(No Model.) 5 Sheets—Sheet 1.

H. S. MAXIM.

RECOIL MECHANISM FOR GUNS.

No. 347,945. Patented Aug. 24, 1886.

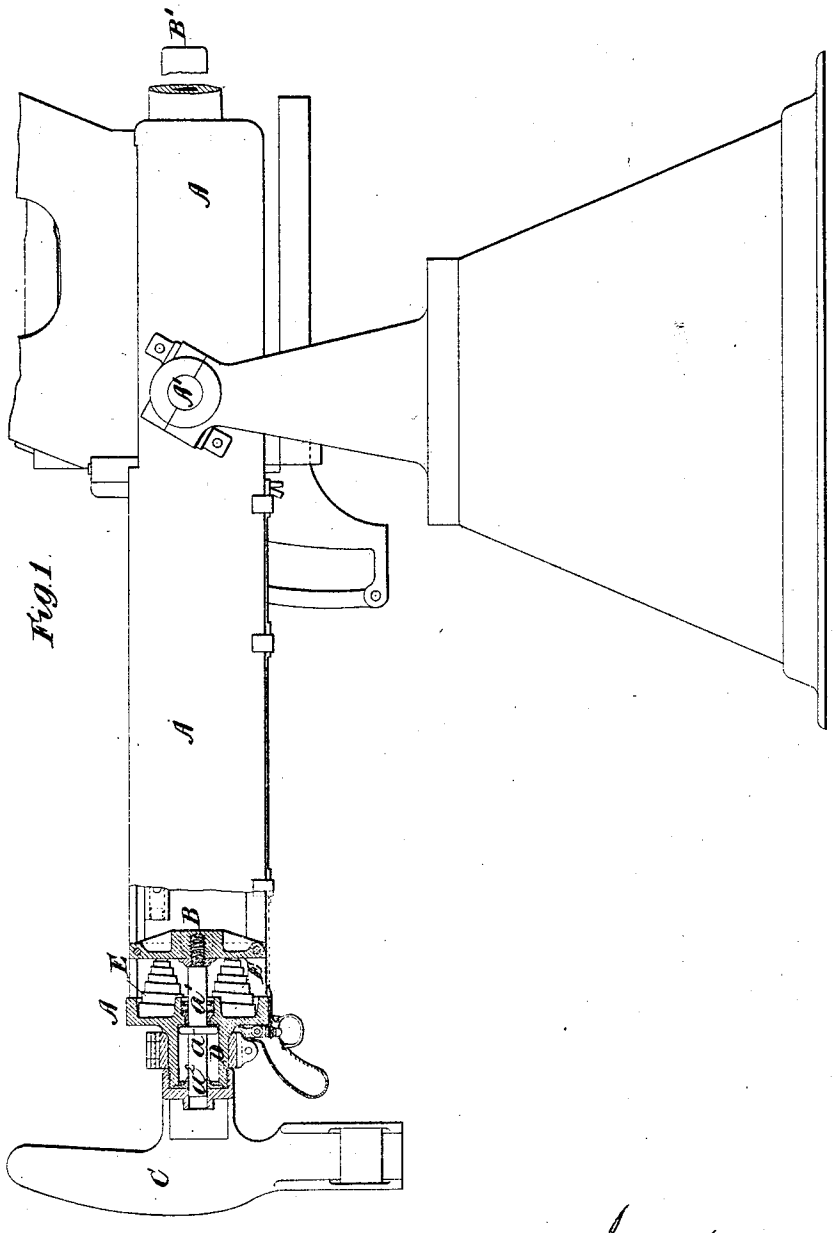


Fig. 1.

Witnesses.
J. S. Hartley
Edwin Seger

Inventor
Hiram S. Maxim
By Duncan, Curtis & Page.
Attys.

(No Model.) 5 Sheets—Sheet 2.

H. S. MAXIM.

RECOIL MECHANISM FOR GUNS.

No. 347,945. Patented Aug. 24, 1886.

