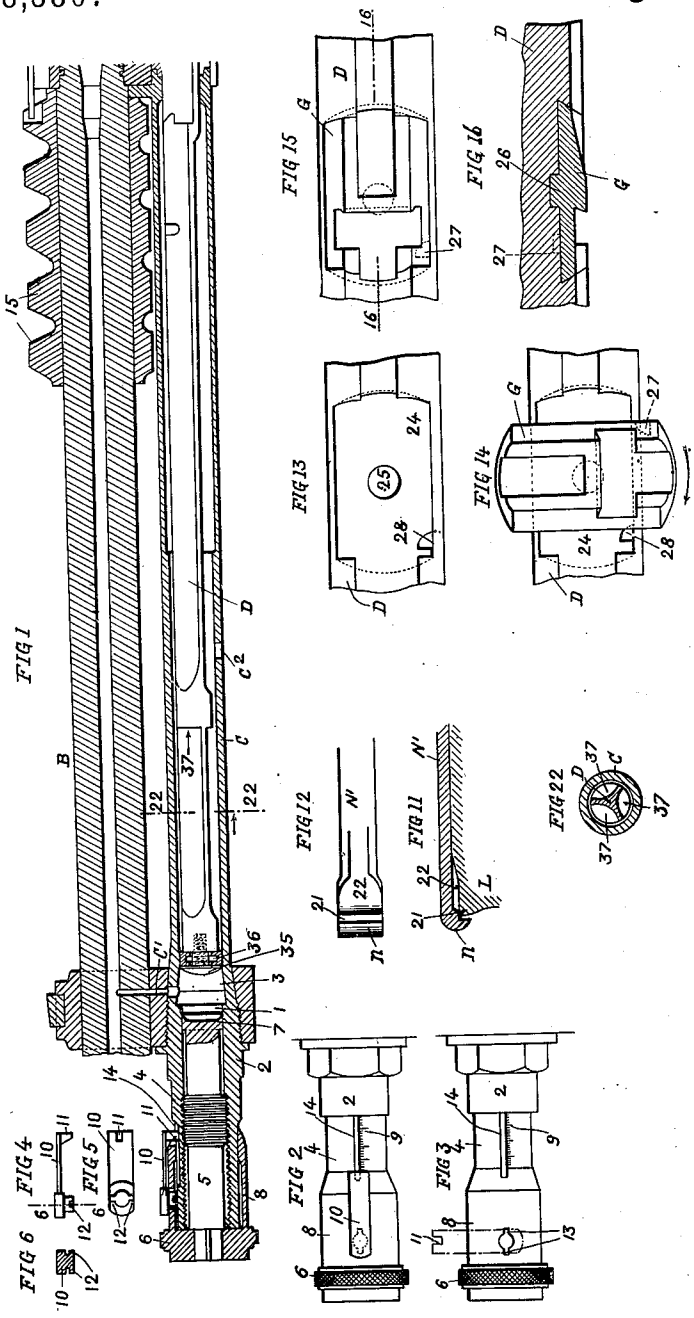
(No Model.) 3 Sheets—Sheet 1.

L. V. BENÉT & H. A. MERCIÉ.

GAS OPERATED GUN.

No. 588,380. Patented Aug. 17, 1897.



