No. 891,778. PATENTED JUNE 23, 1908.

L. MERTENS.

NON-RECOILING FIREARM.

APPLICATION FILED APR. 25, 1908.

3 SHEETS—SHEET 1.

Fig. 1.

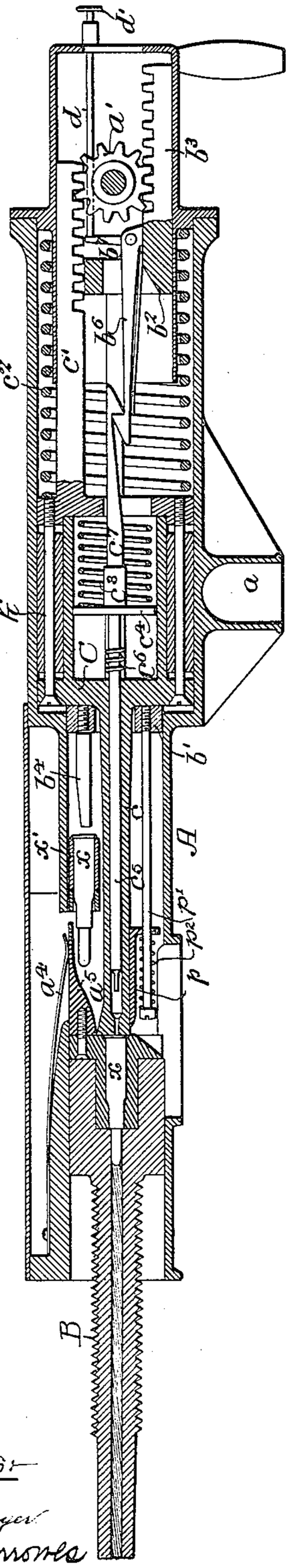
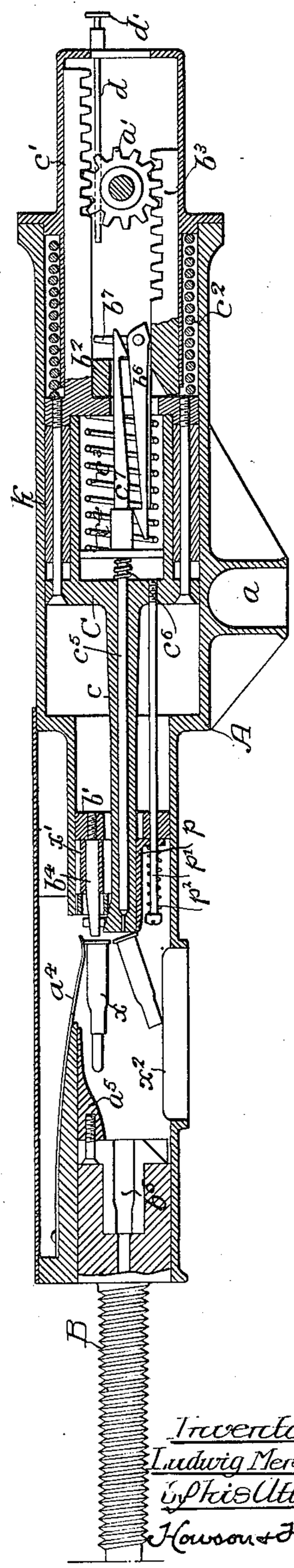


Fig. 2.



Witnesses:

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3 SHEETS—SHEET 2.