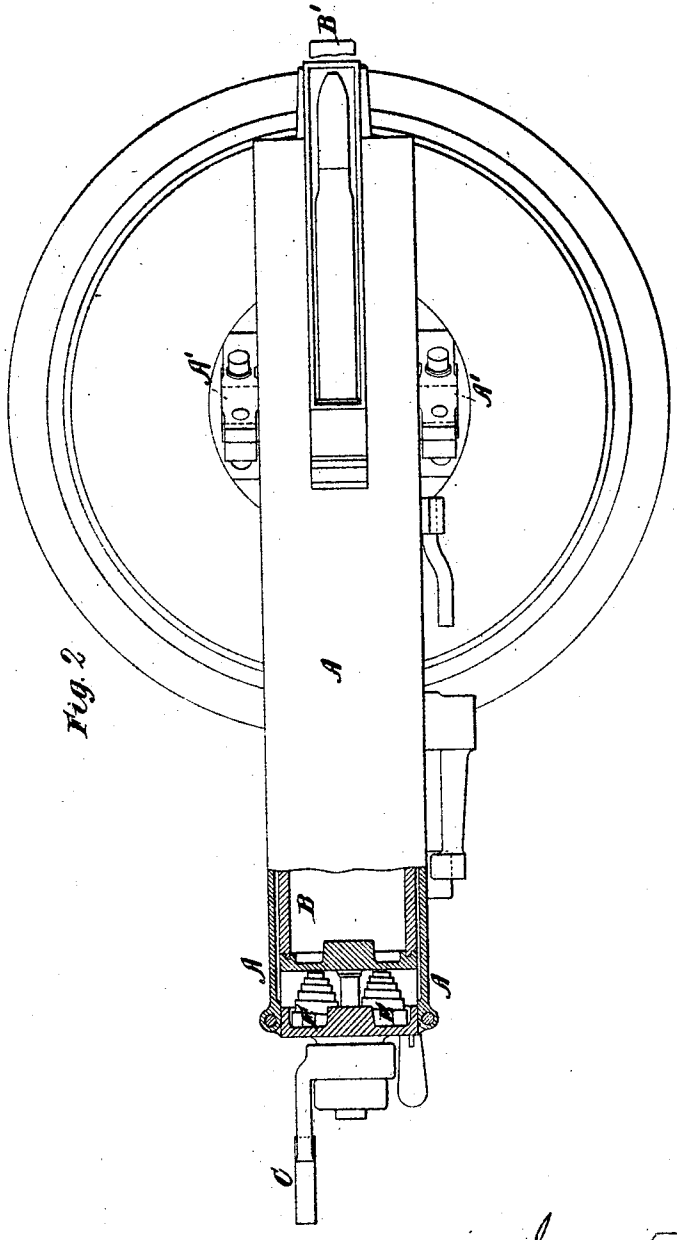


Fig. 2.

Witnesses,
H. H. Smith
T. L. Talcott

Inventor.
Hiram S. Maxim
By Duncan, Curtis & Page
attys.

(No Model.) 5 Sheets—Sheet 3.

H. S. MAXIM.

RECOIL MECHANISM FOR GUNS.

No. 347,945. Patented Aug. 24, 1886.

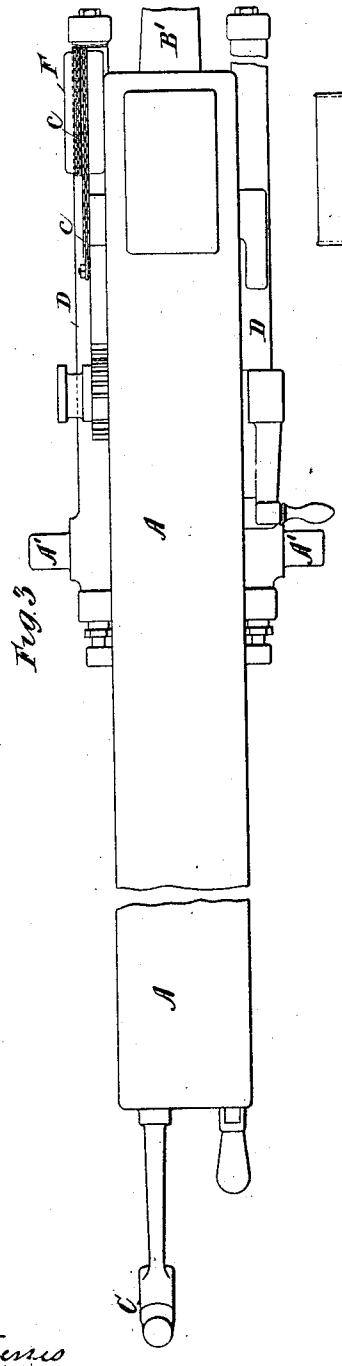


Fig. 3.

