April 24, 1951 L. MACKTA 2,549,832

REPLACEABLE GUN LINING

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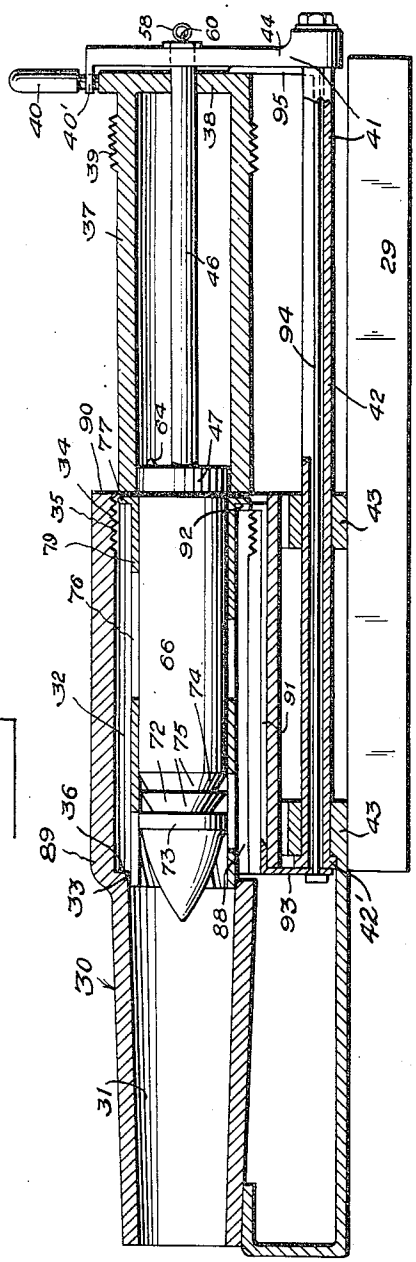

Fig. 1.

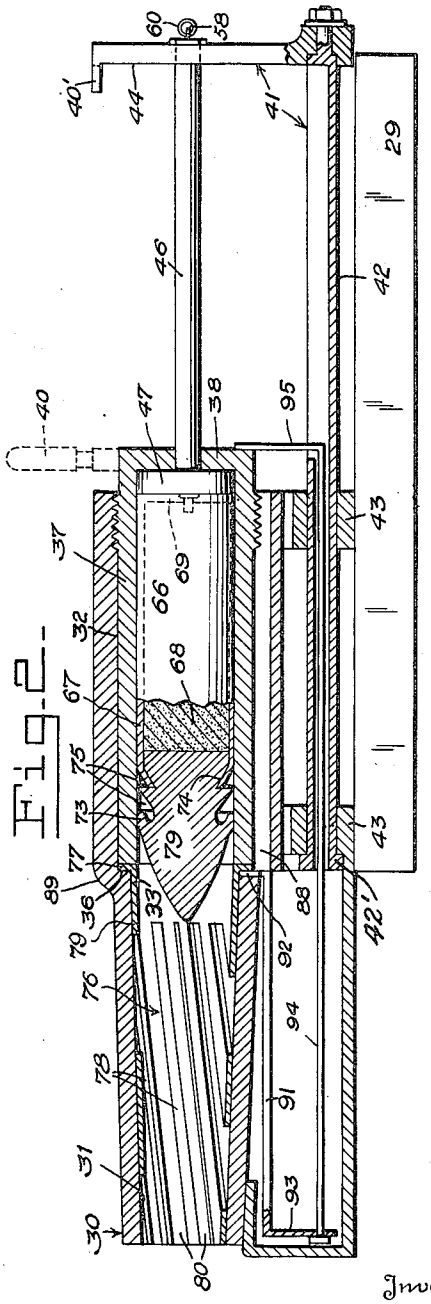

Fig. 2.

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REPLACEABLE GUN LINING

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Fig. 3.

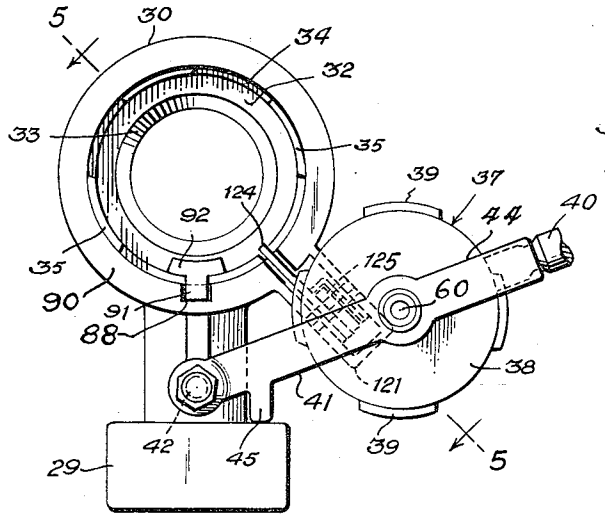

Fig. 4.