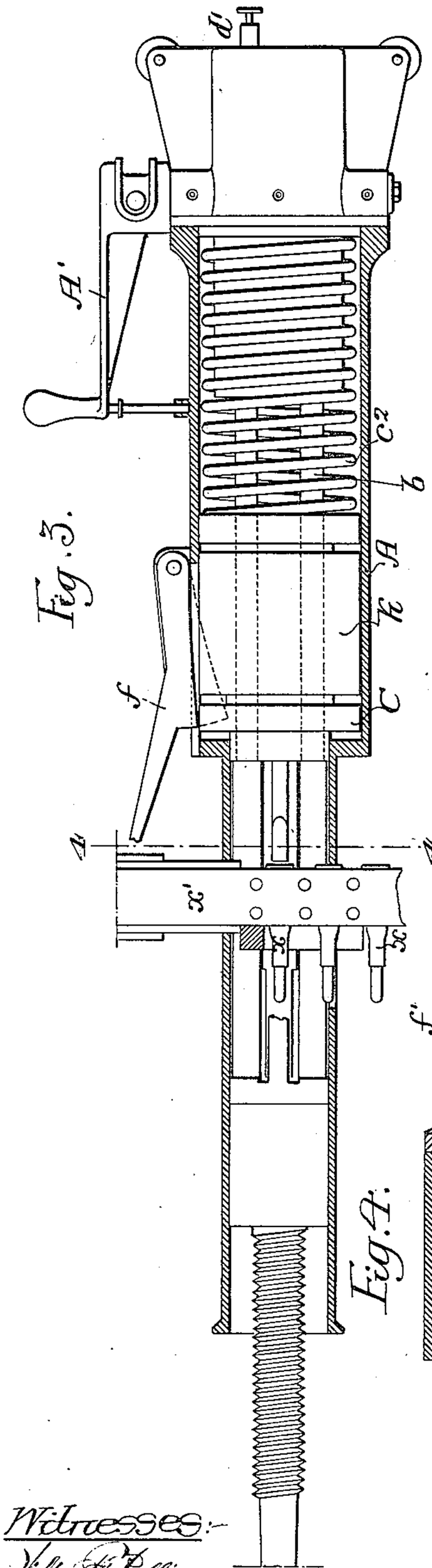

Fig. 3.

