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GAS OPERATED AUTOMATIC FIREARM

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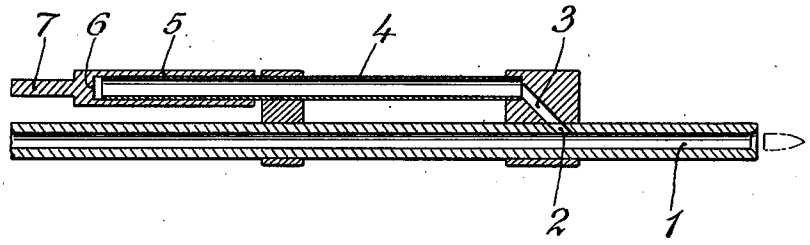

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GAS OPERATED AUTOMATIC FIREARM

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2 Claims. (Cl. 42—3)

In manually reloaded and also in automatic firearms some gas from the exploded powder will always remain in the barrel after each shot.

This gas certainly is quite detrimental to manually reloaded firearms, in that the reloading requires a comparatively long time. In automatic and semi-automatic arms, however, in which the reloading takes place very rapidly, only a small fraction of a second being required, and in which a great number of shots occur in rapid succession, this gas may cause serious inconveniences, due to the fact that it collects as soot upon the cartridge, in the chamber and also to some extent in the mechanism.

The present invention has for its purpose to remove this drawback in automatic and semi-automatic firearms of the gas-reloading type, wherein some part of the gas is passed through a channel in the barrel into a gas cylinder, wherein it presses upon a piston and puts the piston and also the ejecting and reloading mechanism in operation to perform the ejecting and reloading after each shot. The gas cylinder when closed has a comparatively large volume, for instance as set forth in my U. S. Patent No. 2,003,066, dated May 28, 1935, according to which the volume of the cylinder is sufficiently large to supply the air necessary for completing the burning of the gases entering said cylinder. According to the present invention, the channel leading from the barrel to a cylinder of aforesaid type is arranged in such manner that it makes an acute angle with the portion of the barrel located rearwardly of the point of entry of the channel into the barrel.

This relationship between the channel and barrel is known per se, but only in firearms, wherein the gas cylinder volume was quite small as compared with the barrel volume and wherein the said inclined position of the said channel therefore could not and was not intended to have the effect obtained by this invention.

By this new combination an ejector effect is obtained which causes a sucking-out of the powder gas after each shot. An inclined channel connected with a cylinder not having sufficiently large volume will not be able to provide an ejector effect. This will be understood from the following:

Let it be assumed that the distance between the inclined channel and the barrel mouth is 170 mm. and that the velocity of the projectile is 800 meters a second. This means that the projectile requires $\frac{1}{4700}$ of a second to travel through this distance and that the driving power, the pressure of the powder gas, acts only for $\frac{1}{4700}$ of a second, and consequently like a hammer blow.

Let it be further assumed that the opening of the operating mechanism requires about $\frac{1}{20}$ of a second, and that the length of movement of the mechanism is 126 mm. Then the velocity of movement of the piston would be 2520 mm. a second, from which follows that the piston will move 0.535 mm. during the $\frac{1}{4700}$ of a second, during which the driving power is acting.

From this calculation it is evident that the volume under consideration, when the ejector effect is to be estimated, is the cylinder volume at a closed mechanism.

Any increase in volume as a result of movement of the piston and consequently any increase in the gas quantity causing the ejector effect is quite negligible during the short time in which the powder gas acts upon the piston. The intended ejector effect therefore is obtained only, if the inclined channel is combined, according to the present invention, with a large gas cylinder volume.