Witnesses:
J. Stephen Gnista
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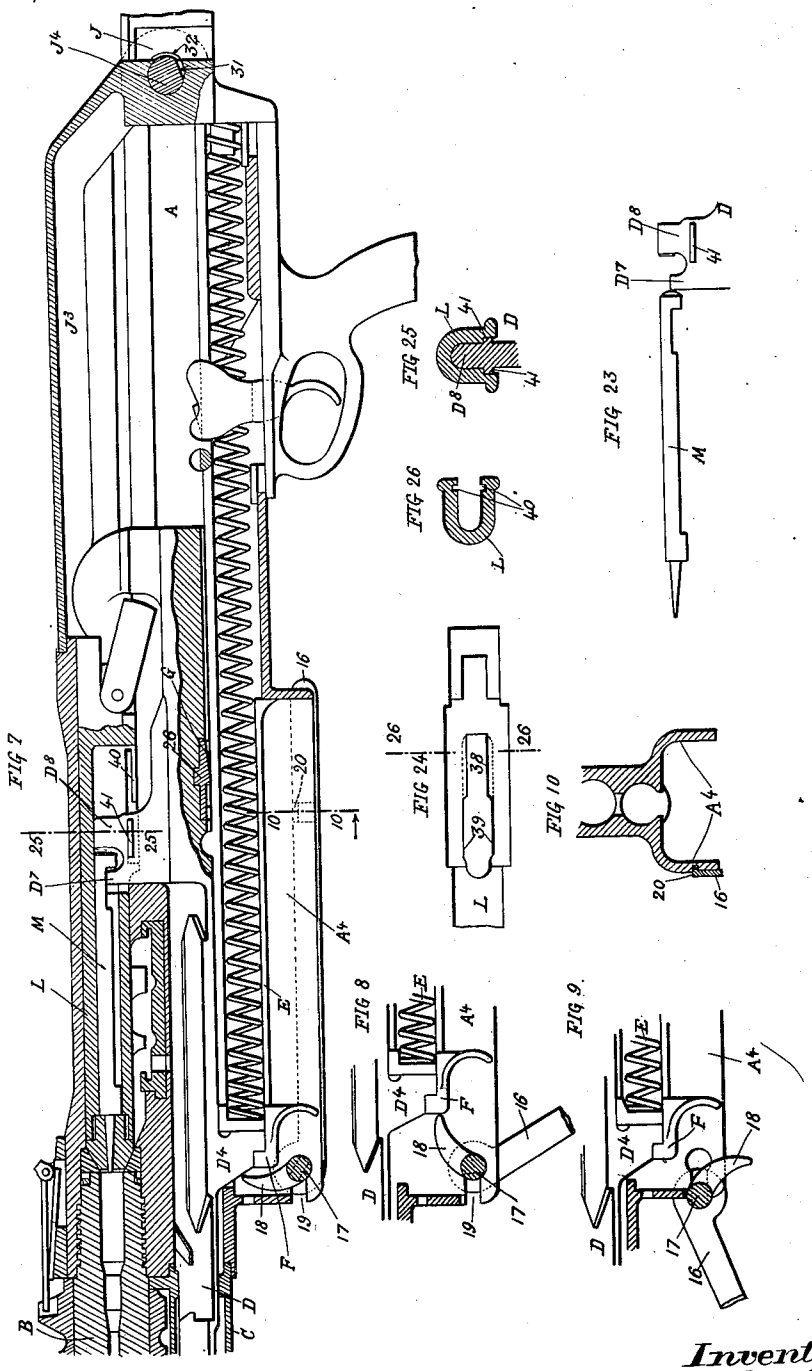
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(No Model.) 3 Sheets—Sheet 2.

L. V. BENET & H. A. MERCIÉ.

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(No Model.) 3 Sheets—Sheet 3.

L. V. BENÉT & H. A. MERCIE.

GAS OPERATED GUN.

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FIG 21

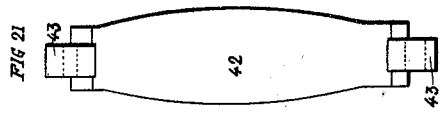


FIG 19

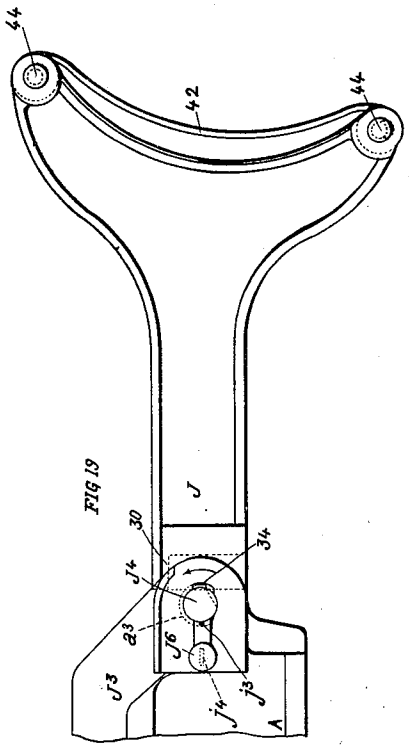


FIG 20

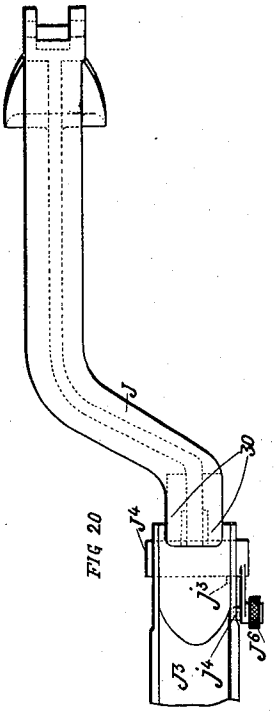


FIG 17

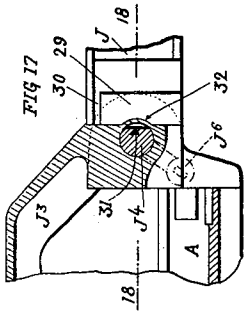
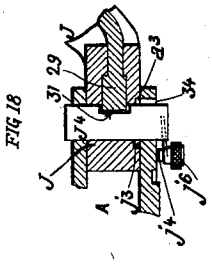


FIG 18



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UNITED STATES PATENT OFFICE.