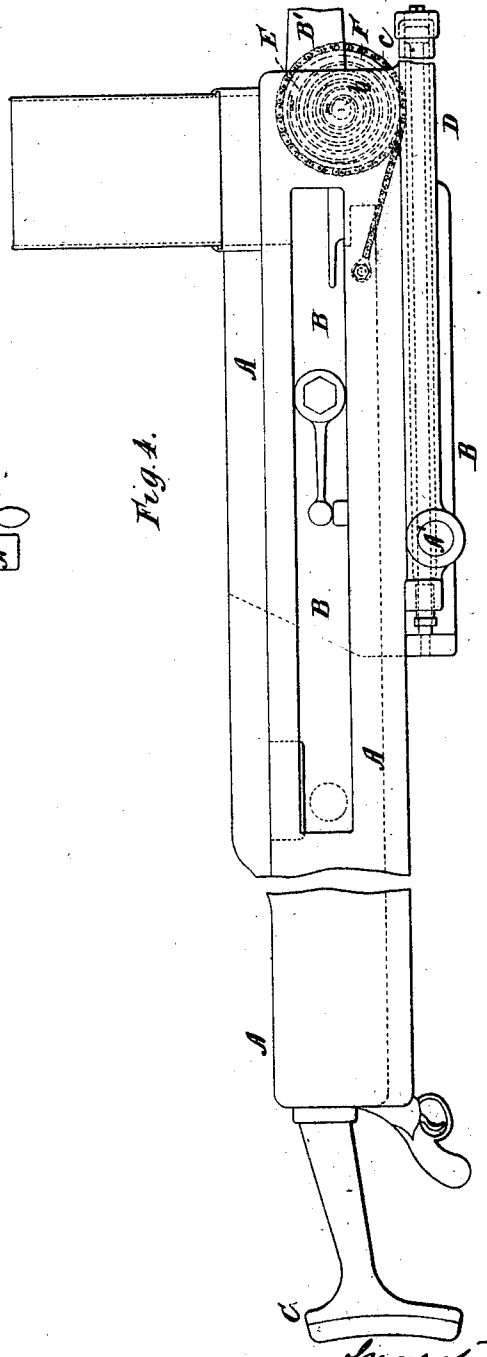


Fig. 4.

Witnesses
F. E. Hartley
Edwin Seger

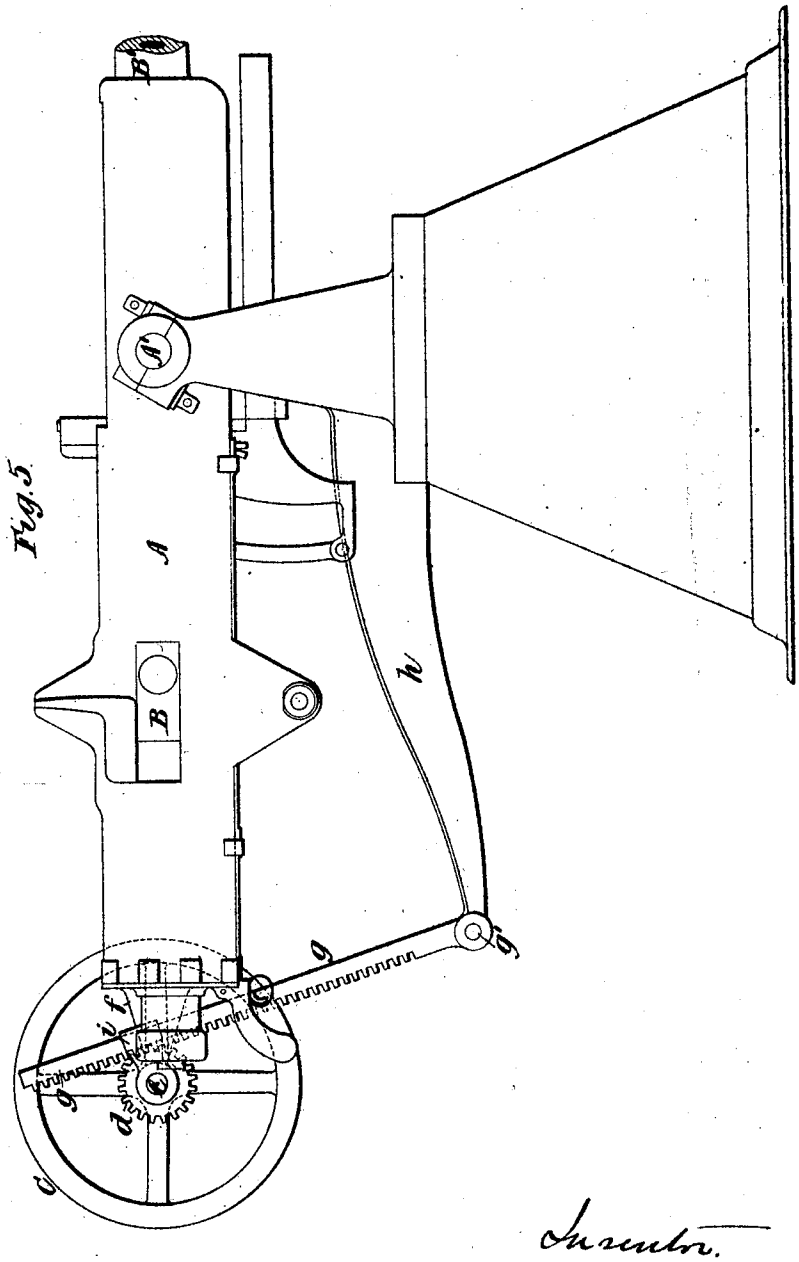
Inventor
Hiram S. Maxim
By Duncan, Curtis & Page
Attys.

