Aug. 15, 1944. D. M. WILLIAMS 2,355,768

GAS-OPERATED SELF-LOADING FIREARM

Filed Feb. 4, 1942 2 Sheets-Sheet 1

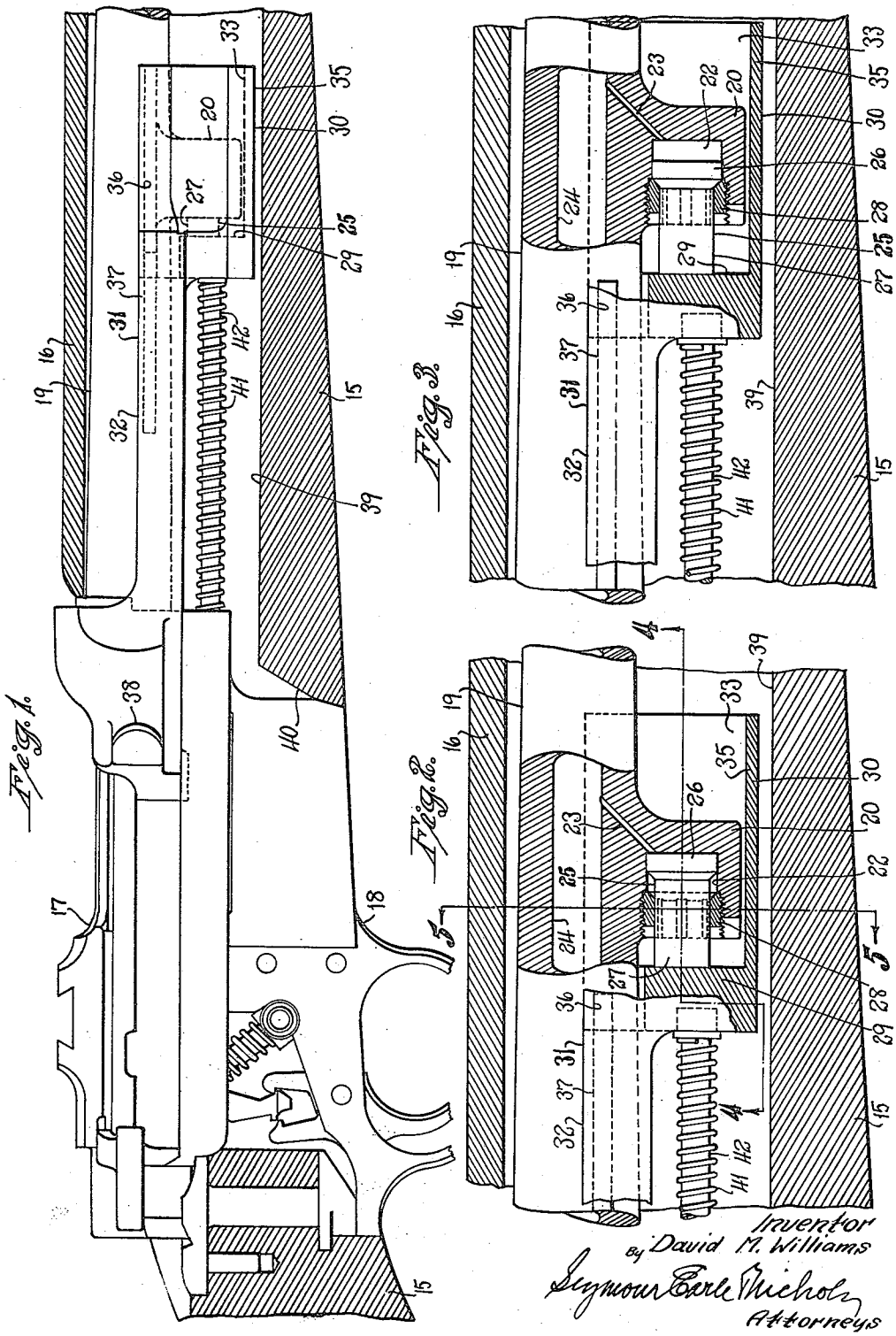


Fig. 1.

Fig. 2.

Fig. 2a.

Inventor
by David M. Williams
Seymour Earle Nichols
Attorneys

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Fig. 4.

