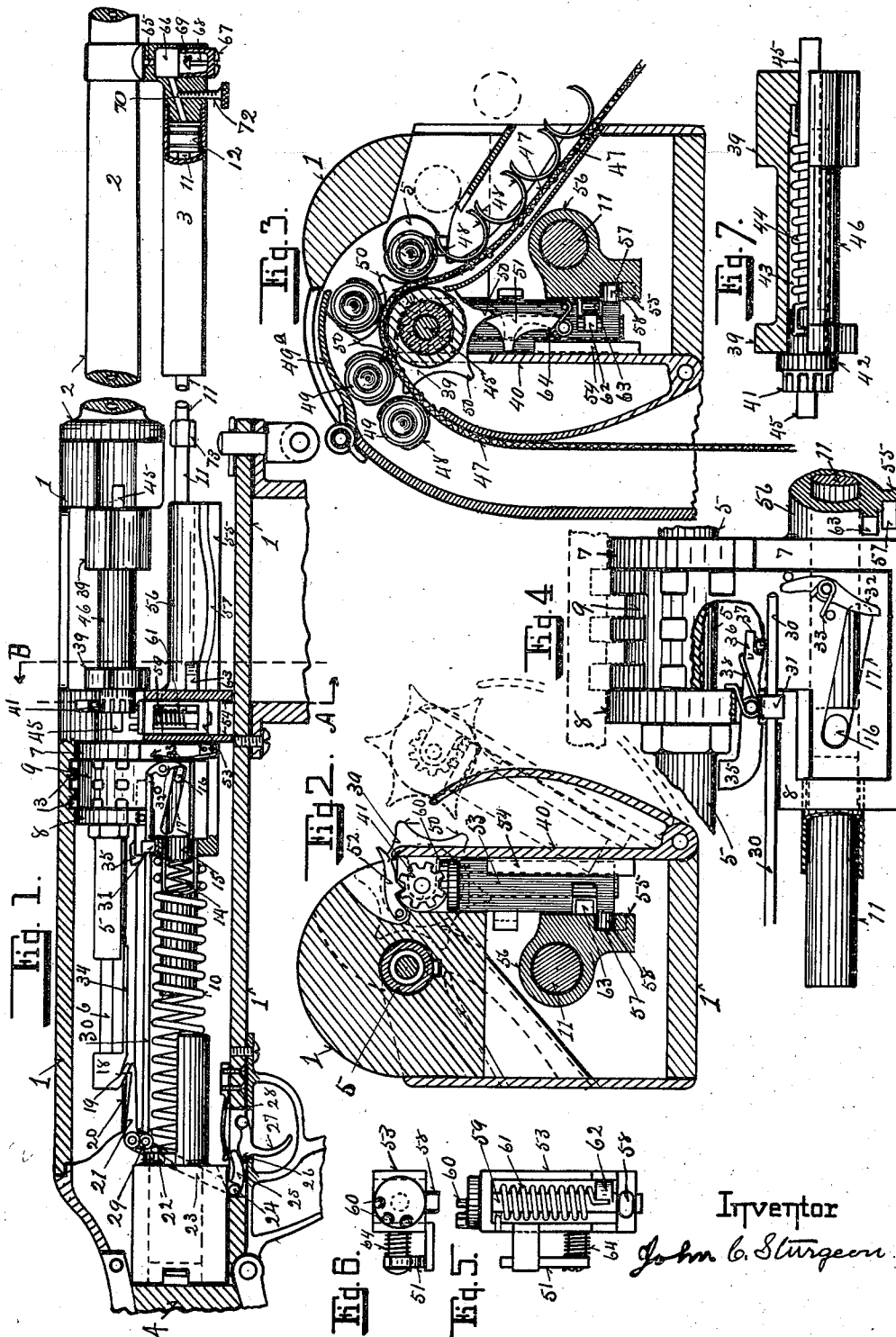


J. C. STURGEON.
 AUTOMATIC RAPID FIRE GUN.
 APPLICATION FILED MAY 5, 1917.

1,290,854.

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AUTOMATIC RAPID-FIRE GUN.