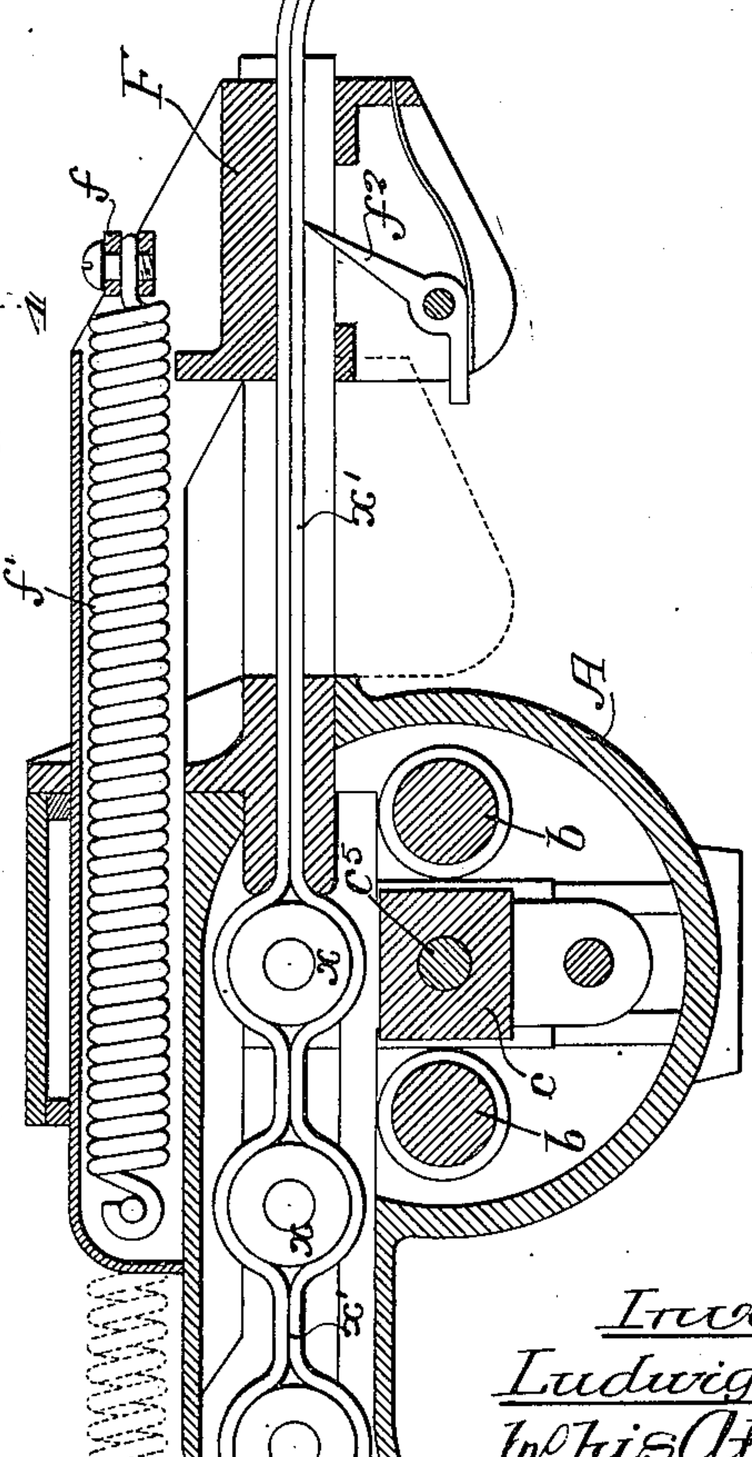

Fig. 4.

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3 SHEETS—SHEET 3.

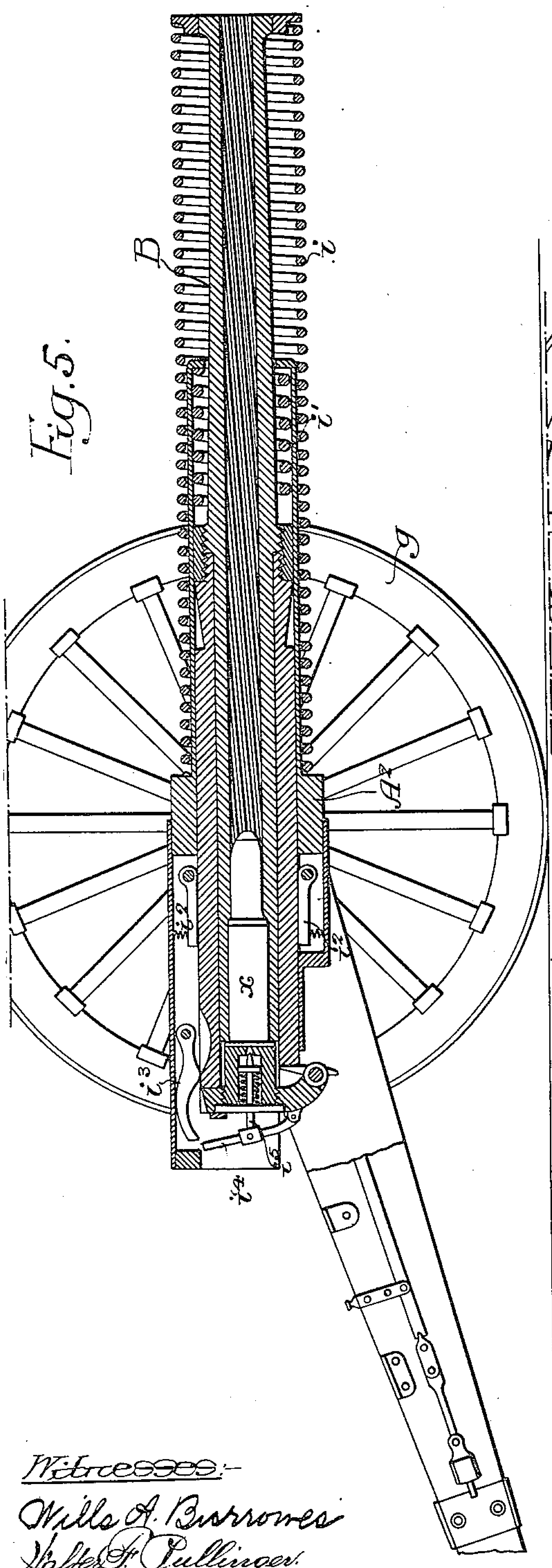

Fig. 5.

