapted to open the closure, a second accumulator adapted to close the closure, means whereby one of the accumulators is tensioned by the gun-barrel on recoil, and means whereby the other accumulator is tensioned by the gun-barrel on counter-recoil, one of the accumulators comprising a cylinder and a helical spring having one end abutting said cylinder and the other accumulator comprising a drum jointed to said cylinder and a volute spring having one end attached to said drum, said springs, drum and cylinder being arranged in such a manner that the cylinder is carried along by the drum on recoil to tension the helical spring and the drum is rotated by the cylinder on counter-recoil to tension the volute spring, a locking device being provided for the accumulator containing the helical spring, and the drum being provided with a projection adapted to automatically withdraw said locking device when the tensioning of the volute spring is completed.

8. In a recoil gun, the combination with the gun-barrel and its breech closure, of an accumulator adapted to open the closure, a second accumulator adapted to close the closure, means whereby one of the accumulators is tensioned by the gun-barrel on recoil, and means whereby the other accumulator is tensioned by the gun-barrel on counter-recoil, one of the accumulators comprising a cylinder and a helical spring having one end abutting said cylinder and the other accumulator comprising a drum jointed to said cylinder and a volute spring having one end attached to said drum, said springs, drum and cylinder being arranged in such a manner that the cylinder is carried along by the drum on recoil to tension the helical spring and the drum is rotated by the cylinder on counter-recoil to tension the volute spring, a locking device being provided for the accumulator containing the helical spring, and the drum being provided with a projection adapted to automatically withdraw said locking device when the tension of the volute spring is completed, said locking device and said projection being arranged in such a manner that the opening of the closure is delayed until the gun-barrel has approximately returned to firing position.

The foregoing specification signed at Barmen, Germany, this 24th day of March, 1909.

MAX HERMSDORF.

In presence of—
OTTO KÖNIG,
WILLY KLEIN.