(No Model.) 5 Sheets—Sheet 4.

H. S. MAXIM.

RECOIL MECHANISM FOR GUNS.

No. 347,945. Patented Aug. 24, 1886.



Witnesses.
F. S. Hartley
Edwin Seger

Inventor.
Hiram S. Maxim
By Duncan, Curtis & Page
attys.

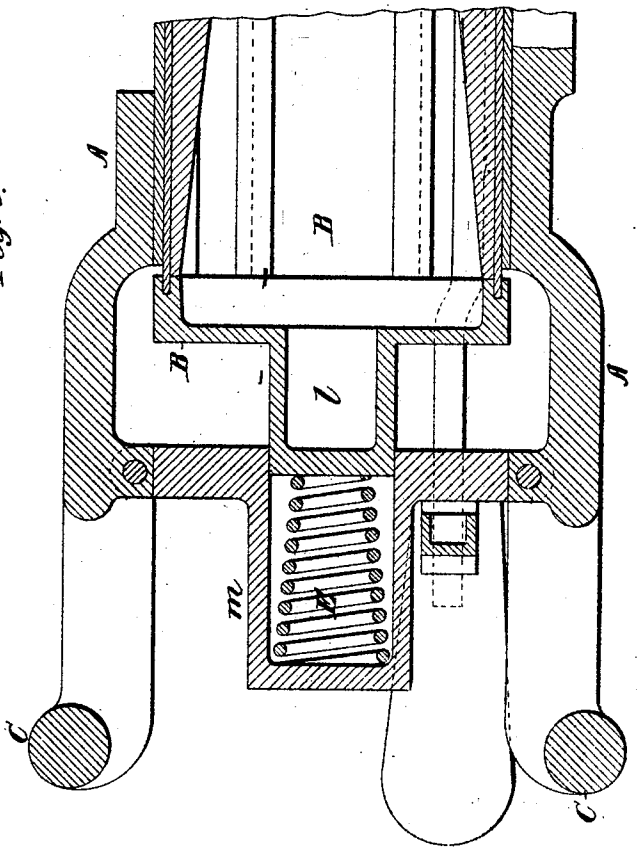
(No Model.) 5 Sheets—Sheet 5.

H. S. MAXIM.

RECOIL MECHANISM FOR GUNS.

No. 347,945. Patented Aug. 24, 1886.

Fig. 6.



Witnesses
F. E. Hartley
Edwin Seger

Inventor.
Hiram S. Maxim
By Duncan, Curtis & Page
Attys.

UNITED STATES PATENT OFFICE.

HIRAM STEVENS MAXIM, OF LONDON, ENGLAND.

RECOIL MECHANISM FOR GUNS.

SPECIFICATION forming part of Letters Patent No. 347,945, dated August 24, 1886.

Application filed May 18, 1886. Serial No. 202,555. (No model.)