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To all whom it may concern:

Be it known that I, JOHN C. STURGEON, a citizen of the United States, residing at Erie, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Automatic Rapid-Fire Guns; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, forming part of this specification.

This invention relates to automatic rapid-fire guns, and has for its principal objects the improvements in the cartridge-feeding mechanism, in the mechanism for preventing the premature discharge of the arm prior to the complete locking of the breech-bolt, and in gas regulating and sediment trapping mechanism.

It also consists in the structure of the parts of the operative mechanism of the arm and their coöperative combination in the arm substantially as hereinafter described.

These and other features of my invention are hereinafter fully set forth and described and illustrated in the accompanying drawings in which—

Figure 1, is a longitudinal vertical section of the frame and parts of the device, with parts in elevation.

Fig. 2, is an enlarged transverse section of the same on the line A in Fig. 1 looking in the direction of the arrow.

Fig. 3, is an enlarged transverse section on the line B in Fig. 1 looking in the direction of the arrow.

Fig. 4, is an enlarged view in elevation of a section of the breech-bolt locking mechanism when unlocked.

Fig. 5, is a view in elevation of the vertically movable sprocket spring winding mechanism.

Fig. 6, is a top or plan view of the same.

Fig. 7, shows the cartridge conveying sprocket partially in elevation and partially in section.

In these drawings 1 indicates the gun frame, 2 portions of the barrel, 3 the gas-cylinder, 4 a section of the gun-butt, 5 the breech-bolt, 6 the firing-pin, 7—8 the breech-bolt locking frame, 9 the vertically movable locking-lug mounted and operating in said frame, 10 the spring for moving the breech-

bolt locking-lug mechanism and the breech-bolt forward, 11 the rod extending from the piston 12 in the gas-cylinder 3 to and communicating with the locking-lug 9 and locking-lug frame 7—8 to unlock the breech-bolt 5 by moving the locking-lug 9 downward to disengage it from the locking-lugs 13 on the frame, and then move it, the locking-lug frame 7—8 and the breech-bolt 5 backward, and 14 a spring carried by the locking-lug frame 7—8, engaging the end 15 of the rod 11 for moving the rod 11 forward in the locking-lug frame 7—8, and engaging the locking-lug 9 with the lugs 13 on the frame to lock the breech-bolt 5 when in its forwardmost position ready for firing. This movement of the locking-lug 9 with relation to the locking-lug frame 7—8 is effected by a stud 16 on the rod 11, which engages an inclined slot 17 in the lower part of the locking-lug 9; the movement forward and backward of the stud 16 in the slot 17 operates to raise and lower the locking-lug 9 as illustrated in Figs. 1 and 4.

On the rear end of the firing-pin 6 which is mounted in the breech-bolt 5, and spring actuated (not shown) in the usual manner, I secure a block 18 provided with a sear-notch 19 adapted to be engaged during the rearward movement of the breech-bolt by sears 20—21, pivoted in the gun-frame, and to retain the firing-pin during the forward movement of the breech-bolt until released by the operation of the sears 20—21. One of these sears 20 is provided with a downwardly extending arm 22 (shown in dotted lines) adapted to be engaged by an upwardly extending arm 23 (shown in dotted lines) mounted on a rock-shaft 24 removably mounted in the lower part of the frame 1. The rock-shaft 24 is provided with a forwardly extending arm 25 adapted to be engaged by the heel 26 of a trigger 27 removably pivoted in the lower part of the gun-frame 1.

To retain these parts in the normal positions there is a flat spring 28 secured to the frame and engaging the arm 25 as illustrated in Fig. 1. The sear 21 is provided with a downwardly extending arm 29 to which is pivoted a forwardly extending rod 30 which extends through a guide 31 on the side of the part 8 of the locking-frame, so as to slide freely therein; and on the side of the locking-lug 9 there is a centrally pivoted

