Nov. 2, 1926. 1,605,393

R. M. CUTTS, JR

CLIMB ARRESTER

Filed July 20, 1925

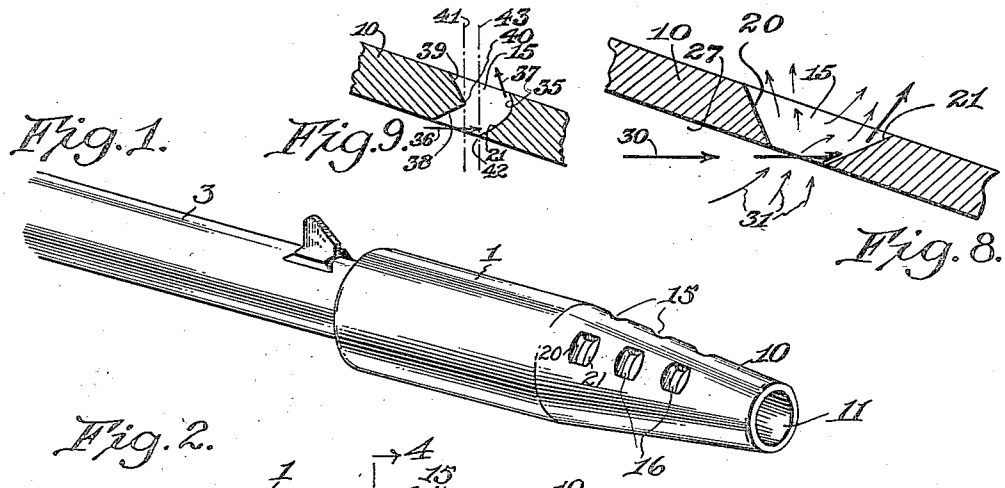
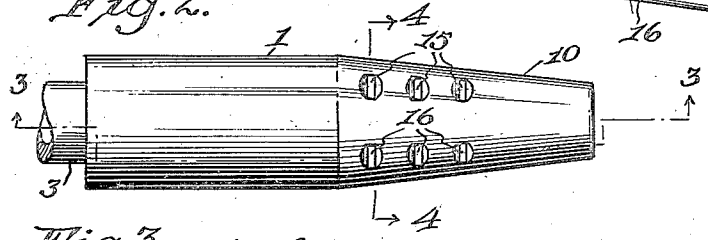


Fig. 2.



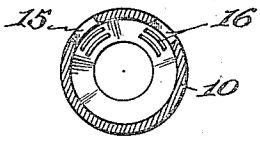


Fig. 4.

Fig. 3.

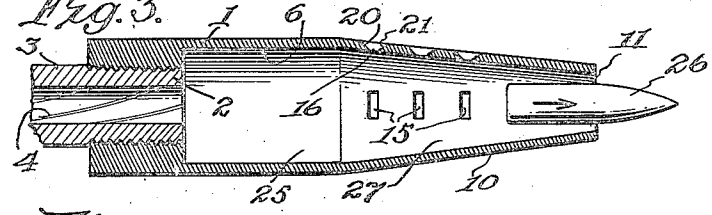
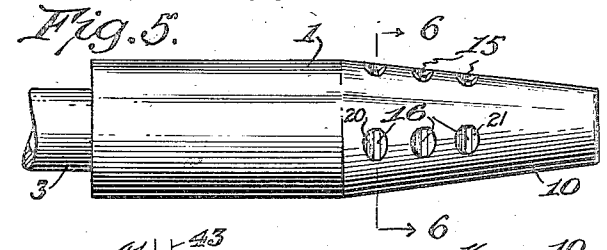


Fig. 5.



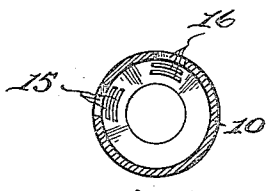


Fig. 6.

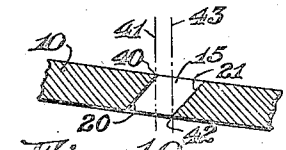


Fig. 10.

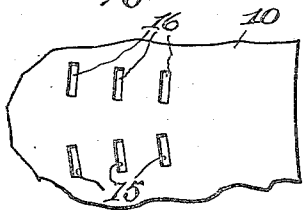


Fig. 7.

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UNITED STATES PATENT OFFICE.

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CLIMB ARRESTER.

Application filed July 20, 1925. Serial No. 44,954.

