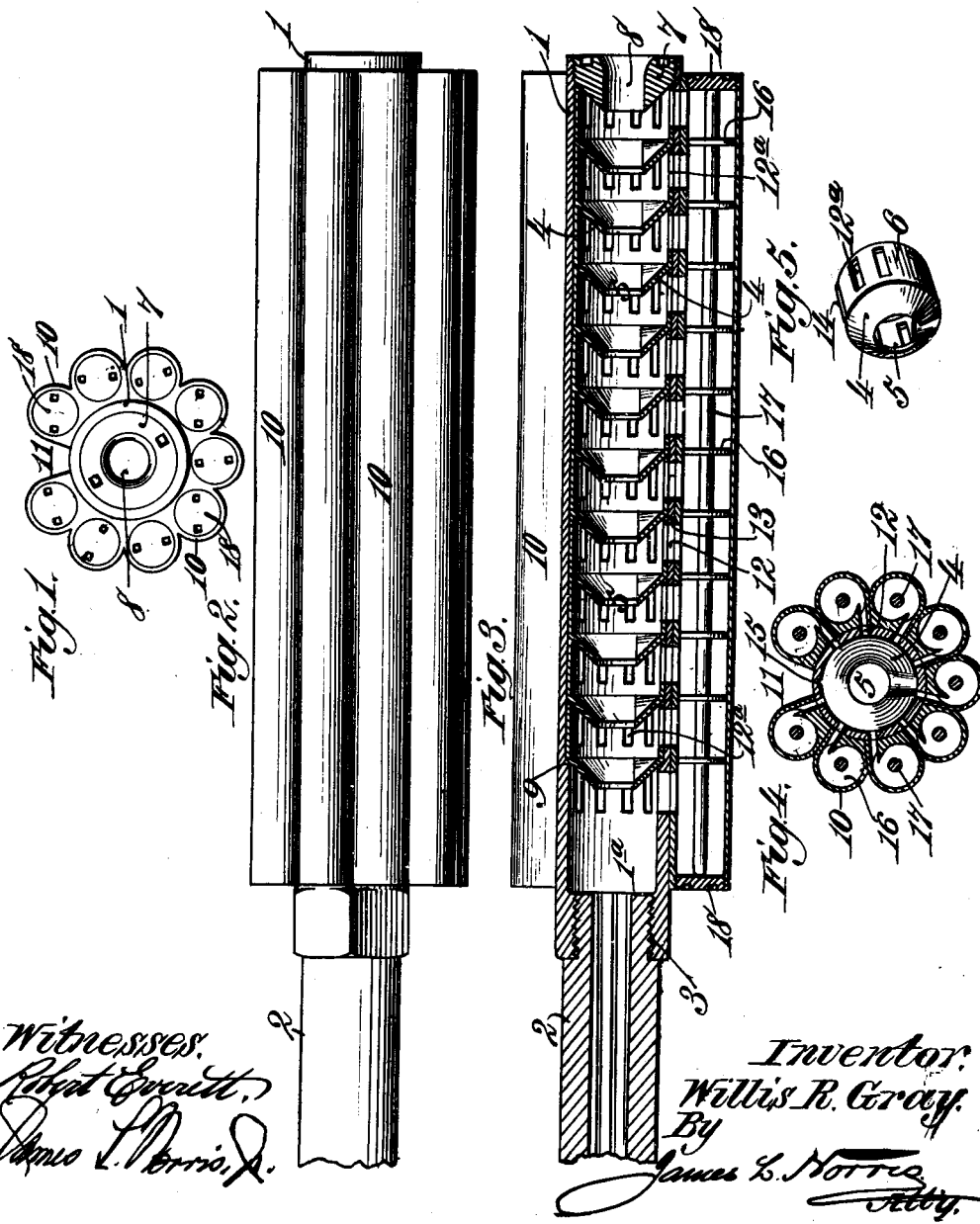


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SILENCER FOR FIREARMS.
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UNITED STATES PATENT OFFICE.

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SILENCER FOR FIREARMS.

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To all whom it may concern:

Be it known that I, WILLIS R. GRAY, a citizen of the United States, residing at Oakton, in the county of Fairfax and State of Virginia, have invented new and useful Improvements in Silencers for Firearms, of which the following is a specification.

