July 13, 1948. G. A. BARKER 2,444,910

MUZZLE BRAKE FOR GUNS

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Fig. 1

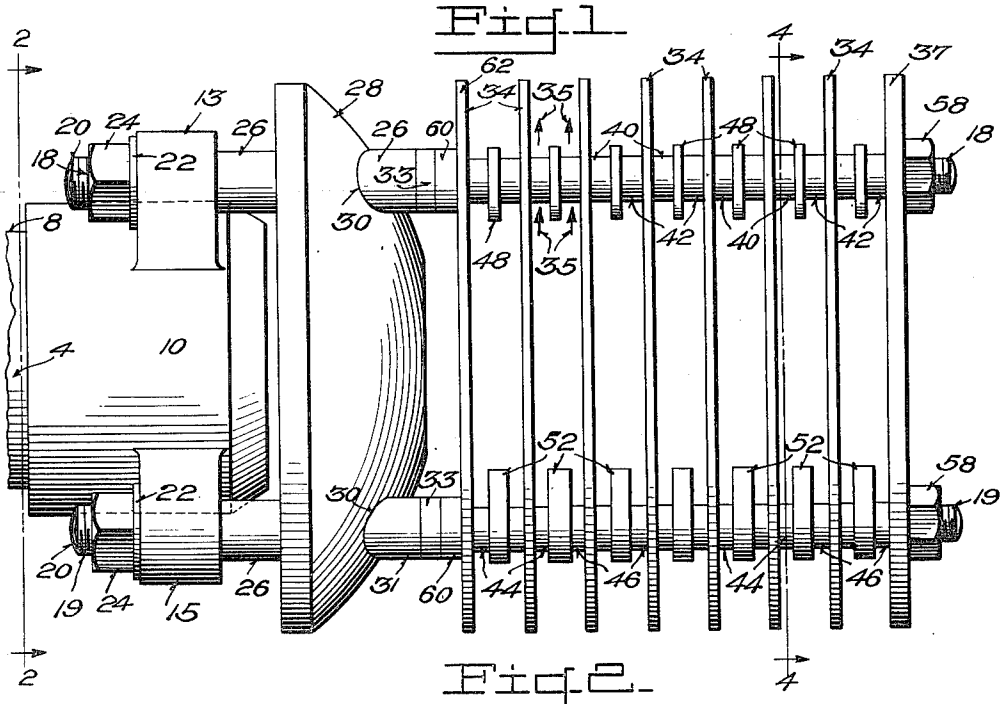
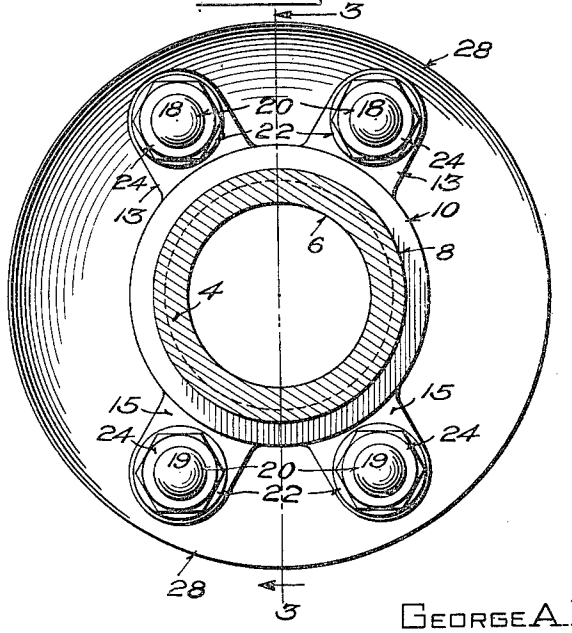


Fig. 2



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Fig. 3.