lever 32 provided with a spring 33 for moving its lower end into the path of the stud 16, as illustrated in Fig. 4, so that when the stud 16 moves forward to the end of the slot 17 in the locking lug, thereby completing the locking movement of the lug, it engages the lever 32, which meanwhile has been raised into contact with the end of the rod 30 by the upward movement of the locking-lug 9, and operates the lever 32 to move the rod 30 rearwardly and thereby disengage the sear 21; thus, it will be observed that if the operator by means of the trigger 27 holds the sear 20 out of engagement with the sear-notch 19, the completion of the locking movement of the locking-lug 9 actuating the lever 32 will automatically release the sear 21 and permit the automatic repetition of the firing operation, so long as the operator retains the sear 20 out of engagement, until the cartridge supply is exhausted. To prevent premature firing of the arm there is an extension 34 on the sear-notch block 18 which extends forward under the rear portion of the breech-bolt 5.

In the path of this part 34 there is provided a rocking lever stop 35 pivoted in the part 8 of the locking frame; one arm 36 of this lever stop extends inward between the parts of the locking-lug 9 where it is engaged when the locking-lug 9 is raised, by a transverse pin 37 therein, which operates to lower the stop 35 on the other arm thereof so as to permit the end of the part 34 to pass over it. In Fig. 4 I show the parts of this mechanism in their positions when the breech-bolt is unlocked; a spring 38 operating on the stop to retain it in operative position as shown in Fig. 4 while the breech-bolt is unlocked.

For feeding cartridges to the arm there is a sprocket-wheel 39 mounted in suitable bearings preferably on the side-plate 40 hinged to the gun-frame 1, as illustrated in Figs. 3 and 4. This sprocket-wheel 39 (see Fig. 7) is provided at its rear end with a gear 41, the hub 42 of which extends into and rotates freely in a chamber 43 in the sprocket-wheel 39; and in this chamber 43 there is a spiral sprocket-motor spring 44, one end of which engages the gear hub 42, and the other a recess in the sprocket-wheel 39 at the opposite end of the chamber 43. To retain these parts in their proper positions there is a central removable pintle 45 which extends sufficiently beyond the ends of the gear 41 and of the opposite end of the sprocket 39 to form a bearing for all parts thereof on which they will freely rotate as desired. The intermediate portion 46 of the sprocket 39 is cut away, as clearly shown, to form a bearing for a cartridge belt 47, as clearly shown in Fig. 3, to which cartridge belt 47, clips 48 are secured to clamp cartridges 49 thereto, which car-

tridges are engaged by the teeth 50 of the sprocket; the cartridges 49 being preferably held in contact with the sprocket by a hinged spring actuated plate 49^a bearing thereon as the sprocket 39 is rotated by the action of the spring 44 to move the cartridges in front of the retracted breech-bolt 5, as illustrated in Fig. 3, from whence the bolt on its forward movement pushes the cartridge in front of it through the clips 48 and into the barrel. This operation of the sprocket occurs only after the breech-bolt 5 has fully completed its rearward traverse, and its rotation is controlled so as to leave the cartridge in front of the bolt by a receding stop 51 hereinafter more fully described, which engages one of the sprocket-teeth 50 as illustrated in Fig. 3.

For retaining the sprocket spring 44 at suitable tension to operate the sprocket-wheel 39 there is a dog 52 which engages the teeth of the gear wheel 41 as illustrated in Fig. 2; and to rotate the gear wheel 41 and wind up the spring 44 what it relaxes at each forward movement of the sprocket wheel 39 there is provided a vertically movable frame 53 clearly shown in Figs. 5 and 6. This frame is mounted in guides 54 on the gun frame directly under the gear 41 so that it will move freely up and down therein. On the front part 7 of the locking-lug frame there is a forwardly projecting cam surface 55 having on its upper part a sleeve 56 through which the rod 11 operates, and in this cam surface 55 there is a cam groove 57, the central part of which is depressed below the end parts thereof, and on the frame 53 there is a laterally projecting stud 58 which engages said cam groove and operates to lower the frame 53 midway of the traverse of the cam surface 55 and raise the frame 53 at each end of the traverse of the cam surface 55 which travels in unison with the breech-bolt 5. In this frame there is mounted a vertical shaft 59 provided with a segment of gear teeth 60 adapted to engage the teeth of the gear 41 when the frame 53 is in a raised position.