My present invention relates to improvements in silencers adapted for use in connection with firearms for the purpose of rendering the discharge thereof noiseless or practically so by causing a gradual release of the exploded gases at or beyond the muzzle, and it has for its object to provide an improved device of this character which is relatively simple and inexpensive in construction and which in use is capable of diverting the gases at high pressure from the rear of the projectile after the latter has left the muzzle of the firearm and conducting the gases so diverted into a suitable number of appropriately distributed expansion chambers wherein the gases are gradually reduced in pressure before they are permitted to escape to the atmosphere, the construction and relative arrangement of the gas diverters and expansion chambers being such that the projectile in its flight is not retarded or deflected and the sound of the discharge and the recoil of the firearm are reduced to a minimum owing to the relatively large capacity afforded by the expansion chambers within a relatively small compass.

To these and other ends, the invention consists in certain improvements, and combinations and arrangements of parts, all as will be hereinafter more fully described, the novel features being pointed out particularly in the claims at the end of the specification.

In the accompanying drawing: Figure 1 is a front elevation of a silencer constructed in accordance with one embodiment of my invention, the form shown being adapted for use in connection with rifles; Fig. 2 is a side elevation of the device; Fig. 3 represents a central longitudinal section thereof; Fig. 4 represents a transverse section; and Fig. 5 is a detail perspective view of one of the gas-diverting elements of the device. Similar parts are designated by the same reference characters in the several views.

Silencers constructed in accordance with my present invention are capable of use in connection with firearms of different kinds. In the accompanying drawing, I have shown the form which I prefer to use in connection

with rifles using a single projectile. It will be understood, however, that the form shown is given as an example of one embodiment of the invention and in practice it may be found desirable or necessary to make certain slight changes in the construction or relative arrangement of the parts in order to adapt the device to firearms of different classes or sizes. Certain constructions may also be used which will be the equivalents of that shown in the drawing. For these reasons, the claims will not be limited to the precise construction shown in the drawing.

In the present instance, the device is especially adapted for use in connection with rifles using a single or solid projectile, and I shall describe such construction specifically as an example of one embodiment of the invention. In this instance, the device comprises a tube or casing 1, the bore of which is adapted to be arranged in alinement with the barrel of the firearm, the muzzle portion 2 of the firearm being shown conventionally in the drawing. Any suitable means may be provided for detachably connecting the device to the firearm, a thread connection 3 being shown in the drawing. This tube provides a passage for the projectile after leaving the muzzle of the firearm and it also contains devices for diverting the gases following the projectile and at high pressure, from a longitudinal or axial path to paths transverse to the length of the tube, the diverted gases being then received by the expansion chambers to be hereinafter described. I provide a suitable number of longitudinally spaced gas diverters within the tube and each diverter preferably consists of a septum or diaphragm portion 4 having an aperture 5 to provide an unobstructed passage for the projectile therethrough, and a sleeve-like portion 6. In order to effectually divert the gases from a path in alinement with the muzzle and in a direction to effectively conduct such gases into the expansion chambers, the septum or diaphragm portion of each diverter is preferably in the form of a truncated cone, the wall of each septum or diaphragm being presented to the axis of the tube 1 at an angle of 45° or approximately so, the apices of the septums or diaphragms being all directed toward the rear of the device or toward the muzzle of the firearm. The gas diverters are all assembled within the tube 1 and are preferably

clamped firmly in position to prevent rattling. In the construction shown, these diverters may be placed into the forward end of the tube one at a time and the sleeve-like portions 6 will serve as spacers for maintaining the various gas diverters in properly spaced relation. The forward end of the tube 1 is closed, except for the passage for the projectile, by a plug 7 which may be threaded or otherwise suitably fitted to the tube and has an aperture 8 for the exit of the projectile, this aperture 8 being of course in alinement with the apertures 5 of the gas diverters and is also in alinement with the bore of the firearm. The rear side of this plug 7 is also preferably formed as a truncated cone in order that it may also serve as a gas diverter, and when this plug is inserted and fastened, it not only prevents the direct escape of the high pressure gases from the forward end of the tube, but it also clamps the several gas diverters firmly within the tube. The thrust of the rearmost gas diverter may be sustained in any appropriate way by the tube 1, the latter being shown in the present instance as having a reduced bore 1^a toward its rear end which forms an abutment or thrust shoulder 9 against which the rearmost gas diverter bears.

