PATENT SPECIFICATION

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PROVISIONAL SPECIFICATION
No. 3756 A.D. 1943.

Improvements in or relating to Means for Silencing Firearms

I, WILLIAM GODFRAY DE LISLE, a British Subject, of The Holt, South Eden Park Road, Beckenham, Kent, do hereby declare the nature of this invention to be as follows:—

This invention relates to means for silencing fireams of the type (hereinafter referred to as the type described) comprising a tubular casing that is carried or is to be carried by the firearm in spaced relation with the barrel thereof, and a plurality of baffle-plates mounted in spaced relation one with another within the casing, which baffle-plates have perforations providing a through-way for the projectile in line with the central longitudinal axis of the barrel.

It is an object of the present invention to provide improved silencing means of the type described of robust and compact construction which shall be more efficient in operation and more effective in silencing firearms than those proposed heretofore.

According to a feature of the invention, there is provided a method of silencing firearms comprising the steps of causing the gas as it escapes from the muzzle of the barrel to flow in a direction lying transversely of the central longitudinal axis of the barrel, and thereafter to swirl in a confined space situated in front of the barrel with the vortex of swirl lying offset from the path of flight of the projectile.

Provision is preferably made for reducing the gas pressure behind the projectile just before it leaves the barrel.

Provision is also preferably made for some gas to escape through the wall of the barrel into an expansion chamber that surrounds the barrel and is in open relation with said confined space in front of the barrel for the purpose of assisting in building up back pressure in front of the muzzle.

According to another feature of the invention there is provided silencing means of the type described comprising the combination of means for preventing or tending to prevent the formation of a partial vacuum at the muzzle of the barrel, with baffle-plates which are so constructed and arranged as to cause the gases emitted from the barrel to swirl about a vortex that is offset from the path of the projectile through the baffle-plates.

The casing preferably extends rearwardly around the barrel beyond the muzzle thereof to provide an expansion chamber situated between the muzzle and the breech of the barrel.

The vacuum-prevention means may be constituted by a nozzle, such as an expansion nozzle, situated or arranged to be situated at the muzzle of the barrel. In some cases this nozzle may be formed or provided on the muzzle.

In a convenient construction a baffle-plate has the form of a disc that has an eccentric perforation for the passage of the projectile, and has a radial slit that extends from the periphery of the disc, preferably through the perforation, the two portions of which disc at opposite sides of the slit are spaced apart angularly one in relation to the other in the direction of length of the casing.

The baffle-plates may be each of spiral or substantially spiral formation, and their peripheries may be spaced away from the internal periphery of the casing to provide an annular space or gap that surrounds the baffle-plates at the inner face of the casing.

According to one method of carrying the invention into practice which will now be described by way of example with reference to silencing the discharge of a rifle of .22 in. calibre, silencing means comprises a tubular casing about 13 in. long mounted eccentrically on the rifle, so that a rear portion about $7\frac{3}{4}$ in. long constituting an expansion chamber surrounds the barrel, and a front portion about $5\frac{1}{4}$ in. long constituting a baffle chamber, extends in front of the muzzle. This casing, which is circular in cross section and may be about $1\frac{3}{8}$ in. diameter, is mounted in spaced relation to the barrel which is situated in the upper part of the expansion

chamber.

Two parallel rods which extend from end to end of the casing spaced away from its internal periphery may lie on a horizontal diameter of the casing. A plurality of substantially spiral baffle-plates, each as described above, are threaded on these rods and lie in spaced relation one from another and from the internal periphery of the casing. The front end baffle-plate, of which baffle-plates there may be about ten, is spaced away from an end flat plate which has a hole in the line of flight of the bullet, and has also in its lower portion a circular or arcuate row of relatively small powder-discharge holes adjacent to that part of its periphery which lies at the bottom of the casing.

The muzzle of the barrel is provided with an expansion nozzle that may be carried by said rods or be screwed on the barrel. Alternatively, the muzzle may be counter-sunk to form a nozzle of like shape. Whichever construction is adopted the rear baffle-plate is spaced away a short distance from the nozzle.

An eccentric cylindrical shield is arranged surrounding the barrel at the rear of its muzzle and in spaced relation therewith to form an annular space to be placed in open relation with the interior of the barrel by way of a plurality of vents. These vents may be disposed evenly around the periphery of the barrel in order that the pressure of the gases shall be reduced evenly around the periphery of the projectile. Each vent may have the form of a slot of tapered formation in cross-section extending in the direction of length of the barrel, so that the length of the slot is greater at the outer periphery of the barrel than at the inner periphery thereof. Such a slot may be $\frac{1}{16}$ in. diameter at its inner end, and $\frac{3}{16}$ in. diameter at its outer end, and the slots may extend about 1 in. along the barrel, the front end of the front slot being about $1\frac{1}{4}$ in. from the muzzle, and the rear end of the rear slot about $5\frac{1}{2}$ in. from the breech.

In operation the column of air in the barrel and the gas leakage past the bullet first appears at the muzzle of the barrel. This is unavoidable and assists in building up in front of the muzzle of the barrel back pressure which assists the correct functioning of the expansion nozzle fitted to the end of the barrel.