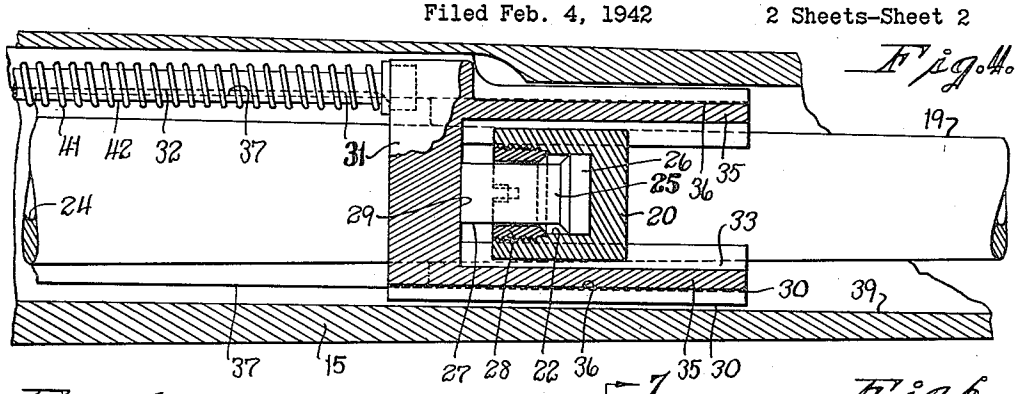


Fig. 5.

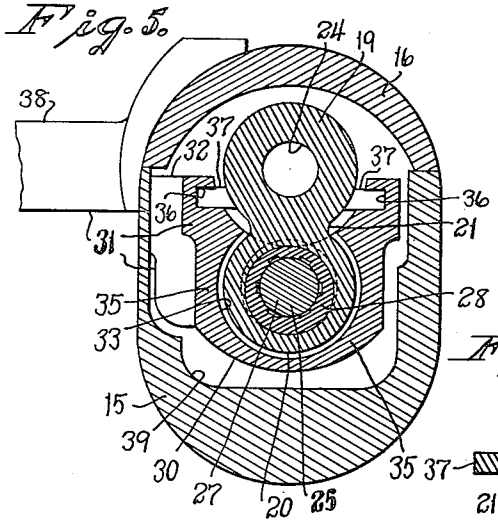


Fig. 6.

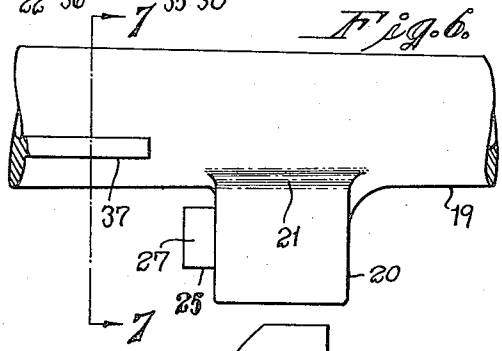


Fig. 7.

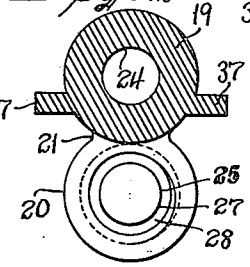


Fig. 8.

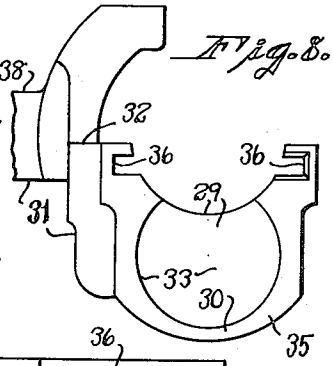


Fig. 9.