The high pressure gas which is diverted from the rear of the projectile as the latter passes through the silencer is conducted into expansion chambers of improved construction which are located exteriorly of the tube 1. In the present instance, these expansion chambers are in the form of tubes 10 which are applied in a suitable way to the exterior of the tube 1 and extend longitudinally thereof. Any suitable number of these tubes may be provided in order that the capacity of the expansion space provided thereby is sufficient to properly expand the high pressure gas and thereby minimize the sound of the discharge. In the present instance, these tubes 10 are placed in close relation about the tube 1, but the two-adjacent tubes at the top of the device are separated a distance sufficient to afford an unobstructed sight opening 11 which is in alinement with the sights on the firearm. Suitable communication is provided between these tubes 10 which form the gas expansion chambers and the central tube which contains the gas diverters. In the present instance, the tube 1 is provided with sets of ports, the ports 12 of each set being spaced circumferentially of the tube 1, one port being provided for each tube 10 and the sets of ports are spaced longitudinally of the tube 1, one set of ports being provided for each gas diverter. Continuations of the ports 12 form inlet passages to the tubes 10 which form the gas expansion chambers, and the inlet passage for each expansion chamber

enters such chamber preferably in a tangential direction. By introducing the gas at high pressure into each expansion chamber in a tangential direction, each expansion chamber is capable of receiving the maximum volume of gas with a minimum back pressure, the gas being trapped in these expansion chambers in such a way that it cannot return to the central tube until after its pressure has been materially reduced.

Between the ports 12, the unperforated portions 13 of the central tube form partitions which prevent the passage of gas at high pressure from the rear side to the forward side of each gas diverter or, in other words, these dividing partitions compel the high pressure gases to pass directly to the expansion chambers. The sleeve-like portions 6 of the gas diverters are of course provided with ports 12^a which register with the ports 12 in the tube 1 and to insure such registration, any suitable means may be provided such, for instance, as a rib 14 upon the sleeve-like portion of each diverter, the several ribs upon the diverters being arranged to slidably enter a longitudinal groove 15 which may be formed at a suitable point within the tube 1.

The gas expansion chambers are preferably provided with suitable means for preventing the high pressure gas from flowing longitudinally therein or from short-circuiting directly between one set of ports 12 and another set of such ports. In the present instance, I have shown each gas expansion chamber as provided with a series of longitudinally spaced partitions 16 which are carried by a longitudinally extending spacing rod 17, the partitions being located between each set of ports 12. The ends of each tube 10 may be closed by threaded or other suitable plugs 18 and these plugs may bear upon the ends of the spacing rod 17 and thereby clamp the partitions as a unit in proper position within the expansion chamber.

In operation, the projectile leaving the muzzle of the firearm passes directly through the apertured gas diverters or deflectors and the aperture at the forward end of the device without being deflected or retarded in any manner by the silencer. The gases following the projectile at high pressure have an initial direction in alinement with the bore of the firearm but when such gas enters the relatively larger tube, it expands in diameter, and the outer portion of the somewhat expanded body of gas is caught by the angularly disposed diverters or deflectors, each diverter taking up a proportion of the gas and directing it through the ports of the inner tube and into the respective compartments of the outer gas-expanding tubes or chambers wherein the gas is divided into charges which are dis-

tributed between the expanding chambers and thereby expanded materially before it can return to the inner tube and finally escape to the atmosphere, the deflection and the division and expansion of the gas within the relatively large aggregate space afforded by the expansion chambers preventing a sudden release of the exploded gases and thus minimizing the sound of the discharge.

10 I claim as my invention:

1. A gun silencer comprising a tube adapted for attachment to the muzzle of a gun and provided with a plurality of longitudinal rows of ports in its wall for the discharge of the exploded gases, and a plurality of non-communicating gas-expanding chambers located exteriorly of said tube, each chamber being individual to one longitudinal row of ports and having its lateral wall curved about an axis located exteriorly of said tube, said chambers having inlet passages in their lateral walls which connect them to receive and expand charges of the exploded gases discharged through the respective longitudinal rows of ports.

2. A silencer for firearms comprising a tube adapted for attachment to the muzzle of a firearm and containing a set of longitudinally spaced gas-diverting devices, said tube also having a plurality of longitudinal rows of ports in its wall, and a plurality of non-communicating gas-expanding chambers grouped circumferentially on the exterior of said tube and having tangential inlet passages in their lateral walls to receive individual charges of gas from the longitudinal rows of ports, the wall of each gas-expanding chamber being curved transversely about an axis located exteriorly of said tube.

3. A silencer for firearms comprising a tube adapted for attachment to the muzzle of a firearm and forming a passage for the projectile and also having ports in its wall, a set of gas-diverting devices contained within said tube, said devices being arranged in cooperative relation with the ports in the wall of such tube and having apertures for the passage of the projectile, and a plurality of non-communicating circumferentially spaced gas-expanding chambers having their walls curved transversely about different axes located exteriorly of said tube and having tangential passages whereby they receive and expand separate charges of the gases diverted from said tube through the ports therein.