LAURENCE V. BENÉT AND HENRI A. MERCIÉ, OF PARIS, FRANCE, ASSIGNORS TO THE HOTCHKISS ORDNANCE COMPANY, LIMITED, OF LONDON, ENGLAND.

GAS-OPERATED GUN.

SPECIFICATION forming part of Letters Patent No. 588,380, dated August 17, 1897.

Application filed February 16, 1897. Serial No. 623,632. (No model.) Patented in England December 18, 1896, No. 29,118; in Belgium January 21, 1897, No. 125,916; in Spain February 23, 1897, No. 20,285; in Austria April 4, 1897, No. 47/1,177, and in France April 19, 1897.

To all whom it may concern:

Be it known that we, LAURENCE V. BENÉT, a citizen of the United States, and HENRI A. MERCIÉ, a citizen of the Republic of France, residing at Paris, in the Republic of France, have invented new and useful Improvements in Automatic Machine-Guns, (for which we have obtained Letters Patent of Great Britain No. 29,118, dated December 18, 1896; Letters Patent of Belgium No. 125,916, dated January 21, 1897; Letters Patent of Spain, addition, No. 20,285, dated February 23, 1897; Letters Patent of Austria, dated April 4, 1897, tome 47, folio 1,177, and Letters Patent of France, addition, dated April 19, 1897,) of which the following is a specification.

These improvements relate to that class of gun in which a portion of the powder-gas is utilized for operating the breech-action and feed mechanism of the firearm, and more particularly to that class of automatic machine-gun described and illustrated in Letters Patent of the United States under date of July 14, 1896, bearing No. 564,043, granted to the Hotchkiss Ordnance Company, Limited, of London, England. It is evident, however, that the improvements about to be described may be applied, in whole or in part, to guns operated by any well-known mechanical means.

Reference is had to the accompanying drawings, in which the same parts are indicated by the same letters throughout the several views.

Figure 1 is a longitudinal vertical section, in which the gun-barrel and the cylinder are shown broken away and the pressure-regulating chamber is reduced to its smallest capacity. Fig. 2 is a plan view of the pressure-regulating chamber after it has been adjusted so as to somewhat increase the capacity of the said chamber. Fig. 3 is a similar view to Fig. 2, showing the manner in which the latch is fitted on the pressure-regulating chamber. Fig. 4 shows the latch separately in elevation. Fig. 5 is an inverted plan view of the same, and Fig. 6 represents a section on the line 6 6 of Fig. 4. Fig. 7 represents a central vertical longitudinal section through the rear portion of the gun. Figs. 8 and 9 represent detail views showing the operation of the means for moving the cocking-handle to the rear should the piston stick. Fig. 10 represents a cross-section on the line 10 10 of Fig. 7 and looking in the direction of the arrow. Fig. 11 represents a central longitudinal section through the front end of the improved extractor and the contiguous portion of the breech-block. Fig. 12 represents an inverted plan view of the front end of the extractor. Fig. 13 represents an inverted plan of that part of the piston to which the trigger-stop is applied. Fig. 14 represents the same part of the piston shown in Fig. 13 with the trigger-stop in the first position prior to being inserted in the piston. Fig. 15 represents the same part of the piston shown in Figs. 13 and 14 with the trigger-stop in place. Fig. 16 represents a section on the line 16 16 of Fig. 15. Fig. 17 is a detail sectional view of the rear portion of the device shown in Fig. 7 and illustrates the means of securing the shoulder-piece to the gun. Fig. 18 represents a section of the device shown in Fig. 17 on the line 18 18 of the said figure and looking down. Fig. 19 represents a side elevation of the shoulder-piece, showing the method of connecting the same to the rear portion of the gun. Fig. 20 is a plan view of the parts shown in Fig. 19, the buffer shoulder-plate being omitted. Fig. 21 represents an elevation of the buffer shoulder-plate detached from the shoulder-piece. Fig. 22 represents a section on the line 22 22 of Fig. 1 and illustrates the means for preventing the gases from fouling the parts of the mechanism in rear of the operating-face of the motor-piston. Fig. 23 represents the firing-pin as in the danger position relative to the tangs occasioned by inaccurate assembling of the parts. Fig. 24 is an inverted plan view of a portion of the breech-block, showing mechanism to obviate the inaccurate adjustment shown in Fig. 23. Fig. 25 represents a cross-section of the parts shown in Figs. 7 and 24 on the line 25 25 of Fig. 7, and Fig. 26 represents a cross-section on the line 26 26 of Fig. 24.