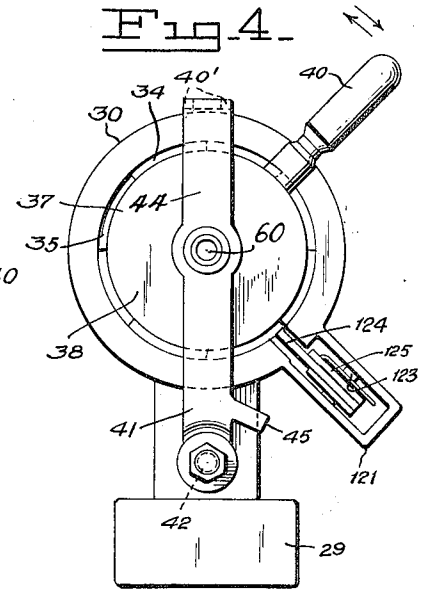

Fig. 5.

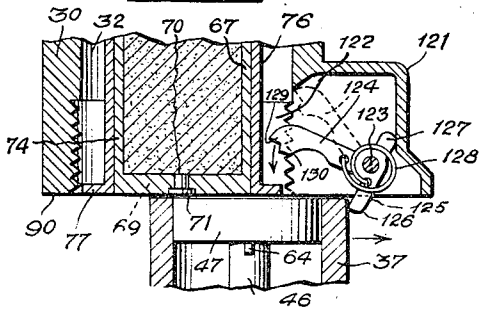

Fig. 6.

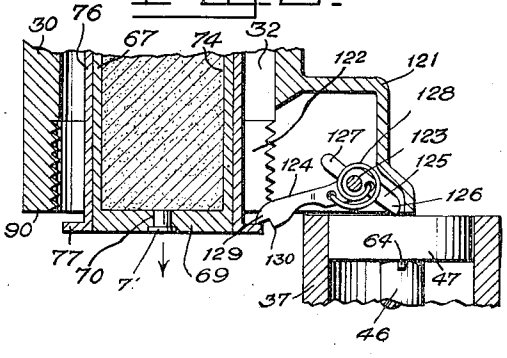

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Fig. 7.

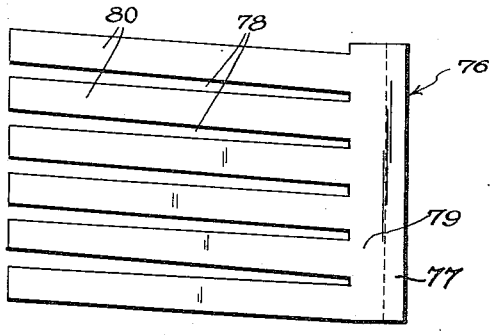


Fig. 11.

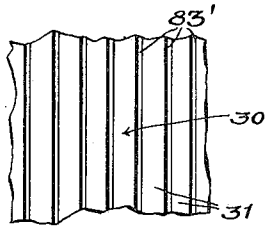


Fig. 8.

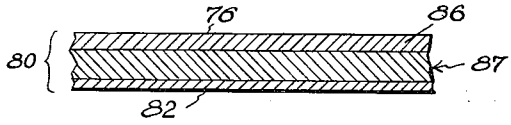


Fig. 12.

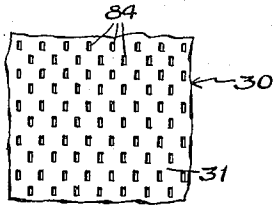


Fig. 9.

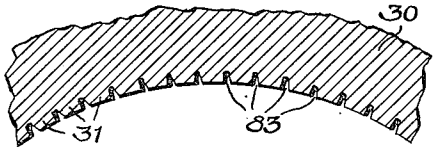


Fig. 13.

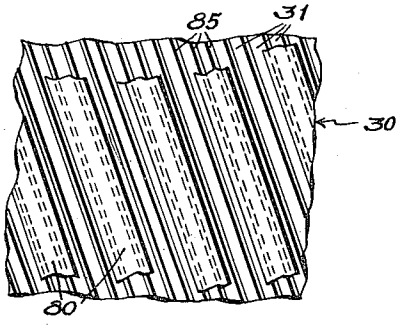
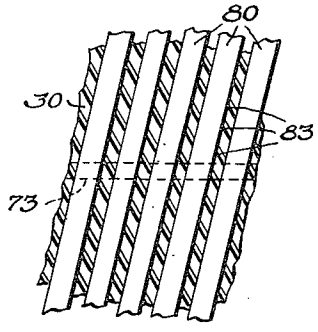


Fig. 10.