As the bullet passes along the barrel, the said vents in the form of gas-discharge slots are uncovered in succession towards the muzzle, which vents serve to allow some of the gases propelling the bullet to escape into the expansion chamber, thereby still further building up the back pressure and also reducing the volume of gases flowing at high velocity behind the bullet. The short length of the barrel left intact at the muzzle end serves to steady the bullet should its balance have become upset or deranged through gases escaping behind it transversely to its path of flight. Also this short imperforate length of barrel permits the bullet to act as a stopper in front of the gases during the period of their escaping through these vents.

When the bullet travels through the baffle-plates after having passed the nozzle, the gases are made to swirl so that their travel is transverse to the path of flight of the bullet. It is arranged that the path of the bullet shall pass outside the vortex of the swirl. The expansion chamber is carried back towards the breech of the barrel far enough to enclose the said vents primarily to provide increased expansion space for the gases, and secondly to produce a compact, robust and easily handled type of firearm, equipped with a silencer.

When the gases strike the first baffle-plate after having left the nozzle, they are in a semi-dispersed state, that is, they have followed to some extent the lines of the nozzle, although there is probably still a column of concentrated gas directly behind the bullet. The effect of striking the first baffle-plate is that most of the gas is made to swirl in such a manner that the vortex of this swirl is central with the silencer tube, the longitudinal axis of the barrel and path of the bullet being offset from and eccentric to the centre of this tube. The effect of this swirl is to make the gas travel transversely of the path of the bullet, and in doing so a small proportion of it will tend to deflect and dissipate the column of high pressure gas directly behind the bullet. It is, of course, impossible for one baffle-plate to do all that is required in this direction, and therefore a number of similar plates are placed in spaced relation one behind another, each one contributing in some degree towards making the gas follow a path other than the flight of the bullet, the net result of which is that the bullet leaves the silencer with the gas following it at a greatly reduced velocity. The pressure of the gas in the silencer is higher than the pressure of the atmosphere outside, and it discharges itself from a simple nozzle or hole in the end plate of the silencer tube as a jet of gas travelling at a sufficiently low velocity as to produce very little or no sound.

In addition to this, in order that unburnt powder as well as burnt powder,

refuse, etc., being the products of combustion, shall not accumulate unduly in the silencer, particularly the live powder which on accumulation could cause serious accidents should it become ignited at any time, the baffle plates do not fit the tube of the silencer tightly, but have a small gap around their periphery, while in the end plate of the silencer body small slots or holes are pierced so that the above debris can be discharged or fall out as the case may be. The presence of these additional holes in the end plate provides additional exits for the gas, but this is purely incidental and does not affect the resulting sound in any way.

The nozzle, preferably an expansion nozzle, is provided for the purpose of preventing a vacuum from being formed at the muzzle. The collapse of this vacuum produces a sharp "crack" which heretofore has not been suppressed except by means of sound-absorbing or damping material, such as felt. This "crack" is normally transmitted through the wall of the silencer of the type described, but by the provision of this nozzle, this vacuum is prevented from being formed, and therefore there is no "crack" to be silenced.

The vents in the barrel surrounded by a shield reduce the volume of gas following the bullet and prevent the gases which are travelling at high velocity from impinging directly on the wall of the silencer, which would cause a noise. The invention thus provides an improved robust, compact, and silent firearm, whereof the barrel and silencer form an unitary structure which can be attached to a firearm having any mechanism whether of the single, repeater or automatic type of feed.

Another advantage of reducing the gas pressure behind the bullet just prior to its leaving the muzzle of the barrel is that when the bullet becomes unsupported after leaving the muzzle, there is not the same pressure of gas behind it as there would normally be to upset its balance. In actual practice a rifle bullet travels many feet from the muzzle of a gun before it rotates freely about its own centre of gyration in true flight. This upsetting is caused by the gases following it at high pressure from the muzzle. It is, therefore, reasonable to presume that if this velocity and gas pressure can be reduced just before the bullet leaves the barrel, the effect of this disturbance will be beneficially reduced, thereby improving accuracy in use of the firearm.

Dated this 8th day of March, 1943.

W. G. DE LISLE.

PROVISIONAL SPECIFICATION
No. 7964 A.D. 1943.

Improvements in or relating to Silencers for Firearms

I, WILLIAM GODFRAY DE LISLE, a British Subject, of The Holt, South Eden Park Road, Beckenham, Kent, do hereby declare the nature of this invention to be as follows:—

This invention relates to silencers for firearms.

The Specification of Application No. 3756/43 describes a silencer for use with a rifle having a casing providing an expansion chamber surrounding a plurality of vents constituting gas-discharge slots in the barrel, and a cylindrical shield that is concentric with the barrel, but lies eccentrically in the casing and surrounds the gas-discharge slots. In some cases it is found that the gas impacting on the cylindrical metal shield, which was slightly longer than the apertured portion of the barrel, was liable to produce an undue amount of noise, and it is an object of the present invention to obviate this defect.

