July 19, 1927. 1,636,357

R. M. CUTTS, JR

ANTICLIMB DEVICE

Filed May 22, 1926

Fig. 1.

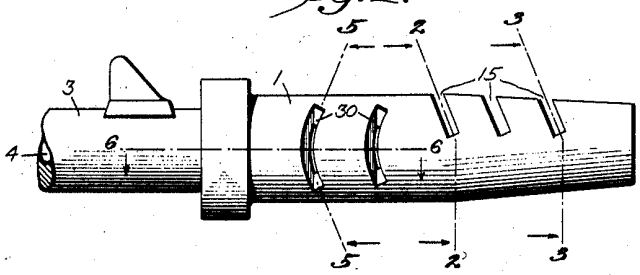


Fig. 2.

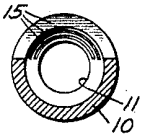


Fig. 3.

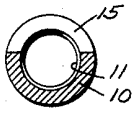


Fig. 4.

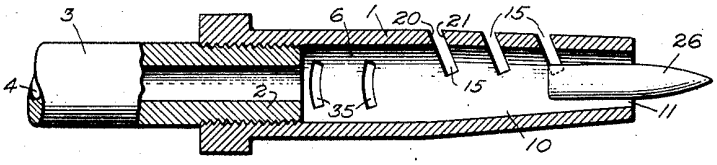


Fig. 5.

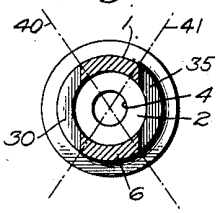


Fig. 6.

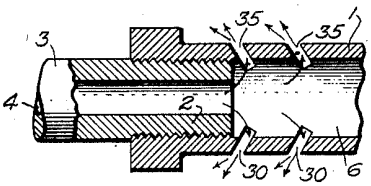
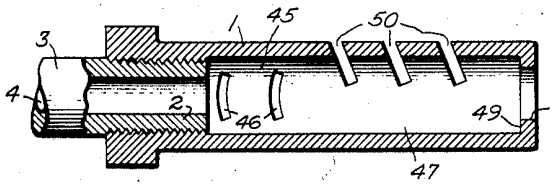


Fig. 7.



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UNITED STATES PATENT OFFICE.

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ANTICLIMB DEVICE.

Application filed May 22, 1926. Serial No. 110,983.

This invention relates to anti-climb devices for use on rifles, and has for its object to provide a construction more efficient in use and less costly to manufacture than those heretofore proposed.

With these and other objects in view the invention consists in the novel details of construction and combinations of parts which will be more fully disclosed hereinafter and particularly pointed out in the claims.

Referring to the accompanying drawings forming a part of this specification in which like numerals designate like parts in all views:

Fig. 1 is a side elevational view of the invention as applied to a rifle barrel;

Fig. 2 is a transverse sectional view taken on the lines 2—2 of Fig. 1 and looking in the direction of the arrows;

Fig. 3 is a transverse sectional view taken on the lines 3—3 of Fig. 1 and looking in the direction of the arrows;

Fig. 4 is a vertical longitudinal sectional view of the parts shown in Fig. 1;

Fig. 5 is a transverse sectional view taken on the line 5—5 of Fig. 1 and looking in the direction of the arrows;

Fig. 6 is a partial longitudinal sectional view taken on the line 6—6 of Fig. 1 and looking in the direction of the arrows; and

Fig. 7 is a vertical longitudinal sectional view similar to Fig. 4 illustrating a modified form of the invention.

This invention is adapted to prevent the climb, jump or whip, as well as reduce the recoil, of machine guns, automatic or semi-automatic rifles of various sizes, and firearms of all kinds. It is attached to the muzzle in any suitable manner and may be adapted to compensate for, or produce, a lateral movement of the muzzle of the firearm, as will be disclosed later.

This invention constitutes an improvement over the invention disclosed in my co-pending application filed July 20, 1925, Serial No. 44,954, entitled Climb arrester.

This invention comprises a substantially cylindrical member 1 threaded internally at one end to engage the end of the muzzle 2 of the rifle barrel 3 provided with the usual bore 4. When the device is thus secured to a rifle there is formed an expansion chamber 6 which may be cylindrical or otherwise but of a diameter adjacent the muzzle 2 greater than the bore 4 of the rifle or weapon to which the device may be attached. At the approximate longitudinal center, the device is drawn, molded or otherwise formed to provide a compression chamber as indicated at 10, and an opening 11 at the free end of the device. The internal diameter of this constricted opening 11 will be, in all cases, slightly larger than the caliber of the ammunition used in the weapon.