In the drawings we have only illustrated such portion of the machine-gun of the class under consideration as is necessary for an intelligible description of the improvements herein referred to.

In machine or other guns operated by the powder-gas, as is the case in the aforementioned Letters Patent, the violence or speed with which the mechanism will act depends upon the pressure of the gas acting upon the exposed end of the motor-piston.

One of the objects we have in view to accomplish is to provide means for regulating at will the pressure of the said gas. The means consist, broadly speaking, in providing between the port which admits the powder-gas from the barrel and the cylinder in which the piston acts a chamber the capacity of which can be varied as required. This improvement is shown in Figs. 1, 2, 3, 4, 5, and 6.

In order to facilitate the comparison with the drawings of the aforementioned patent, we will here employ in respect of the parts which have remained unchanged the same letters of reference as those employed in the said patent.

B, as in the said patent, represents the barrel; C, the cylinder of the motor-piston; C′, the canal bringing the bore in communication with the cylinder C, and D represents the motor-piston.

The chamber of variable capacity is formed by a recess 1 in the head 2 of the cylinder C and opens into the chamber 3, inside the cylinder C. The head 2 terminates in a screw-threaded tubular portion 4, into which is screwed a rod 5, having at one end a milled knob 6 and at the other end an obturating-ring 7, the outer face of which acts as a wall, limiting the capacity of the recess or opening 1. A tubular portion 8, concentric with the rod 5 and integral therewith, moves along a scale 9, formed upon the tubular portion 4, and the conventional division of which enables the gun-servant to ascertain the size of the chamber formed by the parts 1, 7, and 3. In order to arrest the rod 5 in a desired position when once the capacity of the chamber has been regulated, there is fixed to the tubular portion 8 a spring-latch 10, having a nose 11. (See Figs. 1, 4, and 5.) The said latch comprises a pivot provided with two projections 12, which, when the latch is being put in place, as shown by the dotted lines of Fig. 3, pass through notches 13 made in the opening for receiving the said pivot of the latch. By imparting one-quarter of a turn to the latch the latter passes from the position shown in Fig. 3 to that shown in Fig. 2 and is thereby secured, its nose 11 engaging a groove 14 in the tubular portion 4.

By screwing or unscrewing the knob 6 the obturating-ring 7 can be used to advance or recede at will, consequently decreasing or increasing the capacity of the space formed both by the extension 1 and the chamber 3. It therefore follows that before actuating the motor-piston the powder-gas will first have to expand into the said space and to fill it, after which it will act upon the piston under a determined pressure, the length of time necessary for the development of such pressure and the amount of the latter being a function of the capacity of the said space.

In machine-guns of the class under consideration, in which a large number of rounds are fired in rapid succession from a single barrel, the successive discharges add continual increments of heat to the barrel, and as the radiating-surface of the latter is small the temperature of the barrel soon reaches such a degree that the metal becomes softened or even plastic, the interior surface becomes eroded, and the barrel expands and is thereby rendered unserviceable after a small number of rounds. In machine-guns of this class it has been attempted to obviate this difficulty by surrounding the barrel by a water-jacket with a view of causing the heat to be absorbed by the water. This offers great tactical objections from the fact that water must be carried for the service of the gun and that the steam evolved renders the position of the gun visible from long distances. The construction of a water-jacket also offers great mechanical difficulties and complications, since means must be provided for retaining the water while permitting the escape of the steam at all angles of elevation and depression. We obviate these inconveniences by forming on the barrel a series of ribs of steel or other metal for the purpose of absorbing the heat developed and giving it off by radiation. This improvement is illustrated in Fig. 1, in which B is the barrel, over which is either fitted or shrunk on a sleeve 15, of steel or other suitable metal, having annular ribs, as shown, or having longitudinal, helical, or other projections for providing a large radiating-surface. This sleeve therefore greatly increases not only the surface of radiation, but the mass of metal that absorbs and transmits the heat developed by the powder-gas. This radiating-sleeve may be a separate piece, as shown, or the ribs or projections may be formed in one with the barrel. We prefer, however, to make it a separate piece and to shrink it on the barrel—that is to say, we make the interior diameter of the sleeve of smaller diameter than the part of the barrel on which it is assembled, expand it by heat, and slip it in place. When cooled, it contracts on the barrel, compressing the latter. By this arrangement if the barrel becomes softened by heat it is prevented from expanding owing to the compression exerted by the sleeve.

