Oct. 18, 1932. E. H. SMITH 1,883,028

GUN

Filed Aug. 1, 1931 2 Sheets-Sheet 1

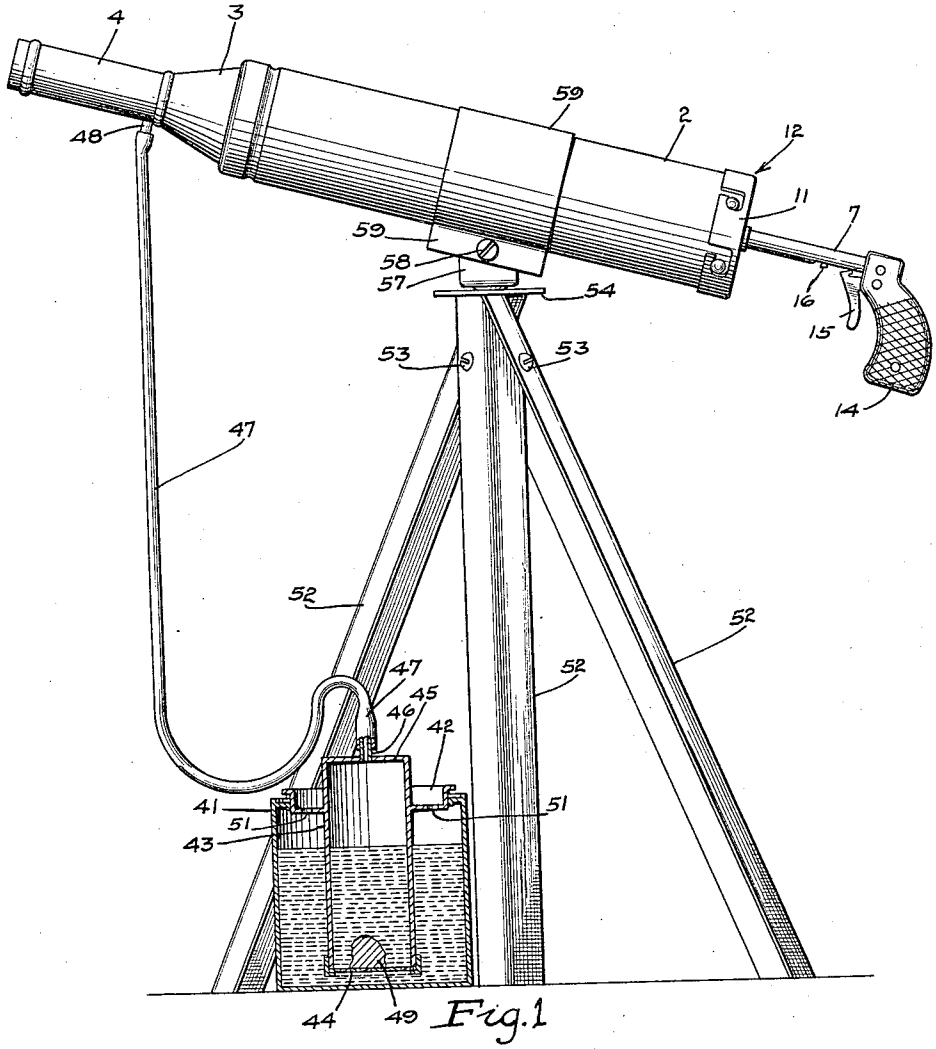


Fig.1

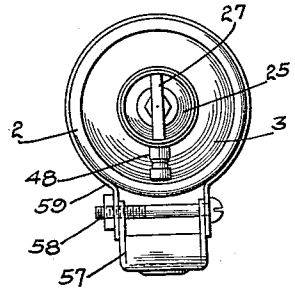


Fig.5

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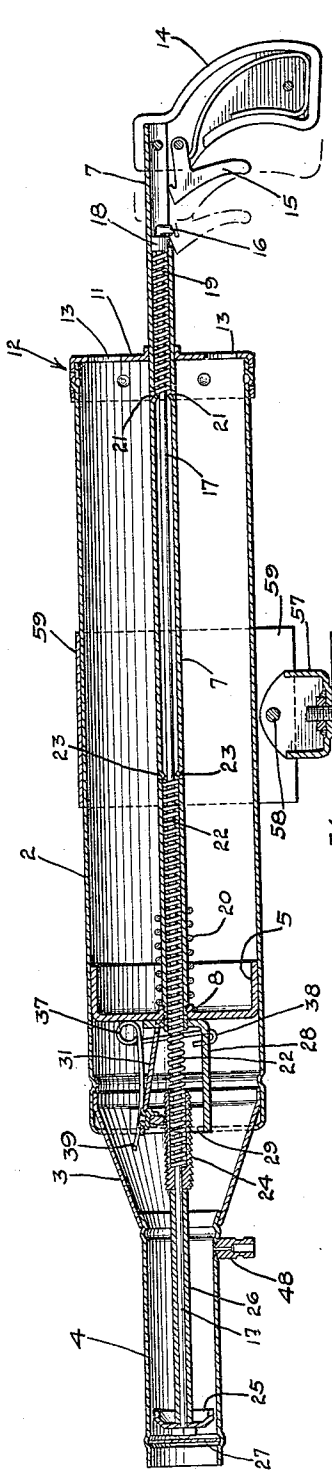


Fig. 2

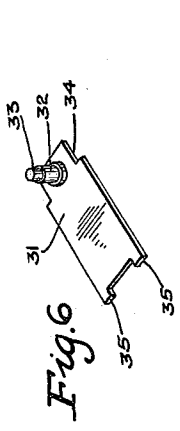


Fig. 6

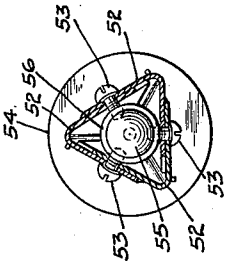


Fig. 7

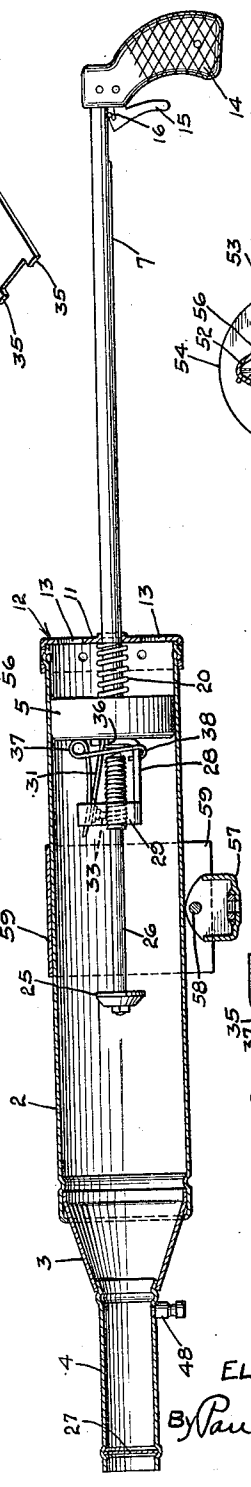


Fig. 3

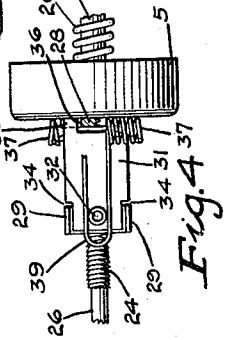


Fig. 4

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Patented Oct. 18, 1932

1,883,028

UNITED STATES PATENT OFFICE

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GUN

Application filed August 1, 1931. Serial No. 554,489.

This invention relates to new and useful improvements in guns and more particularly to a gun adapted to utilize a gaseous mixture as an explosive medium therefor.

An object of the invention is to provide a gun of the general character disclosed in my copending application, Serial No. 512,279, filed January 30, 1931, and comprising a casing having a plunger reciprocally mounted therein and provided with an operating rod protruding from one end of the casing and having a pistol grip whereby said rod may be conveniently operated.

A further object is to provide a gas gun comprising a casing having a barrel provided at one end thereof and communicating with the atmosphere, and means being provided for supplying an explosive agent to the interior of said body portion when said plunger is operated in one direction, and said plunger being provided at one end with an extension having means thereon for preventing the gaseous mixture from burning in the form of a flame, from the end of the barrel after the gun has been fired, thereby preventing pre-ignition of a following charge drawn into the explosion chamber provided by said casing.

