H. P. MAXIM.

SILENT FIREARM.

APPLICATION FILED JUNE 26, 1908.

916,885.

Patented Mar. 30, 1909.

Fig. 1.

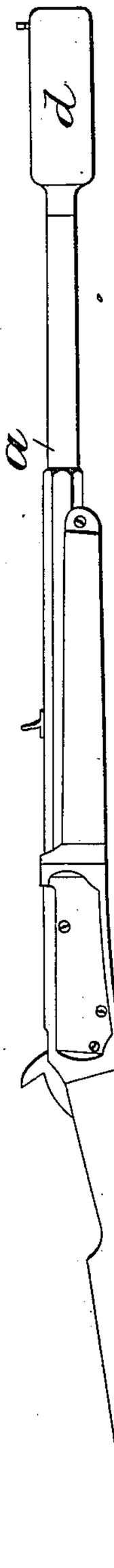


Fig. 2.

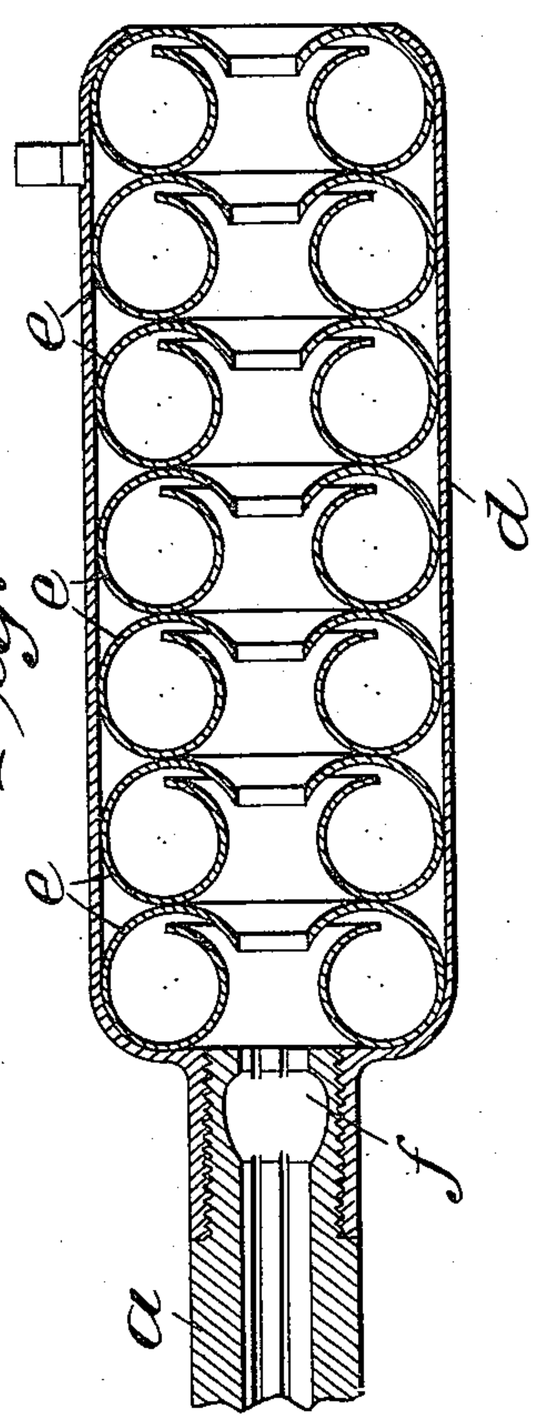


Fig. 3.