When a gun of the class under consideration is fired with powder giving a considerable quantity of residue, this will collect in the front part of the gas-cylinder, and if the gun is allowed to remain with the piston in its forward position for any considerable time

this residue will harden and the piston cannot be moved to the rear or cocked position by means of the finger-piece connected to the said piston.

Another object we desire to accomplish is to enable the piston to be readily started when the gas-cylinder so becomes clogged with residue. To accomplish this object, a lever is mounted in the front part of the cocking-guard, the said lever being journaled in the guard and provided with a toe which bears against a tang on the piston. When the lever is not in use, it can be held in place against the cocking-guard, where it remains without taking any part in the movement of the mechanism of the gun; but should the piston stick in its forward position and if the operation of the finger-piece cannot move it the lever can be operated, the toe thereof then pressing against the said tang and the piston being forced to the rear with great power. This improvement is shown in Figs. 7, 8, 9, and 10, where D, as in the aforesaid patent, represents the piston, D^4 represents the tang under the piston D and having connected to it the cocking-handle F, E represents the mainspring, and A^4 represents a guard.

The lever 16 for forcing the piston to the rear is journaled in the guard A^4, and on its axis 17 it carries a toe 18. At each end the axis 17 is oppositely flattened, as shown in dotted lines in Figs. 7, 8, and 9, for enabling the lever to be introduced in place by causing the flattened portion to pass through an opening 19 on each side of the guard A^4, as shown in Fig. 9. The cocking-handle F is pulled by hand sufficiently toward the right to allow of the lever 16 being introduced and placed in the normal position shown in Fig. 8. When it is not necessary to make use of the lever, it is turned until it assumes the horizontal position shown in Fig. 7, in which it is locked by a latch 20, engaging a corresponding recess in the guard A^4, as shown in Fig. 10. In that position of the lever its toe 18 is inoperative and does not partake in the movements of the mechanism of the gun; but if the piston D sticks in its forward position—*i. e.*, the position it occupies in Fig. 7—the lever 16 is to be disengaged and moved downward, the toe 18 presses the tang D^4 to the rear into the position shown in Fig. 8, the piston no longer sticks, and the operator can readily actuate the cocking-handle F by hand.

A difficulty experienced with extractors used in this class of guns lies in the fact that the claw of the extractor in riding over the flange or head of the cartridge in loading or in ejecting will often detach small particles of the cartridge metal, which, lodging between the breech-block and the extractor when the latter is in the act of riding over the flange or head of the cartridge, will prevent the extractor from returning to its normal position in contact with the breech-block and from fully engaging with the head of the cartridge.

Another object we desire to accomplish is to provide simple and efficient means whereby the extractor may perform its office independently of the presence of foreign substances which may collect between the breech-block and the extractor. To accomplish this object, a chamber is formed on the inside of the extractor and affords a lodging-place for any small bits of metal or other foreign bodies, as above mentioned. This arrangement is illustrated in full size in Figs. 11 and 12, in which N′ is the extractor, the extremity of which alone is shown. *n* is the claw or hook thereof. L is the breech-lock. On the extractor is formed a small shoulder 21 and a recess 22, the former acting to keep the extractor at the proper distance from the breech-block L, and the latter acting as a cavity for receiving the particles or foreign bodies hereinbefore referred to.

The trigger-stop described in the aforementioned Letters Patent, while readily disconnected and assembled, is in a measure unsatisfactory on account of its tendency to detach itself from the piston when the latter is dismounted, falling to the ground with the risk of loss and delay.

Another object we desire to accomplish is to securely attach to and readily dismount the trigger-stop from the piston, while at the same time obviating the above-mentioned difficulty. This improvement is illustrated in full size in Figs. 13, 14, 15, and 16. Fig. 13, which is an inverted plan, shows the part of the piston to which the trigger-stop is applied. Fig. 14 shows the first position assumed by the trigger-stop previous to its being in place. Fig. 15 shows the trigger-stop in place, and Fig. 16 is a section on the line 16 16 of Fig. 15. Moreover, the trigger-stop G is illustrated on a reduced scale in Fig. 7 in the position it assumes normally. In the arrangement the trigger-stop G is not pivoted, as in the said patent, but is provided with a dowel 26, preferably a central one, around which it can be turned. In the piston D is formed a small cavity, the transverse sides of which are dovetailed, and in the center of that cavity is formed a recess 25, into which fits the dowel 26 of the trigger-stop G. The sides of the trigger-stop, which are in an arc of a circle, are likewise dovetailed to correspond with the dovetailed sides or walls of the cavity 24.