Other objects reside in the constructional details of the operating rod for the plunger; the ignition means carried by the plunger, and also the means for supporting the file or abrasive element of the igniter; the pistol grip provided at one end of the operating rod and its trigger which controls the operation of the igniter; the generator which is so constructed that all gas generated therein, under normal conditions, will be delivered to the explosion chamber of the gun, and also whereby should the conduit connecting the generator with the explosive chamber become congested, the gas in the generator will be discharged to the atmosphere, thereby positively eliminating the danger of the generator exploding; and, in the general construction of the support for the gun which provides a very simple and inexpensive structure which may be manufactured at a very small cost.

Other objects of the invention will appear from the following description and accompanying drawings and will be pointed out in the annexed claims.

In the accompanying drawings, there has been disclosed a structure designed to carry out the various objects of the invention, but it is to be understood that the invention is not confined to the exact features shown as various changes may be made within the scope of the claims which follow.

In the drawings:

Figure 1 is a side elevation of my improved gun showing the generator in cross-section;

Figure 2 is a longitudinal sectional view through the body of the gun showing the plunger and operating rod in their forward positions;

Figure 3 is a view similar to Figure 2, showing the operating rod and plunger retracted;

Figure 4 is a detail view showing the plunger removed from the barrel;

Figure 5 is a front view of the gun looking into the barrel thereof, the support being omitted;

Figure 6 is a perspective view of the holder for the pyrophoric metal; and

Figure 7 is a horizontal sectional view on the line 7—7 of Figure 2.

The novel gun featured in this invention is shown comprising a casing 2 provided at one end with a frustro-conical head 3 suitably secured thereto. A barrel 4 is suitably secured to the head 3 and is substantially axially alined with the casing 2.

A plunger 5 is mounted within the chamber defined by the walls of the casing 2, and is suitably secured to one end of a tubular operating rod 7 by such means as threads 8. The operating rod 7 has its opposite end slidably supported in an aperture provided in a cap 11 detachably secured to the rear end of the barrel 2 by suitable bayonet slots and projections 12, as best shown in Figure 1. The cap 11 is provided with suitable openings 13 to permit free movement of the plunger 5, within the casing 2.

A pistol grip 14 is secured to the outer end of the tubular operating rod 7 and has a spring actuated trigger 15 adapted to en-

gage a detent 16 provided upon one end of a stem 17, mounted for relative movement within the operating rod 7. A suitable collar 18 is shown positioned upon the stem 17 adjacent to the detent 16 and substantially fits within the tubular rod 7 so as to provide a bearing for that end of the stem 17. A cushion spring 19 is coiled about the stem 17 and has one end thereof adapted to engage the collar 18 and its opposite end engaging inwardly bent abutments 21 provided in the wall of the operating rod 7. A cushion spring 20 is loosely coiled about the operating rod 7 to prevent the plunger from impacting with the cap 13, when the plunger is retracted. (See Figure 3.)

The opposite end of the stem 17 has a compression spring 22 coiled thereabout, one end of which is seated against abutments 23 provided in the wall of the operating rod 7 and the opposite end thereof being received in a bore provided in an abrasive member or file 24, which also is mounted upon the stem 17. The stem projects beyond the member 24 and has a small plate 25 secured to the end thereof which is spaced from the file 24 by a suitable spacer 26. By this arrangement, the stem 17 and operating rod 7 are adapted for relative axial movement, the spring 22 constantly tending normally to retain these two parts in the positions shown in Figure 2. A suitable cross member 27 is secured to the end of the barrel 4 and traverses the opening therein, as best shown in Figure 5. This cross member is adapted to be engaged by the end of the stem 17 when the operating rod is thrust forwardly to the position shown in Figure 2, for reasons which will subsequently be described.

