M. HERMSDORF.

RECOIL GUN.

APPLICATION FILED JULY 19, 1909.

1,003,106. **Patented Sept. 12, 1911.**

3 SHEETS—SHEET 1.

Fig. 1.

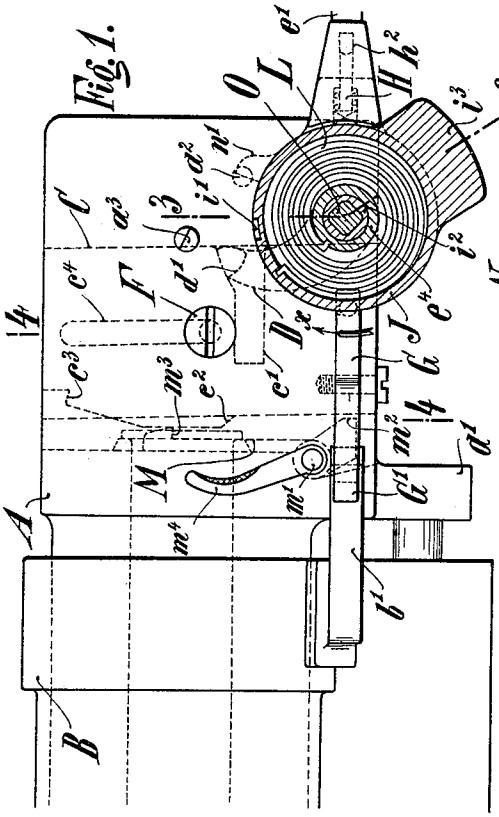


Fig. 2.

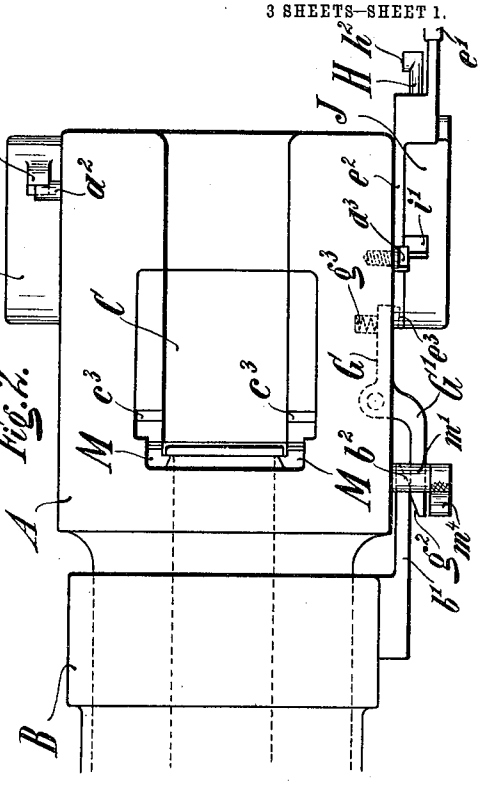


Fig. 3.

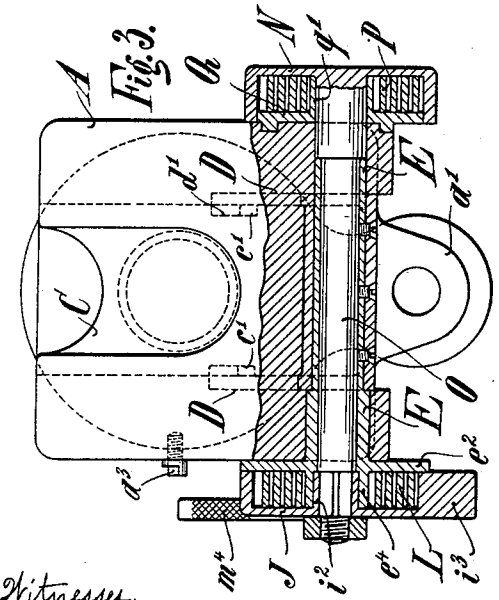
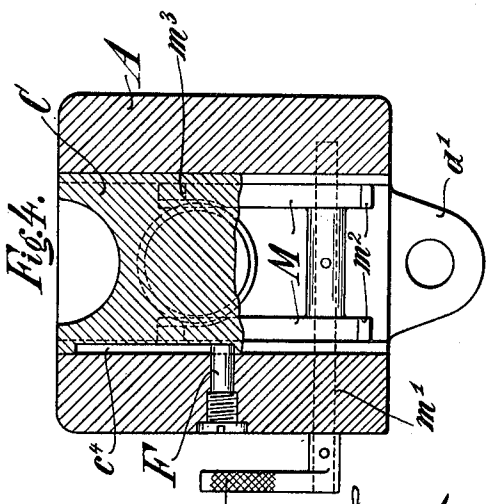


Fig. 4.