4. A silencer for firearms comprising a tubular member adapted for attachment to the muzzle of a firearm and containing a set of longitudinally spaced gas-diverting devices, and a plurality of circumferentially spaced tubes applied exteriorly to said tubular member and extending longitudinally thereof, said exterior tubes being non-communicating and having tangential inlet-passages for conducting separate charges of the diverted gas thereto.

5. A silencer for firearms comprising a tubular member adapted for attachment to the muzzle of a firearm and containing a set of longitudinally spaced gas-diverting devices, and a plurality of non-communicating gas expanding tubes applied exteriorly to said tubular member and extending longitudinally thereof, intercommunicating passages being provided between the tubular member and the gas expanding tubes, such passages being connected tangentially to the respective gas expanding tubes.

6. A silencer for firearms comprising a tubular member adapted to receive the exploded gases from a firearm forming a passageway for the projectile, said member being provided with sets of circumferential ports in its wall, sets of gas-diverting devices contained within said member and located to divert the gases and direct them through said sets of ports, a plurality of gas expanding tubes applied exteriorly to said member and extending longitudinally thereof, intercommunicating passages being provided between the ports of said member and said tubes, said passages entering the gas expanding tubes tangentially, and partitions dividing each gas expanding tube in the direction of its length.

7. A silencer for firearms comprising a tubular member adapted to receive the exploded gases from a firearm and providing a passageway for the projectile, said member being provided with sets of lateral ports, a set of gas-diverting devices contained in said tubular member and spaced longitudinally thereof, each gas-diverting device having a portion in the form of a truncated cone having its apex directed toward the rear and its base at the inner circumference of the tubular member, each gas-diverting device being located between two adjacent sets of ports, a plurality of gas expanding tubes grouped about the exterior circumference of said tubular member, each gas expanding tube having a tangential passage communicating with a corresponding port in said tubular member, and longitudinally spaced partitions contained within each gas expanding tube and dividing the latter into individual compartments.

8. A gun silencer comprising a tube adapted for attachment to the muzzle of a gun and provided with longitudinally spaced sets of ports in its wall, the ports of each set being spaced circumferentially of the tube to divide the exploded gases into a plurality of separate charges, a set of longitudinally spaced gas-diverting devices contained within the tube and operative to deflect the exploded gases through said

ports, and a plurality of circumferentially spaced gas expanding chambers located exteriorly of said tube and having tangential inlet passages which connect them to receive and expand the separate charges of gas from the respective longitudinally spaced ports in the tube.

9. A gun silencer comprising a tube adapted for attachment to the muzzle of a gun and provided with longitudinal rows of ports in its wall for the discharge of the exploded gases, a set of gas diverting devices contained within the tube and operative to deflect the exploded gases through said ports, and a set of individual circumferentially spaced and longitudinally extending gas expanding chambers located exteriorly of said tube and having circumferentially tangential inlet passages which connect them to receive and expand separate charges of the exploded gases discharged through the respective longitudinal rows of ports in said tube.

10. A gun silencer comprising a casing adapted for attachment to the muzzle of a gun and having a wall provided with longitudinally spaced ports and forming an inner chamber containing a set of gas diverting devices for deflecting the exploded gases through the ports in said wall, and a longitudinally extending gas expanding chamber curved transversely about an axis located exteriorly of said ported wall and having a tangential passage connecting it to each of the longitudinally spaced ports

in said wall whereby the exploded gases are divided into separate charges which are expanded in said exterior expansion chamber.

11. A silencer for firearms comprising a casing adapted for attachment to the muzzle of a firearm and containing a set of longitudinally spaced gas diverting devices and also having a set of transversely curved longitudinally extending and non-communicating gas expanding chambers which are grouped circumferentially with respect to the gas diverting devices and are connected by circumferentially tangential passages to receive and individually expand divided portions of the exploded gases therefrom.

12. A silencer for firearms comprising a tube adapted for attachment to the muzzle of a firearm and having ports in its wall for the discharge of the exploded gases, and a separate tubular gas-expanding chamber having a tangential inlet passage which connects it to receive the exploded gases discharged through said ports and having a curved wall, the axis of which is located exteriorly of said tube.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

WILLIS R. GRAY.

Witnesses:

JAMES L. NORRIS, Jr.,

CHAS. S. HYER.