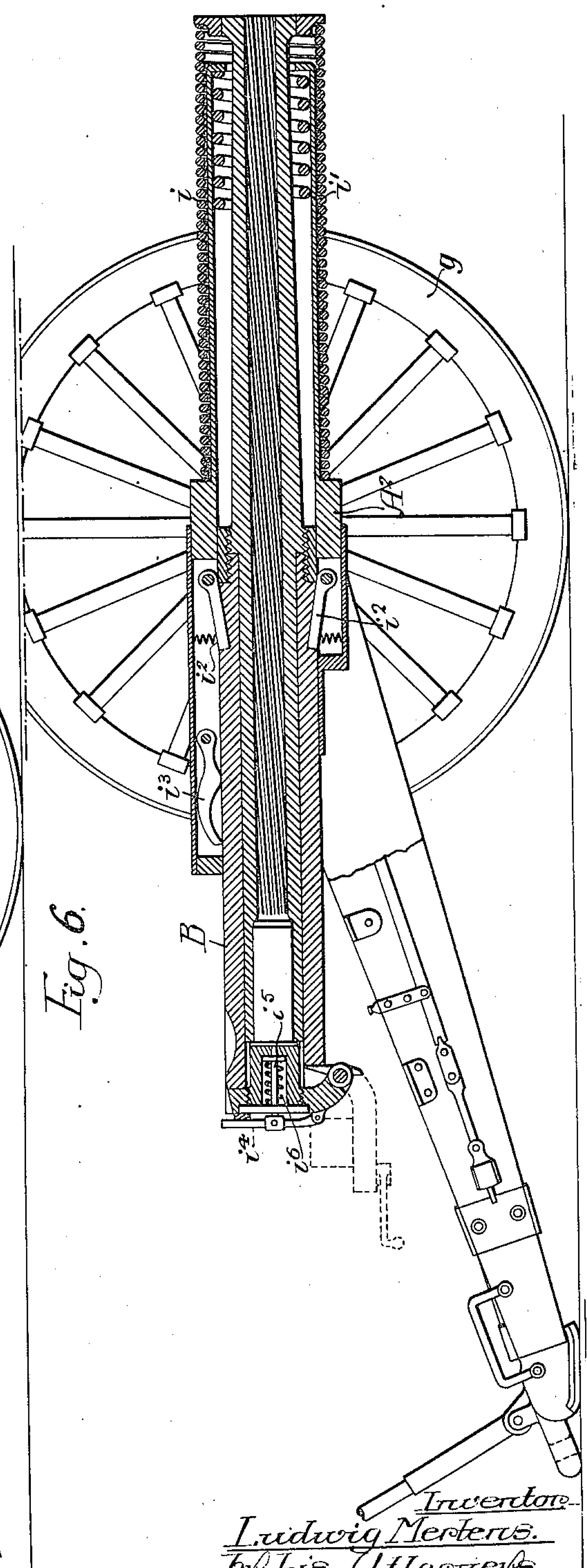

Fig. 6.

Witnesses:-

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UNITED STATES PATENT OFFICE.

LUDWIG MERTENS, OF LONDON, ENGLAND.

NON-RECOILING FIREARM.

No. 891,778. Specification of Letters Patent. Patented June 23, 1908.

Application filed April 25, 1908. Serial No. 429,245.

To all whom it may concern:

Be it known that I, LUDWIG MERTENS, a subject of the King of Prussia and the German Emperor, residing in London, England, have invented certain Improvements in Non-Recoiling Firearms, of which the following is a specification.

One object of my invention is to provide mechanism for application to fire-arms whereby the recoil of the latter, that is to say, the backward impulse imparted to it upon the firing of a charge, is absorbed partly by stopping the forward movement of certain masses and partly by the stressing of a spring or other suitable device, the idea being to avoid either altogether or to a great extent the direct effect of the recoil upon the casing or body of the weapon.

Another object of the invention is to provide recoil preventing mechanism in which the effect of the recoil is manifested only in the re-action of a spring or other device during the whole period of time from the discharge of the weapon until the final return of the parts of the fire-arm to a position ready for another shot.