Witnesses,
J. M. Wynkoop,
C. B. Orkelton

Inventor,
Max Hermsdorf.
By Knight Bros
Attorneys.

M. HERMSDORF.

RECOIL GUN.

APPLICATION FILED JULY 19, 1909.

1,003,106.

Patented Sept. 12, 1911.

3 SHEETS—SHEET 2.

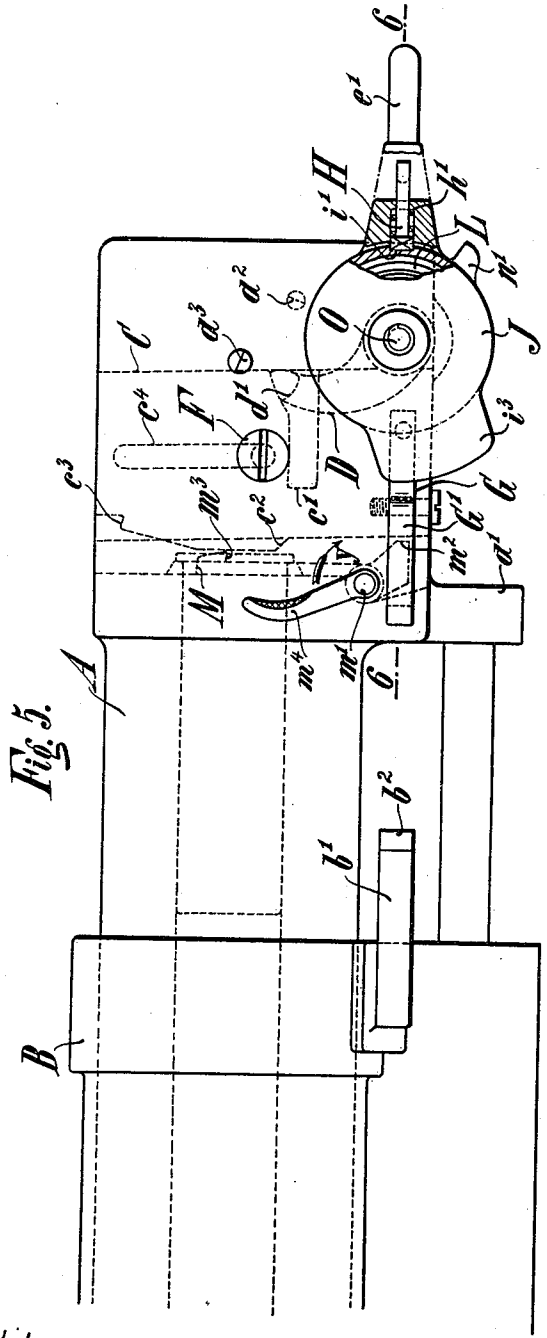


Fig. 5.

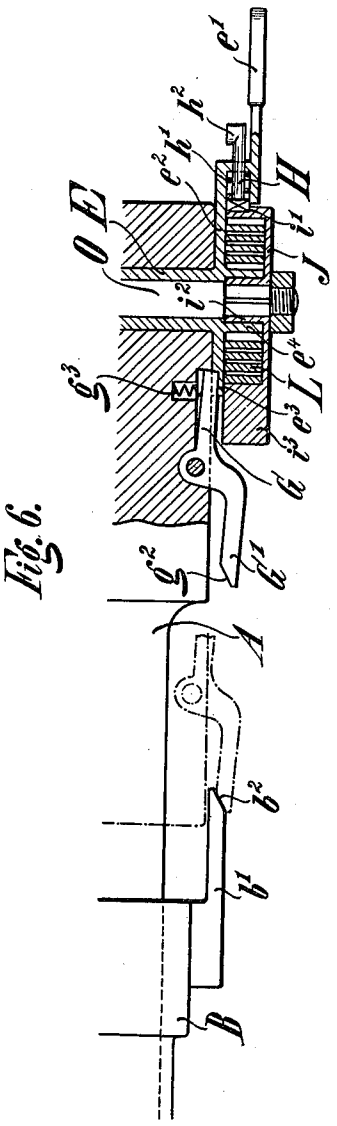


Fig. 6.