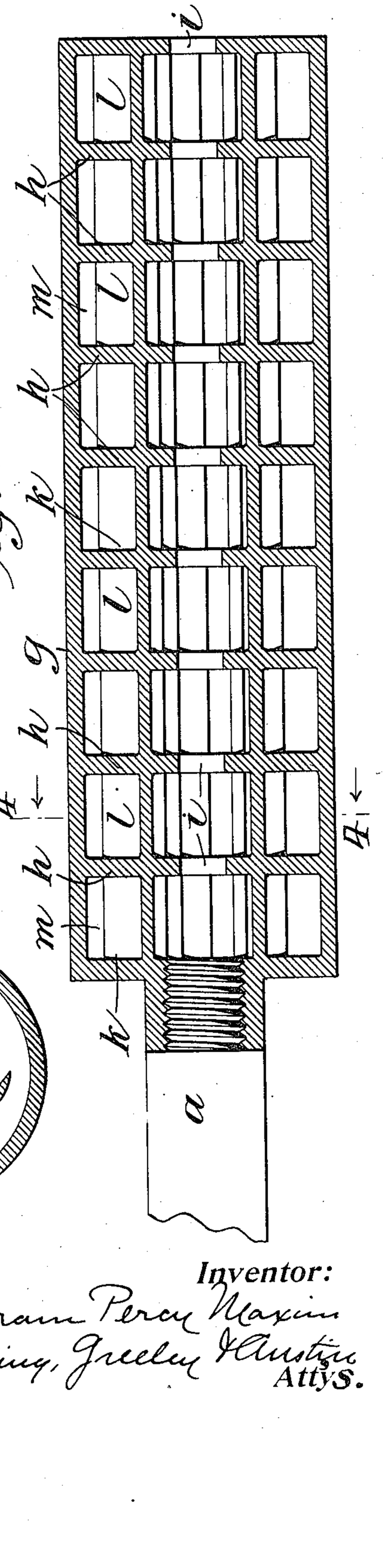
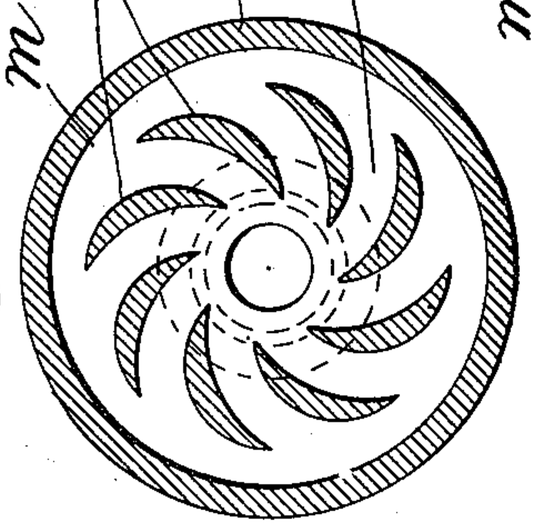


Fig. 4.



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UNITED STATES PATENT OFFICE.

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SILENT FIREARM.

No. 916,885. Specification of Letters Patent. Patented March 30, 1909.

Application filed June 26, 1908. Serial No. 440,429.

To all whom it may concern:

Be it known that I, HIRAM PERCY MAXIM, a citizen of the United States, residing in Hartford, in the State of Connecticut, have invented certain new and useful Improvements in Silent Firearms, of which the following is a specification, reference being had to the accompanying drawing, forming a part hereof.

Various attempts have been made heretofore to render noiseless the discharge of firearms by preventing the sudden release of the powder gases at the muzzle of the firearm. In some of the devices designed for this purpose the bore of the firearm is obstructed mechanically after the passage of the projectile and the gases which follow the projectile are diverted through ports provided for the purpose into chambers from which they are allowed to escape gradually. Devices of this character are more or less effective in reducing or preventing the noise of discharge, but in some cases they are objectionable upon other grounds. In other of the devices designed for the purpose the mechanical obstruction of the bore is avoided and provision is made for the escape of the gases from the bore of the firearm in rear of the muzzle either directly into the atmosphere or into a surrounding chamber from which they subsequently escape, it being the intention in such cases that the escape of the gases shall be so gradual as at least to diminish the noise of discharge. In still other of the devices in which the mechanical obstruction of the bore is avoided, deflectors perforated for the passage of the projectile, are disposed beyond the muzzle for the purpose of distributing the gases of explosion over a large area and of directing them either laterally or rearwardly or both laterally and rearwardly, it also being proposed in some cases to restrict somewhat the escape of the gases. Practically, however, devices of the two classes last mentioned, at least so far as produced hitherto, have had, in some cases, no substantial effect in reducing the noise of discharge, and in some cases have been able at the most only to modify the noise of discharge.