According to the invention, there is provided for use with a silencer for firearms, whereof the barrel is provided with a plurality of vents, a sound-absorbing device in the form of a liner for that part of the casing of the silencer surrounding the vents, which liner will extend, when in use, from a situation just in front of an expansion nozzle of the barrel to the rear of the silencer casing, and comprises a tubular layer of sound-absorbing yieldable material protected on the inside by a thin metallic sheath.

Preferably the liner also comprises a thin metallic sheath on the outside of the sound-absorbing material.

The objects of providing the sound-absorbing device with the internal or both internal and external metallic sheath are (1) to avoid disintegration of the sound-deadening yieldable material by the impact on it of the hot gases escaping from the vents in the barrel, (2) to avoid contamination and fouling of the sound-deadening material by the products of combustion, and (3) to enable the liner to be readily removed and cleaned.

This liner may be used with or without the shorter sleeve, preferably of mild

steel, that surrounds the vents and serves to disperse the hot gases issuing from them.

The sound-absorbing yieldable material may be of animal, vegetable or mineral origin and may consist of felt, rubber or rubberised fabric, asbestos, lead wool or the like. When inner and outer metallic sheaths are provided they may be sealed at their ends so as to enclose the sound-absorbing material fluid-tight. The liner can then be washed or otherwise cleaned without affecting the sound-absorbing material. Owing to the outer metallic sheath of the liner it can be readily slid into and out of position in the silencer casing.

Each metallic sheath may be composed of any convenient metal, such as brass foil.

Dated this day of May, 1943.

W. G. DE LISLE.

COMPLETE SPECIFICATION

Improvements in or relating to Silencers for Firearms

I, WILLIAM GODFRAY DE LISLE, a British Subject, of 43, Belgrave Road, London, S.W.1, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to silencing means for firearms of the type (hereinafter referred to as the type described) comprising a tubular casing that is carried or is to be carried by the firearm in spaced relation with the barrel thereof, and baffle-means comprising a plurality of baffle-plates mounted in spaced relation one with another, within the casing, which baffle-means has perforations providing a throughway for the projectile in line with the central longitudinal axis of the barrel.

It is an object of the present invention to provide improved silencing means of the type described of robust and compact construction which shall be more efficient in operation and more effective in silencing firearms than those proposed heretofore.

According to the invention there is provided silencing means of the type described, wherein the baffle-plates are each in the form of a disc of spiral or substantially spiral formation and are arranged to cause the gases emitted from the barrel to swirl about an axis that is offset from the path of the projectile through the baffle-plates, each of which baffle-plates has an eccentric perforation for the passage of the projectile, characterised in that baffle-plates situated towards the front end of the silencer have each a radial slit that extends from the periphery of the disc, preferably through the perforation, the two portions of which disc at opposite sides of the slit are bent so as to be spaced apart angularly one in relation to the other and lie at opposite sides of the general plane of the disc.

The improved silencing means preferably comprises means for preventing, or tending to prevent, the formation of a partial vacuum at the muzzle of the barrel.

When an expansion nozzle is situated, or arranged to be situated, at the muzzle of the barrel, the nozzle may be constructed and arranged to constitute the vacuum-prevention means referred to in the preceding paragraph.

The casing of the silencing means may extend, or may be constructed to extend, rearwardly around the barrel beyond the muzzle thereof to provide a rearwardly-closed expansion chamber situated between the muzzle and the breech of the barrel.

The peripheries of some or all of the baffle-plates may be spaced away from the internal periphery of the casing to provide an annular space or gap that surrounds the baffle-plates at the inner face of the casing.

The baffle-plates may be arranged in two groups, whereof a front group comprises baffle-plates constructed as set forth above, and the second group is arranged between the barrel-muzzle and the front group, and comprises a plurality of baffle-plates which are each of flat construction, one or more of which have each a shallow arcuate peripheral recess which, when in its position of use, lies in the lower part of the silencer.

When the barrel is provided with a plurality of vents in its front end portion, a sound-absorbing device may be provided in the form of a liner for that part of the casing of the silencer surrounding the vents, which liner will extend, when in use, from a situation in front of the barrel-muzzle to the rear of the silencer casing, and may comprise a tubular layer of sound-absorbing yieldable material protected on the inside or both on the inside and the outside by a thin metallic sheath.

One embodiment of the invention and a modification thereof are diagrammatically illustrated by way of example in the accompanying drawings, wherein:—

Figure 1 is a side elevation showing a rifle provided with one construction of silencer according to the invention,

Figure 2 is a vertical longitudinal section showing the silencer on a scale larger than that of Figure 1,

Figure 3 is a detail sectional elevation taken on the line 3—3 in Figure 2, showing a baffle-plate,

Figure 4 is a detail plan view showing several baffle-plates and rods, broken away, on which they are mounted,

Figure 5 is an end elevation of the silencer as viewed from the left-hand end of Figure 2, and

Figure 6 is a diagram described hereinafter,

Figure 7 is a vertical longitudinal section showing another construction of silencer according to the invention, and

Figure 8 is a enlarged vertical section taken on the line 8—8 in Figure 7.

Like reference characters designate like parts throughout the several views.