The wall of the compression chamber 10 is provided with a plurality of apertures 15 whose centers are substantially disposed in a longitudinal plane of the device, and each aperture is of such size that substantially all thereof lies above the central horizontal plane of the climb arrester.

It is to be understood that the positions of said apertures may be varied to obtain the results desired with the variation in the firearms to which the climb arrester is to be applied all within the scope of this invention and in the manner to be later explained. Each of the apertures 15 comprises a substantially rectangularly shaped opening extending transversely of the device and as best illustrated in Figures 1 and 4. Each aperture is provided with a rear surface 20, and a forward surface 21, both of which are angularly disposed to an element of the chamber 10, all as will be clear from Fig. 4. However, it may be readily seen by anyone skilled in the art that the general outline of these apertures is not essential to this device.

From what has now been disclosed it will be apparent that this device is provided with an expansion chamber in connection with a compression chamber extending from the muzzle of the rifle to the constricted opening 11. Further it will be seen that after the bullet 26 has left the muzzle of the rifle the gases of combustion propelling said bullet will enter and expand in the chamber 6 and then said gases will enter the constricted orifice 11. But by this time the bullet 26 will have become more or less centered in said constricted orifice 11 thereby diminishing to a large extent the area of said orifice, but not, however, totally closing the same, with the result that the pressure of the gases expanded in the chamber

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6 will be increased. Also it will be seen from the above disclosure that the apertures 15 offer a means of escapement for the gases, but the direction of this escapement is substantially at right angles to the forward movement of said gases. Inasmuch as the apertures are disposed above the central horizontal plane of the device, when it is secured in normal position on the weapon, the gases will escape therethrough in a direction above said horizontal plane and to either side of a longitudinal vertical plane, and thereby produce a reaction in the opposite directions which will tend to force the muzzle 2 in the direction of said reaction. This reaction is made sufficient to compensate for the vertical climb of said nozzle. It will of course be obvious that the longitudinal position as well as the number of apertures will vary with the degree of compensation required by the weapon to which the device is applied. That is to say, a machine gun with an attachment of this nature will very likely require the apertures 15 to be in a different longitudinal position relative to said device than the apertures in a device made for other fire-arms.

Also it will be obvious that this climb arrester may be rotatably adjusted relative to the muzzle of the rifle as may be required and may be secured in said adjusted position in any suitable manner not shown. The first purpose of this adjustment is to change the position of the common central vertical plane through the apertures 15 in order to compensate for any lateral translated movement as may be found necessary from the use of the weapon. The second purpose of this adjustment is to obtain traversing fire, either to the right or left.

From actual tests, it has been found that a device made in accordance with this invention will increase the pressure of the gases therein notwithstanding the plurality of apertures 15 through which some of the gases are free to escape. This degree of compression, may of course be varied but said degree is always dependent on the caliber of, and pressure developed in, the weapon upon which the device is to be used, in combination with the desired increase of pressure of said gases in the device, and the total cross-sectional area of the apertures. The size of each aperture 15 may also be varied according to the particular weapon with which the device is to be used, but in all cases the size of each opening may be figured from tests, and standards created in order that the apertures may be of sufficient size so that the gases escaping therethrough will produce a reaction on the diametrically opposed interior wall of the device to force the climb arrester in the direction of said reaction. That is to say, the gases in passing through the apertures 15 react against the opposite imperforate wall of the device with a component of force at right angles to the longitudinal axis of the device and with a second component of force parallel to said axis, whether the apertures 15 be slanted rearwardly as shown in the figures or slanted in a correspondingly forward direction. If the apertures are vertically disposed then the gases passing therethrough will react against the opposite wall of the device with a force acting only at right angles to the longitudinal axis of the device. The result of these forces tends to move the muzzle of the gun in the direction of the resultant of said component forces.