To all whom it may concern:

Be it known that I, HIRAM STEVENS MAXIM, mechanical engineer, a citizen of the United States of America, and resident of London, England, have invented new and useful Improvements in Automatic and other Guns, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to automatic and other guns wherein a handle, shoulder-piece, crutch, or similar device is attached to the gun at the breech end thereof to facilitate the control of the gun by the gunner in training or pointing and firing the same.

My said invention is designed to avoid or diminish the shock imparted to the gunner by the recoil of such guns, and thus enable him to work a comparatively heavy gun without injury or inconvenience.

Six-pounder and other guns mounted on trunnions and supported in or upon suitable carriages or mountings have in some instances been provided with a crutch or device, against which the gunner can place his shoulder, and which is intended to give him perfect control over the gun, so that he can readily point and fire the same at a rapidly-moving object within short range. This crutch or device has heretofore been attached to the breech end of the barrel. Therefore, unless the carriage or mounting is secured to a very strong and rigid support—such as the deck of an armor-plated ship—the shock imparted to the gunner by the recoil is so great that the firing of such guns from the shoulder is impracticable. According to my present invention the said shoulder piece or crutch, or its equivalent, instead of being attached to the barrel, is attached to an outer frame or support, which is mounted upon trunnions carried in bearings in a suitable carriage or mounting, and which does not participate in the recoil—that is to say, when the gun is fired the said outer frame remains stationary, while the barrel and breech mechanism recoil within the said frame. I usually arrange the barrel and breech mechanism in an inner frame, which is fitted to slide to and fro in the said outer frame or support. Between the said outer frame and the inner frame or between the said outer frame and the barrel and breech mechanism I arrange one or more dash-pots, springs, or hydraulic or other buffers or cushions for diminishing the shock produced by the recoil of the barrel and breech mechanism, or of the said inner frame and parts carried thereby.

In the accompanying drawings, Figure 1 is a side elevation, partly in vertical central section, of an automatic gun supported on a conemounting and having my present improvements applied thereto. Fig. 2 is a plan of the same, partly in horizontal section. Fig. 3 is a plan, and Fig. 4 a side elevation, of another automatic gun with my present improvements applied thereto. Fig. 5 is a side elevation of a gun and its mounting, showing means, hereinafter described, for facilitating the training or pointing of the gun. Fig. 6 is a horizontal section showing a modification of my said invention.

A is the outer frame or support. A' A' are the trunnions, which are formed thereon or rigidly attached thereto. B is the inner frame, which is fitted to slide to and fro in the said outer frame, and to which the barrel B' is firmly secured. This inner frame, moreover, carries the breech mechanism, which may be of any suitable construction. C is a shoulder-piece or crutch, which is firmly attached to the outer frame, A.

D is a chamber formed in the rear end of the frame A, and containing glycerine or other suitable liquid. The interior of this chamber is slightly taper—that is to say, it is rather larger at its rear end than at its forward end. *a* is a piston inserted therein, and of such diameter that it fits the smaller part thereof. This piston has two rods, *a' a²*, which extend through and work in cup-leathers at the ends of said chamber. The piston-rod *a'* is screwed firmly into the rear end of the inner frame, B. When the inner frame recoils, the liquid in the chamber D is forced through the space between the piston and the sides of the said chamber; but as this space is very small considerable resistance is offered to the recoil of the said inner frame, which resistance, by reason of the taper form of the said chamber, diminishes as the said frame moves backward. The shock produced by the recoil is thus greatly diminished. To further diminish such

shock, volute springs E, which act as buffers or cushions, are placed between the rear ends of the inner and outer frames. The springs E also serve to effect the return movement of the inner frame and parts carried thereby. The cylinder or chamber D, and piston *a* assist in supporting the rear end of the inner frame, B, and in guiding the said frame in its to-and-fro movement.

Any other suitable buffer or cushion may, with more or less advantage, be substituted for those above described for the purpose of diminishing the shock produced by the recoil.

In the gun shown in Figs. 3 and 4, I employ two dash-pots or hydraulic buffers, D, one at each side of the gun. I also employ a coiled spring, E, arranged within a casing or drum F, fitted to rotate upon a pin or stud, *b*. One end of this spring is attached to the said drum and the other end to the said pin or stud. A chain, *c*, is wound around and attached at one end to the drum F. This chain is attached at its other end to the inner frame, B, so that when the latter recoils the spring will be wound up, thereby diminishing the shock produced by the recoil, and its reaction will cause the return movement of the said frame.