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Patented Apr. 24, 1951

2,549,832

UNITED STATES PATENT OFFICE

2,549,832

REPLACEABLE GUN LINING

Leo Mackta, Brooklyn, N. Y.

Application May 7, 1945, Serial No. 592,435

12 Claims. (Cl. 42—78)

(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.

The invention relates to an improved gun, and to ammunition and other elements of a novel load for use therein, as well as to the means for loading the gun and firing the same.

One object of the invention is to provide means for maintaining a gun in effective condition and particularly in minimizing erosion, and also by enabling frequent renewal of chamber surfaces, and to provide material and present a method of effecting frequent renewal of rifling, even with each shot fired if desired, and in such event to present ammunition embodying the necessary elements for effecting such renewal incident to and as a part of the operation of loading the gun. It is an important advantage in this respect that such loading may be effected with about the same facility and time of loading as with conventional ammunition.

Another important aim is to present novel means for securing a rifling assembly separably in the bore of a gun tube. That is to say, it is contemplated to have a more or less simple bore in that part of the tube intended for the passage of the projectile and to enable the insertion or removal of my land means at will without requiring machine shop operations, and with the gun in its usual place of operation, whether in the field or in a permanent emplacement. Also it is the aim to enable such emplacement and removal by the use of such simple loading mechanism as will correspond closely to conventional construction and operation and readily operable without detriment to efficient and rapid firing of the weapon.

It is a further object of the invention to present a gun which may be used for high velocity action with artillery calibers while at the same time being readily portable. A further aim is to present the invention in a practical adaptation to use with tapered bores, particularly in reference to the novel rifling above referred to.

Erosion of the barrel of a gun begins principally at the forward part of the chamber, and this is quickly followed by destruction of the near end portions of the lands in the bore and the forcing cone at the throat. The destruction of part of the lands results in an initial movement of the projectile without rotation, and the relatively uneroded portions of the lands are then encountered with such abruptness by the projectile sealing or rotating rings or flanges, that a

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severe and destructive shock and tearing action is imparted to the material of the barrel and the projectile, hastening deterioration of the gun and impairing the effective flight of the projectile. In addition to deviation from a true line of flight, the trajectory of the projectile becomes modified at an early stage in such erosion involving uncertain range, and this also seriously affects the fighting value of armament because of the uncertainty of aiming. Erosion of the lands progresses forwardly with each shot. It often is necessary for artillery or other guns in critical battles to be continued much longer in use than the maximum ordinarily expected and in some cases a projectile will move more than its length in the bore before encountering adequate land elements to effect its rotation, and the resultant shock then is a serious threat to the safety of operation of the gun, not to mention the loss of range and accuracy involved. It is believed that prevention of initial erosion at the forward part of the chamber will delay the erosion of the lands materially, for a number of reasons which will be understood, including avoidance of focusing gases in the space enlarged by erosion, upon the more restricted part of the bore in advance thereof.

For the last reasons as well as to enable repair or prevention of erosion of the chamber and bore, it is an aim of my invention to enable the renewal of the face of the chamber at frequent intervals, in a novel, economical, and simple way, which may be carried out without returning the gun to a manufacturing or base repair plant.

The desirability and difficulty of avoiding excessive heating of guns incident to battle firing is well understood and it is an object of this invention also to enable the dissipation of heat imparted to face materials of the bore and chamber at a distance from the gun so as to enable sustained and more frequent fire of large caliber guns especially.

Still further objects, advantages, and features of invention and the nature of the invention otherwise will appear from the following description and accompanying drawings, wherein:

Fig. 1 is a longitudinal sectional view of a gun embodying my invention with the breech sleeve or chamber wall element withdrawn, a load in the chamber and the breech sleeve positioned for return, the cartridge case-liner being in section.

Fig. 2 is a similar view with the breech sleeve in closed position, a part of the cartouche and projectile being in section.

Fig. 3 is a rear elevation of the gun with open breech.

Fig. 4 is a similar view closed.

Fig. 5 is a fragmentary longitudinal section on the line 5—5 of Fig. 3 with a cartridge unit and case in position and with the breech sleeve and obturator piston at an intermediate position in opening movement, illustrating initial action of the ejector.

Fig. 6 is a similar view with the breech fully opened.

Fig. 7 is a plan of the blank for the load case and barrel liner.

Fig. 8 is a fragmentary section of a possible form of sheet material for production of the combined case and liner.

Fig. 9 is a fragmentary enlarged cross section of the barrel.

Fig. 10 is a developed approximate face view of the bore and a liner therein showing a grooving of the barrel in relation to a passing sealing or rotating ring.