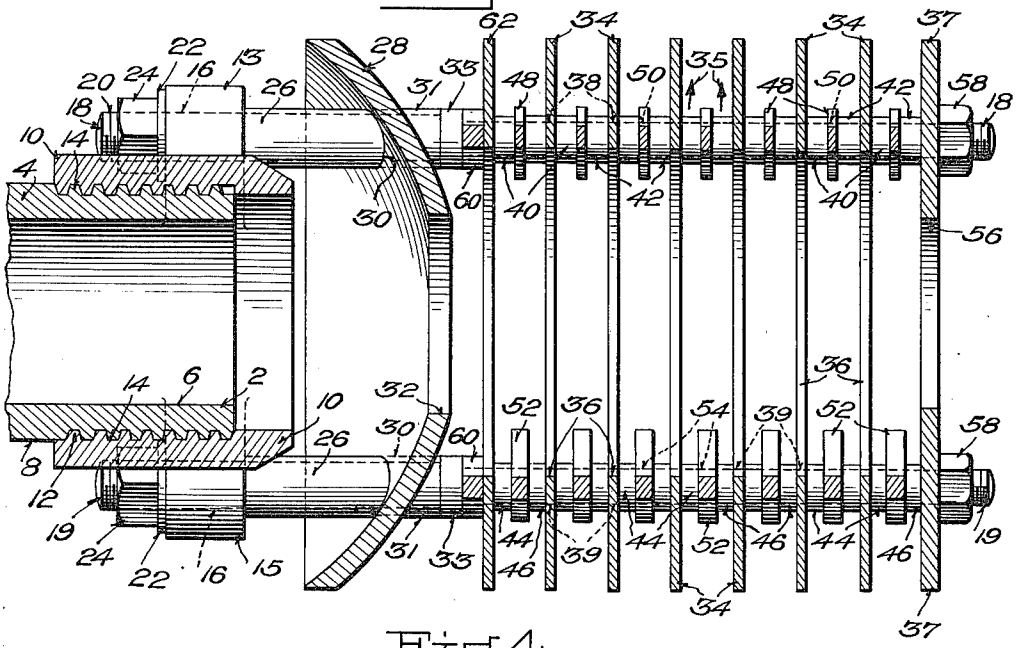
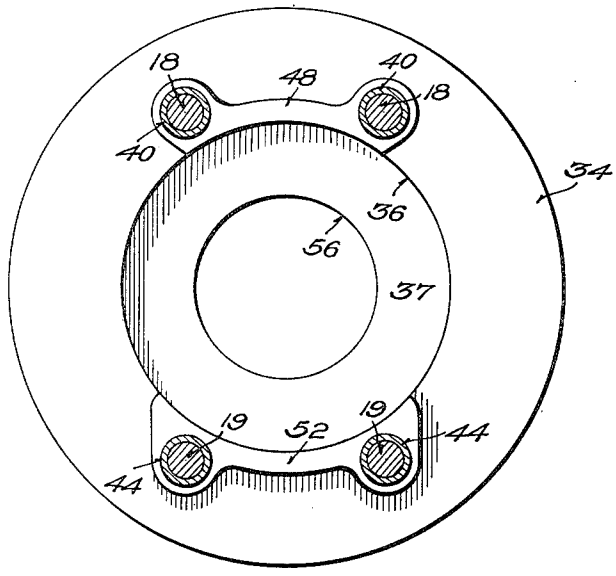


Fig. 4.



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MUZZLE BRAKE FOR GUNS

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7 Claims. (Cl. 89—14)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment to me of any royalty thereon.

This invention relates to muzzle brakes for guns.

A purpose of the invention is to provide a muzzle brake of improved construction, in which the pattern of gas discharge from the brake can more effectively be predetermined.

Another purpose of the invention is to provide a brake which has improved anti-jump characteristics.

A further purpose of the invention is to provide a brake which is easily adjustable to give any desired pattern of gas discharge.

An additional purpose of the invention is to provide a means for lessening the tendency of muzzle brakes to raise dust, and to lessen the volume of gas discharged to the rear toward the gunners.

Another purpose of the invention is to provide a muzzle brake which is simple to manufacture and can be quickly and easily assembled, disassembled and adjusted.

Other and further purposes of the invention will appear from the following specification.

A preferred embodiment of the invention has been illustrated in the drawings in which

Figure 1 is a side elevation view of a muzzle brake,

Figure 2 is a cross-section taken along the line 2—2 of Figure 1,

Figure 3 is a longitudinal cross-section taken along the line 3—3 of Figure 2, and

Figure 4 is a cross section taken along the line 4—4 of Figure 1.

As will be seen from the drawings, this invention is characterized by simplicity of construction and maximum ease of assembly and disassembly.

The forward end of muzzle 2 of a gun barrel 4 having a barrel bore 6, has secured over its outer surface 8 a hollow cylindrical member or housing 10. The housing 10 may have inner threads 12 engaging matching external threads 14 in the gun barrel 4.