Referring first to Figures 1—6, the invention will now be described by way of example with reference to silencing the discharge of a riffle 10 having a barrel 12 of .45 in. calibre, by means of silencing means comprising a tubular casing 14. This casing, which may be about 16 in. long, is mounted eccentrically on the rifle, so that a rear end portion constituting an expansion chamber 16 surrounds the barrel, and a front end portion constituting a baffle chamber 18 extends in front of the nozzle 20 of the barrel. This casing 14, which is circular in cross-section and may be about 2 inches diameter is mounted in spaced relation to the barrel 12 which is situated in the upper part of the expansion chamber 16.

A circular mount 22, 24 in the form of a socket for carrying the rear end of the casing 14 is fixed at the front end of the receiver 26 by means of a lock nut 28 screwed on the barrel. The circular wall 24 of this mount, on which the rear end of the casing 14 makes a sliding fit, has a short pin 30 which enters into the open-ended slot 32 in the casing at its rear end. The casing carries at its rear end a rear sight 34 and its front end a foresight 36, both of known construction.

The silencing means also comprises a plurality of baffle-plates threaded on a plurality of parallel rods that extend within the casing 14 in the direction of its length. As illustrated, two such rods 40, 42, which lie on a horizontal diameter of the casing 14, have their rear ends screwed into the end wall 22 of the mount 22, 24, and carry each a cap screw 44 at its front end. The rear end portions of these rods are of smaller diameter than the front portions on which two tubes 46, 48 are respectively carried. A plurality of substantially spiral baffle-plates 50 are threaded on these tubes 46, 48 and lie in spaced relation from the internal periphery of the casing 14. Each of these baffle-plates 50 has the form of a disc that has an eccentric perforation 52 in line with the barrel for the passage of the projectile, and has a radial slit 54 that extends from the periphery of the disc through the perforation 52 to the centre of the disc; the two portions of the disc at opposite sides of the slit are bent so as to be spaced apart angularly one in relation to the other and lie at opposite sides of the general plane of the disc. The baffle-plates are thus substantially spiral and, as shown most clearly in Figure 4, provide a substantially spiral passage, along which the gases escaping from the muzzle of the barrel will flow. The peripheries of the baffle-plates are spaced away from the internal periphery of the casing 14 to provide at each plate a space or gap that surrounds it at the inner face of the casing for permitting solid products of combustion to pass along the inner face of the casing.

The front end baffle-plate, of which baffle plates there may be about 13, is spaced away from an end flat plate 56, shown most clearly in Figure 5, situated at the front outer end of the casing. This plate 56 has in its lower portion an arcuate row of relatively small powder-discharge holes 58 adjacent to that part of its periphery which lies at the bottom of the casing. A short gas discharge tube 60 is carried by this plate 56 so as to lie in line with the perforation 52 and the barrel 12.

Means for preventing, or tending to prevent, the formation of a partial vacuum at the muzzle of the barrel is provided within the expansion chamber 16 in the casing 14. This vacuum-prevention means is constituted by an expansion nozzle 62 formed or provided on the muzzle 20, for which purpose the latter is screw-threaded externally, and the stem of the nozzle is screw-threaded internally. Preferably the internal face 64 of the nozzle has the shape shown in Figure 6, which shows a maximum diameter D, a minimum diameter $d=0.4D$, a radius of curvature of the side face of the nozzle being $1.4d$. In some cases the nozzle may be mounted on the rods 40, 42 but that arrangement is not preferred.

The silencing means described above is combined with a cylindrical shield 66, that is screwed on the barrel-muzzle 20 and lies in spaced relation with the barrel, to form a concentric annular space 68 placed in open relation with the interior of the

barrel by way of a plurality of vents 70 therein. These vents 70 are disposed evenly in a plurality of rows extending around and along the periphery of the barrel, with the vents in one longitudinal row preferably staggered in relation to those in an adjacent longitudinal row, in order that the pressure of the gases shall be reduced evenly around the periphery of the projectile. There may be 6 vents per row around the barrel, and these rows may be spaced about ¼ in. apart. The annular space 68 is closed at its front end at the nozzle 62 which may be distinct from the shield 66 and may serve as a lock nut for it, but the space 68 is open at its rear end.

In operation the column of air in the barrel and the gas leakage past the bullet first appears at the muzzle of the barrel. This is unavoidable and assists in building up in front of the muzzle of the barrel back pressure which assists the correct functioning of the expansion nozzle fitted to the end of the barrel.

As the bullet passes along the barrel, the said vents 70 constituting gas-discharge holes are uncovered in succession towards the muzzle, which vents serve to allow some of the gases propelling the bullet to escape into the expansion chamber, thereby still further building up the back pressure and also reducing the volume of gases flowing at high velocity behind the bullet. The short length of the barrel left intact at the muzzle end serves to steady the bullet should its balance have become upset or deranged through gases escaping behind it transversely to its path of flight. Also this short imperforate length of barrel permits the bullet to acts as a stopper in front of the gases during the period of their escaping through these vents.

When the bullet travels through the baffle-plates 50 after having passed the nozzle 62, the gases are made to swirl so that their travel is transverse to the path of flight of the bullet. It is arranged that the path of the bullet shall lie off-set from the axis of the swirl. The expansion chamber is carried right back as far as the receiver, primarily to provide increased expansion space for the gases, and secondly to produce a compact, robust and easily handled type of firearm, equipped with silencer.