Fig. 11 is a similar view of another arrangement of the grooves longitudinally of the barrel.

Fig. 12 is a similar view illustrating the use of recesses of small dimensions longitudinally of the barrel or interrupted grooves.

Fig. 13 is a similar view illustrating barrel grooves coincident in direction with the lands.

There is illustrated a gun comprising a base 29 which may have any suitable mounting for pointing of the gun, these details not being illustrated, since they are not a novel feature of my invention. On this base there is rigidly secured a barrel or tube 30 which includes a bore 31 and a chamber, the latter comprising a chamber recess 32 formed immediately to the rear of the throat or forcing cone 33 constituting a tapered enlargement of the bore leading from the recess 32. In the present instance, for convenience in illustrating the invention, the recess 32 is continued through the breech end of the gun with a slight further recess 34 in which interrupted interior threads 35 are formed, such as those of conventional breech recesses. The forward end of the recess 32 forms a shoulder 36 at the rear of the throat on the tube. The tube may be conventionally reinforced or assembled, these details not being illustrated.

For the purpose of portability the bore portion of the barrel in this instance is quite short in proportion to the caliber thereof, and is formed with a pronounced taper reducing its diameter progressively from the throat to the muzzle. The tapered bore may be smooth or formed with small grooves, recesses or other irregularities of slight altitude as compared to conventional rifle lands, and not intended as rifling, as will be more particularly described.

The breech closure and chamber assembly.—A revoluble closure or breech sleeve is provided, consisting of a cylindrical sleeve 37 adapted to extend into the recess 32 to or near the shoulder 36. If desired a tapered fit may be employed to facilitate a supporting contact between the face of the recess and that of the sleeve. The sleeve is formed with an integral head 38, and exteriorly is provided with conventional interrupted threads 39 coordinated with those of the recess 34 for sliding movement of the closure inwardly to near final position and then rotation to coengage the threads. A radial operating handle 40 is mounted on an extension of the closure, and is vertical when in unlocked position.

The breech sleeve 37 is supported slidably for movement into and out of the recess 32 by means of a frame 41 rockable transversely. The frame includes a longitudinal rectilinear base shaft or bar 42 parallel to the axis of the tube, revolubly mounted in bearings 43 beneath the chamber portion of the tube and it extends rearwardly of the breech of the gun a distance at least equal to the length of the closure including the sleeve. A stop collar 42′ is provided on the forward end of the bar. At the rear end of the bar 42 a lever arm 44 is fixed thereon, extending vertically upward in closed positions of the parts, and oscillatable with the bar for movement to the right as in Fig. 3, and return. The base 29 extends beneath the lever and a stop lug 45 is formed on the lever to engage the base and limit movement of the lever toward the right as the parts are viewed in Figs. 3 and 4.

A stud shaft 46 is fixed in the lever 44, projected forwardly and positioned on the lever so as to lie coaxial with the tube 30 at the upright position of the lever. The head 38 is bored and engaged slidably on the shaft 46, and at the forward end of the shaft 46 there is mounted a piston 47 fitted slidably in the sleeve 37, by which the latter is supported at its forward end. The piston has a forward face close to the plane of the breech end of the tube 30 and has a firing mechanism therein as shown in Figs. 7 and 8. The lever arm 44 is extended from its pivot and beyond the base of the shaft 46 to a distance slightly beyond the periphery of the breech closure, and provided with two forwardly projected lugs 40′ positioned to receive therebetween the base of the operating handle 40 when the latter is drawn to its rearmost position as shown in Fig. 1. It is possible then to swing the closure, including the piston and the shaft 46 and lever arm 44 as a unit to the open breech position shown in Fig. 3.

The load.—The ammunition is a cartridge unit 66 shown in Figs. 1 and 2, and consists of a cartouche or envelope 67 which may be of fiber, and may be destructible by the burning of the charge 68 of propellant explosive therein. The cartouche corresponds to the ordinary cartridge case, and includes a thickened head 69 (which may be considered the head of the load or cartridge) axially in which is set a primer 70 shaped and exposed at 71 (Figs. 5 and 6) for engagement and detonation by the firing pin 49 when operated as described. The cartouche is formed with a cylindrical wall 74 open at the forward end whereby the mouth of the envelope is formed and in this mouth there is snugly fitted the base of a projectile 72 of conventional construction. In this instance it is shown with an integral sealing or rotating ring or flange 73, immediately behind which suitable grooves 75 are formed in the projectile to receive the metal displaced by the forcing cone or throat and the rifling of the bore when the projectile is fired. The edge portion of the wall 74 is crimped inward into the rearmost groove of the projectile and secured so as to hold the latter securely in place during shipment and handling.