The housing 10 has two pairs of radially projecting external lugs 13 and 15 which each are provided with a transverse bore 16 extending parallel to the bore 6 of the gun barrel 4. Each bore 16 has inserted through it a cylindrical rod, the two upper rods being indicated at 18 and the lower rods at 19, said rods having a threaded rearward end 20 over which is placed an annular washer 22 and a nut 24.

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A deflector plate 28 is located forward of the housing 10 and is kept spaced therefrom by means of hollow cylindrical spacing members 26, located over the rods 18 and 19 as indicated. The deflector plate 28 has a central hole 32 axially aligned with but slightly larger in diameter than the barrel bore 6, to permit passage of a shell through the hole. As illustrated the inner and outer surfaces of deflector plate 28 are spherical in curvature. The deflector plate 28 has four holes 30 through it, through which the rods 18 and 19 entered. The spacing members 26 may extend through the holes 30 so that their forward ends 31 project over the rods 18 and 19 forward of deflector plate 28. If this is done, the deflector plate has the spacing members 26 secured to it by welding or brazing.

Or the spacing members 26 may be made in two parts, one extending forwardly up to the rearward surface of the deflector plate 28 and the other part, corresponding to extension 31, extending forwardly from the forward surface of deflector plate 28. In that case, the holes 30 in deflector plate 28 would only be large enough to receive rods 18 and 19, but not large enough for spacers 26 and 28 to pass through. The rods 18 and 19 each have an enlarged portion or collar 33 fixed in its location on the rod. Thus either the parts forward of or those to the rear of the collars 33 may be disassembled without disturbing the remaining parts.

A plurality of spaced circular baffle plates 34 each having a central hole 36 larger in diameter than hole 32, are located forward of deflector plate 28 as shown. Each baffle plate 34 has upper transverse holes 38 and lower transverse holes 39 through which the rods 18 and 19 extend and on which the plates 34 are supported. Plates 34 are spaced from each other by pairs of hollow washers 40 and 42. The spacing washers 40 and 42 serve as spacers for the upper holes 38 in plates 34, and spacing washers 44 and 46 serve as spacers for the lower holes 39 in plates 34. Between each pair of washers 40 and 42 is located a member 48 which has holes 50 through it at each end through which the two upper rods 18 extend, and it is thus seen that member 48 acts as an obstruction and diminishes the cross-section of the clear path that would normally exist between adjacent plates 34 for the escape of gases radially outward. Thus, by increasing the thickness of members 48 and correspondingly decreasing the thickness of spacing washers 40 and 42 to maintain a constant spacing between adjacent plates 34, the size of the upward path as indicated by arrows 35 for escape

of gases radially outward between the plates 34 is reduced. Similarly, by making the members 48 thinner, and the washers 40 and 42 thicker, the size of the said path is increased.

As shown, the lower spacer washers 44 and 46 also have located between them gas obstruction members 52 which have holes 54 through them near each end through which extend the lower rods 19. The members 52 are made long enough to bridge across the two lower rods 19. It will be noted that the members 48 and 52 do not extend radially inwardly beyond the limits of hole 36 in plates 34. The members 48 and 52 may also be called metering plates, since they have the primary function of metering the rate of flow of gas radially outward between the baffle plates 34 by acting as partial obstructions to the passage of gases.

We may make the lower metering plates 52 thicker than the upper metering plates 48, as shown, while maintaining the spacing between baffle plates 34 and keeping plates 34 parallel to each other as shown. If this is done it is apparent that more gas will flow upwardly past upper metering plates 48 than will flow downwardly past lower metering plates 52. The result will be a resultant thrust downward due to the reaction of the excess quantity of upwardly escaping gases past metering plates 48. Since the tendency of a gun barrel may be to jump upward at the muzzle end on being fired, the result of addition of the muzzle brake of the design illustrated herein, is to counterbalance the tendency of the gun to jump upwards.

By altering the relative thickness and shape of the metering plates, the muzzle brake may be employed to give any desired pattern of radial gas flow between the baffle plates 34. Thus, any desired gas isobar may be obtained in the rear of the gun as well as on all sides of the gun. In other words, any desired gas isobar can be obtained for the entire area adjacent to the gun.

The forwardmost baffle plate 37 is constructed like the other baffle plates 34, except that it is preferably made thicker than the others and has a central hole 56 which is not as large in diameter as the holes 36 in the baffle plates 34. But the hole 56 should be large enough to permit the projectiles to pass through it without touching it.