When the gases strike the first baffle-plate after having left the nozzle 62, they are in a semi-dispersed state, that is, they have followed to some extent the lines of the nozzle, although there is probably still a column of concentrated gas directly behind the bullet. The effect of striking the first baffle-plate is that most of the gas is made to swirl in such a manner that the vortex of this swirl is central with the silencer tube, the longitudinal axis of the barrel and path of the bullet being offset from and eccentric to the centre of this tube. The effect of this swirl is to make the gas travel transversely of the path of the bullet, and in doing so a small proportion of it will tend te deflect and dissipate the column of high pressure gas directly behind the bullet. It is, of course, impossible for one baffle-plate to do all that is required in this direction, and therefore a number of similar plates are placed in spaced relation one behind another, each one contributing in some degree towards making the gas follow a path other than the flight of the bullet, the net result of which is that the bullet leaves te silencer with the gas following it at a greatly reduced velocity. The pressure of the gas in the silencer is higher than the pressure of the atmosphere outside, and it discharges itself from the tube 60 as a jet of gas travelling at a sufficiently low velocity as to produce very little or no sound.

In addition to this, in order that unburnt powder as well as burnt powder, refuse and solid products of combustion, shall not accumulate unduly in the silencer, particularly the live powder which on accumulation could cause serious accidents should it become ignited at any time, the baffle-plates do not fit the tube of the silencer tightly, but, as mentioned above, have a small gap around their periphery, while in the end plate of the silencer body small slots or holes 58 are pierced so that the above debris can be discharged or fall out as the case may be. The presence of these additional holes in the end plate provides additional exits for the gas, but this is purely incidental and does not affect the resulting sound in any way.

The expansion nozzle 62 is provided for the purpose of preventing a vacuum from being formed at the muzzle. The collapse of this vacuum produces a sharp " crack " which heretofore has not been suppressed except by means of sound-absorbing or damping material, such as felt. This " crack " is normally transmitted through the wall of the silencer of the type described, but by the provision of this nozzle, this vacuum is prevented from being formed, and therefore there is no " crack " to be silenced.

The vents 70 in the barrel surrounded by the shield 66 reduce the volume of gas following the bullet and prevent the gases which are travelling at high velocity from impinging directly on the wall of the silencer, which would cause a noise. The

invention thus provides an improved robust, compact and silent firearm, whereof the barrel and silencer form an unitary structure which can be attached to a firearm having any mechanism whether of the single shot, repeater or automatic type of feed.

Another advantage of reducing the gas pressure behind the bullet just prior to its leaving the muzzle of the barrel is that when the bullet becomes unsupported after leaving the muzzle, there is not the same pressure of gas behind it as there would normally be to upset its balance. In actual practice a rifle bullet travels many feet from the muzzle of a gun before it rotates freely about its own centre of gyration in true flight. This upsetting is caused by the gases following it at high pressure from the muzzle. It is, therefore, reasonable to presume that if this velocity and gas pressure can be reduced just before the bullet leaves the barrel, the effect of this disturbance will be beneficially reduced, thereby improving accuracy in use of the firearm.

The construction of silencing means shown in Figures 7 and 8 is similar to that described above with reference to Figures 1—6, but differs therefrom in that the baffle-plates in the casing 14 are arranged in two groups, whereof a front group comprises baffle-plate 50 constructed as described above, and the rear group is arranged between the barrel muzzle and the front group, and comprises baffle-plates each of flat construction. As illustrated, the rear group comprises three baffle-plates 72, 74 and 76, whereof the plate 76 situated next adjacent to the group of plates 50, is of larger diameter than the plates 72 and 74, and makes a snug fit in the casing 14. The two plates 72 and 74 have each a shallow arcuate peripheral recess 78 which, when in its position of use, lies in the lower part of the silencer. The end baffle-plate 76 of the rear group situated remote from the nozzle 62 has in place of the arcuate peripheral recess an arcuate row of relatively small holes 80 lying opposite to the arcuate recess in the next adjacent baffle-plate 74. Each of these baffle-plates of the rear group has in it a perforation or aperture 82 in line with the perforations 52 in the front group of baffle-plates for providing a throughway for the projectile in line with the central longitudinal axis of the barrel. In this modified construction the gases issuing from the nozzle behind the projectile are throttled somewhat by the rear group of baffle-plates before they have imparted to them the swirling motion by the front group, whereby the efficiency of the silencer is enhanced.

In some cases it is found that the gas impacting on the metal shield 66 shown in Figure 2, which is slightly longer than the apertured portion of the barrel, is liable to produce an undue amount of noise. In order to obviate this defect, as shown in Figures 7 and 8, a sound-absorbing device in the form of a liner is provided for that part of the casing 14 of the silencer which surrounds the vents 70, which liner extends when in use, from a situation in front of the expansion nozzle 62, to the rear of the silencer casing 14. As illustrated, this liner comprises a tubular layer 82 of sound-absorbing yieldable material protected on the inside by a thin metallic sheath 84. The liner also preferably comprises a thin metallic sheath 86, on the outside of the sound-absorbing material which may be of animal, vegetable or mineral origin and may be comprised of felt, rubber or rubberised fabric, asbestos, lead-wool or the like. The objects of providing the sound-absorbing device with the internal or both internal and external metallic sheath are (1) to avoid disintegration of the sound-deadening yieldable material by the impact on it of the hot gases escaping from the vents in the barrel, (2) to avoid contamination and fouling of the sound-deadening material by the products of combustion, and (3) to enable the liner to be readily removed and cleaned.