The employment of a shoulder-piece or crutch attached to a stationary outer frame or support, as above specified, is very important in my automatic guns when made of large size, more especially when the inner frame recoils a considerable distance, because, by reason of the rapid changes in the position of the center of gravity of the gun relatively to the trunnions, it would be difficult without a shoulder-piece or crutch to properly control the gun for the purpose of training or pointing and firing the same; but my improvements are not limited in their application to automatic guns, as they may be applied to any gun in which the barrel and breech mechanism can be arranged to recoil in an outer frame or support mounted upon trunnions. Moreover, this outer frame or support may consist simply of a trunnion ring or box provided with one or more rearwardly-extending arms, to which the shoulder-piece or crutch, or its equivalent is attached.

To provide more efficiently for facilitating the training or pointing of the gun, I sometimes employ a rack-and-pinion device arranged as shown in Fig. 5—that is to say, a pinion, *d*, is fixed upon a shaft, *e*, supported in brackets *f*, firmly attached to the frame A. This pinion is geared with a rack, *g*, pivoted at *g'* to an arm, *h*, firmly attached to or formed integrally with the upper or swiveling part of the mounting. A stirrup or strap, *i*, is fitted upon the shaft *e*, to serve as a guide for the rack *g*, and to hold the same in gear with the pinion *d*. A wheel, C, is fixed on the shaft *e*, whereby the pinion *d* can be rotated to elevate or depress the gun. This wheel serves as the shoulder-piece; but it is evident that a much more efficient control of the gun is obtained than with the arrangements hereinbefore described. The wheel C is sometimes arranged to operate the pinion *d* through the medium of suitable gearing.

In Fig. 6 I have shown a modification of my invention, wherein I employ two handles, C, in place of the shoulder-piece or crutch hereinbefore described. *l* is a piston or plunger, which is formed on or attached to the inner frame, B, and which is fitted to slide to and fro in a cylinder, *m*, formed on or attached to the outer frame, A. A spring, E, is placed within the said cylinder to diminish the shock produced by the recoil, and to effect the return movement of the inner frame and parts carried thereby. The said cylinder and piston assist in supporting the rear end of the inner frame, B, and in guiding the said frame in its to-and-fro movement.

It is obvious that any other suitable device can be substituted for the shoulder-piece, wheel, or handles, above described, for enabling the gunner to properly control the movement of the gun in training or pointing and firing the same.

What I claim is—

1. The combination, in a gun, of a frame or support mounted upon trunnions and provided with a shoulder-piece or its equivalent, a barrel and breech mechanism movable in said frame, and a buffer or device interposed between the barrel and the frame for diminishing the shock produced by the recoil, as herein set forth.

2. The combination, in a gun, of an outer frame or support mounted upon trunnions and provided with a shoulder-piece or its equivalent, an inner frame adapted to slide to and fro in said outer frame, a barrel and breech mechanism carried by the inner frame, and a buffer or device, substantially as herein described, interposed between the two frames for diminishing the shock of the recoil, as set forth.

3. The combination of a frame or support mounted upon trunnions and provided with a shoulder-piece or its equivalent, a barrel and breech mechanism adapted to move to and fro in said frame, and a dash-pot, the two parts or members of which are connected, respectively, to the frame and the movable barrel, whereby it is adapted to act as a buffer to diminish the shock of the recoil of the barrel, as set forth.

4. The combination of a frame or support mounted upon trunnions and provided with a shoulder-piece or its equivalent, a barrel and breech mechanism adapted to move to and fro in said frame, a dash-pot, the two parts or members of which are connected, respectively, to the frame and the movable barrel for taking up the recoil of the barrel, and a volute spring or its equivalent interposed between the barrel and frame for restoring the barrel to position after recoil, as set forth.

5. The combination of the outer frame, A,

provided with the trunnions A' A', and the shoulder-piece or its equivalent C, the inner frame, B, movable in the frame A, the barrel and breech mechanism carried by the frame B, the chamber D, containing glycerine or other fluid and contained in or connected with the frame A, the piston *a*, connected to frame B and working in the chamber D, and the springs or their equivalent interposed between the two frames, as and for the purpose set forth.

In testimony whereof I have hereunto signed my name in the presence of two subscribing witnesses.

HIRAM STEVENS MAXIM.

Witnesses:
ALFRED WAUGH,
W. J. SKERTEN.