Witnesses
J. M. Skynkoop
E. B. Melton

Inventor,
By Max Hermsdorf.
Knight Bros
Attorneys

M. HERMSDORF.

RECOIL GUN.

APPLICATION FILED JULY 19, 1909.

1,003,106. **Patented Sept. 12, 1911.**

3 SHEETS—SHEET 3.

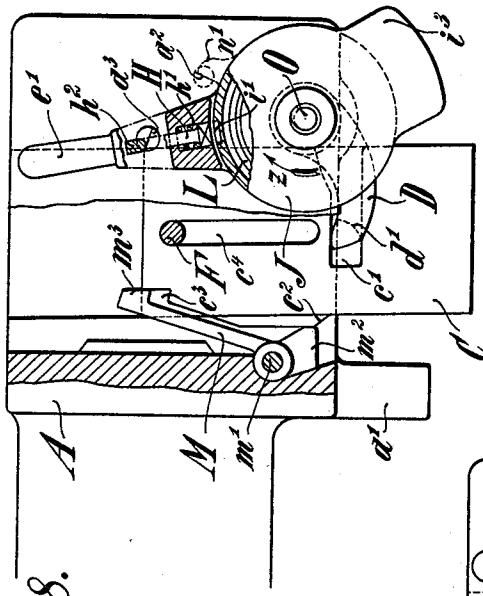


Fig. 8.

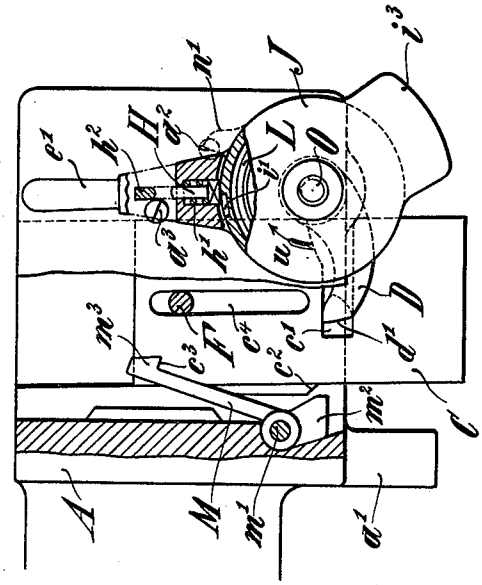


Fig. 9.

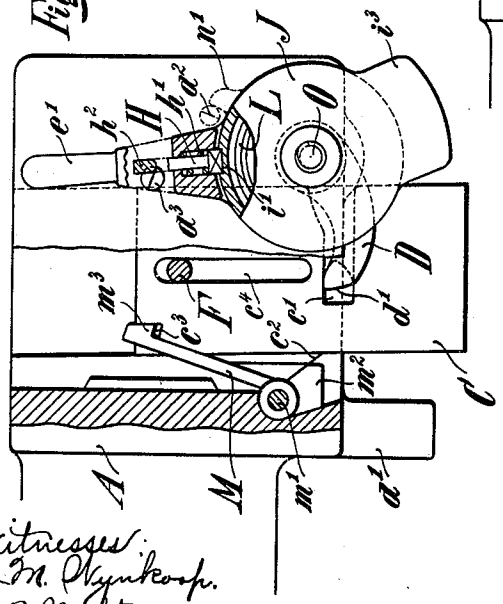


Fig. 7.

Witnesses:
J. N. Wynkoop.
C. B. Melton

Inventor.
Max Hermsdorf.
By Knight Bros.
Attorneys.

UNITED STATES PATENT OFFICE.

MAX HERMSDORF, OF ESSEN-ON-THE-RUHR, GERMANY, ASSIGNOR TO FRIED. KRUPP AKTIENGESELLSCHAFT, OF ESSEN-ON-THE-RUHR, GERMANY.

RECOIL-GUN.

1,003,106. Specification of Letters Patent. **Patented Sept. 12, 1911.**

Application filed July 19, 1909. Serial No. 508,267.

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 is provided with an accumulator for the automatic movement of the breech block.

The main feature of the invention consists in having a part of the accumulator arranged in such a manner on the gun-barrel that when the gun-barrel moves after firing the action of the inertia causes the part of the accumulator to carry out a movement relative to the gun-barrel by which movement tension is imparted to the accumulator. In this manner it is unnecessary to provide special tensioning devices which connect the accumulator with a part of the gun not partaking of the recoil and counter-recoil of the gun-barrel.

In the accompanying drawings, the invention is, by way of example, shown applied to spring-accumulators for the automatic opening and closing of the wedge-closure of a gun.