The liner.—The load also includes a metal combined case and barrel rifling liner 76 (which may be termed a liner), surrounding the cartouche and laid snugly thereagainst. The case-liner is formed of metal which may be produced from suitable blanks by extrusion after the manner of making metal cartridge cases, or may be stamped from flat sheet stock as in Fig. 7, and shaped to the diameter desired. The case 76

includes a rear base flange portion 77 at right angles to the axis of the load and there are formed in the forward part a multiplicity of slots 78 which in the present instance open through the forward end of the liner and extend obliquely rearwardly nearly or quite to the flange portion 77; in the present instance stopping short of the flange and thus leaving a circumferentially continuous throat portion 79. The material between the slots constitutes a number of lands 80. The lands are preferably of nearly or quite uniform width from their bases at the throat portion forwardly although they may be tapered slightly toward their forward ends to maintain an intimate engagement with the sealing and rotating bands of projectiles during firing. The case-liner of the load is shown as extending slightly forward beyond the forward-most sealing flange 73, but this length may be varied as found desirable. Also the length of the liner is in this instance slightly greater than the interior length of the recess 32. The major diameter of the liner flange 77 is sufficiently less than that of the chamber recess 32 at the shoulder 36 to permit the flange 77 to lie separably against the shoulder 36 as will be made clear hereinafter. The forward-most flange 73 is spaced from the rear face of the cartouche head 69 less than the interior length of the sleeve 37, so that when the load is positioned as in Figs. 1 and 2 there is a clearance between the ogive, bourrelet and flange 73 of the projectile on the one hand, and the throat 33 and superposed lands, on the other hand, to free the latter for forward sliding movement as will appear. To minimize friction between the projectile and lands the latter may be faced electrolytically or otherwise with a material 82 (Fig. 8) having a relatively low index of friction, such as copper. The body of the lands may be of a material of a hardness and toughness correlated to the material in the rotating bands or flange of the projectile, and if practicable may itself have a low index of friction, so that application of the facing 82 may be dispensed with. This land construction may include a body of a thickness related to the material of the rotating rings or flanges, and in the width of the lands, the power of the propelling charge and the safety factors in the materials of the tube and jacketing, all of which may be calculated. It is believed that by reason of frequent replacement and consequent perfection of the driving edges of the lands, a thickness less than the depth of conventional rifling is practicable and the width of the lands may be determined by conventional calculation modified by expediency or requirements indicated in practice. A compensating factor is the taper of the bore 31.

Land-tube keying.—In case of need I have here presented in Figures 9 to 13 means to hold the lands to the bore so that relative rotation of the liner unit will not occur, notwithstanding that the liner is free for removal with little force. This means consists in forming in the face of the bore, a multiplicity of small pits or recesses 83 or other irregularities or eccentricities of the circumferential contour of the bore face, and adapting the lands to function with these by intrusion thereinto under the pressure exerted on the lands by sealing and rotating rings, bands or flanges or projectiles, while the latter are being propelled by the products of combustion of the propelling charges detonated in the chamber of the gun. These recesses may be termed key grooves or recesses. In the forms shown it is contemplated that these shall be of slight depth, only a fraction of the height of the land. As shown in Figures 9 and 10 these consist of spiral grooves or rifling which may be continuous from the throat to the muzzle of the tube and having a direction opposite that of the direction of twist of the lands 80. An approximate showing of the grooves 83 in cross section in Figure 9 may be modified as to size and spacing as found desirable. The grooves 83, however, preferably have a radial side at the left as in rifling and it is thought the opposite side may simply slope as indicated. The twist or pitch of the grooves 83 may be such that the portion of any one groove exposed between two lands will be included within the longitudinal measurement of a passing sealing band or flange, as indicated in dotted lines at 73 in Fig. 10, so that leakage of gases through the grooves will be prevented.

In Figure 11 the key grooves 83' extend longitudinally of the tube rectilinearly and parallel to longitudinal geometrical elements of the tube face.

In Figure 12 the key recesses 84 are shown as non-continuous in any direction but being slightly elongated. If this elongation is longitudinal as shown, the lengths of the recesses may be less than the longitudinal dimension of the rotating and sealing band 73.

In Fig. 13 the key grooves 85 shown in the bore are spiral with the same direction and pitch or twist as the lands 80 and alined therewith.

A relatively hard resilient material in the land will be sprung or deformed over the recesses to a degree, by a passing projectile and the liner 76 will thereby be held against relative movement upon the face of the bore, and after the passage of the projectile will recover from such deformation so that it may be readily drawn from the tube.