In the present invention it has been discovered that the noise of the discharge of a firearm, so far as it is due to the escape of powder gases into the atmosphere, can be overcome if the gases, following the projectile, are made to dissipate their energy by being given a rotary or whirling movement in a suitable chamber, the velocity being so great that the gases are held by centrifugal action against the wall of the chamber until by friction against such wall the velocity is gradually retarded and the gases are permitted to escape gradually through an opening which may be and is preferably the opening for the passage of the projectile. Such movement of rotation of the body of gas may take place about an axis coincident with the axis of the bore of the firearm or otherwise, and while theoretically the entire body of the gases of a single discharge might receive the desired rotary or whirling movement in a single chamber, practially, on account of the considerable size which a single chamber would necessarily have, it is desirable to provide a succession of diaphragms, partitions or spreaders forming a succession of chambers among which the gases of a single discharge are distributed and from one to another of which the gases may pass in succession as their velocity is successively reduced, the direction of movement of the gases being preferably reversed in the passage from one chamber to the next and an oscillation of the gases being thus produced, whereby their energy is the more quickly dissipated. Such chambers, however, might be made to communicate with the bore of the firearm at different points along its length, but are preferably located at the true muzzle of the firearm, that is, at the point where the projectile has already received its maximum impetus, and constitute an extension of the barrel.

The invention will be more fully explained hereinafter with reference to the accompanying drawing in which two different forms of the devices for developing the desired rotary movement of the gases are shown as illustrative of the nature of the invention.

In said drawing—Figure 1 is a view in side elevation of an ordinary sporting rifle or shoulder arm provided with one embodiment of the invention. Fig. 2 is a detail view, in longitudinal section and on an enlarged scale, of the device or appliance shown in Fig. 1. Fig. 3 is a view similar to Fig. 2, but showing a different form of means for setting up the rotary or whirling movement of the gases. Fig. 4 is a view in transverse section on the plane indicated by the line 4—4 of Fig. 3.

Obviously the invention is applicable to any form of firearm, whether pistol, shoulder arm, machine gun or heavy ordnance, but an explanation of the nature of the invention in connection with the application to a shoulder arm will be sufficient. The rifle represented in Fig. 1 of the drawing comprises a barrel *a*, a stock *b* and firing mechanism *c*. At the end or muzzle of the barrel *a* is secured a casing *d*, preferably substantially circular in cross section and of greater or less length according to the result to be produced, such casing having an opening in line with the bore of the barrel for the passage of the projectile, but preferably having its walls otherwise imperforate. Within the casing *d* is a series of diaphragms, partitions or spreaders *e* having an opening in line with the bore of the barrel for the passage of the projectile and forming cells or separate chambers in each of which rotary movement of the body of the gases following the projectile is established. In the form of the device shown in Fig. 2, each of such cells is annular, with reference to the axis of the barrel of the firearm, about which it is disposed, the diaphragm being spiral or conchoidal in cross section about the opening for the passage of the projectile, with the mouth or wall about the opening directed toward the breech of the firearm so that the gases which follow the projectile from the muzzle of the firearm, as they expand or diverge, are directed, by the guiding surface presented by the diaphragm or cell wall, into the adjacent chamber or cell and so that the body of gas within the cell has a whirling or rotary movement about a substantially circular or annular line or axis, the main portion of the chamber being generally circular in cross section, that is, of such form as to facilitate the whirling movement of the gases about a stationary axis. The velocity of the rotation will be very great. Under the centrifugal action developed by the rapid rotary movement the gases are pressed outward against the wall of the cell or chamber and the velocity of movement of the gases is gradually reduced, the energy of the gases being thus dissipated. When the velocity is so far reduced as to be exceeded by the expansive force of the gases, the rotary movement in the chamber will cease and the gases will find their way out through the annular opening through which they entered, in a reverse direction, and thence through the opening for the passage of the projectile into the next cell or chamber and eventually into the atmosphere. Obviously the cell or chamber nearest the muzzle of the firearm will be filled with the whirling gases at the highest pressure and successive cells or chambers will also receive gases from the central column following the projectile, but at a gradually reduced pressure and velocity.

The number of diaphragms, partitions or spreaders to be used will depend upon the character of the firearm to which the device is to be applied and of the ammunition used, the degree to which the noise of discharge is to be reduced and, inversely, the diameter which it is practicable to permit the outer casing to have.