An embodiment of the invention is illustrated in the drawing which shows the foremost portion of a firearm barrel. The barrel **1** somewhat behind the muzzle is provided with a bore **2**, and the bore or channel is inclined so that its axis makes an acute angle with the barrel axis. The channel or bore **2** continues in a correspondingly inclined channel **3** rearwardly to the front end of a gas cylinder **4**, which has a piston at its rear end comprising a surrounding sleeve **5** having a bottom **6**. A bar **7** extends rearwardly from this piston for operating the breech mechanism (not shown). The present invention is not particularly concerned with this reloading mechanism per se. This mechanism may for instance be constructed according to the British Patent No. 415,841. The drawing shows the position of the piston when the breech is closed as during the firing of the shot at the moment at which the projectile leaves the barrel.

The piston **5**, **6** may also be arranged to slide in the interior of the cylinder **4**. When in closed position the cylinder **4** has a large volume, preferably half of the barrel volume, but it may also be somewhat larger or less, according to the caliber of the weapon. The operation is as follows:

When the shot is fired, the powder gas, after the projectile has passed by the gas channel **2**, **3**, will flow through the latter and into the cylinder **4**, until the projectile is out of the barrel. The projectile requires less than $\frac{1}{3000}$ of a sec-

ond to travel from the channel 2 to the muzzle, but this time is nevertheless sufficient for the cylinder 4 to be filled with sufficient gas to cause the motion of the piston 5, 6 and the mechanism operated thereby during the reloading.

As the projectile, as mentioned above requires an exceedingly short time for its travel from the gas channel until it has left the muzzle, the piston during this short time can have moved only a fraction of the movement required of it for opening the breech.

The condition existing as the projectile leaves the muzzle is that the cylinder 4 is filled with powder gas under a certain pressure. This gas presses upon the piston 5, 6 at one end of the cylinder, while at the other end of the cylinder it flows out through the gas channel 3, 2, and on account of the inclination of the channel flows further out through the firearm muzzle. This outflow of the gas takes place during the rearward motion of the piston 5, 6, until the sleeve 5 has cleared the cylinder 4 and the piston and cylinder are put into connection with the fresh air.

Owing to the inclined position of the channel 2 an ejector effect is obtained because the gas flowing out from the cylinder 4 draws along with it the powder gas which is present in the barrel 1 rearwardly of channel 2. The condition necessary for a good effect is obviously that the cylinder 4 shall have a large volume and that the length of movement of the piston shall be comparatively great. If the emptied cartridge casing has been loosened and pulled somewhat out of the chamber before the sleeve 5 clears the cylinder 4 fresh air will be sucked through the chamber and into the barrel as a result of the above-mentioned ejector effect. Thereby the barrel is cleaned to a still greater extent, and simultaneously the stream of fresh air drawn through the barrel between each shot will have a cooling effect upon the barrel.

Experiments have shown that all sooting of cartridge casings, the chamber and other mechanism is avoided. Furthermore the extraction of the empty casings is more uniform and easier than heretofore.

I claim:

1. In a firearm of the gas reloading type, in combination a barrel, a cylinder, a breech-operating piston movable under the influence of powder gas pressure in said cylinder, said piston closing said cylinder when in closed breech position and opening said cylinder to the atmosphere when in open breech position, the volume of said cylinder when the piston is in closed breech position being about one-half the volume of the barrel, said barrel having a lateral bore, which, where it disembogues into the barrel, forms an acute angle with respect to the portion of the barrel axis in rear of the bore, and means providing a channel connecting said bore with said cylinder.

2. In a firearm of the gas reloading type, in combination a barrel, a cylinder, a breech-operating piston movable under the influence of powder gas pressure in said cylinder, said piston closing said cylinder when in closed breech position and opening said cylinder to the atmosphere when in open breech position, said cylinder, when in closed breech position having a large volume of the order of one-half the volume of the barrel bore sufficient to provide the air necessary for completing combustion of the gases entering thereinto from the barrel so as to reduce accumulation of soot in the cylinder, means providing a channel connecting said cylinder with said bore, said channel, where it disembogues into the bore forming an acute angle with the portion of the bore in rear of said channel so that after firing the high pressure gas in said cylinder flows through the channel into said bore and creates a forwardly directed current of air through the bore to clear the bore of powder gas to minimize deposit of soot in said barrel and channel and to cool the barrel.

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