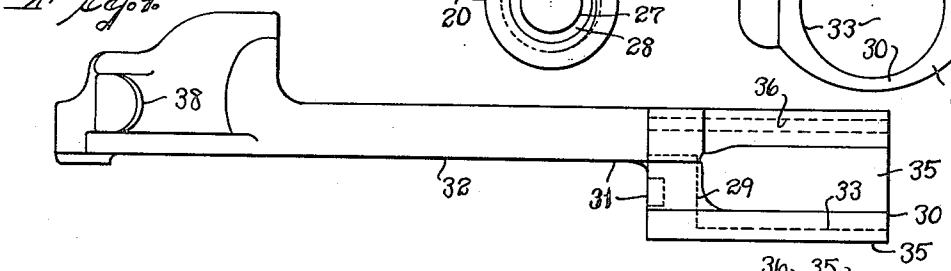
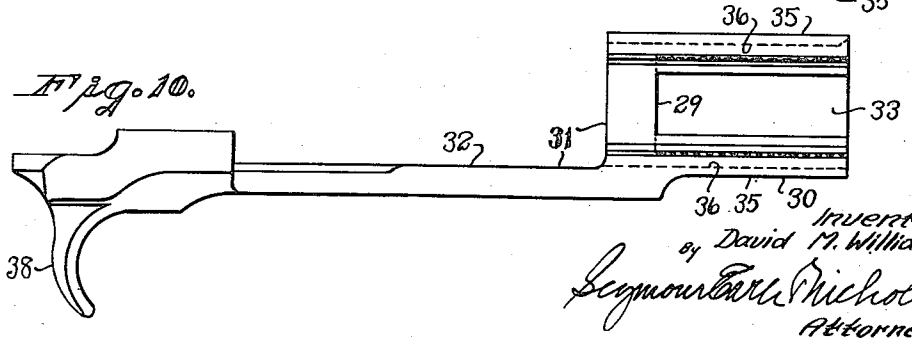


Fig. 10.



Inventors
by David M. Williams
Seymour Earl Nichols
Attorneys

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GAS-OPERATED SELF-LOADING FIREARM

David M. Williams, New Haven, Conn., assignor to Western Cartridge Company, New Haven, Conn., a corporation of Delaware

Application February 4, 1942, Serial No. 429,447

6 Claims. (Cl. 42—3)

The present invention relates to improvements in repeating firearms and relates more particularly to improvements in repeating firearms which are actuated by gas pressure from the barrel of the firearm for purposes of extracting the just-fired cartridge and effecting the reloading of the firearm.

One of the objects of the present invention is to provide a superior gas-operated repeating firearm construction in which the stock is effectively shielded from hot gases and residues which may escape past the actuating-piston.

Another object of the present invention is to provide a superior gas-operated self-loading firearm in which provision is made for locally and harmlessly arresting and collecting carbon and other residues which may escape past the gas-operated piston of the firearm.

A further object of the present invention is to provide a superior firearm structure of the character referred to in which the gradual charring of the stock by the effects of escaping gases and residues, is so minimized as to be negligible.

Still another object of the present invention is to provide a superior gas-operated self-loading firearm which with particular reference to its action-slide and associated mechanism may be produced at a low cost for manufacture and embody such ruggedness as to give long periods of uninterrupted use.

With the above and other objects in view, as will appear to those skilled in the art from the present disclosure, this invention includes all features in the said disclosure which are novel over the prior art and which are not claimed in any separate application.

In the accompanying drawings, in which certain modes of carrying out the present invention are shown for illustrative purposes:

Fig. 1 is a broken view of the central portion of one form which a gas-operated repeating firearm embodying the present invention may assume, the structure being shown partly in side elevation and partly in vertical central-longitudinal section;

Fig. 2 is a broken view partly in side elevation and partly in vertical central-longitudinal section of the portions of the structure immediately adjacent the cylinder and piston, the parts being shown in the positions which they assume immediately prior to the discharge of the firearm;

Fig. 3 is a view corresponding to Fig. 2 but showing the parts in the positions which they assume at the instant the piston has reached the limit of its rearward travel as a result of the discharge of the firearm;

Fig. 4 is a horizontal sectional view taken on the line 4—4 of Fig. 2;

Fig. 5 is a transverse sectional view taken on the line 5—5 of Fig. 2;

Fig. 6 is a broken view in side elevation of the portion of the barrel immediately adjacent its cylinder;

Fig. 7 is a transverse sectional view taken on the line 7—7 of Fig. 6;

Fig. 8 is a view in front elevation of the action-slide detached;

Fig. 9 is a detached view in side elevation of the action-slide; and

Fig. 10 is a top or plan view thereof.

