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3,199,501 8/1965 Bertschinger ..... 124/11  
3,204,625 9/1965 Shepherd ..... 124/11  
3,261,341 7/1966 Merz ..... 124/11

FOREIGN PATENTS

68,242 10/1957 France ..... 124/11  
711,542 7/1954 Great Britain..... 124/13  
506,007 10/1951 Belgium ..... 124/13  
891,215 9/1953 Germany..... 124/11  
1,034,853 4/1953 France ..... 124/11  
1,108,641 9/1955 France ..... 124/13

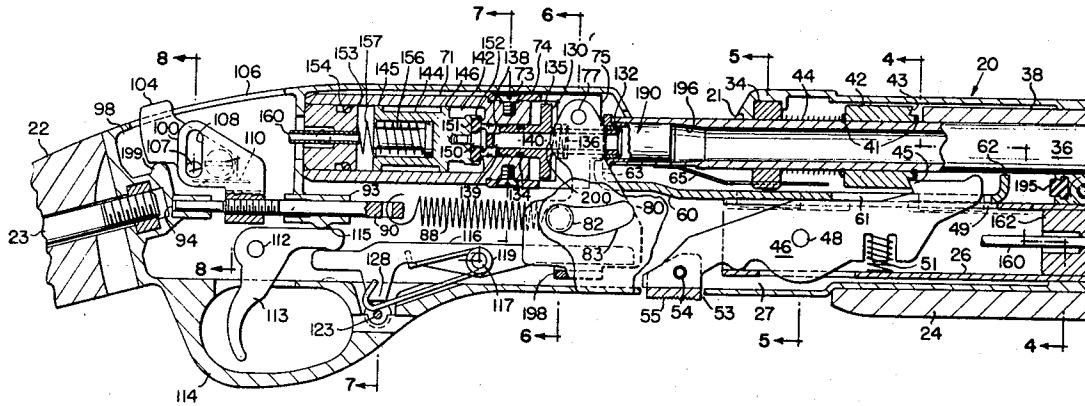
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[54] **GAS-POWERED SHOTGUN**  
**10 Claims, 11 Drawing Figs.**  
[52] U.S. Cl. .... **124/11,**  
**124/38, 124/40, 124/30; 273/106**  
[51] Int. Cl. .... **F41b 11/06**  
[50] Field of Search..... **124/11, 13,**  
**13A, 38**

[56] **References Cited**

UNITED STATES PATENTS			
1,214,398	1/1917	Welch .....	124/13
2,283,300	5/1942	Vincent.....	124/11
2,495,829	1/1950	Vincent.....	124/13
3,067,730	12/1967	Merz .....	124/11
3,084,833	4/1963	Kline .....	124/11
3,119,384	1/1964	Merz .....	124/11

**ABSTRACT:** The barrel is spring-loaded to forward position, and is pulled rearwardly to chamber the shell. In forward position a shell can be loaded through the breech opening, but the hammer may not be cocked. Rearward movement of the barrel seats the shell, and trips a locking lever, which holds the barrel in rear position, and permits the hammer to be cocked. When the trigger is actuated, the hammer opens a valve admitting the propellant gas to the rear of the shell to drive shot therefrom out the barrel. Manual release of the locking lever, permits the barrel to return to forward position and causes extraction of the spent shell.