It is also desired to so construct the cartridge chamber of a fire-arm that the cartridge case or shell shall not be distorted or otherwise injured by the powder gases generated at the time of a discharge.

These and other advantageous ends I secure as hereinafter set forth, reference being had to the accompanying drawings, in which Figure 1, is a vertical section of a rapid firing gun of the automatic type, showing the latter as equipped with my invention and illustrating the various parts in the positions occupied just prior to the firing of a cartridge; Fig. 2, is a vertical section of the fire-arm shown in Fig. 1, illustrating the parts in the positions occupied by them after a cartridge has been fired and while the spring is compressed to its maximum extent; Fig. 3, is a plan of the fire-arm shown in Figs. 1 and 2, certain of the parts being illustrated in section; Fig. 4, is a transverse section, on an enlarged scale, of the fire-arm taken on the line 4—4, Fig. 3; Figs. 5 and 6 are vertical sections illustrating my invention as applied to a field gun, the various parts being shown as in Figs. 1 and 2 respectively, in the positions occupied just before a charge has been fired and immediately after such firing.

Referring to Figs. 1 to 4 of the above drawings A represents the casing of a fire-arm constructed according to my invention which is provided with a cavity *a* for the reception of a standard whereby it is supported. This casing carries within it a longitudinally movable barrel B connected by two bolts *b* with an ejecting ring *b'* and a block b^2 having projecting rearwardly from it a toothed rack b^3, it being understood that both the ring and the block b^2 are suitably guided within said casing. Projecting forwardly from the ring *b'* is a finger b^4 designed to engage the rear end of the cartridges *x* in the cartridge belt *x'* so as to force these forward out of said belt into position to be engaged by the forwardly projecting part *c* of the breech block C.

In the rear of the casing A is revolubly mounted a pinion *a'* whose teeth mesh with the rack b^3 and also with the second rack *c'* which projects rearwardly from the breech block C, and there is a relatively heavy spring c^2 within the casing preferably encircling this rack and the block b^2 with its rack, as illustrated. Said spring at one end abuts against the rear end of the casing and at the other engages the rear face of the breech block C so as to at all times tend to maintain this in its most forward position. It will be understood that the two racks *c'* and b^3 are so assembled that when the first of these is in its most forward position, the latter occupies its most rearward position. Slidably mounted upon the breech block C is a part *k* which I shall designate as the hammer, while within said breech block is a spring c^3 acting upon a plate c^4 to which is attached the rear end of the firing pin c^5. Said pin extends through the tubular extension *c* of the breech block so as to be capable of engaging the primer of the cartridge properly inserted in the cartridge chamber b^5 at the rear of the barrel. The spring c^6 is placed upon the firing pin so as to exert a braking force upon the plate c^4 when this is moved forward by the spring to fire the cartridge.

Extending rearwardly from the plate c^4 is a rod c^7 having a hook designed to engage with the hooked end of a second rod b^6 pivotally mounted upon the block b^2 and there is also attached to this second hooked rod an arm b^7 capable of engaging a longitudinally movable rod *d* having a headed projection *d'* at the extreme rear of the fire-arm. Fastened to the forward end of

the casing and projecting rearwardly so as to be free to engage a cartridge as it is forced from the cartridge belt, is a flat spring a^4.

From Figs. 3 and 4 it will be understood that there is an opening in the side of the main casing A through which a pivotally mounted lever f carried by the casing is permitted to extend into and engage the longitudinally movable breech block C. This lever is connected to one end of a spring f' whose other end is connected with a slide F having a pawl f^2 capable of engaging the cartridge belt x' so as to periodically move this a predetermined distance each time the lever f is given a complete oscillation. It should be understood that the breech block with its extension c and rack c' is equal in weight to the weights of the barrel B, the bolts b, ring b', and the rack b^3, while the hammer k upon the breech block is designed to have a weight which is to the weight of the breech block and its parts c and c' as half of the cross-section of the projectile is to the difference between the cross-section of the back part of the cartridge case and said projectile.