Figure 1 is a side view, partly in section, of the parts of the gun to which the invention relates, the gun being in the firing position and the closure being closed; Fig. 2 is a top view of Fig. 1; Fig. 3 is a rear view of Fig. 1, partly in section on the line 3—3, Fig. 1; Fig. 4 is a section on line 4—4, Fig. 1, looking from the right; Fig. 5 is a side view corresponding to that shown in Fig. 1, and showing the parts in the position which they assume when the gun-barrel has carried out a part of the recoil movement. Fig. 6 is a top view of Fig. 5, partly in section on line 6—6, Fig. 5, and, Figs. 7 to 9 are three side views, partly in section, of the opened gun closures, showing the parts of the closure in different positions.

The gun-barrel A, which through the medium of its horn a^1 is connected with a recoil-brake and a recuperator, is mounted to slide in the cradle B. The recoil-brake and the recuperator, which are not shown in the drawings, may be of any suitable known construction.

The closure of the gun-barrel is formed by a breech block C which is vertically slidable in the breech of the gun-barrel. The closure is opened and closed by means of two operating levers D (see especially Fig. 3) which are rigidly secured on a hollow shaft E journaled in the breech on the gun-barrel and which are provided with heart-shaped lugs d^1 which engage in curved grooves c^1 in the breech block. A bolt F (Fig. 4) which is located in the breech of the gun-barrel projects into a groove c^4 in the breech-block and limits the opening movement of the breech block (Fig. 8). On a shaft m^1, which is journaled in the breech of the gun-barrel, is mounted a bifurcated ejector M which is provided with noses m^2 which are capable of coöperating with shoulders c^2 on the breech-block in such a manner that the ejector is completely swung out before the breech-block has reached its lowermost position. The upper ends of the ejector are provided with hook-shaped projections m^3 which can swing into notches c^3 in the breech block when the breech block is near its lowermost position. By means of a lever m^4 (Figs. 1 to 5), which is secured on the shaft m^1 of the ejector, the ejector can be swung out by hand when the breech block assumes the position shown in Fig. 9.

That end of the shaft E of the operating levers which projects outside of the breech of the gun-barrel carries a hollow trunnion e^4 (Figs. 1, 3 and 6) and a disk e^2 which is provided with a handle e^1. On the side toward the breech the disk e^2 is provided with a notch e^3 (Figs. 2 and 6) into which can enter one arm G of a two-armed lever G G^1 (Fig. 6), which is journaled in the breech and which is under the action of a spring g^3. The other arm G^1 of the two-armed lever is adapted to coöperate with a striker b^1 provided on the cradle B. When the gun-barrel is in firing position the arm G^1 lies against the outer side of the striker b^1 (Figs. 1 and 2). The striker b^1 and the lever arm G^1 are provided with inclined faces b^2 and g^2 through the medium of which the lever G G^1 can be turned by the striker b^1 during the counter-recoil of the gun-barrel.

A bolt H is mounted in the handle e^1 of the disk e^2 in such a manner that the bolt can move radially relative to the axis of rotation of the disk. By means of a spring

h^1 the bolt H is pressed against the periphery of a drum J and the bolt is capable of snapping into a notch i^1 in the drum (Figs. 5 to 7). The bolt H is provided with a nose h^2 and through the coöperation of the nose h^2 with an inclined striker a^3 on the breech of the gun-barrel the bolt can again be withdrawn from the notch i^1. Through the medium of a hollow trunnion i^2 the drum is loosely rotatably journaled in the hollow trunnion e^4 of the shaft E of the operating levers (Figs. 3 and 6) and the drum serves for receiving a volute spring L which effects the closing of the closure. The spring L, which has its outer end engaging in the cylindrical wall of the drum J and has its inner end engaging in the hollow trunnion e^4 of the shaft E of the operating levers (Fig. 1), is under initial tension in such a manner that it tends to turn the operating levers D in the direction of the arrow x (Fig. 1) and tends to turn the drum J in the opposite direction. The rotation of the operating levers D is limited by the abutment of the lugs d^1 against the rear wall of the opening of the breech (Fig. 1). While the operating levers assume this position, that is while the closure is closed and locked, the notch e^3 of the disk e^2 is located opposite the lever arm G so that the arm G can enter into engagement with the notch e^3 (Figs. 2 and 6). A weight i^3, the purpose of which will presently be explained, is located on the cylindrical wall of the drum J. The weight is arranged in such a manner that, when the drum is in the position of rest (Fig. 1), the center of gravity of the drum is located below the axis of rotation of the drum.