In order to effect keying engagement between the land and tube by a somewhat different function of the land, I have shown in Fig. 8 on the external face of the land next to the face of the bore a substantial body of metal or other material 86 more or less plastic or flowing under the high pressures involved in the passage of the rotating band or flange of a projectile through the gun. The material 86 is united with the land body material 87. The latter may be a relatively hard steel, while the key material may be soft iron, bronze, brass, or copper applied in conventional ways, as for instance, by electrolytic deposition. Such materials are capable of extrusion from their initial surface contours on the lands, into the grooves or recesses, by a flowing action under the pressures indicated, yet by alloy or otherwise may be made tough and sufficiently resistant to shear to hold the land keyed to the tube, against the torsional forces exerted by the projectile.

The liner extractor (Figs. 1, 2 and 3).—A narrow longitudinal channel 88 is formed within the tube 30 at the lower side of the chamber recess 32 opening at its forward end through the external surface of the chamber enlargement 89 on the gun and also through the breech face 90 of the gun tube. Laid slidably in the channel and coextensive in length therewith there is a push rod 91, at the rear end of which there is an extractor jaw 92, arranged transversely in the chamber recess and adapted to receive the flange 77 thereagainst while the jaw 92 is at initial loading position in the extreme

rear part of the breech recess. The jaw 92 is adapted to support the load initially, and after positioning of the load in final position before closing of the breech will support the rear end of the load. The rod 91 has on its forward part a downwardly extended rigid arm 93 and connected revolubly to the extremity of the latter there is a draw rod 94, extended slidably through the bar 42 to a point immediately to the rear of the head 38 of the chamber member 37. From a point in advance of this the bar 42 is channelled rearwardly on its upper side to the lever arm 44, and an upstanding arm 95 is fixed on the rod 94 extending upwardly through this channel close behind the head 38 of the breech closure or chamber member. The arm 95 is thus movable by the chamber member rearwardly carrying the push rod and ejector jaw to the positions of Fig. 1.

The liner ejector (Figures 5 and 6).—At the right of the tube and mounted thereon at and forwardly of the breech face, there is an ejector device operative to push the flange 77 of the rifling unit or liner a distance rearwardly of the breech on movement of the piston 47 and sleeve 37 to full open position. For this a housing 121 is provided on the gun adjacent a radius of the breech axis extending downwardly at an angle of approximately 45 degrees to the vertical. From the housing a slot 122 is formed through the wall of the breech recess and opening through the breech face 90 of the gun. On a pintle 123 fixed across the housing at right angles to said radius on ejector arm or lever 124 is pivoted having a length sufficient to swing from a forward retracted position in the housing clear of the chamber recess, thence rearwardly through the slot 122 (Fig. 5) into the chamber but short of the lands or liner and rearwardly to the flange 77 when in initial loaded position, and beyond, as in Fig. 6. On the same pintle there is pivoted close beside the lever 124 a separate actuating lever 125 having a rearward arm 126 with an open breech position at the right hand or outer limit of its movement forwardly of the path of the piston 47 and sleeve 37 as in Fig. 6 and movable rearwardly into such path and toward the left a distance where it is checked in an initial closed breech position in such path, by its integral forwardly extended arm 127, which engages the wall of the housing to limit movement of the lever 125 (Fig. 5). A torsion spring 128 has one end connected to the lever 125 and its other end connected to the arm 124 under stress tending to move the arms 124 and 126 toward each other. This constitutes a resilient operative connection between the arms 125 and 124.

The arm 124 is moved to its forward position by entry of the sleeve 37 into the chamber recess 32 and is so held until the sleeve is withdrawn. Outward movement of the arm 124 is limited by the end of the sleeve 37 and the piston 47. The arm 124 is so shaped that when the end of the sleeve 37 is at its full open position just out of line longitudinally with the wall of the chamber recess, the sleeve 37 holds the arm 124 in an inoperative position a short distance rearward of the face 90. The end of the arm has an ejector bill 129 set forwardly sufficiently to lap the flange 77 when the sleeve is in loaded position or part way, inward of the face 90 of the gun. A cam 130 is thus formed, the rear side of which engages the sleeve 37 and piston 47 to hold the bill 129 in-operative close before the flange 77. As may be understood, the sleeve is movable laterally on opening of the breech to clear the arm 124 further and permit its full ejector action. For this purpose the arm 124 may be curved and recessed as shown to permit a good full ejection movement, and affording the rear cam face 130 against which the sleeve 37 may engage with a minimum impedance, to move the arm 124 forwardly by the lateral return movement of the sleeve 37 toward closed position, and permitting the sleeve to subsequently push the flange 77 and arm 124 forward in the sliding movement of the sleeve and liner.