Thus an expansion space or chamber may be considered to exist in the muzzle brake in the space between the forward face of deflector plate 28 and the baffle plate 37, the expansion space being cylindrical in shape with its outer boundary defined by the holes 36 in the baffle plates 34. It should be noted that the diameter of this gas expansion space is appreciably greater than the diameter of the barrel bore 6 or of the holes 32 or 56. If the diameter of the gas expansion chamber were not appreciably greater than that of the openings 6, 32 and 56, it would be found that a considerable portion of the gases would follow the projectile through hole 56, and expand beyond plate 37, instead of being subjected to controlled expansion between the baffle plates. Thus, the use of this enlarged expansion chamber contributes greatly to the enhanced efficiency of the muzzle brake described herein.

The nuts 58 threaded to the forward ends of rods 18 and 19, and the nuts 24 serve to draw the entire assembly together. Additional metering plates 60 may be located between the collars 33 and the rearwardmost baffle plate 62 if desired to limit or control the escape of gases by this path.

The gas deflector plate 28 assists in the braking of the gun, that is, in restraining the tendency of the gun to recoil upon being fired, by deflecting rearwardly a portion of the discharged propellent gases. It has been found that the highest allowable pressure of gas rearwardly discharged by a muzzle brake cannot be more than approximately eight pounds per square inch if the gunners are to physically endure it. Hence the invention provides for the gas deflector plate 28 to discharge only a portion of the gases rearwardly, so that this pressure is not exceeded. The remainder of the gases is discharged through the plurality of baffle plates 34, the gases issuing radially outward from the path of the projectile as it leaves the gun bore. The gas deflector plate 28 has an added and important function, in that deflecting a portion of the gases rearwardly, that portion of the gases is prevented from being deflected downward and thus minimizing the raising of dust due to muzzle blast.

The total cross-sectional area represented by the discharge paths between the combined baffle plates 34 and the metering elements 48 and 52 is greater than the cross-sectional area of the barrel bore of the gun to which I attach my muzzle brake. This proportioning of parts provides a radial-escape passage-area to the atmosphere for substantially all of the propellent gases remaining after a portion of them has been discharged rearwardly by the deflector plate 28. I thereby, fully utilize the energy of the propellent gases, permitting only a negligible quantity to pass out the front of the muzzle brake.

While the illustrations show a single deflector plate with a plurality of baffle plates and metering plates located forward thereof, I do not wish to be limited to this construction, since if desired, metering plates may also be located between the housing 10 and the deflector plate 28. This will be determined by the particular pattern of gas dispersion desired. The metering plates may be of uniform or of varying cross-section or thickness to regulate the quantity and directions of escaping gases.

While the invention has been described in specific terms, it is to be understood that numerous changes may be made in the size, shape, materials and arrangements without departing from the spirit and scope of the invention as claimed herein.

I claim:

1. A muzzle brake comprising a housing adapted to be attached to the muzzle of a gun barrel, a first pair of spaced radial ears on said housing, a second pair of spaced radial ears on said housing diametrically positioned relative to said first pair of ears, rods attached to said ears and extending parallel to the axis of said housing, a plurality of circular baffle plates axially spaced a predetermined distance relative to each other on said rods, said baffle plates being centrally and axially aligned openings for the passage of a projectile from the gun muzzle, said baffle plates discharging radially outward and about its circumference the propellent gases generated incident to the firing of the gun for projecting a projectile, individually removable metering members on said respective pairs of rods, each metering member being between adjacent baffle plates, said metering members controlling the rate and the angular direction of discharge of said gases between the baffle plates, removable spacer washers on said rods on opposite sides of each metering member for locating each metering member

centrally spaced from its adjacent baffle plates, means on the ends of said rods for compacting said baffle plates, metering members and spacer washers on said rods, said metering members and spacer washers being removable whereby said members and washers may be replaced by different sized plates and washers, respectively, without altering said predetermined distance between plates to obtain thereby a resultant thrust in a predetermined direction perpendicular to the axis of the gun barrel.