To the hollow trunnion i^2 of the drum J is non-rotatably connected a shaft O (Fig. 3) which passes through the hollow shaft E of the operating levers and terminates on the other side of the breech where its end is formed as a drum N which contains a volute spring P which effects the opening of the closure. The outer end of the opening spring P engages in the cylindrical wall of the drum N and its inner end engages in a hollow trunnion q^1 which surrounds the shaft O. The trunnion q^1 is located on a disk Q which is non-rotatably connected with the breech of the gun-barrel. The opening spring P is under initial tension in such a manner that it tends to turn the drum N in the same direction (opposite the direction of the arrow x, Fig. 1) as the closing spring L tends to turn the drum J. A stop a^2, which is arranged on the breech and located in the path of movement of a stop n^1 on the drum N (see especially Fig. 2), serves for limiting the rotary movement of the drum N and the drum J which is non-rotatably connected therewith.

Before the gun is fired, the parts assume the position shown in Figs. 1 to 4. After the gun is fired the gun-barrel recoils in the cradle B. Directly after the commencement of the recoil movement the arm G^1 of the two-armed lever G G^1 slides away from the striker b^1 (see the position indicated in dotted lines in Fig. 6) and the spring g^3 therefore causes the arm G to enter the notch e^3 in the disk e^2 (Fig. 2) thereby preventing rotation of the disk, the handle e^1, the shaft E of the operating levers, and the operating levers D. During the first part of the recoil movement the inertia causes the drum J to turn in the direction of the arrow x (Fig. 1), as the center of gravity of the drum is located beneath the axis of rotation of the drum due to the presence of the weight i^3, and through the medium of the hollow trunnion i^2 and the shaft O the turning movement of the drum J is partaken of by the drum N. The result is that tension is imparted to the springs L and P. When the drum J has reached the position shown in Figs. 5 and 6, the bolt H snaps into the notch i^1 in the drum J. The drums J and N are then coupled to the disk e^2 and the shaft E of the operating levers through the medium of the bolt H and the notch i^1. The parts remain in the position shown in Figs. 5 and 6 during the further recoil and during the greater part of the counter-recoil. A change in this position by expansion of the springs L and P is prevented by the engagement of the arm G of the two-armed lever G G^1 in the notch e^3 of the disk e^2. Shortly before the counter-recoil is completed the arm G^1 of the two-armed lever G G^1 slides with its inclined face g^2 along the inclined face b^2 of the striker b^1 on the cradle (see the position indicated in dotted lines in Fig. 6) so that the two-armed lever G G^1 is turned against the action of the spring g^3 and the arm G is brought out of engagement with the notch e^3. The opening spring P is therefore now free to expand and through the medium of the drum N, the shaft O, the drum J, the coupling H i^1 and the disk e^2, the spring P turns the shaft E and the operating levers D in the direction opposite to the arrow x (Fig. 1) so that the closure is opened. While this takes place the closing spring retains its tension because the parts (the hollow trunnion e^4 and the drum J) in which the spring L engages are non-rotatably connected with one another by the disk e^2 and the coupling H i^1 so that they turn to the same extent when the opening spring P expands. Toward the end of the opening movement of the breech block the shoulders c^2 on the breech block C hit the noses m^2 on the ejector M, thereby suddenly turning the ejector in the direction of the arrow y (Fig. 5).

The empty shell is thus ejected. When the breech block has reached the position shown in Fig. 7, the hook-shaped projections m^3 of the ejector have swung into the notches c^3 in the breech block, and the nose h^2 on the bolt H is about to coöperate with the inclined striker a^3 on the breech of the gun-barrel. During the further descent of the breech block, that is when the parts pass from the position shown in Fig. 7 to the position shown in Fig. 8, the coöperation of the nose h^2 with the striker a^3 causes the bolt H to be withdrawn from the notch i^1 in the drum J. The upper end wall of the groove c^4 then abuts against the bolt F and the stop n^1 on the drum N abuts against the stop a^2 (Fig. 8). By reason of the disengagement of the coupling H i^1, the closing spring L has become free and it turns shaft E of the operating levers and the handle e^1 in the direction of the arrow z (Fig. 8) and elevates the breech block. These movements are, however, immediately interrupted because the lower wall of the notches c^3 of the breech block hits the hook-shaped projections m^3 of the ejector. At that moment the parts of the closure assume the position shown in Fig. 9, which is the loading position. If loading now takes place the ejector M is swung out by the base-rim of the cartridge shell to such an extent that the projections m^3 on the ejector pass out of engagement with the notches c^3 in the breech block. There is now nothing to prevent the closing spring L from expanding. While the drums J and N are held in position by the stop a^2, the shaft E of the operating levers is turned by the expanding closing spring in the direction of the arrow u (Fig. 9) and the operating levers effect the closing of the closure. When the closure is closed the parts again assume the position shown in Figs. 1 and 4. If the closure is to be closed without previous loading the operator brings the projections m^3 of the ejector out of engagement with the notches c^3 of the breech block by turning the ejector M through the medium of the lever m^4.