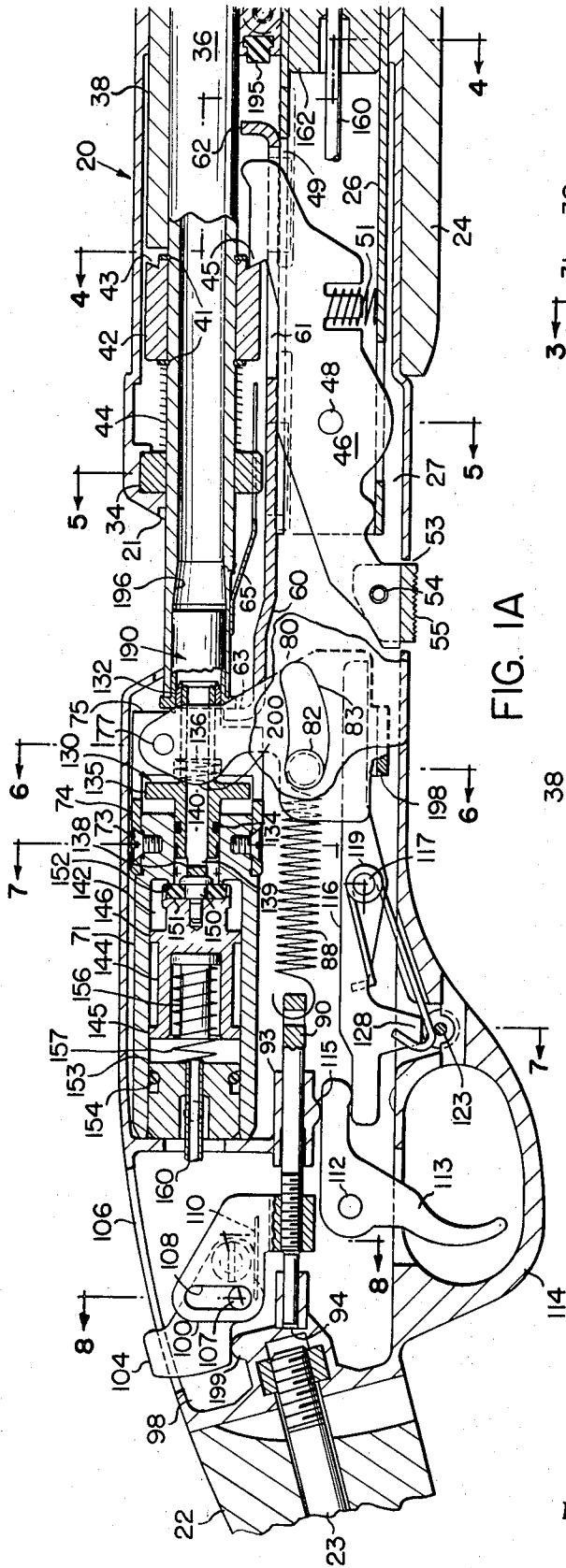


FIG. 1A

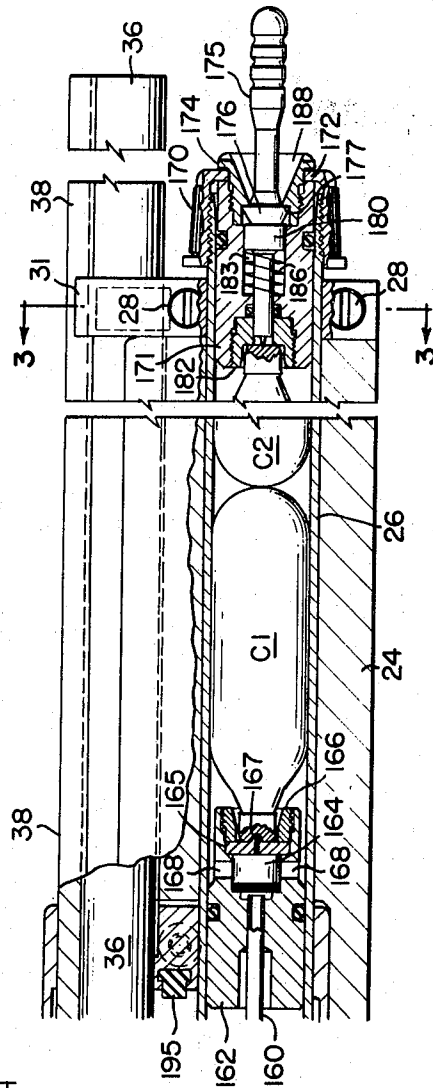


FIG. 1B

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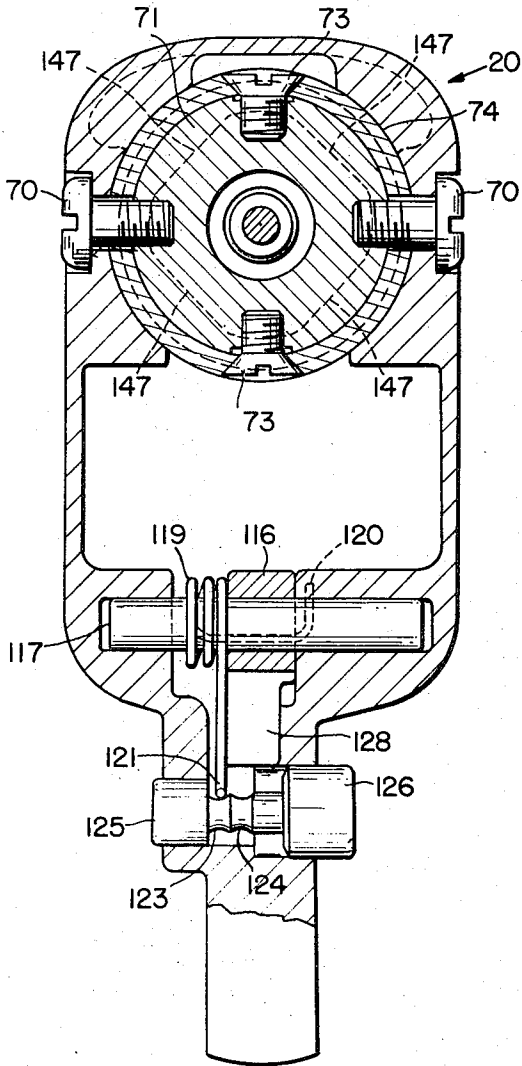