It is to be observed that the device 1 also has formed in the wall of the expansion chamber 6 a plurality of apertures 30 very similar to the apertures 15, in that they are slits obliquely disposed to an element of the chamber. These slots 30, likewise rearwardly inclined as particularly illustrated in Fig. 6, are adapted to receive a portion of the gases emerging from the muzzle 2 of the rifle barrel 3 which, in passing therethrough, will be deflected in the direction illustrated by the arrows. The result of the passage of the gases through the apertures 30 will cause a reaction in a direction of the resultant of the component forces of the emerging gases. Stated in other words, there will be a tendency to move the gun not only in a forward direction, but also in a direction away from the apertures 30. However, it is not desired to have the gun move positively in this last named direction, because such a movement would cause a substantially horizontal movement of the gun which in turn would create a traversing fire, due to the said apertures 30 being disposed in a substantially horizontal plane of the device 1 disposed 90° from the longitudinal plane of the device through the centers of the apertures 15. Therefore there is provided a plurality of apertures 35 exactly similar to the apertures 30 but diametrically opposed thereto in order to negative the action of the gases emerging through the latter. That is to say, each aperture 35 comprises a slot disposed in a plane angularly disposed to an element of the chamber, said slot extending outwardly and rearwardly with respect to the gun. The gases emerging from the muzzle 2 into the expansion chamber 6 will therefore pass through the apertures 35 exactly in the same manner as they pass through the apertures 30 except as to direction. From Figure 5 it will be seen that the extremities of the apertures 30 and 35 lies in intersecting diameters 40 and 41 of the device 1 which is a very important feature and necessary in order to prevent horizontal translation of the gun barrel during semi-automatic or automatic fire while at the same time allowing the gases to escape through said apertures.

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The purpose of these side apertures is to counteract the recoil of the gun and it is to be observed from the drawings that the centers of said apertures are disposed in a substantially horizontal plane when the device 1 is in normal operative position upon the gun barrel 3, which is at 90° to the vertical plane passing through the centers of the apertures 15. The result of this construction is that the gases passing through the apertures 15 will overcome the climb of the gun while gases passing with equal force through the side apertures 30 and 35 will reduce the recoil of said gun. From actual tests it has been found that these apertures 30 and 35 of equal size and opposite disposition utilize but a small percentage of the gases of combustion, thus reserving the greater percentage of gases for use in the compression chamber 10 to prevent the climb or vertical movement of the muzzle of the gun by their emergence through the apertures 15.

It is to be understood, however, that the apertures 30 and 35 may be placed forward in the walls of the compression chamber where better results may be obtained from the gases emerging therethrough due to the increased pressure of said gases. In this connection, however, the slots 15 will be either omitted entirely or reduced in number in order to accommodate the recoil slots 30 and 35 and in direct proportions to the amount of climb to be overcome.

In Figure 7 is shown a modified form of the invention wherein the device 1 comprises a cylinder which lacks the compression chamber 10. However, the gases emerging from the muzzle 2 of the rifle 3 will enter the portion 45 of the cylinder corresponding to the expansion chamber and a portion of these gases will pass outwardly through diametrically opposed slotted apertures 46 exactly similar to the apertures 30 and 35. The muzzle gases will travel into the forward portion 47 of the cylinder, but before they can pass through the orifice 48 in the end of the cylinder, they will encounter the turned-over end portion 49 of the cylinder, forming the orifice 48, and be obstructed suddenly thereby, and to such an extent that the pressure of said gases will be increased and another portion of the gases will emerge through the slotted apertures 50 in a manner similar to the escape of the gases through the apertures 15. The apertures 50 are exactly similar to the apertures 15 except that they are not provided in a tapered section of the device with the result that the forward innermost edge of said apertures 50 will not act upon the gases traveling through the device in the same positive manner that the corresponding edges of the apertures 15 act upon the gases passing therethrough. The turned-over end portion 49 of the device of Figure 7 falls within the scope of this invention but is illustrated only to show another means of building up, maintaining, and retaining for a longer period of time than possible with the construction shown in Fig. 4, a pressure of the gases for use through apertures as heretofore disclosed.

However, this modified construction, which may be used with an equal degree of success with low powered guns, is not suitable for higher powered guns due to the fact that the increase of gas pressure is formed suddenly as contradistinguished from the gradual building up of the same pressure in the preferred form illustrated in the preceding figures. The advantage accruing from a gradual building up of the pressure will be apparent but may be stated as allowing the work to be performed by said gases starting sooner, and extending over a longer period of time. This is due to the fact that, with particular reference to Figure 4, the increase in the gas pressure starts when the bullet 26 reaches the compression chamber 10 and gradually builds up until the maximum diameter of the bullet is centered in the orifice 11. On the other hand, with the construction shown in Figure 7, the gas pressure is not increased until said gas has reached the end wall 49 of the cylinder at which time it is practically instantaneously increased, due to the centering of the bullet in the orifice 48. It is to be understood, however, that in the use of the modified form with lower powered guns, the bullets of which are generally of a short longitudinal dimension, it is highly desirable to retain the gases within the chamber 47 for a period of time sufficient to allow them to perform the work necessary, and therefore in this case the longitudinal dimension of the orificial surface would necessarily be increased. Stated in other words, it is obvious that for a low powered gun utilizing a short bullet, the increase in longitudinal dimension of the orificial surface would have an effect on the gases in combination with said bullet, very similar if not equal to the effect produced by the combination of a longer high powered bullet with the orifice 11 shown in Fig. 4 or an orifice of relatively short longitudinal surface.