The particular gas-operated repeating firearm herein chosen for purposes of illustrating one form which the present invention may assume, includes in the main a stock 15, a barrel-cover 16, a receiver 17, a trigger-plate 18 and a barrel 19. The stock 15 and the barrel-cover or cap 16 are preferably formed of wood or other suitable heat-insulating material, while the parts 17, 18 and 19 are preferably formed of high-grade steel. At its rear end, the barrel 19 is rigidly connected to the forward end of the receiver 17. A short distance forwardly of the front end of the said receiver 17, the barrel 19 is formed with an integral downwardly-extending lug 20 which is cylindrically contoured exteriorly at all points save where it is integrally connected by a contracted waist-portion 21 (Fig. 5) to the adjacent portion of the barrel 19.

The lug 20 above referred to of the barrel 19 is formed with a rearwardly-opening piston-chamber 22 and with an inclined gas-passage 23 leading forwardly and upwardly from the front end of the said piston-chamber into communication with the bore 24 of the barrel 19, as is especially well shown in Figs. 2 and 3. Reciprocating in the piston-chamber 22 is a piston generally designated by the reference character 25 and including a relatively-large head 26 at its forward end from which latter rearwardly projects an integral cylindrically-contoured stem 27 extending beyond the rear face of the lug 20. The said stem 27 extends axially through a retaining-ring 28 threaded into the rear end of the piston-chamber 22 and having its forward face engaged on occasion by the rear face of the head 26 of the piston 25.

The rear end of the stem 27 of the piston 25 normally engages the forward face of the rear wall 29 of the cross-head 30 of a reciprocating action-slide generally designated by the reference character 31. The said action-slide 31 includes, in addition to the cross-head 30, an integral bar 32 projecting rearwardly from the right side of the cross-head 30 and extending adjacent the right side of both the receiver 17 and the barrel 19.

Forwardly of its rear wall 29, the cross-head 30 of the action-slide 31 is formed with a forwardly-opening cylindrically-contoured chamber 33 having an interior diameter slightly exceeding the

external diameter of the cylindrically-contoured lug 20 of the barrel 19, as is especially well shown in Fig. 5. The chamber 33 just referred to is thus bounded at its rear end by the rear wall 29 and is laterally bounded by a substantially-tubular lateral wall 35 formed integral with the rear wall 29 and open at its forward end and partially at its upper side.

Adjacent the upper edge of each of the respective opposite terminals of the tubular wall 35, the cross-head 30 is provided with one of two inwardly-opening horizontal guide-grooves 36—36, each of which receives with a free sliding fit the adjacent one of two guide-ribs 37—37 formed integral with and respectively laterally-projecting from each of the respective opposite sides of the rear portion of the barrel 19.

The rear portion of the bar 32 of the action-slide 31 is formed with a laterally-extending finger-piece 38 and may be connected in any desired manner to the breech-mechanism of the firearm (not shown) to effect the operation thereof.

The cross-head 30 of the action-slide 31, as well as a portion of the bar 32 thereof, is accommodated with capacity for horizontal reciprocation in an upwardly-opening groove 39 formed in the stock 15. At its rear end, the upwardly-opening groove 39 just referred to communicates with a vertical recess 40 which intersects both the upper and lower surfaces of the stock 15 and accommodates the receiver 17 and trigger-plate 18 as is especially well shown in Fig. 1.

The action-slide 31 is normally yieldingly urged forwardly into the position in which it is especially well shown in Figs. 1, 2 and 4, by a helical spring 41 encircling a horizontal plunger 42 which latter under the urge of the said spring 41 thrusts at its forward end against the rear wall 29 of the cross-head 30 of the action-slide 31.

The forwardly-opening cylindrically-contoured chamber 33 in the cross-head 30 of the action-slide 31 may be conveniently produced by means of an end-milling cutter, and by its interior shape, complementing as it does the exterior shape of the lug 20 of the barrel 19, a uniform clearance is provided which serves to substantially evenly distribute gases and residues which may escape from the piston-chamber 22 around the stem 27 of the piston 25.

When the firearm is discharged, gas under pressure will pass from the bore 24 of the barrel 19 into the forward portion of the piston-chamber 22 and impinge upon the forward face of the head 26 of the piston 25. This will result in these gases (taken from the high-pressure zone in the bore 24) forcibly driving the piston 25 rearwardly until the said piston is checked by the engagement of the rear face of its head 26 with the front edge of the retaining-ring 28. The movement of the piston 25 as above described will correspondingly move the action-slide 31 rearwardly against the tension of the spring 41. When the rearward movement of the piston 25 is checked as above described, the action-slide 31 will continue its rearward movement under the momentum imparted to it by the said piston 25 and in any approved manner will actuate the firearm mechanism.