2. A muzzle brake comprising a housing adapted to be attached to the muzzle of a gun barrel, pairs of spaced radial ears on said housing diametrically positioned relative to each other, rods attached to said ears and extending parallel to the axis of said housing, a plurality of baffle plates spaced a predetermined distance relative to each other on said rods, said baffle plates having axially aligned openings for the passage of a projectile from the gun muzzle, said baffle plates discharging radially outward and about its circumference the propellent gases generated incident to the firing of the gun for projecting a projectile, individually and selectively removable metering members on said rods, each metering member being located between adjacent baffle plates for controlling the rate and the angular direction of discharge of said gases between the baffle plates, removable spacer means on said rods for spacing each metering member relative to its adjacent baffle plates, removable means on said rods for compacting said baffle plates, metering members and removable spacer means on said rods, said metering member and spacer means being removable whereby said members and spacer means may be replaced by different sized plates and spacer means, respectively, without altering said predetermined distance between plates to obtain thereby a resultant thrust in a predetermined direction perpendicular to the axis of the gun barrel.

3. A muzzle brake comprising a housing adapted to be attached to the muzzle of a gun barrel, a supporting means on said housing, a plurality of baffle plates spaced a predetermined distance relative to each other on said supporting means, said baffle plates having aligned openings for the passage of a projectile from the gun muzzle, said baffle plates discharging annularly and radially outward propellent gases generated incident to the firing of the gun for projecting a projectile, removable metering members on said supporting means, each metering member being between adjacent baffle plates for controlling the rate and the angular direction of discharge of said gases between the baffle plates, removable spacer means on said supporting means for locating each metering member relatively to its adjacent baffle plates, removable fastening means on said supporting means for compacting thereon said baffle plates, metering members and spacer means, said metering members and spacer means being individually and selectively removable whereby said members and spacer means may be replaced by different sized plates and spacer means, respectively, without altering said predetermined distance between plates to obtain thereby a resultant thrust in a predetermined direction perpendicular to the axis of the gun barrel.

4. A muzzle brake comprising a housing means adapted to be attached to the muzzle of a gun barrel, diametrically positioned rods attached to said housing means, a pair of circular baffle plates spaced a predetermined distance relative

to each other on said rods, said baffle plates having aligned openings for the passage of a projectile from the gun muzzle, each said baffle plate discharging radially outward and completely about its circumference propellent gases generated incident to the firing of the gun for projecting a projectile, removable metering members on said rods and between said baffle plates for controlling the rate and the angular direction of discharge of said gases between the baffle plates, removable spacer members on said rods locating each metering member relatively of said baffle plates, removable means on said rods for compacting said baffle plates, metering and spacer members on said rods, the rod portions between said baffle plates being adapted to receive metering members of different sizes and spacer members of different lengths whereby said members may be individually and selectively removed and replaced by other members, respectively, to vary the resultant thrust of the discharged gases between said baffle plates without altering said predetermined distance between the baffle plates, the combined lengths of spacer and thicknesses of metering members not exceeding the predetermined distance between the baffle plates.

5. A muzzle brake for guns comprising a supporting means adapted to be attached to the muzzle end of a gun barrel, an element carried by said means for deflecting the flow of a portion of the discharged propellent gases rearwardly of the brake, baffle elements carried by said means for deflecting the flow of the remainder of the discharged propellent gases radially outward, removable metering elements on said supporting means for differentially regulating the flow of the latter discharged propellent gases radially outward, and means on said supporting means spacing said metering elements from said baffle elements whereby said metering elements may be substituted by different-size metering elements without altering the spacing of the baffle elements to control the direction of the resultant thrust of said gases.

6. A muzzle brake for guns comprising a supporting means for attaching said brake to a gun muzzle, a baffle means on said supporting means for deflecting gun discharge gases radially outward of said baffle means substantially in a plane at right angles to the muzzle axis, a removable element on said supporting means and spaced from said baffle means metering the flow of said gases through said baffle means and means whereby the spacing between said metering element and said baffle means may be varied, thereby controlling the rate and angular direction of said gases through said baffle means.

7. A muzzle attachment for a gun comprising a supporting means adapted to be secured to a gun, carrying means on said supporting means, radially symmetrical baffle devices spaced on said carrying means, said baffle devices being so constructed and arranged in the path of escaping propellent gases as to radially deflect the same for discharge to the atmosphere, radially symmetrical individual metering means of various metering effect detachably mounted on said carrying means between adjacent ones of said baffle device to control the radial direction of discharge of said gases in accordance with the radial disposition of said metering means, each said individual metering means including a spacing element and a metering element separable therefrom, the axial thickness of each metering element being proportioned to the desired magnitude of metering ef-

fect, the combined axial dimensions of each metering element and its associated spacing element being a constant and equal to the axial distance between any two adjacent baffle devices, whereby the overall length of the muzzle attachment is maintained constant regardless of the axial thickness of the metering elements selected.

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