In the opening of the breech, after the sleeve 37 is fully withdrawn, in its lateral movement toward the position shown in Fig. 3, the sleeve 37 engages the arm 126 as shown in Fig. 5, at which time the arm 124 may be at the position illustrated in full lines in Fig. 5, by reason of the spring 128 being free of strain although the arm 124 may be held by the spring further rearward and the spring may tend to hold it much further rearward. Upon engagement of the arm 126 by the sleeve 37, this arm is moved to the right, placing the spring 128 under maximum tension when the forward face portions of the closure engage against the arm 126. As soon as the left side edge of the sleeve 37 passes to the recessed rear side of the arm 124, the latter is free to move to full ejecting position, moving the flange and liner correspondingly, as shown in Fig. 6.

Operation.—In the use of the gun and load as described, the breech being open as in Fig. 3, the load in the form of a cartridge and liner as described is introduced into the breech of the gun and positioned as in Fig. 1, with the forward ends of the lands of the liner extended slightly into the bore 31 for support of the forward cartridge end while the rear end of the liner rests on the ejector head 92. The sleeve 37 and its supporting frame are then rocked to the left to the position of Fig. 4. It should be noted that in the rocking movement of the breech closure and supporting frame the arm 95 is included, so that it is always against the head 38 of the chamber and breech closure. The handle 40 is then pushed forward, clearing it from between the lugs 40' and pressing the breech sleeve or chamber wall portion 37 forwardly against the base flange 77 of the rifling or liner and case member 76. The operation is continued, the liner passing slidingly along the bore and being gradually pressed inwardly to a taper corresponding to that of the barrel. The flange 77 finally comes to rest against the shoulder 36, checking also further forward movement of the sleeve 37 in position for meshing of the interrupted threads thereon with those of the breech recess. The forward movement of the liner has thus carried the ejector head 92, rods 91 and 94 and arm 95 to their forwardmost positions, shown in Fig. 2. Rotation of the chamber member as a breech closer, now, by movement of the handle 40 toward the right, will mesh the matched threads 35 and 39 and and press the chamber member tightly forward, clamping the flange 77 in place.

The breech closure having been rotated to locked position, after proper pointing of the gun the lanyard 58 may be pulled to fire the charge in the cartouche. In the progress of combustion of the charge the projectile is moved forward from the position in Fig. 2 until the first flange 73 reaches the forcing cone at 33, and is finally forced forward against the lands 80, where it functions in a way corresponding to

conventional construction as to engraving, sealing and rotating. As the ring **73** passes forward, it exerts sufficient pressure to intrude a part of the land material into the key grooves or recesses **83—85** as before indicated, instantly securing the lands against slippage on the face of the bore.

It is contemplated that the same liner may be used for several shots.

After the firing of each shot the breech is opened by swinging the handle **40** to the left to disengage the threads of the closure and tube, and the handle drawn back to position between the lugs **40'**. This withdraws the rifling-liner unit **76** from the bore **31** by reason of the arm **95** being pressed backward, drawing the rod **94** and the push rod **91** rearward so that the extractor head **92** presses the flange **77** out closely following the end of the sleeve **37**. The latter having arrived at its position clear of the breech as in Fig. 5, it may be swung to the right, clearing the anchor plunger from the head of the cartouche.

In the final opening movements of the sleeve **37** and piston the ejector is caused to act, as before described, moving the liner to a position where it may be engaged by a hook or other tool for complete removal from the gun, together with the cartouche in which the preceding charge was fired, if any parts of the cartouche remain.

In the event that the liner is to be continued in use for succeeding shots, it may be left in place. A new cartouche with projectile may be slipped into the used liner while still in place in the breech, and after positioning of the sleeve **37** against face **130** the new cartouche and old liner are pressed forward with the flange **77** against the extractor head **92**, after which closing and firing of the gun are proceeded with as before described.

The small key grooving **83—85** or the like embodied as above will be largely protected from erosion and require retooling rarely, if at all during the life of the gun. It is an advantage that efficiency of the keying will not be materially affected by loss of exact contour in the grooves.

In the use of the chamber member herein disclosed, due to the time element involved in conduction of heat through the materials employed, and the promptness to be expected in the opening of the breech after firing, a minimum communication of heat to the body of the tube is involved, and in addition a major increment of heat incident to firing of a given charge is dissipated by radiation and natural connection from the chamber member, at a distance from the gun tube, which may be hastened by air circulating means known though forming no essential part of my invention.

Likewise, the withdrawal of the rifling unit or liner immediately after each shot fired will, as in the case of the chamber member, though to a lesser extent, effect a removal from the bore of heat accreted in the liner, and enable its dissipation at a distance from the gun. My liner will also act in some degree as an insulator of heat for the tube, since the intimacy of its engagement with the bore is instantly lessened after passage of the rotating bands of the projectile.