As the firearm is discharged as above described, minute but potentially-harmful amounts of carbon and other residues will be expelled from the piston-chamber 22 past the stem 27 of the piston 25 and thence into the chamber 33 in the cross-head of the action-slide 31. Under these conditions, however, and owing to the location of the rear wall 29 and the laterally-enveloping character of the tubular wall 35 of the cross-head 30, such residues will be prevented from striking the adjacent portions of the stock 15. Now owing to the fact that powder and other residues tend to cling to metal surfaces, such residue as does emerge from the piston-chamber 22 will mainly cling to and become deposited upon the walls of the cylindrically-contoured chamber 33 in the cross-head 30 of the action-slide 31 and will not, therefore, tend to distribute themselves in and between the various operating-members of the firearm to thereby ultimately interfere with the operation of the same.

Furthermore, such of the hot gases as escape from the piston-chamber 22 when the firearm is discharged and before the rear face of the head 26 of the piston moves into seating and sealing engagement with the retaining-ring 28, will be prevented from impinging upon adjacent portions of the stock 15. It will be noted that the length of the tubular wall 35 of the cross-head 30 is such that (as is shown in Fig. 3), it continues to laterally envelop the rear portion of the lug 20 of the barrel 19, as well as the piston 25, until the action-slide 31 has traveled rearwardly a distance greatly in excess of the distance traveled by the piston 25. While the upper side of the chamber 33 in the cross-head 30 is open, it will be noted that the under surface of the barrel serves as a closure therefor so that gases and residues are prevented from direct impingement upon the adjacent portions of the stock 15 or its equivalent.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

I claim:

1. A gas-operated repeating firearm structure including in combination: a receiver; a barrel connected to the said receiver; a piston-chamber structure adjacent the said barrel and having a rearwardly-opening piston-chamber therein communicating with the bore of the said barrel; a stock adjacent the said receiver, barrel and piston-chamber structure; a piston reciprocating in the piston-chamber of the said piston-chamber structure and movable rearwardly therein under gas pressure from the bore of the said barrel; a reciprocating action-slide associated with the said piston and driven rearwardly thereby, the said action-slide having a portion provided with a transverse wall extending laterally across the rear end of the piston-chamber in the said piston-chamber structure and engaged by said piston, and a flange-like side wall extending forwardly from the said transverse wall and laterally enveloping the bottom and sides of the said piston-chamber structure to shield the said stock from the impingement of hot gases and residues; and stop-means limiting the movement of the piston to a fraction of the movement of the said action-slide; the flange-like side wall of the action-slide having a length greater than the stroke of the said piston.

2. A gas-operated repeating firearm structure including in combination: a receiver; a barrel conencted to the said receiver; a piston-chamber

structure adjacent the said barrel and having a rearwardly-opening piston-chamber therein communicating with the bore of the said barrel; a stock adjacent the said receiver, barrel and piston-chamber structure; a piston reciprocating in the piston-chamber of the said piston-chamber structure and movable rearwardly therein under gas pressure from the bore of the said barrel; means carried by the piston-chamber structure for limiting the rearward movement of the said piston; and an action-slide associated with the said piston and driven rearwardly thereby, the said action-slide having a portion provided with a transverse wall extending laterally across the rear end of the piston-chamber in the said piston-chamber structure and having a flange-like side wall extending forwardly from the said transverse wall a distance exceeding the length of stroke of the said piston, the said flange-like side wall laterally enveloping the bottom and sides of the said piston-chamber structure to shield the said stock from the impingement of hot gases and residues.