Mounted at the front end of the extension of the breech block is a piece p for assisting in the ejection of empty cartridges from the barrel, having a downwardly projecting lug through which extends a headed rod p' fixed to said breech block. Between the head of this rod and said lug there is confined a spring p^2, which under working conditions serves to yieldingly connect said member p and said rod p'.

Under operative conditions and with the parts occupying the positions shown in Fig. 1, the forward movement of the rod d causes the hook b^6 to release the hook c^7 so that the firing pin c^5 is driven forward by the spring c^3 and so caused to engage and explode the primer of a cartridge x. As a result of the discharge of this cartridge the movable breech block under action of the pressure due to the explosion is forced backward and strikes and carries back with it the hammer k. At the same time the barrel is driven forward to a small extent by the frictional force of the projectile passing through it and also by the pressure exerted by the powder gases as well as by the force transmitted from the rack c' through the pinion a to the rack b^3 and bolts b. As a consequence the spring c^2 is compressed, and the extension c of the breech block having suitable cartridge gripping mechanism (not shown) removes the empty cartridge shell from the cartridge chamber of the barrel and delivers this upon an inclined surface x^2 so that it is expelled from the casing. At the same time the forward movement of the ring b', which as before noted is attached to the barrel b, forces a second cartridge from the belt x' and delivers it directly in front of the breech block extension c. After the projectile has left the barrel and the pressure of the powder gases in the latter is equal to the atmospheric pressure, the barrel and the breech block continue their movement apart until the spring c^2 is compressed to its maximum extent when said parts are brought to rest. Immediately thereafter the reaction of the compressed spring again forces forward the breech block C and, through the rack c' the pinion a' and rack b^3, move the barrel B to the rear. As a result the fresh cartridge, which is pressed downwardly by the spring a^4, is guided by a suitably formed piece a^5 connected to the rear end of the barrel, and is forced by the extension c of the breech block C into the cartridge chamber. The forward movement of the breech block causes the oscillation of the lever f with a consequent movement of the slide F and cartridge belt carried thereby, so that a new cartridge is brought in position in front of the finger b^4.

If the rod d be arranged to be temporarily locked in its inner position, the breech block C will at the completion of its forward movement under the action of the expanding spring c^2 cause the arm b^7 of the hook b^6 to again strike this rod so that the actuating spring of the firing pin, which was compressed as the breech block moved forwardly, is again free to expand and forces the firing pin into engagement with the primer of a second cartridge. If, however, this rod d has not been pushed inwardly, the various parts of the weapon will hold and remain in the various relative positions illustrated in Fig. 1. By means of the crank A' the pinion connecting the two racks may be operated so that the weapon may be fired at will instead of being made wholly automatic as would otherwise be the case. It is to be understood that when operating automatically the hammer k continues to move forward after the breech block C has come to rest, so that when said block is again driven to the rear by the explosion of another cartridge, it meets the forwardly moving hammer, which before it is brought to rest, absorbs a portion of the energy of recoil possessed by said breech block.

In the modified form of my invention such as would be employed when it is applied to a field gun such as illustrated in Fig. 6, I mount the main case or body A^2 of the gun upon wheels g in the well-known manner, and place within said case or body a longitudinally slidable barrel B. Between this barrel and the body is placed a relatively heavy spring i and I also place between these parts a second or braking spring i' designed to bring the barrel to rest when it has been moved under the action of said main spring i. Upon the casing or body I also mount two or any desired suitable number of locking pawls i^2 which are arranged to engage with

suitable recesses in the barrel when the spring i has been compressed to a maximum extent and which may be moved at will by any desired mechanism (not shown) to cause them to release said barrel. There is also placed upon the casing a firing pawl i^3 designed to engage a lever i^4 mounted upon the breech of the gun and having connected to it a firing pin i^5. The rear end of the barrel is provided with a cam surface designed to permit the pawl i^3 to turn on its pivot so as to engage and then release the firing pin lever i^4 which is at all times acted on by a spring i^6 tending to move it toward a cartridge.