In order to assemble the trigger-stop, it is first placed against the piston D in the position illustrated in Fig. 14, with the dowel 26 engaging its recess 25, whereupon one-quarter of a turn is imparted to it in the direction of the arrow, so as to cause it to assume the position shown in Fig. 15, in which it is parallel with the piston. In order to stop the trigger-stop in position, it is provided with a stud 27, which engages a corresponding step 28 in the piston.

Another object we desire to accomplish is to make the shoulder-piece separable from

the breech-cover, instead of, as in the said patent, making it in one piece with the said cover, the object being to reduce the length of the gun for transportation. The device by means of which this object is accomplished is shown in Figs. 7, 17, 18, 19, 20, and 21. Fig. 7 illustrates the breech-cover J^3 and shoulder-piece J, which in the said patent are in one piece, while here they constitute two separate pieces, and A illustrates the receiver. In Fig. 7, in which the shoulder-piece J is shown broken away, the three parts are illustrated as assembled and locked. Fig. 17 illustrates the three parts assembled together, but the pin J^4 is in the required position for admitting the shoulder-piece to be placed on or removed.

J^6, as in the said patent, represents the button for operating the pin J^4, and j^3 represents the small stud, which engages in a circular slot a^3. (Shown in dotted lines in Fig. 19 and in full lines in the section Fig. 18.)

The shoulder-piece J has a T-shaped projection 29, which fits into a corresponding vertical slot in the breech-cover J^3. A lip 30 on each side of the projection 29 stops the downward movement of the shoulder-piece in the slot of the breech-cover J^3 when placing the shoulder-piece. The pin J^4 is flattened at 31, Figs. 7, 17, and 18, and in the vertical wall of the shoulder-piece facing the said pin is formed a recess 32, Figs. 7 and 17, in the form of an arc of a circle, the radius of which is slightly greater than that of the radius of the pin J^4.

In order to assemble the parts, the breech-cover J^3 is first put in place, whereupon the pin J^4 is so presented opposite its opening that its stud j^3 may be in front of the groove 34, formed in the receiver A. (See Figs. 18 and 19.) The pin then assumes a position in which it is revolved through one hundred and eighty degrees from the position shown in Figs. 18, 19, and 20. The pin is then inserted, and when its stud j^3 has reached beyond the groove 34 and is in the circular slot a^3 the button J^6 is rotated in the direction of the arrow, Fig. 19, until the pin assumes the position illustrated in Fig. 17, in which the flattened portion 31 is in a vertical plane. The shoulder-piece J can then be put in place by sliding it down until its lips 30 rest upon the breech-cover J^3, the recess 32 being opposite the flattened portion of the pin J. On turning the button J^6 to the extent of, say, forty-five degrees, but in the opposite direction, it is made to pass from the position shown in Fig. 17 to that shown in Fig. 19, in which latter it is stopped by a small lug j^4, as in the aforementioned patent. In passing from one position to the other—*i. e.*, from Fig. 17 to Fig. 19—the flattened portion 31 of the pin J^4 will be replaced by a solid portion, which will fill up the recess 32 and thereby lock the shoulder-piece J.

In the aforementioned patent is shown, in Fig. 7, a piston D, nicely fitting the gas-cylinder and provided with a gas-check groove D^2, with or without a spring or other packing. It has been found that any error of alinement of the piston or of assembling of the barrel or gas-cylinder would set up excessive friction between the piston and the cylinder and prevent the proper working of the mechanism. To obviate these defects, we provide the arrangement shown in Fig. 1, wherein D, as in the other patent, is the motor-piston, and C the cylinder. At the end of the piston is screwed a head 35, between which and the piston is fitted a loose gas-check ring 36. The external diameter of the said ring fits the active portion of the cylinder closely, but fits loosely over the stem of the piston, so that between the central opening of the ring 36 and the screw-threaded rod of the head 35, acting as an axis therefor, there is a relatively large play, and thus there may be large errors in the alinement of the various parts and the ring will still fit closely without excessive friction, as the ring will follow the profile of the cylinder, while the piston acts according to its own alinement.