The means for igniting the gaseous mixture within the casing 2 consists of a pyrophoric igniter carried by the plunger 5, as shown in Figures 2, 3, and 4. This igniter is shown comprising a bracket 28 having a portion apertured and threaded to receive the threaded end of the operating stem 7 whereby said bracket may be firmly secured to the plunger and operating rod. Another portion of the bracket 28 extends forwardly from the plunger 5 in substantially parallel relation to the stem 17, and carries a pair of spaced apart ears or lugs 29 which straddle the abrasive member 24 and provide a guide for one end of a plate 31, having notches 34 provided in the edges thereof adapted to receive the lugs 29, as shown in Figure 4. A holder 32 is secured to the plate 31 adapted to support a suitable pyrophoric element 33. The opposite end of the plate 31 is recessed as shown to provide a pair of spaced projections 35 adapted to be received in recesses or notches 36 provided in the upper part of the vertical portion of the bracket 28, as shown in Figure 3. A suitable spring 37, preferably formed as shown in Figures 2, 3, and 4, is provided with hooked terminals 38 adapted to be received in suitable apertures provided in the lower horizontal portion of the bracket 28, and having its opposite end portion 39 seated against the plate 31 adjacent to the holder 32 for the element 33, whereby said element is held in frictional engagement with the periphery of the abrasive member 24. The member 24 is preferably cylindrical in cross-section, as shown, whereby it may be rotatively adjusted upon the stem 17 to present a new wearing surface to the element 33, when necessary.

The novel igniter above described provides a very simple and practical device which is positive in operation, and the pyrophoric element may readily be replaced when worn, by simply lifting the end portion 39 of the spring out of engagement with the plate 31, whereupon the latter may readily be detached from the bracket 28. Because of the inexpensive construction of the plate 31, upon which the flint holder 32 is secured, the plate and holder are preferably discarded when a new flint is required, and an entire new plate including the holder and flint substituted therefor.

The igniter is operated in the following manner, when the operating rod 7 has been retracted or moved to the position shown in Figure 3 and is then moved forwardly, after firing the gun, the end of the stem 17 will engage the cross member 27 in the barrel 4, when the plunger reaches the position shown in Figure 2. Continued forward movement of the operating rod 7 will cause the tubular rod to move forwardly relatively to the stem 17, the latter being restrained from further movement by reason of its engagement with the cross member 27. Such relative movement of the operating rod 7 upon the stem 17 will cause the detent 16 to move from the full line position in Figure 2 to the position shown in Figure 3, whereby it will operatively engage the trigger 15 which will lock it in the position shown in Figure 3.

During such relative movement of the rod 7 upon the stem 17, the element 33 will move along the abrasive surface of the file 24 from the position shown in Figure 2 to that shown in Figure 3, in which position it will be held when the detent 16 operatively engages the trigger 15. The operating rod 7 is then retracted from the casing 2 to the position shown in Figure 3, whereby the gun is ready to be fired. When the trigger is actuated to release the detent 16, the spring 22 will thrust the stem 17 forwardly with respect to the operating rod 7, whereby the abrasive member 24 will move relatively to the pyrophoric element 33, and the frictional engagement of the latter therewith will cause a spark to be generated within the explosion chamber of the gun, causing detonation of the explosive mixture therein.

Another feature of this invention resides

in the construction of the generator, which supplies the explosion chamber with an explosive gas. The gun herein disclosed is primarily designed to use acetylene gas or other gases of a similar nature for charging it. A simple method of producing such a gas is by subjecting carbide to moisture, and the generator herein disclosed is particularly designed for such use.

The generator comprises a container 41 having an opening in the upper end thereof adapted to be closed by a suitable cover or closure 42, provided upon a relatively smaller container or carbide holder 43, which depends into the outer casing 41 from the closure 42, and has its walls spaced therefrom, as shown in Figure 1. The lower end of the inner carbide holder 43 is provided with a perforated or screened cover 44 detachably secured thereto, while the upper end thereof in closed by means of a wall 45 having a nipple 46 thereon to which one end of a flexible conduit, such as a piece of hose, is attached. The opposite end of this conduit is attached to a nipple 48 preferably depending from the barrel 4 adjacent to the head 3.

To charge the generator, the cover 42 is removed from the container 41 and the perforated cap or closure 44 at the lower end of the carbide holder is then removed therefrom, whereby the operator may place a piece of carbide, indicated at 49 in Figure 1, in the carbide holder 43. The perforated cap 44 is then secured to the carbide holder 43, after which a quantity of water is placed in the container 41 before the carbide holder is inserted thereinto and secured in position by reason of the cover 42 frictionally engaging the upper wall of the container 41. When the carbide is submerged in the water in the container 41, the chemical action resulting from the carbide engaging the water will form an acetylene gas which rises into the upper portion of the carbide holder 43 from whence it will be conducted into the barrel of the gun by means of the conduit 47. Continued generation of gas within the carbide holder 43 will cause a continuous flow of gas to the barrel 4 during the period that the carbide is active.