This liner may be used with or without the shorter sleeve 66, preferably of mild steel, that surrounds the vents and serves to disperse the hot gases issuing from them.

When inner and outer metallic sheaths are provided they may be sealed at their ends so as to enclose the sound-absorbing material fluid-tight. The liner can then be washed or otherwise cleaned, if necessary, without affecting the sound-absorbing material. Owing to the outer metallic sheath of the liner it can be readily slid into and out of position in the silencer casing.

Each sheath 84 and 86 may be composed of any convenient metal, such as brass foil.

The baffle-plates 72 and 74 are of smaller diameter than the baffle-plates 76 in order that they may lie within the sound-absorbing device.

A sound-absorbing device similar to that described with reference to Figures 7 and 8 may be provided in the construction of silencer shown in Figure 2, in which case it may surround some of the baffle-plates 50.

Another function of either construction of silencer described is that of eliminat-

ing flash, which is particularly advantageous in the case of firearms, such as a machine-gun, used at night.

Each construction of silencer described above is self-cleaning, and will also discharge foreign matter, such as sand, which has inadvertently been permitted to enter it.

Various modifications may be made in the details of construction described above without departing from the invention. For example, instead of using an expansion nozzle 62, a nozzle of internal frusto-conical shape may be employed. Also, in some cases more than two rods may be provided for carrying the baffle-plates. Moreover, instead of spacing all of the baffle-plates 50 away from the internal periphery of the casing 14, only some of them may have gaps at their peripheries. Further, if desired, the baffle-plates may be integral one with another and constitute a spiral structure. Again, in some cases the rods 40 and 42 may be dispensed with.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. Silencing means of the type described, wherein the baffle-plates are each in the form of a disc of spiral or substantially spiral formation and are arranged to cause the gases emitted from the barrel to swirl about an axis that is offset from the path of the projectile through the baffle-plates, each of which baffle-plates has an eccentric perforation for the passage of the projectile, characterised in that baffle-plates situated towards the front end of the silencer have each a radial slit that extends from the periphery of the disc, preferably through the perforation, the two portions of which disc at opposite sides of the slit are bent so as to be spaced apart angularly one in relation to the other and lie at opposite sides of the general plane of the disc.

2. Silencing means according to claim 1, comprising means for preventing, or tending to prevent, the formation of a partial vacuum at the muzzle of the barrel.

3. Silencing means according to claim 2, wherein an expansion nozzle is situated, or arranged to be situated, at the muzzle of the barrel, characterised in that the nozzle is so constructed and arranged as to constitute the vacuum-prevention means.

4. Silencing means according to claim 1 or claim 2, wherein the casing extends, or is constructed to extend, rearwardly around the barrel beyond the muzzle thereof for providing a rearwardly-closed expansion chamber situated between the muzzle and the receiver of the firearm.

5. Silencing means according to any of the preceding claims, wherein the peripheries of some or all of the baffle-plates are spaced away from the internal periphery of the casing to provide an annular space or gap that surrounds the baffle-plates at the inner face of the casing.

6. Silencing means of the type described comprising baffle-plates arranged in two groups, whereof a front group comprises baffle-plates constructed as set forth in claim 1, and the second group is arranged between the barrel-muzzle and the front group, and comprises a plurality of baffle-plates which are each of flat construction, one or more of which have each a shallow arcuate peripheral recess which, when in its position of use, lies in the lower part of the silencer.

7. Silencing means according to claim 6, wherein the end baffle-plate of the second group situated remote from the barrel-muzzle has in place of the arcuate peripheral recess an arcuate row of relatively small holes lying opposite to the arcuate recess in the next adjacent baffle-plate of the second group.

8. Silencing means according to any of the preceding claims, wherein an end flat baffle-plate situated at the front outer end of the casing is formed with an arcuate row of relatively small holes adjacent to that part of its periphery which lies at the bottom of the casing.

9. Silencing means according to any of the preceding claims, wherein the baffle-plates are supported by a plurality of parallel rods that are supported at the front and rear ends and extend in the direction of length of the casing.

10. Silencing means according to any of the preceding claims, in combination with a cylindrical shield that lies or is arranged to lie surrounding the barrel at the rear of its muzzle and in spaced relation therewith to form an annular space placed in open relation with the interior of the barrel by way of a plurality of vents therein.

11. Silencing means according to Claim 10, wherein the vents are disposed evenly in a plurality of annular rows around the periphery of the barrel, with the vents in one row preferably staggered in relation to those in an adjacent row, in order that the pressure of the gases shall be reduced evenly around the periphery of the projectile.

12. Silencing means according to Claim 10 or Claim 11, wherein the annular space is closed at its front end outside the barrel and is open at its rear end.