It is not essential that the gas-check ring 36, above set forth, should fit the cylinder with great nicety, as the pressure on the piston may be regulated by the improvement referred to in relation to Figs. 1 to 6, inclusive; but if there be a clearance-space between the said ring 36 and the cylinder some of the gas will pass backward through the cylinder along the fluted piston and reach and foul the breech and feeding mechanism, and another object we desire to accomplish is to prevent the said gas from eventually reaching and fouling the said mechanism. The arrangement suitable for the accomplishment of that object is shown in Figs. 1 and 22, which latter is a cross-section of the piston D on the line 22 22 of Fig. 1, and it consists in forming on the piston, the diameter of which is less than the internal diameter of the cylinder C, one or more baffles or walls 37, by which the gas is deflected and practically prevented from proceeding any farther, said gas escaping into the open air through one or more openings C^2 in the cylinder as soon as the piston has moved sufficiently to the right to uncover the said openings.

In the aforementioned patent the described means of assembling the motor-piston D, Fig. 7, with the breech-block L and firing-pin M is apt to present the following defect: If, as is shown in Fig. 23 of the accompanying drawings, the piston D is not properly assembled with reference to the firing-pin M—that is to say, if the firing-pin is in its forward position with reference to the tang D^7 of the piston instead of being in contact with the tang D^8, as is normally shown in Fig. 7—the gun will be discharged before the breech is closed and locked.

Another part of our present invention is therefore to obviate an inaccurate assembling of the three parts, in order that the serious

defect above referred to may be avoided. An arrangement suitable for the accomplishment of that object is shown in Figs. 7, 24, 25, and 26. The front end of the slot 38, Fig. 24, through which pass the tangs D^7D^8 of the piston, is widened at 39, and in the thickness of the metal we make, on each side of the said slot, a groove 40. (See Fig. 26.) Moreover, we apply on each side of the piston a rib 41, adapted to engage said groove 40, (see Fig. 25,) the length of which rib is substantially equal to but no more than the widened portion 39 of the slot 38. By means of this arrangement the place at which the tangs D^7D^8 can be introduced through the slot 38 is restricted to the widened portion 39. Assuming the firing-pin M to be in the position it occupies in Fig. 7, the assembling of the piston will be possible and normal. If, on the contrary, the firing-pin is, for instance, at the extreme end of its throw toward the right, it will materially oppose any introduction of the said piston-tangs, and the assembling will be rendered impossible. It is therefore necessary that the firing-pin be made to assume the position shown in Fig. 7 before the parts can be assembled.

Another object of our present invention is to reduce to a minimum the effect of the recoil upon the shoulder of the operator of the gun. A special arrangement of buffer suitable for the accomplishment of that object is shown in Figs. 19, 20, and 21. This arrangement consists of a plate 42, of steel or other suitable metal, sufficiently thin to be flexible and suitably shaped to bear properly against the shoulder of the operator. At both ends the said plate carries a boss 43, in which is drilled a hole for the passage of a pin 44, connecting the said plate to the shoulder-piece J. In order that the plate may yield under the pressure exerted by the recoil, either one or both the holes for the passage of the pins 33 are enlarged, as is shown in dotted lines in Figs. 19 and 21.

Having thus described our invention, what we claim, and desire to secure by Letters Patent of the United States, is—

1. The means for controlling the pressure of the powder-gas upon the motor-piston in automatic guns of the character described, which consists in providing a speed-regulating expansion-chamber of adjustable cubical contents connected with the bore of the barrel and with the cylinder of the motor-piston, substantially as described.

2. The means for controlling the pressure of the powder-gas upon the motor-piston in automatic guns of the character described, which consists in providing a speed-regulating expansion-chamber of adjustable cubical contents connected with the bore of the barrel and with the cylinder of the motor-piston, with means for adjusting said chamber to any desired capacity, substantially as described.

3. The means for controlling the pressure of the powder-gas upon the motor-piston in automatic guns of the character described, which consists in providing an expansion-chamber of adjustable cubical contents connected with the bore of the barrel and with the cylinder of the motor-piston, with means for adjusting said chamber to any desired capacity, and means for locking said chamber at the desired adjustment, substantially as described.

4. In a breech-loading gun, the combination, with the barrel B, cylinder C, motor-piston D and canal C′ connecting the barrel to the cylinder, of a chambered head 2, a tubular portion 4, an adjustable rod 5 having an obturated ring 7 and means for operating the said adjustable rod, substantially as and for the purpose set forth.