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

1. In a recoil gun, the combination of the gun barrel and its closure, of an accumulator for effecting the automatic movement of the closure, said accumulator being arranged on the gun barrel and having a part moved by inertia to tension the accumulator when the gun barrel moves after firing.

2. In a recoil gun, the combination with the gun-barrel and its closure, of an accumulator adapted to effect automatic movement of the closure, said accumulator comprising a volute spring and a part for imparting tension to said spring, said part being rotatably arranged on the gun-barrel and having its center of gravity located eccentric to its axis of rotation, whereby said part is rotated by inertia to impart tension to the spring when the gun-barrel moves after firing.

3. In a recoil gun, the combination with the gun-barrel, its closure and the operating shaft for the closure, of a pair of accumulators for the automatic movement of the closure, arranged one on each side of the gun-barrel, one being adapted to open the closure and the other being adapted to close the closure, each of said accumulators comprising a volute spring and a drum for imparting tension to the spring, the spring of one accumulator having its inner end secured to the gun-barrel and having its outer end secured to the drum, and the spring of the other accumulator having its inner end secured to the operating shaft and having its outer end secured to the drum, and means connecting said drums and preventing relative rotation of the drums.

4. In a recoil gun, the combination with the gun-barrel, its closure and the operating shaft for the closure, of a pair of accumulators for the automatic movement of the closure, arranged one on each side of the gun barrel, one being adapted to open the closure and the other being adapted to close the closure, each of said accumulators comprising a volute spring and a drum for imparting tension to the spring, the spring of one accumulator having its inner end secured to the gun-barrel and having its outer end secured to the drum, the spring of the other accumulator having its inner end secured to the operating shaft and having its outer end secured to the drum, and a shaft connected with the first named drum and passing through and adapted to have coupling engagement with said operating shaft and holding said drums against relative rotation.

5. An accumulator for imparting automatic movement to gun closures comprising a volute spring, a rotatable drum, and a weight carried by said drum and so disposed that the center of gravity of the drum is located eccentric to the axis of rotation thereof; said weight being operable through its inertia on the recoil of the gun barrel to tension said spring.

6. In a recoil-gun, the combination with the gun-barrel, its closure and the operating shaft for the closure, of a pair of accumulators for the automatic movement of the closure, arranged one on each side of the gun-barrel, one being adapted to open the closure and the other being adapted to close the closure, each of said accumulators comprising a volute spring and a drum for imparting tension to the spring, the spring of one accumulator having its inner end se-

cured to the gun-barrel and having its outer end secured to the drum, and the spring of the other accumulator having its inner end secured to the operating shaft and having its outer end secured to the drum, and means connecting said drums and preventing relative rotation of the drums, one of said drums being provided with a weight causing the center of gravity of the drum to be located eccentric to the axis of rotation of the drum.

7. In a recoil-gun, the combination with the gun barrel, its closure and the operating shaft for the closure, of a pair of accumulators for the automatic movement of the closure, arranged one on each side of the gun-barrel, one being adapted to open the closure and the other being adapted to close the closure, each of said accumulators comprising a volute spring and a drum for imparting tension to the spring, the spring of one accumulator having its inner end secured to the gun-barrel and having its outer end secured to the drum, and the spring of the other accumulator having its inner end secured to the operating shaft and having its outer end secured to the drum, means connecting said drums and preventing relative rotation of the drums, and means preventing premature rotation of the operating shaft in the direction to open the closure, comprising a retaining lever arranged on the gun-barrel, said lever being adapted to enter into engagement with the operating shaft at the commencement of the recoil, and a member arranged on a relatively fixed part of the gun and adapted to withdraw said lever from the operating shaft shortly before the completion of the counter-recoil.

The foregoing specification signed at Hanover, Germany, this 17 day of June, 1909.

MAX HERMSDORF.

In presence of—
E. T. HUTCHINGS,
LUISE KATHER.