In order that the device may not be required to have an undesirable length, it may be desirable to so form the muzzle of the firearm, as by chambering the bore just back of the muzzle, as at *f*, as to cause the gases to diverge more rapidly than they would otherwise do after leaving the muzzle.

In the form of the device shown in Figs. 3 and 4 the body of gases is caused to have a rotary or whirling movement about an axis which is coincident with the axis of the barrel of the firearm. In this form a casing *g*, preferably circular in cross section and of suitable length, is secured to the muzzle of the barrel *a*. Interiorly, it is divided into successive cells or chambers by successive partitions *h*, having each an opening *i*, for the passage of the projectile, preferably of somewhat greater diameter than the bore of the firearm. In each cell or chamber *k*, thus formed, are disposed a series of stationary blades or vanes *l*, like turbine vanes, approaching somewhat closely to the axis of the casing *g* but terminating before they reach the circumferential wall of the chamber so as to leave a clear annular space *m* adjacent to the circumferential wall. As the gases leave the muzzle of the gun and expand or diverge some of the gases are directed by the guiding surfaces presented by the blades or vanes *l* of the first chamber outwardly into the circumferential space *m* in which the volume of the gases, so entrapped, is caused, by the arrangement of such blades or vanes to acquire a rotary or whirling movement at a high velocity. As in the form of the device first described, the centrifugal action developed by the rapid rotary or whirling movement holds the gases against the wall of the chamber, until their energy is dissipated and their velocity is reduced to such an extent that it is overcome by the expansive force of the gases, when the whirling motion ceases and the gases find their way back, in a reverse direction, through the passages between the blades or vanes and through the opening for the passage of the projectile into the next chamber, in which the action may be repeated but at less velocity and pressure. In this manner the pressure of the gases is gradually reduced until they escape at the extreme forward end of the device, through the opening therein for the passage of the projectile, at such low pressure that the noise of discharge is absent.

The preferable construction, whether of one form or another, is one in which each chamber, in which the energy of the gases is

dissipated, is generally circular in cross section with reference to the axis about which the rotary movement takes place, and the guiding surface, by which the gases are directed into such chamber, is substantially tangential with respect thereto, so that the rotary movement of the gases within the chamber is promoted. Furthermore, the efficiency of such preferable construction being largely dependent upon the continuous whirling or rotary movement of the gases about a stationary axis, that is, upon the continuation of the rotary movement until the velocity is reduced to a point where the centrifugal force is equalized by the expansive force, when the rotary movement will cease and, under the influence of the expansive force, the gases will pass to the next chamber, it is desirable, in such a construction, that the peripheral wall of the chamber shall be generally circular, that is, that it shall extend more than 180° about the axis, so that the gases shall be turned upon themselves and made to rotate continuously in the chamber itself, while at the same time the peripheral wall need not, and, in the construction shown in Fig. 2, for example, cannot always be formed upon the arc of a true circle. The description of the chamber as generally circular in cross section, wherever such description occurs in the claims, is therefore to be understood with the meaning thus explained.

It will be understood that the character, size and location of the chambers employed will be varied according to the conditions of use. For example, they may be larger or smaller and of different contour to develop different degrees of friction, they may be made more or less elastic to diminish danger of breakage by shocks, their walls may be of different thickness, and successive chambers in a series may be varied in form so that those nearest the muzzle shall be subjected to less strain than if they were of uniform contour.

I claim as my invention:

1. A silencing device for firearms, comprising a casing adapted to be secured at the muzzle of the firearm and having an opening therethrough in line with the bore of the barrel for the passage of the projectile and its walls imperforate except in line with the bore of the barrel, said casing having therein a chamber and a guiding surface to direct the gases of explosion into such chamber, whereby the powder gases acquire a rotary or whirling movement about a stationary axis within the chamber and escape through the opening for the passage of the projectile after their energy is dissipated in such rotary or whirling movement.