The shaft 59 is provided with a spiral spring 61 for rotating the shaft in one direction, and an arm 62 adapted to be engaged by a projection 63 on the cam surface 55 near its rear end, which operates to rotate the shaft 59 in the opposite direction, and as at the time when the projection 63 engages the arm 62 the segment of teeth 60 is in engagement with the teeth of the gear wheel 41, it operates to rotate the gear wheel 41 and wind up the sprocket spring 44 the proper amount to maintain its normal tension, while when the stud 58 is traversing the central part of the cam slot 57, the gear segment 60 is lowered out of contact with the gear 41, and the spring

61 then operating on the shaft 59 returns the gear segment 60 to its normal position ready to be again engaged by the projection 63 operating on the arm 62 as above noted.

5 On the front side of the frame 53 there is provided the sprocket wheel stop 51 above referred to, which stop moves up and down with the frame 53 so as to permit the upper end thereof to be withdrawn from in front 10 of the sprocket tooth 50 with which it is engaged and raised behind it so as to engage the next tooth 50 of the sprocket when it is rotated. This rearward movement of the stop is caused by the spring 64 which 15 acts thereon when the frame 53 is at the lowermost point of traverse, and when the rearward traverse of the cam is completed the frame 53 is again raised so that the stop is in operative position as above noted.

20 In conducting the gas from the bore of the barrel 2 to the cylinder 3 there is a vertical passage 65 which discharges into a chamber 66 directly below the passage 65; the bottom of this chamber is preferably 25 closed by a removable screw plug 67 and extending upward from the center of this screw plug there is a standard 68 having preferably a conical top 69 thereon, which receives the blast of gas as it comes from 30 the passage 65 and spreads it, allowing the sediment carried therewith to pass below the conical head 69 while the gas passes from the chamber 66 through a passage 70 into the cylinder 3 and against the piston 12 35 on the end of the rod 11. For controlling and regulating the flow of gas through the passage 70 there is an adjustable thumb-screw 72 provided, the end of which enters the passage 70 and can be operated to con- 40 strict the same.

On the rod 11 there is preferably provided a collar 73 adapted to receive a wrench for rotating the rod 11 when it is desired to detach it from the bolt-locking mechanism; 45 it also performs the function of contacting with the end of the sleeve 56 when the rod 11 has been moved far enough to operate the bolt-locking mechanism, and thereafter the rod 11 and sleeve 56 move on backward in 50 unison, until the breech-bolt and the bolt-locking mechanism have completed their rearward traverse.

In operation as the gun is discharged, a portion of the gases pass from the barrel 55 into the cylinder, contacting with the piston 12 therein forcing it rearwardly until the collar 73 on the rod 11 contacts with the end of the sleeve 56; this operates to compress the spring 14 and release the locking-lug 9 from the gun-frame. These parts, the lock- 60 ing-lug frame and the breech-bolt secured thereto, then move on backward compressing the spring 10 until the backward traverse of these parts is completed. Meanwhile the 65 cam-slot 57 acts on the vertically movable

frame 53 to move it downward and upward as hereinbefore described. At the comple- tion of the backward traverse of the breech- bolt 5, it has withdrawn the spent cartridge shell from the barrel, and the sprocket then 70 being free to rotate, is rotated one tooth, which moves a fresh cartridge in front of the breech-bolt, and pushes the spent car- tridge shell out of the way, the forward move- ment of the breech-bolt, actuated by the spring 75 10 then takes place, pushing the fresh car- tridge out of the clips on the cartridge belt, and into the barrel; this forward movement of the breech-bolt being completed, the spring 14 operates to move the locking-lug 80 upward into engagement with projections 13 on the gun-frame, securely locking the breech-bolt in firing position; and just as this movement of the locking-lug is com- 85 pleted, the stud 16 acting on the lever 32 op- erates to automatically release the sear 20 from the sear-notch 19 allowing the firing- pin 6 to move forward and explode the car- tridge; and this series of operations contin- 90 ues so long as the sear 21 is retained out of engagement, until the cartridge supply is exhausted.