From the foregoing it will therefore be observed that by rotatably adjusting the device 1, the movement of the muzzle of the rifle may be automatically controlled to produce lateral movement thereof when traversing fire is desired. This is accomplished by the escapement of the gases through the apertures 15, which have been now rotated so that the plane of the central portions thereof lies to one side of the vertical plane of the device. While usual normal lateral translation of movement of the muzzle of the rifle is toward the right as viewed from the butt, rotatable adjustment of this device is

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intended to be such as will be understood from the foregoing with reference to the drawings.

It will further be understood, from the above description of the device, that the power of the expanded gases of the fire-arm has been successfully developed, to the absolute maximum, and full advantage taken of every favorable factor in connection with directing and controlling these expanding gases to positively secure the result desired, to the end that the device may be attached to fire-arms, completely efficient, small in size and light in weight. It is apparent that unless the device is clearly efficient, light in weight, and smaller in size, its value will be negligible.

It is obvious that those skilled in the art may vary the details of construction as well as the arrangements of parts, without departing from the spirit of the invention, and therefore it is not desired to be limited to the above disclosure except as may be required by the claims.

What is claimed is:—

1. A firearm provided with a muzzle and a chamber associated therewith adapted to receive the gases of explosion, the walls of said chamber provided with a group of diametrically opposed apertures and another group of apertures disposed to one side of a plane passing through the axis of said chamber, whereby on firing, said gases will exert a forward pressure on said muzzle due to said first named apertures and a downward pressure on said muzzle due to said second named apertures.

2. A firearm provided with a muzzle and a chamber associated therewith adapted to receive the gases of explosion, the walls of said chamber provided with a group of diametrically opposed rearwardly directed apertures and another group of apertures disposed to one side of a plane passing through the axis of said chamber, whereby on firing, said gases will exert a forward pressure on said muzzle due to said first named apertures and a downward pressure on said muzzle due to said second named apertures.

3. A firearm provided with a muzzle and a chamber associated therewith adapted to receive the gases of explosion, the walls of said chamber provided with a group of diametrically opposed transversely extending apertures and another group of apertures disposed to one side of a plane passing through the axis of said chamber, whereby on firing, said gases will exert a forward pressure on said muzzle due to said first named apertures and a downward pressure on said muzzle due to said second named apertures.

4. A firearm provided with a muzzle and a chamber associated therewith adapted to receive the gases of explosion, the walls of said chamber provided with a group of diametrically opposed rearwardly and outwardly directed apertures and another group of apertures disposed to one side of a plane passing through the axis of said chamber, whereby firing, said gases will exert a forward pressure on said muzzle due to said first named apertures and a downward pressure on said muzzle due to said second named apertures.

5. A firearm provided with a muzzle and a chamber associated therewith adapted to receive the gases of explosion, the walls of said chamber provided with a group of diametrically opposed transversely extending apertures obliquely disposed to the axis of said chamber and another group of apertures disposed to one side of a plane passing through the axis of said chamber whereby on firing, said gases will exert a forward pressure on said muzzle due to said first named apertures and a downward pressure on said muzzle due to said second named apertures.

6. In a firearm the combination of a muzzle and a chamber provided with one group of apertures disposed to one side of a plane passing through its axis, and with another group of apertures disposed on opposite sides of a plane passing through said axis, the wall of said chamber opposite said first named apertures being imperforate, and all of said apertures adapted to cause a movement of said muzzle upon firing in a plurality of directions.

7. In a firearm the combination of a muzzle and an adjustable chamber provided with one group of apertures disposed to one side of a plane passing through its axis, and with another group of apertures disposed on opposite sides of a plane passing through said axis, the wall of said chamber opposite said first named apertures being imperforate, and all of said apertures adapted to cause a movement of said muzzle upon firing in a plurality of directions.

8. In a firearm the combination of a muzzle and an adjustable chamber provided with one group of transversely extending apertures disposed to one side of a plane passing through its axis, and with another group of apertures disposed on opposite sides of a plane passing through said axis, the wall of said chamber opposite said first named apertures being imperforate, and all of said apertures adapted to cause a movement of said muzzle upon firing in a plurality of directions.