FIG. 7

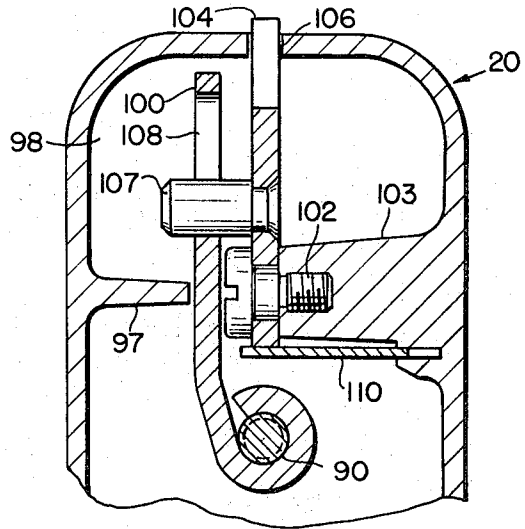


FIG. 8

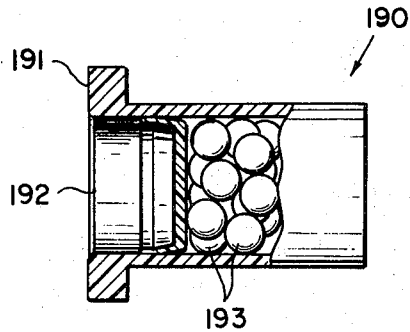


FIG. 9

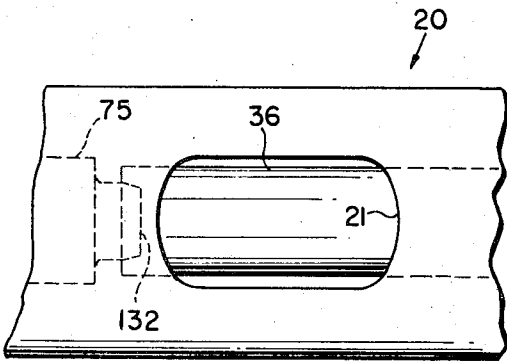
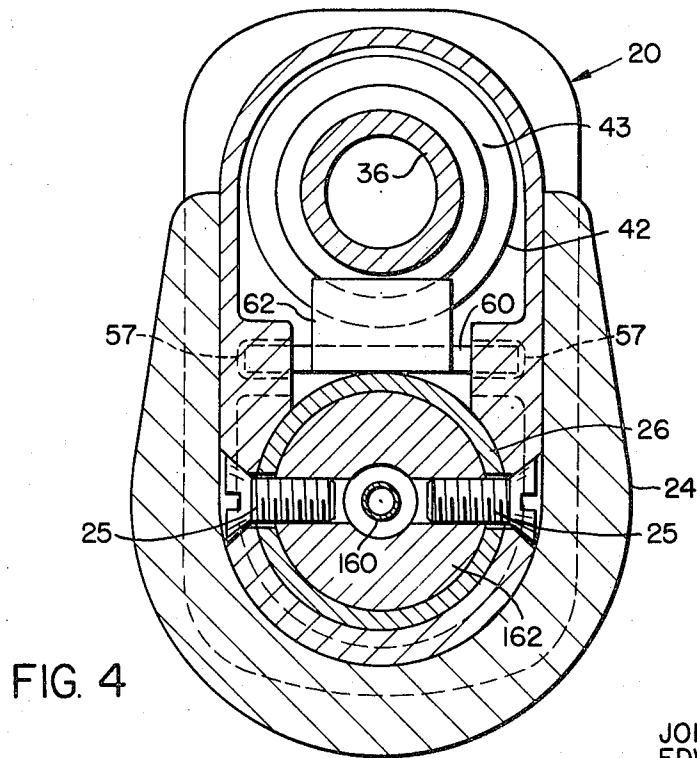
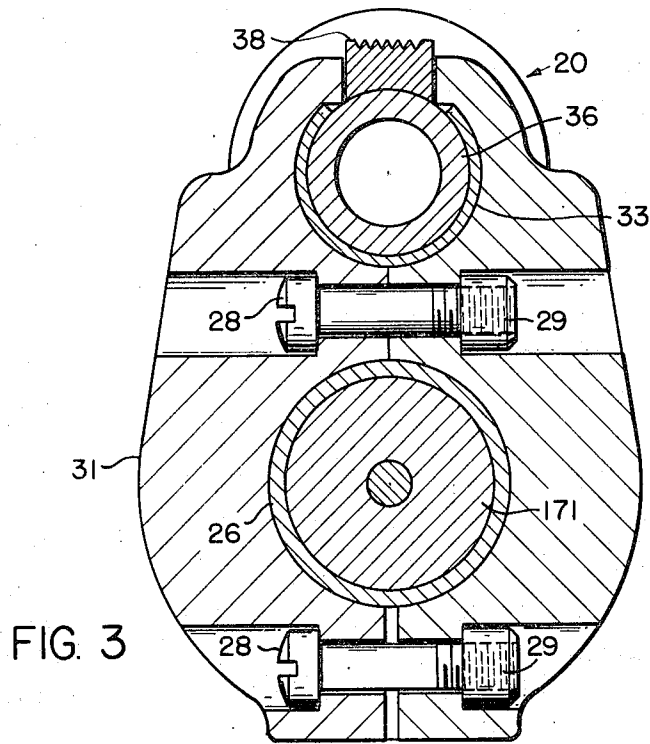


FIG. 2

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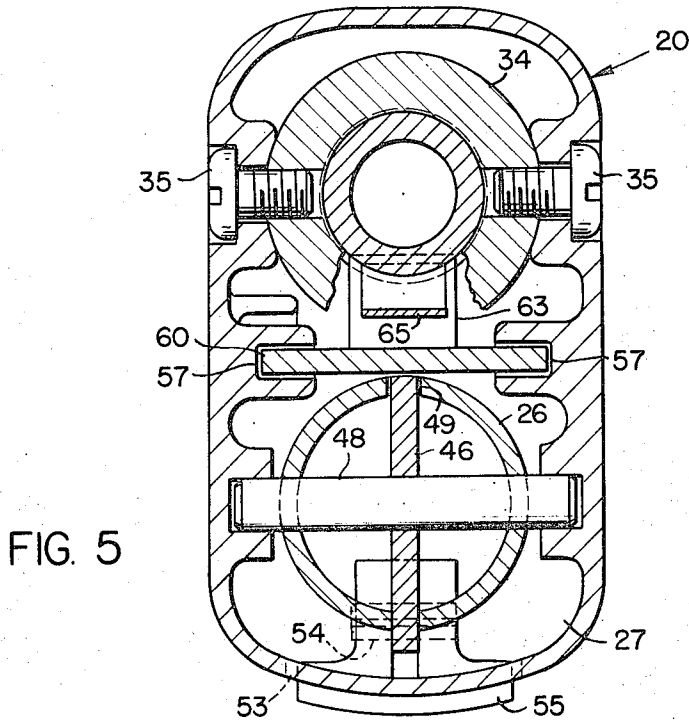