Assuming that the various parts of the apparatus are in the positions illustrated in Fig. 6, and that there is a cartridge in the barrel ready to be fired, I move the pawls i^2 out of engagement with the barrel so as to permit this latter to move forward relatively to the casing under the action of the compressed spring i. Before the barrel, however, reaches the end of its forward movement, the firing pawl i^3 engages the firing lever i^4 and after compressing the spring i^6 releases the said firing lever so that this latter under the action of said spring, moves forward and causes the firing pin to explode the primer of a cartridge. The recoil due to such explosion is absorbed partly in stopping the forward movement of the barrel whose weight is designed to bear a definite relation to the force of explosion, and partly in again compressing the spring i. By the time this compression has reached its maximum the pawls i^2 automatically engage the recesses in the barrel B and retain said spring in its compressed position, with the various parts in place for another shot.

While I have illustrated the fire-arms provided with springs c^2 and i for resisting the movement of the various parts and restoring said parts to their normal positions after a shot, it is to be understood that any other suitable means for receiving and storing energy and afterward giving it out may be employed as a substitute.

I claim:

1. The combination in a recoil preventing device for fire arms of a casing or body, a structure movable relatively thereto, means for exploding a charge, a spring, and means for causing the recoil from said explosion to be partially absorbed in reversing the direction of motion of said movable part and partly in compressing said spring, said means being arranged to set said movable structure in motion prior to the explosion of the charge.

2. The combination in a recoil preventing device for fire arms, of a casing, a barrel movable relatively thereto, means for exploding a charge, a movable breech block, and a movable recoil absorbing piece carried thereby, said piece being given a movement by the breech block opposing that of the breech block as caused by the recoil, a spring placed to be compressed by recoil movement of the breech block, and mechanism connecting the barrel and the breech block, the weight of the barrel and its connected parts being substantially equal to that of the breech block and its parts.

3. The combination in a recoil preventing device for fire arms, of a casing, a barrel longitudinally movable therein, a gear mounted in the casing, a breech block for said barrel also movable in the casing, racks respectively connected to the barrel and to the breech block so as to permit of their movement in opposite directions under force of a recoil, said racks meshing with said gear, and means for exploding a cartridge in the barrel.

4. The combination in a recoil preventing device for fire arms, of a casing or body, a breech block movable relatively thereto, a barrel and means for exploding a charge, means for resisting movement of said breech block as caused by the explosion of the charge, a movable piece arranged to be in motion at the time of the explosion of the charge and thereby cause the force of the recoil to be partly expended upon said moving piece and partly upon said means for resisting the movement of the breech block.

5. The combination in a recoil preventing device for fire-arms of a casing, a barrel longitudinally movable therein, a breech block also movable in the casing, a piece slidably mounted upon the breech block, and means connecting the breech block and the barrel so that movement of said block to the rear causes forward movement of the barrel and vice versa, a spring placed to be compressed by rearward movement of the breech block, with means for automatically firing a succession of cartridges, the parts being so arranged that the rearward movement of the breech block under the action of an explosion occurs while the movable piece thereon is still moving forward.

6. The combination with a firearm, of a body or casing, a barrel and a breech block supported by the casing so as to be free to move in opposite directions under the action of a recoil from an explosion of a charge, a freely movable cylindrical piece mounted on the breech block for diminishing the recoil, means for automatically reloading the fire arm after an explosion of a charge, and means for automatically returning the parts to their normal positions after they have been removed therefrom.

7. The combination in a fire arm of a casing or body, a barrel and a breech block mounted thereon so as to be movable longitudinally in opposite directions under the action of a recoil from an explosion of a charge, means for braking the movement of the breech block and subsequently returning it to its normal position, with a movable struc-

ture designed to be in motion during the explosion of a charge, said motion being in a direction opposite to that of the breech block due to a recoil, and means for firing a cartridge after said structure has started to move.

8. A non-recoiling fire arm including a movable breech block, a weight slidably mounted thereon, means for firing a charge, and a spring for setting said weight in motion immediately prior to the explosion of the charge, said parts being adapted to cause the force of the recoil of such an explosion to be absorbed partially by said spring and partially in reversing the direction of motion of said weight.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

LUDWIG MERTENS.

Witnesses:
LANIA SHAPIRO,
WILLIAM GERALD REYNOLDS.