I have thus shown and described my in- vention so as to enable others skilled in the art to which the invention appertains to 95 construct and utilize the same. I do not, however, confine myself to the exact con- struction, arrangement and combination of the several parts of the mechanism shown and described, as many modifications can be 100 made therein without departing from the spirit of the invention. Therefore what I claim as new and desire to secure by Let- ters Patent is:

1. In a gun, a frame, a reciprocating 105 breech-bolt mounted therein, a locking-lug frame on the breech-bolt, a locking-lug there- in, means for operating the breech-bolt and locking mechanism, and means on the lock- ing-lug frame operatable by the locking-lug 110 for preventing the discharge of the gun be- fore the breech-bolt is completely locked.

2. In a gun, a frame, a reciprocating breech-bolt mounted therein, a locking-lug frame secured to the breech-bolt, a recip- 115 rocating locking-lug mounted in said locking- lug frame, gas and spring actuated mecha- nism for operating said locking-lug and means on the locking-lug operatable only when the breech-bolt is fully locked for re- 120 leasing the firing-pin.

3. In a gun, a frame, a reciprocating breech-bolt mounted therein, a locking-lug frame secured thereto, a vertically movable locking-lug mounted in said frame, gas and 125 spring mechanism operating said locking-lug and reciprocating the locking mechanism and breech-bolt, a reciprocating firing-pin in the breech-bolt, a lever on the locking-lug frame, movable into the path of the traverse 130

of the firing-pin mechanism when the breech-bolt is unlocked, and means on the locking lug for removing the lever from the path of the firing-pin mechanism when the bolt is locked.

4. In a gun, a frame, a reciprocating breech-bolt mounted therein, a locking-lug frame thereon, a locking-lug in said frame, a firing-pin mounted in the breech-bolt, a gas cylinder under the barrel and communicating with the bore thereof, a piston in said cylinder, a rod from said piston communicating with the locking-lug frame, a stud thereon operating in an inclined slot in the locking-lug, and a spring on the locking-lug engaging the rear end of said rod, a lever mounted on the locking-lug so that the lower end of it will be engaged by said stud, a rod extending from the sear mechanism adapted to be engaged by the upper end of said lever when the locking-lug is in a locked position.

5. In a gun, a frame, a reciprocating breech-bolt therein, a firing-pin in said breech-bolt, a sear for engaging said firing-pin, a locking-lug frame secured to said breech-bolt, a vertically movable locking-lug therein, means for operating said locking-lug, a rod extending from the sear to the locking-lug and means on the locking-lug adapted to engage said rod, and operate said sear as the locking movement of the locking-lug is completed.

6. In a gun, a frame, a reciprocating breech-bolt therein, a firing-pin in the breech-bolt, sear mechanism for the firing-pin, a locking-lug frame secured to the breech-bolt, a vertically movable locking-lug in said frame, a centrally pivoted lever stop on the locking-lug frame movable into the path of the firing-pin mechanism when the breech-bolt is unlocked, and out of said path when the breech-bolt is locked, means for operating the locking-lug, a centrally pivoted lever on the locking-lug, the upper end of which communicates with the firing-pin sear mechanism and operates it when the breech-bolt is fully locked, and means on the locking-lug operating means engaging the lower end of said lever and operating it when the breech-bolt is fully locked.

7. In a gun having cartridge inlet and outlet openings, a reciprocating breech-bolt, a sprocket-wheel mounted in the cartridge inlet opening parallel with the breech-bolt, a stop adapted to limit the rotation of the sprocket-wheel, a spiral motor spring for rotating the sprocket, a gear wheel connected to said spring, a segmental gear intermittently engaging said gear wheel, a cam for raising and lowering said segmental gear, and a reciprocating stud intermittently operating said segmental gear.