13. Silencing means according to any

of the preceding claims for use with a barrel provided with a plurality of vents in its front end portion, comprising a sound-absorbing device in the form of a liner for that part of the casing of the silencer surrounding the vents, which liner will extend, when in use, from a situation in front of the barrel-muzzle to the rear of the silencer casing, and comprises a tubular layer of sound-absorbing yieldable material protected on the inside by a thin metallic sheath.

14. Silencing means according to Claim 13, wherein the liner also comprises a thin metallic sheath on the outside of the sound-absorbing material.

15. Silencing means according to Claim 13 or Claim 14 wherein some of the baffle-plates of the second group thereof set forth in Claim 6, are surrounded by the front end portion of the liner.

16. Silencing means according to Claim 1 as shown in Figures 2, 3, 4, 5 and 6, or modified according to Figures 7 and 8 of the accompanying drawings.

Dated this 7th day of June, 1944.

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111 & 112, Hatton Garden,
London, E.C.1,
Chartered Patent Agents.

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579,168 COMPLETE SPECIFICATION

SHEET I

[This Drawing is a reproduction of the Original on a reduced scale.]

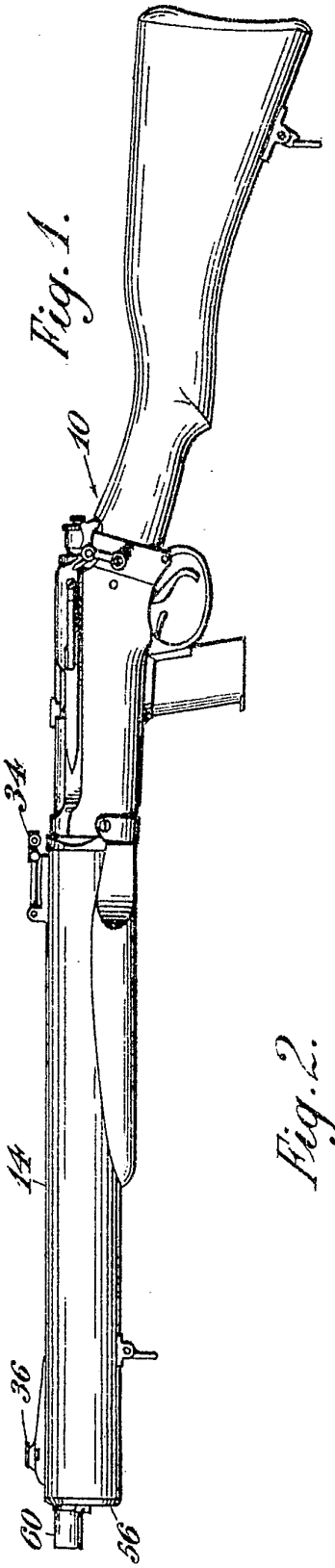


Fig. 1.

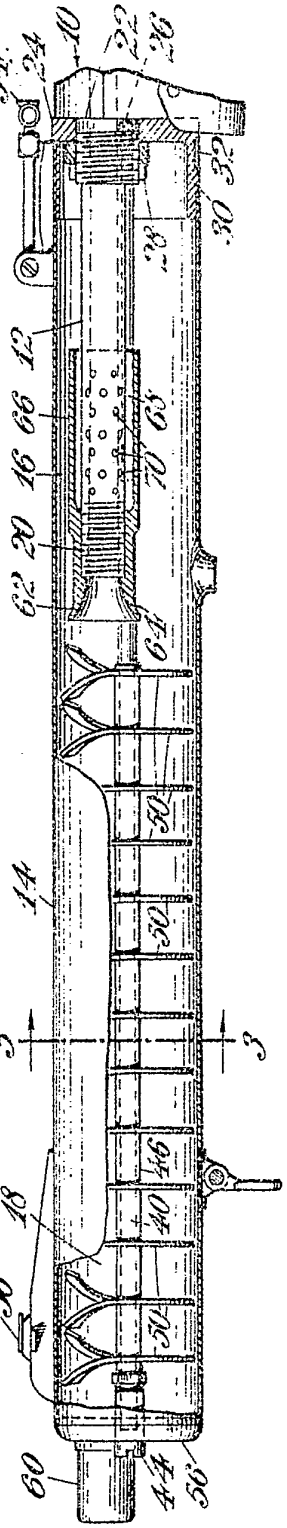


Fig. 2.

Fig. 3.

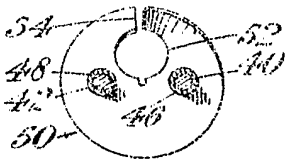
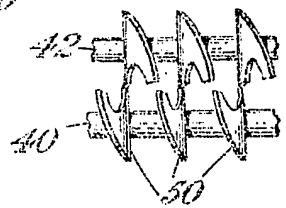


Fig. 4.