2. A silencing device for firearms, comprising a casing adapted to be secured at the muzzle of the firearm and having an opening therethrough in line with the bore of the barrel for the passage of the projectile, said casing having therein a chamber generally circular in cross section and extending more than 180° about its axis and a guiding surface substantially tangential with respect to the circular chamber to direct the gases of explosion into such chamber, whereby the powder gases acquire a continuous rotary or whirling movement about a stationary axis within the chamber, until their velocity is reduced to a point where the centrifugal force is equalized by the expansive force, and escape through the opening for the passage of the projectile after their energy is dissipated in such rotary or whirling movement.

3. A silencing device for firearms, comprising a casing adapted to be secured at the muzzle of the firearm and having an opening therethrough in line with the bore of the barrel for the passage of the projectile and its walls imperforate except in line with the bore of the barrel, said casing having therein a chamber generally circular in cross section, and a guiding surface to direct the gases of explosion into such chamber, whereby the powder gases acquire a rotary or whirling movement about a stationary axis within the chamber and escape through the opening for the passage of the projectile after their energy is dissipated in such rotary or whirling movement.

4. A silencing device for firearms, comprising a casing adapted to be secured at the muzzle of the firearm and having an opening therethrough in line with the bore of the barrel for the passage of the projectile and its walls imperforate except in line with the bore of the barrel, said casing having therein a series of chambers, each chamber having a guiding surface by which the powder gases are directed in a substantially tangential direction into the chamber, whereby the powder gases acquire a rotary or whirling movement within each chamber and escape from each chamber to the next and eventually into the atmosphere through the opening for the passage of the projectile after their energy is dissipated in such rotary or whirling movement.

5. A silencing device for firearms, comprising a casing adapted to be secured at the muzzle of the firearm and having an opening therethrough in line with the bore of the barrel for the passage of the projectile, said casing having therein a series of chambers, each chamber being generally circular in cross section, and having a guiding surface by which the powder gases are directed in a substantially tangential direction into the chamber, whereby the powder gases acquire a rotary or whirling movement within each chamber and escape from each chamber to

the next and eventually into the atmosphere through the opening for the passage of the projectile after their energy is dissipated in such rotary or whirling movement.

6. A silencing device for firearms, comprising a casing adapted to be secured at the muzzle of the firearm and having an opening therethrough in line with the bore of the barrel for the passage of the projectile and its walls imperforate except in line with the bore of the barrel, said casing having therein a series of chambers, each chamber being generally circular in cross section, and having a guiding surface by which the powder gases are directed in a substantially tangential direction into the chamber, whereby the powder gases acquire a rotary or whirling movement within each chamber and escape from each chamber to the next and eventually into the atmosphere through the opening for the passage of the projectile after their energy is dissipated in such rotary or whirling movement.

7. A silencing device for firearms, comprising a supporting shell or casing imperforate except in line with the bore of the barrel and a diaphragm therein having an opening for the passage of the projectile and substantially conchoidal in cross section about the opening, forming an annular cell or chamber, such diaphragm having an opening for the passage of the projectile and the escape of the gases and having its mouth or wall about such opening directed toward the breech of the firearm whereby the gases which follow the projectile are caused to acquire a rotary or whirling movement in the cell about a substantially circular or annular axis and the energy of the gases is dissipated in such rotary or whirling movement.

8. A silencing device for firearms, comprising a supporting shell or casing and a series of diaphragms or spreaders disposed in said shell or casing and forming therein a succession of chambers, each of such diaphragms or spreaders having an opening for the passage of the projectile and for the escape of the gases from each chamber into the next and from the last into the atmosphere and a guiding surface by which the gases are made to assume a rotary or whirling movement and the energy of the gases is dissipated in such rotary or whirling movement.

9. A silencing device for firearms, comprising a supporting shell or casing and a series of diaphragms or spreaders disposed in said shell or casing, each of said diaphragms, substantially conchoidal in cross section, forming an annular cell and having an opening for the passage of the projectile and for the escape of the gases from each chamber into the next and from the last into the atmosphere, the mouth or wall about said opening being directed toward the breech of the firearm, whereby the gases are caused to acquire a rotary or whirling movement in the cell about a substantially circular or annular axis and the energy of the gases is dissipated in such rotary or whirling movement.

This specification signed and witnessed this 25th day of June, A. D. 1908.

HIRAM PERCY MAXIM.

Signed in the presence of—
WILLIAM B. GREELEY,
AMBROSE L. O'SHEA.