Therefore, each time that the plunger 5 is moved rearwardly, from the position shown in Figure 2 to that shown in Figure 3, the suction created by the reciprocal movement of the plunger within the casing 2, will cause acetylene gas to be drawn into the explosion chamber of the casing 2, and at the same time fresh air will be drawn thereinto from the atmosphere because of the barrel being open. The trigger is then actuated, causing the explosive mixture within the casing 2 to become ignited, resulting in a loud report. The operator will then thrust the plunger forwardly, thereby purging the explosive chamber of the burnt gases and, at the same time, cocking the trigger 15 by reason of the forward end portion of the stem 17 engaging the cross member 27. The plunger may then again be moved to the position shown in Figure 3, whereupon the gun is again charged and rendered ready to fire. The cover member 42 of the generator is provided with suitable openings 51 to permit the escape of gas entering the upper portion of the container 41 above the water level, which would occur should the conduit 47 accidentally become clogged. By the provision of these openings, the generator is rendered safe for use, even by smaller children.

The provision of the small plate 25 at the forward end of the stem 17 is important in that it positively prevents free burning of the gas within the barrel 25 directly following the firing of the gun, should the charge be too rich. Without this plate 25, such burning of the gas may result because of the continuous supply of gas to the barrel 4 when a fresh piece of carbide has been placed in the carbide holder 43, regardless of the position of the plunger 5. The diameter of the plate 25 is slightly smaller than the bore of the barrel 4 so that a small annular gap is provided between the marginal edge of the plate and the wall of the barrel.

Thus, when the plunger is thrust forwardly immediately after firing the gun, and assuming that the supply of gas to the barrel is such as to cause the gas to continue to burn in the barrel 4, as soon as the plate 25 enters the barrel, the burnt gas and air confined within the casing 2 ahead of the plunger 5, and also the additional gas being supplied thereto from the generator, will be discharged therefrom through the small annular gap around the plate 25, which will cause this air to be expelled from the barrel of the gun at a comparatively high velocity, resulting in the extinguishing of the flame tending to burn at the end of the barrel.

Another feature of this invention resides in the construction of the support for the casing 2, whereby the gun may be universally manipulated in a manner similar to a machine gun. This support is best shown in Figures 1 and 2, and preferably comprises three legs 52 formed from sheet metal and being angular in cross-section. The upper ends of these legs are so constructed as to permit them to be overlappingly engaged as shown in Figures 1 and 7. One flange of each leg is provided with a suitable aperture and the opposite flange thereof is provided with a threaded socket. These apertures and sockets are adapted to receive suitable screws 53, whereby the upper ends of the legs 52 may be rigidly secured together in the form shown in Figure 1. The upper terminals of the legs are cut on an angle so as to provide a horizontal face against which a suitable plate 54 is seated. This plate has a central aper-

ture adapted to receive the upper end of a bolt 55, the lower end of which may be provided with a washer 56 adapted to be seated against the inner terminals of the screws 53, as shown in Figures 2 and 7.

A member 57 is received in threaded engagement with the upper end of the bolt 55 above the plate 54, and has a screw or bolt 58 pivotally connecting it with a clamping band 59 encircling the casing 2. By thus supporting the casing 2 upon the legs 52, the casing may be tilted to various angular positions, and the bolt 55 also permits the casing 2 to be relatively rotated upon the support about the axis of the bolt 55.

The construction of the gun and its support herein disclosed is very simple and inexpensive, as will readily be understood by a study of the drawings, whereby the entire apparatus may be manufactured at a very small cost so that it may be dispensed to the public at a price within reach of all. The gun is light in weight and is so constructed that it may readily and quickly be taken down and packed in a box for future use. The cap 11 provided at the rear end of the casing 2 is readily detachable whereby the interior working mechanism of the gun may readily be removed therefrom for inspection or for replacing the pyrophoric metal 33. The abrasive member 24 may also be adjusted upon the stem 17 so as to present a new surface of the element 33 by simply relatively rotating the member 24 upon the stem 17, when the plunger is removed from the device.