FIG. 5

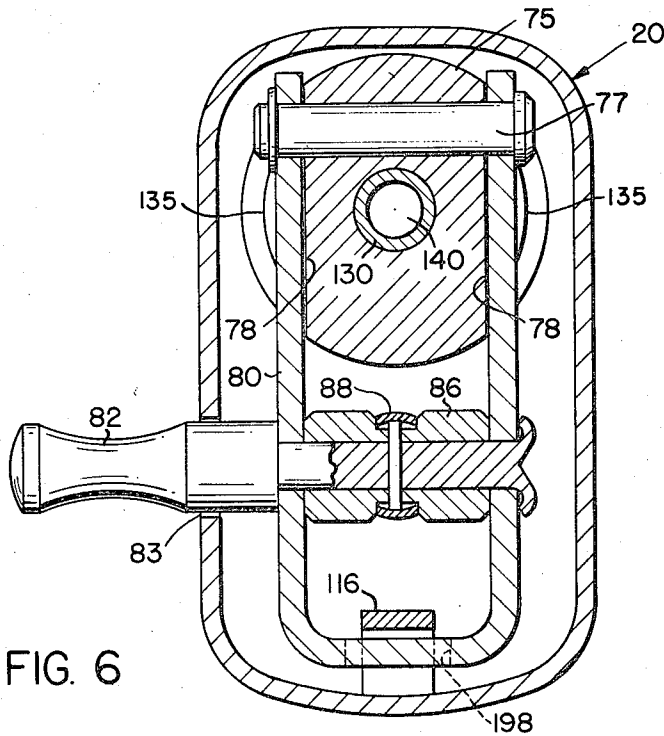


FIG. 6

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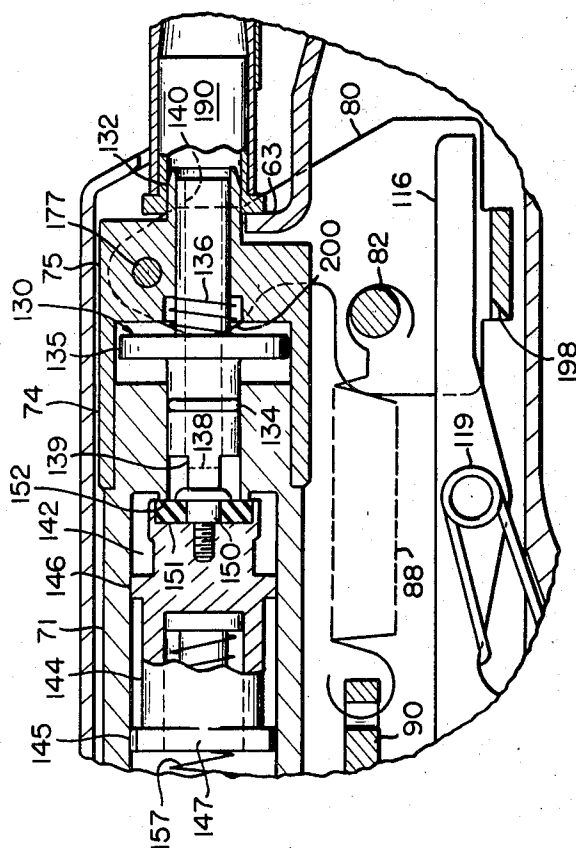


FIG. 10

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## GAS-POWERED SHOTGUN

This invention relates to guns, and more particularly to a gas-powered shotgun.

It is an object of this invention to provide an improved gas-powered shotgun, which is relatively light, inexpensive, and substantially safer to operate than prior such shotguns.

A further object of this invention is to provide an improved gas-powered shotgun having a releasable shell ejecting mechanism, which cannot be operated when the gun is cocked, and having a cocking mechanism, which cannot be operated unless the ejecting mechanism is latched.

Another object of this invention is to provide a gas-operated shot gun which can be adjusted for low and high power operation, respectively.

A further object of this invention is to provide a gas-operated shotgun having a power supply which can be easily and readily tapped and replenished.

An additional object of this invention is to provide a gas-operated shot gun having a novel valve system for controlling the flow of gas under pressure from a supply thereof to the barrel of the gun.

Other objects of the invention will be apparent hereinafter from the specification and from the recital of the appended claims, particularly when read in conjunction with the accompanying drawings.

In the drawings:

FIGS. 1A and 1B are fragmentary side elevational views showing different portions of a shotgun made according to one embodiment of this invention, parts thereof being shown in section;

FIG. 2 is an enlarged fragmentary plan view of a portion of this shotgun;

FIG. 3 is an enlarged fragmentary sectional view taken along the line 3-3 in FIG. 1B looking in the direction of the arrows;

FIG. 4 is an enlarged sectional view taken along the line 4-4 in FIG. 1A looking in the direction of the arrows;

FIG. 5 is an enlarged sectional view taken along the line 5-5 in FIG. 1A looking in the direction of the arrows;

FIG. 6 is an enlarged sectional view taken along the line 6-6 in FIG. 1A looking in the direction of the arrows;

FIG. 7 is an enlarged fragmentary sectional view taken along the line 7-7 in FIG. 1A looking in the direction of the arrows;

FIG. 8 is an enlarged fragmentary sectional view taken along the line 8-8 in FIG. 1A looking in the direction of the arrows; and

FIG. 9 is an axial sectional view of one type of shell, which is adapted to be employed as ammunition for this gun.

## SUMMARY OF THE INVENTION

The gun illustrated comprises a frame, having a barrel reciprocable thereon, a sleeve secured beneath the barrel to hold a pair of cartridges containing gas (e.g., CO<sub>2</sub>) under pressure, a hollow valve block behind the barrel to receive gas from the cartridges, a hammer-operated valve reciprocable in said block and normally closing a duct which registers with the rear end of the barrel and a hammer adapted to be held releasably in cocked position by a trigger-operated sear. The barrel is spring-loaded toward an advanced position in which it is spaced from the forward end of said duct so that a shell holding a plurality of shot may be inserted into the rear end of the barrel through a breech opening in the frame. From this position the barrel is movable manually rearwardly until a recess in the rear end of the shell is pressed by the barrel sealingly over the outer end of said duct. A hooked latching lever in the frame then engages a shoulder on the barrel to hold the barrel releasably in retract position. The hammer may now be moved manually to cocked position. Upon being released by operation of the trigger, the hammer strikes the valve stem to open the valve to admit gas from the valve block to the rear of the shell. This causes the contents of the shell to be discharged from the gun barrel.

After the gun has been fired, the latching lever is manually released, to return the gun barrel to its forward position. During this movement an extractor plate in the frame is shifted forwardly by a shoulder on the barrel, and a flange on this plate withdraws the spent shell from the forward end of said duct, and moves it into engagement with a leaf spring, which ejects the shell out of the breech opening.

Referring now to the drawings by numerals of reference, 20 denotes the frame, which is secured at its rear end to a conventional stock 22 by a bolt 23. Secured in conventional manner to the forward end of the frame 20 is the usual handgrip 24 (FIGS. 1A and 4). Within the handgrip 24 is an elongate sleeve 26, the rear end of which is secured by screws 25 (FIG. 4) into a recess 27 (FIGS. 1A and 5) in the frame.

Sleeve 26 projects beyond the forward end of grip 24 and has fastened thereabout by screws 28 and nuts 29 (FIG. 3) a one-piece clamp 31. Secured in a recess formed in the upper end of clamp 31 is a split bushing 33; and mounted for axial sliding movement in this bushing and in a bushing 34 (FIG. 1A), is the gun barrel 36. Bushing 34 is secured by screws 35 (FIG. 5) in the frame 20 forwardly of its breech opening 21. Barrel 36 is held against rotation by an elongate bar 38, which is secured to the top of the barrel, and which slides in a slot formed between clamp members 31. Bar 38 has a knurled upper surface for easier manipulation of the barrel for cocking.