This invention relates to climb arresters in 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 the views;

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

Fig. 2 is a top plan view of the parts shown in Fig. 1;

Fig. 3 is a longitudinal sectional view taken on the line 3—3 of Fig. 2 and looking in the direction of the arrows;

Fig. 4 is a transverse sectional view taken on the line 4—4 of Fig. 2 and looking in the direction of the arrows;

Fig. 5 is a top plan view of the parts shown in Fig. 2 turned in an adjusted position;

Fig. 6 is a transverse sectional view taken on the line 6—6 of Fig. 5 and looking in the direction of the arrows;

Fig. 7 is a detail view illustrating the development of the conical section of the invention as seen from the inside and illustrating the apertures therein;

Fig. 8 is an enlarged view illustrating the lateral escape of some of the gases from the device; and

Figs. 9 and 10 are detail views similar to Fig. 8 and illustrating modified forms of the apertures in this invention.

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

The invention comprises the substantially cylindrical member 1 provided at one end with internal screw threads adapted to engage the threaded end of the muzzle 2 of the rifle barrel 3, provided with the usual rifling 4. The device has the internal cylindrical chamber 6 of a diameter greater than the bore of the rifle or weapon to which the device may be attached, and about the longitudinal middle point of the device the cylinder 1 is drawn or molded or otherwise formed into the concentrically tapering portion indicated at 10 to produce the constricted opening 11 at the opposite 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 tapered portion 10 is provided with a plurality of apertures 15 constituting one group substantially arranged in a longitudinal plane of the device, and with a second group of apertures 16 substantially arranged in another longitudinal plane of the device, the radial centers of all apertures to be above the central horizontal plane of the climb arrester, and disposed in each group from above the horizontal plane to the vertical center of the climb arrester when locked in position on the fire-arm, the positions of the radial centers of the apertures to be varied within these limits to obtain the results desired with the variation in the fire-arms to which the climb arrester is to be applied in the manner later explained. Each of the apertures 15 and 16 comprises a rectangularly shaped opening extending transversely of the device and as best illustrated in Fig. 7. However, it can be readily seen by any one skilled in the art that the general outline of these apertures is not essential to the functioning of this device. Each aperture is provided with a chamfered or beveled surface 20, see Fig. 3, which extends rearwardly from said aperture, and also the beveled surface 21 extending forwardly of the device. There are no chamfered or beveled surfaces, however, extending laterally away from said apertures, but on the other hand, there is provided substantially radial walls at these points, see Figs. 4 and 6. The purposes of these bevels will presently appear.

From what has been heretofore disclosed it will be apparent that this device is so constructed as to provide an expansion chamber 25 extending from the muzzle of the rifle to the constricted opening 11 of the said device. 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 said chamber, expand therein especially in the cylindrical portion thereof, and then said gases will enter the tapered portion 10 surrounding the passage 27 in order to seek an exit through the constructed orifice 11 at the end of said chamber. 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. The result is that the pressure of the gases expanded in the cylindrical portion of the chamber 25 will be increased, and in escaping through opening 11, the gases impinge on the inner tapered surface 10 to create a friction, and therefore said gases will tend to impart a forward drive to the entire fire-arm, thus overcoming to an appreciable extent the recoil or kick of said fire-arm.

Also, it will be seen from the above disclosure that the apertures 15 and 16 offer a means of escape to the gases from the chamber 25, but the direction of this escape is substantially at right angles to the forward movement of said gases. Also, it will be observed that the apertures 15 and 16 as best illustrated in Figs. 1, 2 and 3 are normally so disposed relative to the barrel 3 of the rifle that the general longitudinal planes passing through each group of apertures will be substantially equi-distant from the central vertical longitudinal plane passing through the rifle and said device. The result therefore of such a construction is to allow some of the gases to escape from the chamber 25 in an upward direction or to either side of the central vertical plane of the device. In other words, the radial centers of all the apertures 15 and 16 are above the central horizontal plane passing through the device when it is locked in position on the weapon as shown in Figs. 1, 2 and 3. It will, of course, be obvious that the longitudinal position as well as the number of apertures in each group 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 each group of apertures 15 and 16 to be in a different longitudinal position relative to said device than the apertures in a device made for a smaller fire-arm.

Also, it will be seen that this climb arrester may be rotatably adjusted relative to the muzzle of the rifle and may be secured in such an adjusted position as may be required, in any suitable manner, not shown. The first purpose of this adjustment is to change the vertical angles through each group of apertures 15 and 16, or in other words, to bring one of such groups such as the apertures 15, see Figs. 5 and 6, nearer the central horizontal plane of the device than the groups of apertures 16 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. In this connection it will also be seen that these apertures 15 and 16 are each provided with an upward and forward bevel 21; and a rear bevel 20, in order that some of the gases may escape laterally from the expansion chamber 25 with the least friction possible. The inclination of the bevels 20 and 21 may be equal with respect to the inner tapered surface of the chamber 25 but by experimentation the degree of inclination of each bevel surface 21 has been found to be most efficient when not greater than 45° to the axis of the bore.