3. A gas-operated repeating firearm structure including in combination: a receiver; a barrel connected to the said receiver; a piston-chamber structure adjacent the said barrel and having a rearwardly-opening piston-chamber therein communicating with the bore of the said barrel; a stock adjacent the said receiver, barrel and piston-chamber structure; a piston reciprocating in the piston-chamber of the said piston-chamber structure and movable rearwardly therein under gas pressure from the bore of the said barrel; a reciprocating action-slide associated with the said piston and driven rearwardly thereby, the said action-slide having a portion provided with a forwardly-opening cylindrically-contoured chamber bounded at its rear by a transverse wall extending laterally across the rear end of the piston-chamber in the said piston-chamber structure and engaged by said piston, and bounded laterally by a flange-like side-wall having a cylindrically-contoured inner face and extending forwardly from the said transverse wall and laterally enveloping the bottom and sides of the said piston-chamber structure to shield the said stock from the impingement of hot gases and residues; and stop-means limiting the movement of the piston to a fraction of the movement of the said action-slide; the flange-like side wall of the action-slide having a length greater than the stroke of the said piston.

4. A gas-operated repeating firearm structure including in combination: a receiver; a barrel connected to the said receiver; a lug rigidly depending from the said barrel and having an exteriorly cylindrically-contoured lower portion and a contracted waist-portion connecting the said portion to the said barrel, the said lug being provided with a rearwardly-opening piston-chamber communicating with the bore of the said barrel; a stock adjacent the said receiver, barrel and lug; a piston reciprocating in the piston-chamber of the said lug and movable rearwardly therein under gas pressure from the bore of the said barrel; a reciprocating action-slide associated with the said piston and driven rearwardly thereby, the said action-slide having a portion provided with a forwardly-opening cylindrically-contoured chamber bounded at its rear by a transverse wall extending laterally across the rear end of the piston-chamber in the said lug and engaged by the said piston, and bounded laterally by a flange-like side wall having a cylindrically-contoured inner face and extending forwardly from the said transverse wall and laterally enveloping the bottom and sides of the said lug to shield the said stock from the impingement of hot gases and residues; and stop-means limiting the movement of the piston to a fraction of the movement of the said action-slide; the flange-like side wall of the action-slide having a length greater than the stroke of the said piston.

5. A gas-operated repeating firearm structure including in combination: a receiver; a barrel connected to the said receiver; a lug rigidly depending from the said barrel and having a rearwardly-opening piston-chamber communicating with the bore of the said barrel; a stock adjacent the said receiver, barrel, piston-chamber and lug; a piston reciprocating in the piston-chamber of the said lug and movable rearwardly therein under gas pressure from the bore of the said barrel, the said piston including a stem projecting rearwardly beyond the rear face of the said lug; a retaining-ring secured to the said lug and having an aperture through which the stem of the said piston projects; and an action-slide associated with the said piston and driven rearwardly thereby, the said action-slide having a portion provided with a transverse wall extending laterally across the rear end of the piston-chamber in the said lug and across the rear end of the said retaining-ring and normally engaged by the rear end of the stem of the said piston, and a flange-like side wall extending forwardly from the said transverse wall and laterally enveloping the bottom and sides of the said lug to shield the said stock from the impingement of hot gases and residues.

6. A gas-operated repeating firearm structure including in combination: a receiver; a barrel connected to the said receiver; a lug rigidly depending from the said barrel and having an exteriorly-cylindrically-contoured lower portion and a contracted waist-portion connecting the said lower portion to the said barrel, the said lug being provided with a rearwardly-opening piston-chamber communicating with the bore of the said barrel; a stock adjacent the said receiver, barrel and lug; a piston reciprocating in the piston-chamber of the said lug and movable rearwardly therein under gas pressure from the bore of the said barrel, the said piston comprising a relatively-large-diametered head and a relatively-small-diametered stem projecting rearwardly therefrom to a point beyond the rear face of the said lug; a stop-ring threaded into the interior of the rear portion of the piston-chamber in the said lug and having a passage therethrough receiving the stem of the said piston; and an action-slide associated with the said piston and driven rearwardly thereby, the said action-slide having a portion provided with a forwardly-opening cylindricaly-contoured chamber bounded at its rear by a transverse wall extending laterally across the rear end of the piston-chamber in the said lug and engaged by the rear end of the stem of the said piston, the said chamber being bounded laterally by a flange-like side wall having a cylindrically-contoured inner face and extending forwardly from the said transverse wall and laterally enveloping the bottom and sides of the said lug to shield the said stock from the impingement of hot gases and residues.

DAVID M. WILLIAMS.