I claim as my invention:

1. A gun comprising a casing having a chamber therein, a plunger movable in said chamber and having an operating rod projecting from one end of the casing, said rod being provided with a suitable hand grip, a pyrophoric igniter carried by the plunger and comprising a relatively movable abrasive member, means connected with said member and having a detent positioned adjacent to said grip, and a trigger adjacent to said grip adapted to operatively engage said detent to secure the abrasive member in position whereby when said trigger is actuated, said abrasive member may be thrust forwardly to cause said igniter to generate a spark.

2. A gun comprising a casing having a chamber therein, a plunger movable in said chamber and having an operating rod projecting from one end of the casing, said rod being provided with a pistol grip, a pyrophoric igniter carried by the plunger and comprising a relatively movable abrasive member, a spring constantly urging said member in one direction, means connected with said member and supported by said operating rod, said means having a detent positioned adjacent to said pistol grip, a trigger adapted to operatively engage said detent to secure the abrasive member in position against the tension of said spring, and whereby when said trigger is actuated, said abrasive member will be thrust forwardly to cause said igniter to generate a spark.

3. A gun comprising a casing having an explosion chamber therein, a plunger movably mounted in said casing and provided with a tubular operating rod projecting from one end of the casing, a pyrophoric metal igniter carried by the plunger, and comprising a relatively movable abrasive member, a stem mounted within said tubular operating rod and connected with said abrasive member, a detent on said stem, a spring-actuated trigger carried by the outer end of the operating rod and adapted to engage said detent and secure the stem in operative position, and a spring adapted to thrust said abrasive member forwardly when the trigger is actuated, whereby said igniter will generate a spark within the explosion chamber to cause detonation of the charge therein.

4. A gun comprising a casing having a chamber therein, a plunger movable in said chamber and provided with an operating rod, an igniter mounted upon the plunger, said igniter comprising a bracket having a plate demountably supported thereon and carrying a pyrophoric element, an abrasive member movably supported adjacent to the plunger and positioned to be engaged by said pyrophoric element, a spring constantly urging said abrasive member in one direction, means on said operating rod exteriorly of the casing for securing said member in operative position against the action of said spring, and means for causing said securing means to be actuated to release said abrasive member whereby a spark is generated.

5. A gun comprising a casing having a chamber therein, a plunger movable in said chamber and provided with a hollow operating rod, a stem mounted in said rod and projecting therefrom beyond the forward end of the plunger, an igniter mounted upon the plunger, said igniter comprising a bracket having a plate demountably supported thereon and carrying a pyrophoric element, an abrasive member movably supported on said stem forwardly of the plunger and positioned to be engaged by said pyrophoric element, a spring constantly urging said abrasive member in a forward direction away from the plunger, means whereby said stem may be relatively axially moved within said rod to position said abrasive member in operative relation to said pyrophoric element, means at the outer end of said operating rod adapted to secure said stem in operative position against the action of said spring, and means for causing said securing means to be actuated to release said stem whereby said abrasive member will be thrust forwardly with re-

spect to said pyrophoric element, causing a spark to be generated.

6. A gun comprising a casing having a chamber therein, a plunger movable in said chamber and provided with an operating rod, an igniter mounted upon the plunger, said igniter comprising a bracket having a forwardly extending portion thereon provided with spaced apart lugs, a plate having a forked end pivotally connected with said bracket and having its opposite end notched and fitting between said lugs whereby said plate is demountably supported on said bracket, a pyrophoric element on said plate, an abrasive member movably supported adjacent to the plunger and positioned to be engaged by said pyrophoric element, a spring constantly urging said plate in a direction to hold the pyrophoric element in frictional engagement with said abrasive member, and means on said operating rod exteriorly of the casing for relatively moving said abrasive member to actuate said igniter.