From actual tests, it has been found that a device made in accordance with this invention will create a forward drive to the weapon when the same is fired due to the gases impinging on the inner tapered surface of the constricted portion 10 which reduces the recoil above mentioned. Further, the degree of taper of the constricted portion 10 is made sufficient to increase the pressure of the gases in the chamber 25, notwithstanding the plurality of apertures 15 and 16 through which some of the gases are free to escape. This degree of taper 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 and 16 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 be resisted by atmospheric pressure to that degree which will produce a reaction of the diametrically opposite interior wall of the device to force the climb arrester in the direction of said reaction.

Therefore, it will be seen that a great advantage lies in a device of this character in that the apertures may be so disposed as to reduce the recoil of the weapon, as well as what is known as the climb or upward movement of the muzzle of the weapon upon firing. That is to say, the gases impart a forward drive to the rifle not only due to their impinging on the tapered surface within the device but also to their passage through the apertures 15 and 16. By referring to Fig. 8, it will be seen that the main force of the gases in the chamber 25 is in the direction of the arrow 30 but

there will also be forces in the direction of the arrows 31. Therefore, it will be seen that some of the force of the gases will be in the direction of said arrow 30 and as a result thereof, the beveled or inclined surface 21 will be acted on by said gas force. In other words, the force of the gases, escaping through each aperture such as 15, will act on said surface 21 of the device in such a direction as will create a downward and forward movement of said device. In addition to this, and with particular reference to Figs. 5 and 6, it will further be seen that a further important feature of the device resides in the ability to adjust the same rotatably so that when the upward movement of the muzzle of the rifle is overcome by the device the rotatable adjustment of the device may be made to overcome any undesirable lateral movement of the fire-arm as well as produce such lateral movement when traversing fire is desired. This is accomplished through the substantially horizontal escapement of the gases through the apertures 15, and the vertical escapement of said gases through the apertures 16 in their adjusted positions as illustrated in Figs. 5 and 6. While the usual lateral translation of a movement of the muzzle of a rifle is toward the right as viewed from the butt, the rotatable adjustability of this device is intended to be such as will cover the translation in either direction. That is to say, the member 1 may be rotatably adjusted as previously described or it may be adjusted in the opposite direction to bring the apertures 16 nearer the central horizontal plane passing through the device.

If desired, a sleeve or curved plate, not shown, provided with apertures adapted to register with the apertures 15 and 16, may be rotatably mounted on the member 1 to vary the extent of opening of said apertures 15 and 16. The bottom wall of the chamber 25 being imperforate the pressure exerted thereon by the gases within said chamber will always be in a direction opposite to the apertures 15 and 16, as will be readily understood.

In Fig. 9 is illustrated a portion of the wall 10 of the device with an aperture 15 of modified form in which the forwardly inclined surface 21 is slightly curved as at 35, so that the gases entering the aperture 15 in the direction of the arrow 36 will leave said aperture in the direction of the arrow 37. It will be observed in this connection that the wall of the aperture 15 consists of two surfaces, 38 and 39, the former being substantially parallel to the forward surface 21, and the latter extending rearwardly in order to furnish an unobstructed passage for the gases as they travel outwardly between said surface 39 and the outer extremity of the curved surfaces 35. This modified form of the invention is particularly desirable when used in conjunction with fire-arms of the larger calibers and those having a greater degree of recoil in that the curved surface 35 and the inclined surface 21 combine to form a pocket for the escaping gases, whereby greater friction will be provided as said gases escape from the device to the end that the degree of recoil of the weapon will be lessened.

Fig. 10 is a modified form of aperture 15 having both front and rear walls forwardly inclined and substantially parallel. In both Figs. 9 and 10, it will be observed that there is provided an unobstructed vertical passage for the escaping gases between the inner limits of both front and rear walls 21 and 20, respectively, of each aperture 15. That is to say, the innermost point 40 of the rear wall is disposed in a plane 41 perpendicular to the longitudinal axis of the device and the innermost point 42 of the front wall of the aperture 15 is disposed in a plane 43 parallel to the plane 41 but spaced therefrom. This construction will permit a direct and unobstructed passage for gases passing through the aperture 15, thereby insuring a positive action of the gases on the imperforate bottom wall of the chamber 27, which will not be entirely counteracted by the gases acting on the perforated upper wall of said chamber, thus producing a movement of the muzzle of the fire-arm in a direction away from the apertures.