5. In a breech-loading gun, the combination, with a barrel B, cylinder C, motor-piston D and canal C′ connecting the barrel to the cylinder, of a chambered head 2, a tubular portion 4, an adjustable rod 5, having an obturating-ring 7, means for operating the adjustable rods 5, and means for ascertaining and determining at will the capacity of the variable chamber 3, substantially as and for the purpose set forth.

6. In a breech-loading gun, the combination, with a barrel B, cylinder C, motor-piston D and canal C′ connecting the barrel to the cylinder, of a chambered head 2, a tubular portion 4, an adjustable rod 5, having an obturating-ring 7, means for operating the adjustable rod 5, means for ascertaining and determining at will the capacity of the variable chamber 3, and means for locking the adjustable rod 5 when once the capacity of the chamber 3 has been adjusted, substantially as and for the purpose set forth.

7. In a breech-loading gun, the combination, with the barrel B, cylinder C, motor-piston D and canal C′ connecting the barrel to the cylinder, of a chambered head 2, a tubular portion 4, an adjustable rod 5, having an obturating-ring 7, means for operating the adjustable rod 5, means for ascertaining and determining at will the capacity of the variable chamber 3, and a spring-latch 10, provided with nose 11 engaging a slot in the said tubular portion 4 and locking the rod 5 in the desired position, substantially as described.

8. In an automatic-machine gun, the combination with a speed-regulating expansion-chamber of adjustable cubical contents connected with the bore of the barrel, of a motor-piston provided with a head projecting into said chamber, and a cylinder inclosing the piston-head and the parts contiguous thereto, a gas-check ring loosely fitting on said piston and snugly fitting in said cylinder in the rear of said head, the head lapping over the inner circumference of said gas-check ring, whereby the gas-check and piston-head form a tight packing for the said piston without affecting the axial alinement of the pis-

ton, substantially as and for the purposes described.

9. In a breech-loading gun, the combination with a motor-piston D, provided with a tang D^4, of a lever 16, pivoted in the casing of the gun and having a toe 18 engaging said tang, substantially as and for the purposes described.

10. In a breech-loading gun, the combination, with a motor-piston D, of a lever 16, pivoted on an axis 17, in the guard A^4, a toe 18, a tank D^4 on the piston, and means for locking the lever 17 in position when not in use, substantially as and for the purpose set forth.

11. In a gun of the character described, the combination with a motor-piston, of auxiliary means for moving the same, comprising a pivoted toe adapted to engage the motor-piston but normally out of engagement therewith and a lever operating said toe, substantially as described.

12. In a gun of the character described, the combination with the motor-piston provided with recess 25, chamber 24, notch 28, and dovetail arc-shaped overhanging lips surrounding opposite ends of said chamber 24, and concentric with said recess 25, of the trigger-stop G provided with central dowel 26, dovetailed edges concentric with said dowel adapted to engage under said lips, and stud 27, adapted to engage in said notch 28, substantially as and for the purpose described.

13. In a breech-loading gun, the combination, with the motor-piston D, of a trigger-stop G having a dowel 26 around which it can rotate in a recess 25 in the motor-piston D, the said trigger-stop being dovetailed on its sides to engage corresponding undercut sides, in a cavity 24 in the motor-piston D, and a stud 28 for stopping the trigger-stop in proper position, substantially as and for the purpose set forth.

14. In a breech-loading gun, the combination with the motor-piston D, provided with ribs 41, of the breech-block L having grooves 40 engaging said ribs and having a slot 38 which is widened at 39 for the introduction and free passage of the ribs 41, substantially as and for the purpose set forth.

15. In a gun of the character described, the combination with the breech-cover and a T-shaped slot therein, of a shoulder-piece provided with a T-shaped projection adapted to fit in said slot, and a pin transversely mounted in said breech-cover and cut away at one side and adapted to allow the said T-shaped projection to pass into its slot when the flat side of said pin is presented thereto, but to lock said T-shaped projection when the curved side of said pin is turned into engagement therewith, substantially as described.

16. In a breech-loading gun, the combination with a motor-piston provided with ribs adapted to engage corresponding grooves of the breech-block, of a breech-block having grooves engaging said ribs and having a widened slot in front of said ribs for the free passage thereof, of the firing-pin traveling in said breech-block and having a projection near its heel adapted to engage between two tangs on the breech-block, substantially as and for the purposes described.

In witness whereof we have hereunto set our hands, this 3d day of February, 1897, in presence of two subscribing witnesses.

LAURENCE V. BENÉT.
HENRI A. MERCIÉ.

Witnesses:
THEODOR C. FAVARGER,
CHARLES KURER.