Held by split rings 41 (FIG. 1A) on the barrel 36 forwardly of bushing 34 is a collar 42. A compression spring 44, which surrounds the barrel 36 and which is interposed between bushing 34 and collar 42, urges the barrel constantly forwardly (toward the right in FIG. 1A) to fired position.

In its front face collar 42 has a groove or notch 43, which is engageable by the hook portion 45 of a pivoted locking lever 46, to hold the barrel 36 in its retracted, cocked position. Lever 46 is pivoted intermediate its end on a pin 48 (FIG. 5) that extends diametrically through the sleeve 26 adjacent the rear end thereof. The hooked end of the lever 46 is urged upwardly into engagement with collar 42 through a slot 49 (FIGS. 1A and 5) in the sleeve 26 and through a registering slot 61 in an ejector plate 60 by a compression spring 51 (FIG. 1A), which is interposed between the sleeve and the lever forwardly of the pin 48. The tail of lever 46 projects out of the sleeve 26, and has pivoted thereon by means of a pin 54 a manually operable, knurled push member 55. Member 55 projects through a slot 53, in the underside of the frame 20, and is operable to pivot lever 46 to disengage its hook 45 from the collar 42.

The ejector plate 60 is mounted to reciprocate in ways 57 (FIG. 4) that are formed in opposite sides of the frame 20. The forward end of this plate 60 is curved upwardly as denoted at 62 (FIG. 1A), so that it is in position to be engaged by collar 42 during the firing advance of barrel 36. Plate 60 extends rearwardly beneath the breech opening 21 in the frame 20, and is bent upwardly at its rear end to form thereon a projectile engaging flange 63.

Secured intermediate its ends in the frame 20 just above the ejector plate 60, and extending rearwardly into the breech opening 21 to engage the underside of the barrel 36, when the latter is in its cocked position, is a leaf spring 65 (FIGS. 1A and 5).

Fastened by screws 70 (FIG. 7) rearwardly of breech opening 21, and coaxially of the barrel 36, is a valve block 71. Secured over the forward end of the block 71 coaxially thereof by the screws 70, and by two further screws 73, is an annular skirt 74, which is integral with, and which projects rearwardly from, a plug 75 (FIGS. 1A and 6). Fastened in plug 75 above its axial centerline, and extending transversely through the plug, is a pin 77, opposite ends of which project beyond a pair of opposed, parallel, flat surfaces 78 formed in diametrically opposite sides of the plug 75.

Pivotaly connected at their upper ends to opposite ends of the pin 77 are the legs of a U-shaped hammer 80 (FIGS. 1A and 6). Beneath the plug 75 the hammer 80 carries a cocking

lever or pin 82 (FIGS. 1 and 6), which projects at its outer end through an arcuate slot 83 formed in one side of the frame 20.

Secured at its forward end to a spacer 86, which surrounds the pin 82 between the legs of the hammer, is a spring 88 (FIGS. 1A and 6). Spring 88 extends rearwardly beneath the valve block 71 and is connected to the forward end of an axially adjustable anchor pin 90. Pin 90 is slidable at its forward end in a sleeve 93 on the frame 20, and at its rear end in a boss 94, formed on the frame rearwardly of the sleeve 93. Threaded at its lower end onto pin 90, and extending upwardly past a projection 97 (FIG. 8) on the inside of the frame, and into a recess 98 formed in the frame rearwardly of the valve block 71, is a link 100. Pivoted at its lower end on a stud 102, which is threaded into a boss 103 formed on the frame opposite projection 97, is a power control arm 104. At its upper end arm 104 projects through a slot 106 in the frame. Intermediate its ends arm 104 carries a pin 107, which projects through a slot 108 in the link 100. A leaf spring 110, which projects from the frame 20 beneath the boss 103, engages the lower end of the arm 104 releasably to hold it in one of two different positions, as described below.

Pivoted intermediate its ends on a pin 112 (FIG. 1A) which is secured in frame 20 beneath and at right angles to the pin 90, is a trigger 113. At one end trigger 113 extends down into the usual trigger guard 114, which projects from the underside of the frame 20; and at its opposite end the trigger extends forwardly beneath a boss 115 formed on the underside of sleeve 93.

Pivoted intermediate its ends on a pin 117, that is secured in frame 20 beneath spring 88 parallel to pin 112 is a trigger sear 116 (FIGS. 1A, 6 and 7). Sear 116 extends at its forward end between the legs of the hammer 80, and at its rear end beneath the forward end of trigger 113. Mounted on the pin 117 is a coiled spring 119, opposite ends of which, respectively, engage beneath the sear 116, and seat selectively in one of two, adjacent circumferential grooves 123 and 124 (FIG. 7) formed in the periphery of a trigger safety pin 125.

The spring 119 urges the sear 116 about the pin 117 in a direction (clockwise in FIG. 1A) to hold the rear end of the sear 116 in engagement with the underside of the forward end of the trigger 113, and the forward end of the trigger against the boss 115 on sleeve 93.

Pin 125 is mounted for limited axial movement in trigger guard 114. At one end thereof the safety pin has a section 126 (FIG. 7), which is positioned beneath a lug 128 formed on the underside of the sear 116, when the pin 125 is in "safety" position.

Mounted to reciprocate in registering axial bores in the plug 75 and the valve block 71 is an axially bored valve stem 130 (FIG. 1A) whose bore registers with the bore of barrel 36. Adjacent its rear end valve stem 130 carries a resilient O-ring 134, which seals the forward end of the bore in the valve block 71. Intermediate its ends the valve stem 130 has a flange 135, which reciprocates in skirt 74 of plug 75. Seated in a recess in the rear of plug 75, and surrounding the valve stem forwardly of flange 135 is a spring 136 (FIG. 1A), which cushions the forward movement of the valve stem. The rear end of the valve stem 130 has a narrow bridge-shaped projection 138 forming a port 139, which connects the axial bore in the valve block 71 with the axial bore 140 in the valve stem.