8. A gun, a frame, a reciprocating breech-bolt and breech-bolt locking mechanism

mounted in said frame, a sprocket wheel parallel with the breech-bolt, a motor spring in said sprocket wheel, a gear wheel connected with said motor spring, a vertically movable member under said gear wheel, a reciprocating cam, a stud on said member engaging said cam, a segmental gear on the top of said member, a shaft supporting said segmental gear, an arm on said shaft, and a stud on said reciprocating cam, adapted to engage said arm

9. In a gun, a frame, a reciprocating breech-bolt, a cam surface below the breech-bolt reciprocating in unison therewith, and having a cam slot therein depressed at its central portion below the end portions thereof, a vertically movable member engaged by said cam-slot, and moved up and down thereby, a segmental gear mounted on said member, and a stud on said cam-surface adapted to rotate said segmental gear.

10. In a gun, a frame, a breech-bolt, a cartridge feeding sprocket parallel therewith, a spiral spring for rotating said sprocket, a spur gear connected to one end of said spiral spring, a vertically movable member, a segmental gear thereon adapted to intermittently engage said spur gear and rotate it, a dog on said member engaging said spur gear, a cam surface below the breech-bolt moving in unison therewith, a cam-slot in said cam-surface, a stud on said vertically movable member engaging said cam-slot, a lug on said cam-surface adapted to operate said segmental gear, and a stop on said member adapted to be moved by the action of said member into and out of the path of the teeth of the sprocket.

11. In a gun, a frame, a cartridge carrying sprocket wheel mounted thereon, a vertically movable member, cam mechanism raising and lowering said member, and a stop pivoted to said member, so as to be brought into and out of the path of the teeth of the sprocket to limit the intermittent rotation thereof.

12. In a gun, a frame, a reciprocating breech-bolt, a locking-lug frame secured thereto, a locking-lug operating in said frame, means for operating said locking-lug, a cartridge moving sprocket-wheel, a cam on said locking-lug frame projecting forward under the breech-bolt and reciprocating in unison therewith, and means connecting the cam and sprocket-wheel for operating the sprocket-wheel.

13. In a gun, a frame, a reciprocating breech-bolt mounted therein, a firing-pin in said breech-bolt, a sear for engaging the firing-pin, a locking-lug frame secured to the breech-bolt, a vertically movable locking-lug therein, means for operating said locking-lug, and means on the locking-lug frame operatable by the locking-lug for interfer-

ing with the forward travel of the firing-pin when the locking-lug is unlocked.

14. In a gun, a frame, a reciprocating breech-bolt mounted therein, a locking-lug frame secured to the breech-bolt, means for operating the locking-lug frame and the breech-bolt, a sprocket-wheel mounted adjacent to the line of travel of the breech-bolt, a cam secured to the locking-lug frame and extending forward under the breech-bolt and moving in unison therewith, and means connecting the sprocket-wheel with said cam whereby the sprocket-wheel is operated.

15. In a gun, a frame, a breech-bolt and breech-bolt locking mechanism, a sprocket wheel parallel with the breech-bolt having the teeth on its central part cut away to receive a cartridge carrying belt, a spring in the body of said sprocket for rotating it, a spur gear connected with said spring for winding it up, a segmental gear adapted to intermittently engage and operate said spur gear, means for operating said segmental gear, a stop adapted to intermittently engage the teeth of said sprocket, a flexible cartridge carrying belt operating in the depression in said sprocket wheel, clips on said belt to removably hold cartridges, to be en-

gaged by the teeth of the sprocket, and a hinged lever contacting with the cartridges between the teeth of said sprocket to retain them in contact therewith. 30

16. In a gas operated gun, a barrel, a cylinder under the barrel, a support connecting the barrel with one end of the cylinder thereunder having a chamber therein, and a passage from said chamber to the bore of the barrel, a screw closure in the bottom of the chamber, an upright stud thereon, a conical head on said stud and a passage from the upper part of said chamber into the cylinder. 35 40

17. In a gas operated gun, a barrel, a cylinder thereunder, a support connecting the barrel and cylinder, a chamber in said support, a passage from the top thereof to the bore of the barrel, a screw-plug for closing the bottom of the chamber, a standard on said screw-plug approximately in line with the passage to the bore of the barrel, a conical head on said standard, a passage from the chamber into the cylinder, and a thumb-screw between the chamber and the end of the cylinder for adjusting the capacity of said passage. 45 50 55

In testimony whereof I affix my signature.

JOHN C. STURGEON.