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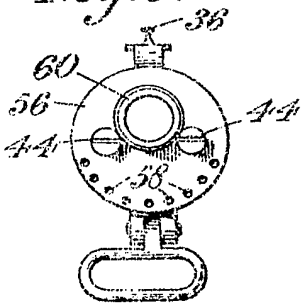

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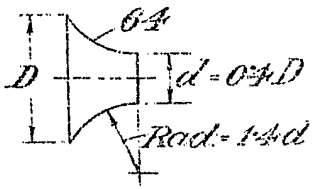

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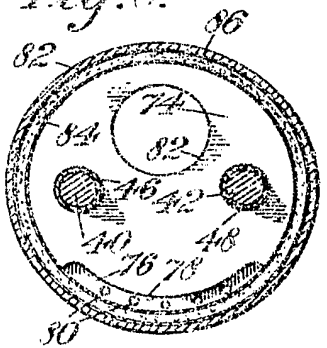

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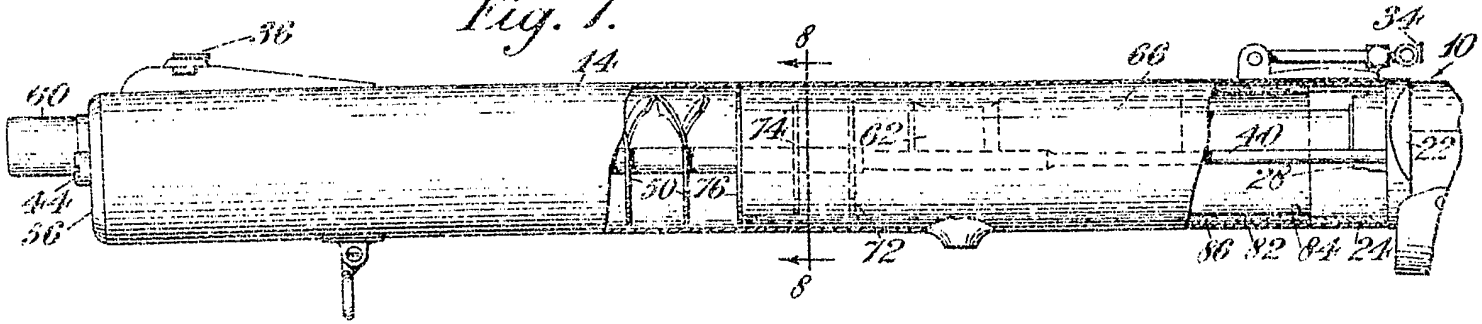


[This Drawing is a reproduction of the Original on a reduced scale.]

579,168 COMPLETE SPECIFICATION

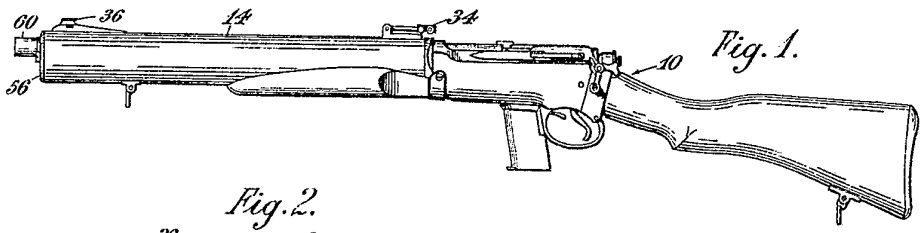


Fig. 1.

Fig. 2.

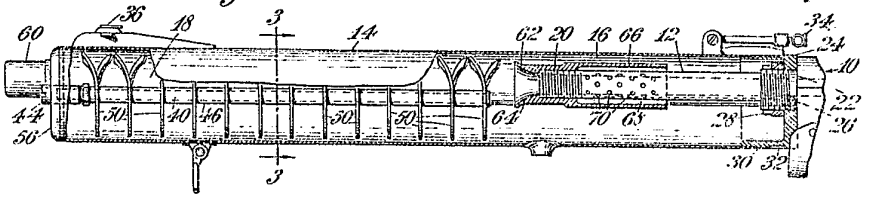


Fig. 3.

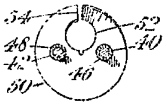


Fig. 4.

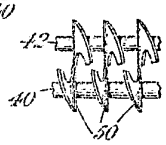


Fig. 5.

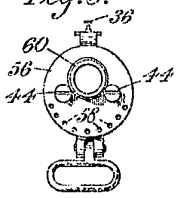


Fig. 6.

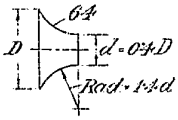


Fig. 8.

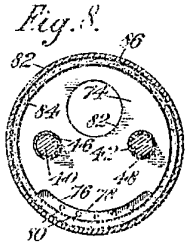
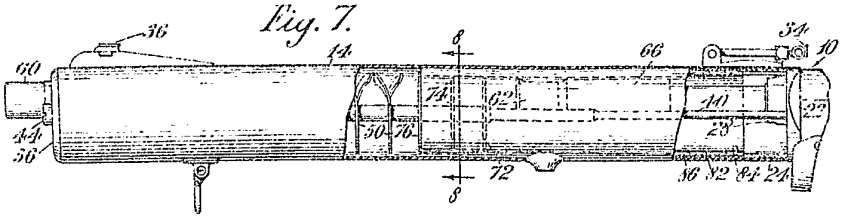


Fig. 7.



SHEET 1

2 SHEETS
SHEET 2

H.M.S.O.(H.)