Mounted to reciprocate in an enlarged chamber or counterbore 142 (FIG. 1A) in the rear of valve block 71 is a valve 144. Valve 144 has a pair of axially spaced, external shoulders 145 and 146, which have axial, sliding engagement with the bore wall of chamber 142. As shown in FIG. 7, each of these shoulders 145 and 146 is generally square in cross section as indicated at 147.

Secured by a stud 150 in a recess in the forward end of the valve 144 is a resilient annulus 151, of rubber or the like, which seats against an annular boss or valve seat 152 that is formed on block 71.

The rear end of block 71 is closed by a plug 153 (FIG. 1A), which has sealed engagement with the bore of the valve block through a resilient O-ring 154.

Seated at one end in a recess in the rear end of the valve 144, and surrounding a centering pin 156 in this recess, is a coiled spring 157. The opposite end of spring 157. The opposite end of spring 157 seats against the inner end of plug 153 to urge the valve 144 in a direction to hold it closed against valve seat 152.

Secured at one end in plug 153 to communicate with the interior of the chamber 142 in block 71 is a tube 160. The opposite end of this tube is secured in a plug 162 (FIG. 1A), which is secured in the sleeve 26. Tube 160 communicates with a chamber 164 formed in a reduced diameter portion of the plug 162 adjacent its forward end. Recess 164 is closed at its forward end by an axial bored piercing member 165, which is secured in plug 162 by a threaded ring member 166, and which has a centrally bored piercing point or projection 167. Chamber 164 communicates with the interior of the sleeve 26 through a pair of radial, diametrically opposed ports 168 formed in plug 162.

Removably secured in the forward end of sleeve 26 by an externally knurled cap 170 (FIG. 1B) and a socket member 174 is an axially bored plug 171. Socket member 174 extends through a central opening in cap 170, and threads into a counterbore in plug 171. Cap 170 threads onto the outer end of sleeve 26 and has a flange 172 that lies between the outer end of plug 171, and a flange on socket member 174, so that upon rotation of cap 170 relative to sleeve 26, the plug 171 and socket 174 are shifted axially as a unit. Mounted in socket member 174 coaxially thereof is a toggle arm 175, the inner end of which has a truncated conical head 176, which is disposed between an internal shoulder 177 formed in socket member 174, and the head of a piercing pin 180, which is reciprocable in the bore of the plug 71. The inner or rear end of pin 180 extends into an axial bore formed in a smaller plug 182, which is threaded into plug 171. At its inner end pin 180 is in position to engage and pierce the cap of a CO<sub>2</sub> cartridge C2 mounted on sleeve 26. Surrounding the shank of the pin 180 in a counterbore 183 in plug 171 is a spring 186, which urges pin 180 toward the right in FIG. 1B, resiliently into engagement with the inner end of the head 176 of toggle arm 175. Between its forward end and shoulder 177 the socket member 174 has an inwardly tapering conical socket 188, which permits arm 175 to be manipulated manually to effect piercing of the cartridge C2.

FIG. 9 illustrates a shotgun shell 190 of the type adapted to be employed with this gun. Such a shell is disclosed in more detail in the copending U.S. Pat. application Ser. No. 537,403, filed Mar. 25, 1966. Housed in shell 190 is a load of shot 193. At its rear end the shell has an external, circumferential flange 191, and a central bore or recess 192, which extends part way into the shell coaxially thereof.

To provide the power for the gun, plug 171 (FIG. 1B) is removed from the forward end of the sleeve 26 by threading the cap 170 back off of the forward end of the sleeve. Two cartridges, C1 and C2 (FIG. 1B) containing gas under pressure (for example, CO<sub>2</sub>) are then inserted into the sleeve 26 in abutting relation with the capped end of the inner cartridge C1 facing the point 167, and the capped end of the outer cartridge C2 facing the forward, outer end of sleeve 26. Plug 171 is then reinserted into sleeve 26, and cap 170 is threaded snugly onto the sleeve. This causes the hollow point 167 to puncture the cap on the cartridge C1 so that the gas therein is released through the point to chamber 164 and tube 160. The toggle arm 175 may then be pivoted manually to cause the pointed end of pin 180 to puncture the cap on the cartridge C2. The cartridge diameters are slightly less than the bore diameter of the sleeve 26, so that gas from cartridge C2 passes rearwardly in the sleeve and through the ports 168 into chamber 164 and tube 160. The chamber 142 thus fills with gas under pressure, since the flats 147 (FIG. 7) on the shoulders 145 and 146 permit the gas from tube 160 to pass axially along the outside of the valve 144.

When the barrel is advanced, the gun may be loaded by inserting the forward end of a new shell 190 through the breech opening 21 into the rear end of the barrel 36. To accom-



modate the shell, the barrel bore has adjacent its rear end a slightly enlarged portion which is connected by a conical surface 196 to the forward portion of its bore. The shoulder 191 of the newly inserted shell is positioned forwardly of the extractor flange 63. At this time the forward end of the locking lever 46 is engaged with the underside of collar 42, so that the trailing end of lever 46 is positioned to block forward movement of the hammer 80.

The barrel 36 is now pulled manually rearwardly far enough for collar 42 to clear the forward end of lever 46 and permit spring 51 to urge lever 46 upwardly until its hook 45 engages in the groove 43 in the forward end of the collar. This movement causes the rear end of the barrel 36 to force the rear, flanged end of the newly-inserted shell 190 sealingly over the boss 132 on the forward end of plug 75, as shown in FIG. 1A. During this movement the flange 191 on the newly-inserted shell 190 also engages the extractor flange 63, and shifts the extractor plate 60 rearwardly so that its flange 62 is withdrawn from engagement with a stop 195.

As the hook 45 pivots upwardly to engage the groove 43 in collar 42, the rear end of the locking lever 46 pivots downwardly so that it no longer blocks the forward movement of the hammer 80. The cocking pin 82 (FIG. 6) is now pushed manually forwardly to swing the hammer 80 forwardly about pin 77 (counterclockwise in FIG. 1A) until the forward end of the sear 116 drops behind a beveled notch 198 (FIGS. 1A and 6) formed in the bottom of the hammer along the rear edge thereof. The spring 119 releasably holds the forward end of the sear 116 downwardly in this recess 198, so that the hammer is held releasably in its forward or cocked position against the resistance of the spring 88 after the cocking lever is released. In its cocked position, the hammer 80 overlies the rear end of the locking lever 46, so that when the hammer is cocked, the lever 46 cannot be pivoted upwardly by block 55 far enough to disengage the hook 45 from the collar 42.