7. A gun comprising a casing having a chamber therein, a plunger movable in said chamber and having a tubular operating rod projecting from one end of the casing, a stem mounted within said operating rod and adapted for longitudinal movement therein, an igniter comprising a bracket secured to the plunger and having a forwardly extending portion, a plate having one end pivotally supported on said bracket and carrying a pyrophoric element, an abrasive member mounted on said stem and positioned to be engaged by said pyrophoric element, means constantly acting on said plate to hold the pyrophoric element in frictional engagement with said abrasive member, a spring constantly urging said member and stem in a forward direction with respect to said element, means at the outer end of said rod adapted to lock said stem in retracted position, and means manually operable to release said stem whereby the abrasive member will be thrust forwardly and cause a spark to be generated within said chamber.

8. A gun comprising a casing provided at one end with a barrel whose diameter is relatively smaller than the diameter of said casing, said casing defining a chamber having a plunger mounted therein and provided with an operating rod projecting from one end of the casing, means for supplying an explosive gas to said chamber when the plunger is moved in one direction, an igniter carried by the plunger, means at the projecting end of said operating rod for actuating said igniter, and means on said plunger adapted to extend into and substantially close said barrel, when the plunger is in a forward position, thereby to prevent burning of the gas being supplied to said casing immediately after the gun has been fired.

9. A gun comprising a casing provided at one end with a barrel whose diameter is relatively smaller than the diameter of said casing, said casing defining a chamber having a plunger mounted therein and provided with an operating rod projecting from one end of the casing, means for supplying an explosive gas to said chamber when the plunger is moved in one direction, an igniter, means at the projecting end of said operating rod for actuating said igniter, means projecting forwardly of the plunger and extending into said barrel, and a plate secured to said means and snugly fitting within said barrel when the plunger is in a forward position, thereby to prevent burning of the gas being supplied to said casing immediately after the gun has been fired.

10. A gun comprising a casing having an explosion chamber therein, a barrel at one end of said casing whose diameter is relatively smaller than the diameter of said casing, a cap detachably secured to the opposite end of the casing, a plunger mounted in said chamber and having an operating rod traversing an aperture in said cap and provided at its outer end with a pistol grip and a spring-actuated trigger, an igniter carried by the plunger and comprising a pyrophoric metal element, a stem mounted for reciprocal movement within said operating rod and having an abrasive member adjustably supported thereon in position to frictionally engage said pyrophoric element, said stem being adapted to extend into said barrel and having a plate secured thereto adapted to substantially close the passage through the barrel, when the plunger is in a forward position, fixed means within the barrel adapted to be engaged by said stem, means connecting said chamber with a supply of gas, whereby when said plunger is moved in one direction, an explosive mixture may be drawn into the explosion chamber, a spring constantly tending to move said stem and said operating rod in opposite directions, and a detent provided at the outer end of said stem and adapted to lockingly engage said trigger upon continued forward movement of the plunger with respect to the stem, after the latter has engaged the fixed means on said barrel, whereby when the plunger has been moved to the end of its charging stroke, the trigger may be actuated to cause detonation of the explosive gas in said barrel.

11. A gun comprising a casing having a chamber therein, a plunger in said chamber having an operating rod protruding from one end of the casing, means connected with said chamber whereby when said plunger is operated, an explosive gas may be drawn into said chamber, and an igniter carried by the plunger and comprising a pyrophoric element, an abrasive member, and means for securing the abrasive member in position whereby, when said member is released, it will frictionally

engage said pyrophoric element and ignite the gaseous mixture in said chamber.

12. A gun comprising a casing having a chamber therein, means for introducing a suitable gas into said chamber, means movably mounted in said chamber and by which air may be drawn into said chamber to intermix with the gas therein and thus provide an explosive charge, said movable means having an operating handle situated exteriorly of the chamber, and an igniter comprising a pivoted trigger mounted adjacent to said operating handle and whereby said igniter may be actuated to ignite the charge in said chamber.

13. A gun comprising a casing having a chamber therein provided with a restricted passage by which communication is established between said chamber and the atmosphere, means for introducing a suitable gas into the chamber, means movably mounted in said chamber and by which air may be drawn into the chamber to intermix with the gas therein and thus provide an explosive charge, means whereby said movable means may be actuated, an igniter for firing the charge in said chamber, and means carried by said movable means and adapted to substantially close said restricted passage, when the movable means is positioned at one end of the chamber.

In witness whereof, I have hereunto set my hand this 29th day of July, 1931.

ELMER H. SMITH.