9. In a firearm the combinaion of a muzzle and a chamber provided with one group of apertures disposed obliquely to the axis of the chamber and to one side of a plane passing through its axis, and with another group of apertures disposed obliquely to the axis of the chamber and on opposite

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sides of a plane passing through said axis, the wall of said chamber opposite said first named apertures being imperforate, and all of said apertures adapted to cause a movement of said muzzle upon firing in a plurality of directions determined by said oblique dispositions.

10. In a firearm the combination of a muzzle and a chamber provided with one group of apertures disposed in a longitudinal plane to one side of a plane passing through its axis, and with another group of apertures disposed on opposite sides of said longitudinal plane, the wall of said chamber opposite said first named apertures being imperforate, and all of said apertures adapted to cause a movement of said muzzle upon firing in a plurality of directions.

11. In a firearm the combination of a muzzle and a chamber provided with one group of apertures disposed to one side of a plane passing through its axis, and with another group of apertures disposed on opposite sides of a plane passing through said axis, the wall of said chamber opposite said first named apertures being imperforate, and all of said apertures adapted to cause a movement of said muzzle upon firing in a plurality of predetermined directions.

12. In a firearm provided with a muzzle the combination of an expansion chamber to receive the gases of explosion as they emerge from said muzzle; a compression chamber in prolongation of said expansion chamber to receive the gases therefrom; and means associated with said compression chamber to release a portion of said gases under increased pressure tending to produce movement of said muzzle in a longitudinal direction.

13. The combination with a gun barrel, of an adjustable chamber mounted on and extending beyond the muzzle of the barrel to receive the gases of explosion as they emerge from said barrel, said chamber being provided with means to substantially simultaneously compress said gases in a longitudinal direction and to release said gases in a transverse direction, said transverse movement being in a direction governed by the adjusted position of said chamber.

14. In a firearm provided with a muzzle the combination of an adjustable expansion chamber to receive the gases of explosion as they emerge from said muzzle; means associated with said chamber to increase the pressure of the expanded gases; and means further associated with said chamber to release the expanded gases under pressure to tend to produce movement of said muzzle in any predetermined direction due to the adjustability of said chamber.

15. In a firearm provided with a muzzle the combination of an expansion chamber to receive the gases of explosion as they emerge from said muzzle; means associated with said chamber to increase the pressure of the expanded gases; and means further associated with said chamber to release the expanded gases under pressure in a plurality of predetermined directions to oppositely counteract the movement of said muzzle in a plurality of directions.

16. In a firearm provided with a muzzle the combination of an expansion chamber to receive the gases of explosion as they emerge from said muzzle; constricting means associated with said chamber to increase the pressure of the expanded gases; and means further associated with said chamber to release the expanded gases under pressure in a plurality of predetermined directions to oppositely counteract the movement of said muzzle in a plurality of directions.

17. In a firearm provided with a muzzle the combination of an expansion chamber to receive the gases of explosion as they emerge from said muzzle; means comprising a tapered passage associated with said chamber to increase the pressure of the expanded gases; and means further associated with said chamber to release the expanded gases under pressure in a plurality of predetermined directions to oppositely counteract the movement of said muzzle in a plurality of directions.

18. In a firearm provided with a muzzle the combination of an expansion chamber to receive the gases of explosion as they emerge from said muzzle; means associated with said chamber to increase the pressure of the expanded gases; and means comprising a plurality of apertures further associated with said chamber to release the expanded gases under pressure in a plurality of predetermined directions to oppositely counteract the movement of said muzzle in a plurality of directions.

19. In a firearm provided with a muzzle the combination of an expansion chamber to receive the gases of explosion as they emerge from said muzzle; means associated with said chamber to increase the pressure of the expanded gases; and means comprising a plurality of apertures further associated with said chamber and arranged in a plurality of groups to release the expanded gases under pressure in predetermined directions to oppositely counteract the movement of said muzzle in a plurality of directions.

20. A firearm provided with a muzzle and an adjustable expansion chamber to receive the gases of explosion as they emerge from said muzzle, said chamber being provided with means to increase the pressure of the expanded gases, and also means to release the expanded gases under pressure, said last named means being disposed at an angle to the axis of said chamber to tend to produce

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a longitudinal and a transverse movement of said muzzle, the transverse movement being in a direction governed by the adjusted position of said chamber.

21. In a fiream provided with a muzzle the combination of a chamber to receive the gases of explosion as they emerge from said muzzle, said chamber provided with means to release a portion of said gases in predetermined directions to counteract recoil, and further provided with means to release under increased pressure another portion of said gases in a predetermined direction to counteract climb of said muzzle.

In testimony whereof I affix my signature.

RICHARD M. CUTTS, JR.

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