When the hammer is cocked, the tension in the spring 88 depends upon the position of the pivotal arm 104. Link 100 (FIGS. 1A and 8), which is threaded into a predetermined position on pin 90 during the assembly of the weapon, is movable by pin 107 on arm 104 between a retracted position (FIG. 1A) in which it is spaced from the stationary sleeve 93, and an advanced position in which the forward end of the link engages sleeve 93. Movement of the link 100 from its advanced to its retracted position increases the tension in the spring 88, and shifts the gun from low power to high power operation. When link 100 is in retracted position, the arm 104 is held releasably, by toggle action of pin 107 being below the centerline of pivot pin 102, against a stop lug 199 (FIG. 1A) formed on the frame 20 at the rear of recess 98. To shift the gun from high powered to low powered operation, the arm 104 is manually pivoted forwardly about the pin 102, to swing the pin 107 in slot 108 until the forward movement of link 100 is stopped by the sleeve 93.

With the gun loaded and cocked, it may be placed on "safety" by pushing the head 126 (FIG. 7) of the pin 125 inwardly beneath the lug 128 on the sear 116, so that the sear cannot be pivoted to release its forward end from the notch 198 (FIG. 1A) in the hammer 80. The end 121 of the spring 119 is thus seated in the recess 124 (FIG. 7) in pin 125 so that the pin 125 is releasably held against axial movement in its safety position.

The now-loaded and cocked gun may be fired by shifting the safety pin axially back to its illustrated "release" position, and by pulling the trigger 113 in the usual manner. This pivots the rear end of the sear 116 downwardly against the resistance of the spring 119 so that the forward end of the sear is disengaged from the hammer 80. This releases the hammer, which is suddenly pivoted rearwardly by the spring 88 with sufficient force to cause rounded shoulders 200 (FIG. 1A) on the rear of the hammer to strike the flange 135 on the valve stem 130, whereby the latter is suddenly shifted rearwardly against the valve block 144 to unseat the rubber annulus 151 from valve seat 152 so that gas under pressure from the chamber 142

flows through the ports 138 and 139 in the valve stem, and its bore 140 to the rear of the shell 190, thus causing the shots 193 (FIG. 9) to be propelled forwardly out of the barrel 36. Then the spring 157, which is more powerful than the spring 136, moves the valve 144 forwardly again to its closed position against the valve seat 152.

The power of the gun depends on the quantity of gas under pressure which is admitted by the valve 144 into the bore 140 of the valve stem 130, and is a function of the distance the valve 144 is moved rearwardly each time it is opened. The greater the impact of the shoulders 200 of the hammer against the flange 135, the greater the distance the valve 144 will be momentarily shifted rearwardly in the valve block 71. This impact is, in turn, a function of the tension in the hammer spring 88, which may be adjusted by the arm 104.

After the gun has been fired, the now-released hammer 80 no longer interferes with the pivotal movement of a lever 46 about the pin 48. The block 55 may, therefore, be pushed upwardly to disengage the hook 45 from the collar 42. This releases the collar 42 and barrel 36, which are then forced forwardly by the spring 44. As the collar 42 advances toward the right in FIG. 1A, it engages the flange 62 on the forward end of the ejector plate 60, thereby shifting the plate forwardly until its flange 62 engages the resilient stop 195 (FIG. 1A) secured in the frame 20 between the barrel 36 and sleeve 26. The forward movement of the ejector plate 60 causes its trailing end 63, which is engaged with the rear face of the flange 191 on the spent shell 190, to withdraw the spent shell from the boss 132 on the forward end of the plug 75, and to shift it forwardly until it registers with the breech opening 21. At this time the trailing end of the leaf spring 65 engages the flange 191 on the shell to prevent it from advancing further, and also ejects the shell upwardly and out of the breech opening 21, while the rear end of the barrel 36 continues to advance to its extreme forward position, at which time it registers, approximately, with the leading edge of the breech opening 21.

From the foregoing it will be apparent that the novel gun disclosed above is safe, compact, and extremely versatile compared to prior, like guns. When the barrel 36 is in its forward, or open position, the gun cannot be cocked; and alternatively, when the gun is cocked, the barrel cannot be opened accidentally by the latch 55. The shells are automatically ejected following each discharge of the weapon; and a newly inserted shell is automatically seated over the discharge end or boss 132 of the propellant chamber each time the barrel is shifted rearwardly into its closed position. Also, the gun may be adjusted manually for low or high powered operation according to the type of target at which the gun is to be fired, merely by pivoting the arm 104 about the pin 102. For large game obviously more power will be indicated than for small game. By employing dual cartridges C1 and C2, the two piercing members 165 and 180, the frequency with which the propellant supply must be replenished is considerably reduced compared to gas-operated guns which utilize a single cartridge. Moreover, the use of the spring-loaded toggle arm 175 for puncturing the cap on the cartridge C2 provides an extremely simple piercing device, which operates automatically to withdraw the piercing point 180 from a cartridge cap after it has been pierced.

While the invention has been described in connection with a specific embodiment thereof, it will be understood that it is capable of further modification, and this application is intended to cover any variations, uses, or adaptations of the invention following, in general, the principles of the invention and including such departures from the present disclosure as come within known or customary practice in the art to which the invention pertains and as may be applied to the essential features hereinbefore set forth, and as fall within the scope of the invention or the limits of the appended claims.

We claim:

1. A gas-operated gun comprising:
  - a frame;
  - a barrel;

means mounting said barrel for axial reciprocation on said frame between advanced and retracted positions respectively;

means for supplying gas under pressure to a chamber in said frame;

means for removably securing a shell in the rear end of said barrel, when said barrel is moved from its advanced to its retracted position;

a hammer movable on said frame between released and cocked position;

means including a normally closed valve responsive to the movement of said hammer from cocked to released position to open said valve to admit gas under pressure from said chamber to the rear of a shell secured in said barrel;

releasable means for holding said barrel in its retracted position; and

means operable, only when said hammer is in its released position, to release said barrel holding means.