It will be understood from the above description of the device that the power of the expanding gas of a firearm has been successfully developed, by experiment, to the absolute maximum, and full advantage taken of every favorable factor in connection with directing and controlling these expanding gases to secure the results desired, to the end that the device will be fully adjustable to fire-arms, completely efficient, small in size and light in weight. It is perfectly clear that unless the device is completely efficient, light in weight and small in size, its practical 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 tapered chamber associated with said muzzle adapted to receive the gases of explosion, the walls of said chamber provided with apertures above a horizontal plane passing through its axis and imperforate below said plane, whereby on firing, said gases will exert a downward pressure on said muzzle and

counteract any tendency of said muzzle to rise.

2. A firearm provided with a muzzle and a tapered chamber associated with said muzzle adapted to receive the gases of explosion, the walls of said chamber provided with a plurality of apertures substantially disposed in a longitudinal plane of said chamber and above a horizontal plane passing through its axis and imperforate below said plane, whereby on firing, said gases will exert a downward pressure on said muzzle and counteract any tendency of said muzzle to rise.

3. A firearm provided with a muzzle and a tapered chamber associated with said muzzle adapted to receive the gases of explosion, the walls of said chamber provided with a plurality of apertures substantially disposed in a longitudinal plane of said chamber and above a horizontal plane passing through its axis and imperforate below said plane, whereby on firing, said gases will exert a downward pressure on said muzzle in a direction away from said apertures and counteract any tendency of said muzzle to rise.

4. A firearm provided with a muzzle and a tapered chamber associated with said muzzle adapted to receive the gases of explosion, the walls of said chamber provided with a plurality of transversely extending apertures disposed in a longitudinal plane of said chamber and above a horizontal plane passing through its axis and imperforate below said plane, whereby on firing, said gases will exert a downward pressure on said muzzle and counteract any tendency of said muzzle to rise.

5. A firearm provided with a muzzle and a tapered chamber associated with said muzzle adapted to receive the gases of explosion, the walls of said chamber provided with forwardly beveled apertures above a horizontal plane passing through its axis and imperforate below said plane, whereby on firing, said gases will exert a downward pressure on said muzzle and counteract any tendency of said muzzle to rise.

6. A firearm provided with a muzzle and a tapered chamber associated with said muzzle adapted to receive the gases of explosion, the walls of said chamber provided with forwardly and rearwardly beveled apertures above a horizontal plane passing through its axis and imperforate below said plane, whereby on firing, said gases will exert a downward pressure on said muzzle and counteract any tendency of said muzzle to rise.

7. In a firearm the combination of a muzzle and a tapered chamber provided with apertures disposed above the horizontal plane passing through its axis, the bottom of said chamber being imperforate and said apertures provided with forwardly inclined surfaces.

8. In a firearm the combination of a muzzle and a tapered chamber provided with apertures substantially arranged in a longitudinal plane of said chamber and disposed above the horizontal plane passing through its axis, the bottom of said chamber being imperforate and said apertures provided with forwardly inclined surfaces.

9. In a firearm the combination of a muzzle and a tapered chamber adjustably secured thereto provided with apertures disposed above the horizontal plane passing through its axis, the bottom of said chamber being imperforate and said apertures provided with forwardly inclined surfaces.

10. In a firearm the combination of a muzzle and a tapered chamber rotatably adjustable thereon provided with apertures disposed above the horizontal plane passing through its axis, the bottom of said chamber being imperforate and said apertures provided with forwardly inclined surfaces.

11. In a firearm the combination of a muzzle and a tapered chamber provided with apertures disposed above the horizontal plane passing through its axis, the bottom of said chamber being imperforate and said apertures provided with forwardly and rearwardly inclined surfaces.

12. In a firearm the combination of a muzzle and a tapered chamber provided with apertures substantially disposed in a longitudinal plane of said chamber and above a horizontal plane passing through its axis, the forward and rearward walls of said apertures being inclined and the side walls of said apertures being parallel.

13. 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 to release the expanded gases under pressure to produce movement of said muzzle in a predetermined direction.

14. 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 bevelled means disposed in said first named means to release the expanded gases under pressure to produce movement of said muzzle in a predetermined direction.

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 compris-

ing a plurality of bevelled apertures to release the expanded gases under pressure to produce movement of said muzzle in a predetermined direction.

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; means associated with said chamber to increase the pressure of the expanded gases; and means comprising a plurality of bevelled apertures substantially disposed in a longitudinal plane of said first named means to release the expanded gases under pressure to produce movement of said muzzle in a predetermined direction.

17. In a firearm provided with a muzzle the combination of a rotatably 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 disposed in a plurality of transverse planes to release the expanded gases under pressure laterally from said first named means to produce movement of said muzzle in a predetermined direction.

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 bevelled apertures substantially disposed in a longitudinal plane of said first named means to release the expanded gases under pressure to produce movement of said muzzle in a predetermined direction away from said apertures.

In testimony whereof I affix my signature.

RICHARD M. CUTTS, Jr.