While I have disclosed my invention with particularity in its best embodiment as far as developed, it will nevertheless be understood that modifications of construction, arrangement, and combination of parts, substitution of material, and equivalents, mechanical and otherwise may

be made without departing from the spirit of the invention set forth in the claims hereto appended, wherein I claim:

1. A gun and rifling consisting of a barrel having a main bore, a generally tubular inner land member longitudinally slidable therein and having spiral slots therein whereby the intervening material between the slots constitutes lands, said lands being of comparatively thin flexible material, the barrel having formed in the face of its bore and arranged to underlie said lands, shallow recesses adapted to receive portions of the lands therein by intrusion under pressure of sealing rings and flanges of projectiles in course of firing.

2. The combination of a barrel having a bore and a thin wall liner therefor having circumferentially spaced, helical slots completely through the wall thereof and extending along the major part of the barrel whereby the intervening material between each two slots constitutes a land, the land portions of said liner contacting the face of said bore separably for longitudinal withdrawal at will and means to hold the liner releasably against relative rotation in the barrel during firing.

3. The structure of claim 2, said last-named means comprising a multiplicity of circumferential small recesses in the bore surface of said barrel and frictionally engaging the land portions of said liner during passage of a projectile along said portions.

4. In combination with a gun, comprising a barrel having a bore enlarged at its breech end to form a chamber, a chamber sleeve fitting said chamber and slidable into and out of the chamber, and including means to releasably secure the sleeve in the chamber, a load including a cartridge case having a firing charge therein and a projectile in advance thereof, said case being of a diameter to fit said sleeve slidably, an outer barrel liner engaged exteriorly and slidably around said case and adapted to be slid into the bore of said barrel, said liner being constructed and arranged to be engaged by the forward end of the sleeve when the latter is moved into said chamber whereby the liner is projected into the bore said liner including a part held between the sleeve and forward end of the chamber, means to hold said case in said chamber against forward movement with the liner, and means to lock and unlock the sleeve in the chamber.

5. The structure of claim 4, said part comprising a base flange of greater radius than the bore of said barrel, said flange being clamped between the inner end of said sleeve when the latter is in forward position and a shoulder between forward end of said chamber and the breech end of the bore.

6. The combination with a gun comprising a barrel having an enlarged breech chamber of a load comprising a cartridge case having a firing charge therein and a projectile in advance of the charge, an outer barrel liner engaged exteriorly and slidably around said case, and adapted to be moved slidably in the barrel into a forward position in advance of said chamber, and means to project the liner forwardly into the barrel from around the cartridge case, said means acting to secure the liner in said forward position.

7. A round of ammunition comprising in combination a case body shaped to fit the chamber of a gun barrel, said case body shaped to hold a projectile, a projectile seated in said case body and projecting forwardly from the case body, said

projectile having an enlarged part deformable by a gun barrel when fired therethrough, conventional primer and propellent means in the case body, and a sleeve slidably fitting the case body and extending forwardly thereof around said projectile beyond the enlarged deformable part, said sleeve being shaped to slidably fit within the bore of a gun barrel in which the round is loaded.

8. In a gun, a barrel body having a bore, a separate rifling liner comprising a thin metallic member constructed to fit smoothly within said bore, said liner having circumferentially-spaced helical slots through its wall, each pair of contiguous slots forming a land therebetween, the bore surface of said barrel having a plurality of helical, circumferentially-spaced grooves having a twist in a direction opposite to that of the slots in said liner said barrel grooves acting to engage and secure the lands of said liner in spaced parallel relation during passage of a projectile therealong.

9. In combination with a gun barrel having a bore and an enlarged breech chamber, a cartridge, a liner fitting about said cartridge and slidable forwardly thereof into said bore, means comprising a sleeve slidable into said chamber between said cartridge and the inner wall of said chamber, said sleeve when slid into said chamber engaging said liner and projecting the same forwardly into said bore, and means for retaining said cartridge within said chamber when said liner is projected forwardly into said bore.

10. The combination recited in claim 9, said liner comprising a cylindrical shell having circumferentially-spaced helically-extending slots through the wall thereof, each pair of adjacent slots defining a land therebetween.

11. In a removable liner for an unrifled gun barrel, a cylindrical metallic shell having circumferentially-spaced, helically-extending slots therethrough, each slot beginning at a point

spaced forwardly from the rear end of said shell and extending through the forward end thereof, said shell being shaped to fit the bore of the barrel.

12. A separable rifling liner for a substantially smooth bore gun tube, comprising a plurality of thin helically wound parallel circumferentially-spaced bands, said bands being inter-connected at their rearward ends only by a throat portion integral with said bands.

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