2. A gas-operated gun as defined in claim 1, including means operable, only when said barrel is in its retracted position, for moving said hammer from its released to its cocked position.

3. A gas-operated gun comprising:

a frame;

a barrel;

means mounting said barrel for axial reciprocation on said frame between advanced and retracted positions respectively;

means for supplying gas under pressure to a chamber in said frame;

means for removably securing a shell in the rear end of said barrel, when said barrel is moved from its advanced to its retracted position;

a hammer movable on said frame between released and cocked positions;

means including a normally closed valve responsive to the movement of said hammer from cocked to released position to open said valve to admit gas under pressure from said chamber to the rear of a shell secured in said barrel;

a shell being insertable through an opening in said frame and into the rear end of said barrel, when the latter is in its advanced position;

said means for securing a shell in said barrel comprising a hollow duct member mounted in said frame rearwardly of said barrel to communicate at one end with said chamber, and adapted to project at its opposite end into a recess in the rear end of said shell, when the latter is disposed in said barrel;

the rear end of said barrel being engageable with an external flange on said shell to shift said shell in a direction to seat its recessed end over said opposite end of said duct member, when said barrel is moved to its retracted position,

a spring urging said barrel toward its advanced position;

a plate mounted in said frame to reciprocate parallel to said barrel;

a first flange at one end of said plate operative to extend transversely behind the external flange on the shell seated on said duct member;

a second flange at the opposite end of said plate operative to be engaged by a projection on said barrel, when said barrel moves from its retracted to its advanced position, thereby to transmit at least part of the advance movement of said barrel to said plate and to the last-named shell to advance the latter off of said duct member; and

resilient means mounted in said frame and engageable with said shell to eject it out of said opening in said frame, when the shell is advanced by said plate.

4. A gas-operated gun as defined in claim 3, wherein said latching means comprises:

a lever pivoted intermediate its ends on said frame and having thereon a hook engageable in a recess on said barrel projection to hold said barrel in its retracted position against the resistance of said spring; and

a further member movably connected to said lever and manually operable from the exterior of said frame to move said lever in a direction to disengage said hook from said projection, only when said hammer is in its released position.

5. A gas-operated gun as defined in claim 4, wherein: said hammer is mounted on said frame to pivot about an axis parallel to the pivotal axis of said lever;

a second spring is connected to said hammer to urge the latter toward its released position;

a trigger-operated sear is engageable with said hammer to hold said hammer releasably in its cocked position; and said projection on said barrel is operative, upon its release by said hook, to pivot said lever in a direction to raise a portion thereof into registry with said hammer to prevent the movement thereof to its cocked position.

6. A gas-operated gun as defined in claim 5, wherein: third spring urges said valve toward its closed position;

a hollow valve stem is reciprocable at one end in said duct member coaxially thereof, and is engageable at its rear end with said valve;

said stem has thereon an external collar engageable by said hammer upon the movement thereof to its released position, to effect shifting of said stem toward said valve to open the latter momentarily against the resistance of said third spring; and

means is operable from the exterior of said frame to adjust the tension in said second spring thereby to adjust force with which said collar is struck by said hammer.

7. A gun, comprising:

a frame;

a barrel mounted on said frame for axial reciprocation between advanced and retracted positions respectively;

means for removably securing a shell in firing position in the rear end of said barrel, when said barrel is in its retracted position;

a hammer means movable on said frame between released and cocked position;

means for discharging the contents of said shell from said barrel upon the movement of said hammer means from cocked to released position; and

releasable means for holding said barrel in its retracted position, said hammer means being operative when in its cocked position to prevent release of said barrel holding means.

8. A gun as defined in claim 7, wherein said barrel holding means includes means for preventing said hammer from being moved to its cocked position, when said barrel is in its advanced position.

9. A gas-operated gun comprising:

a frame;

a barrel mounted on said frame;

means for supplying gas under pressure to a chamber disposed in said frame rearwardly of said barrel;

means for supporting a shell in firing position in said barrel in registry with an opening in the forward end of said chamber;

a valve in said chamber normally closing said opening and reciprocable axially of said opening and said barrel;

a hammer movable on said frame between released and cocked positions;

a reciprocable valve stem mounted in said opening coaxially thereof and having therethrough an axial bore for conveying gas under pressure from said chamber to the rear of a shell in said barrel, when said valve is moved to its open position;

means operatively connecting said stem to said hammer and operative, when said hammer moves from cocked to released position, momentarily to shift said stem in a direction to open said valve;

said stem having thereon an external flange intermediate its ends;

said hammer comprising a U-shaped member having a pair of spaced, upstanding legs flanking said stem and

pivotaly connected at their upper ends on said frame forwardly of said flange to swing about an axis transverse to said stem; and  
 said legs having on their rear edges curved camming surfaces engaging said flange adjacent diametrically opposite sides thereof to shift said stem toward said valve, when said hammer moves to its released position.  
 10. A gas-operated gun comprising:  
 a frame;  
 a barrel mounted on said frame;  
 means for supplying gas under pressure to a chamber disposed in said frame rearwardly of said barrel;  
 means for supporting a shell in firing position in said barrel in registry with an opening in the forward end of said chamber;  
 a valve in said chamber normally closing said opening and reciprocable axially of said opening and said barrel;  
 a hammer movable on said frame between released and cocked positions;  
 a reciprocable valve stem mounted in said opening coaxially thereof and having therethrough an axial bore for convey-

ing gas under pressure from said chamber to the rear of a shell in said barrel, when said valve is moved to its open position;  
 means operatively connecting said stem to said hammer and operative, when said hammer moves from cocked to released position, momentarily to shift said stem in a direction to open said valve;  
 an annular valve seat formed in said chamber around said opening;  
 said valve having on its forward end a resilient surface sealingly seated against said valve seat, when said valve is in its closed position; and  
 said valve stem having on its rear end a narrow, bridge-shaped projection engaging said valve, and forming in the stem a port which is shifted into said chamber to convey gas therefrom to the bore in said stem, when said stem is shifted toward said valve by said hammer, whereby said stem provides a low-throttle path for gas to flow from said chamber to said shell.

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