Dec. 25, 1956 S. K. JANSON 2,775,166

PIVOTED BREECH BOLT LOCK FOR GAS PISTON FIREARMS

Filed Aug. 22, 1952 6 Sheets-Sheet 1

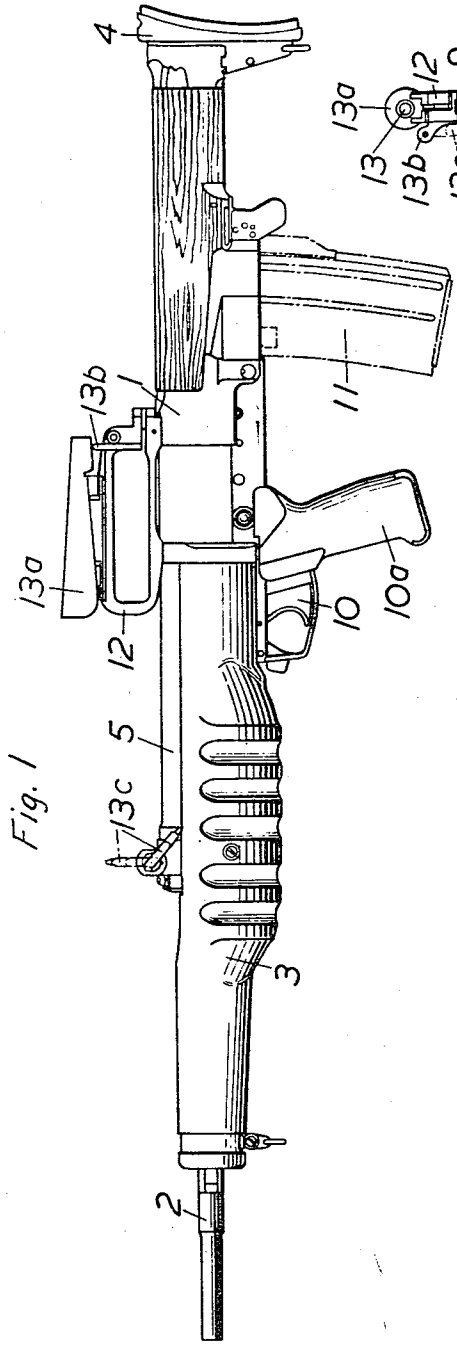


Fig. 1

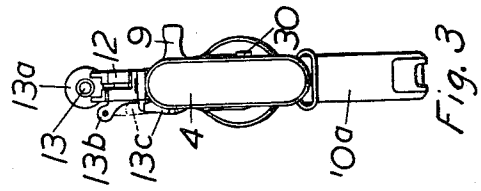


Fig. 3

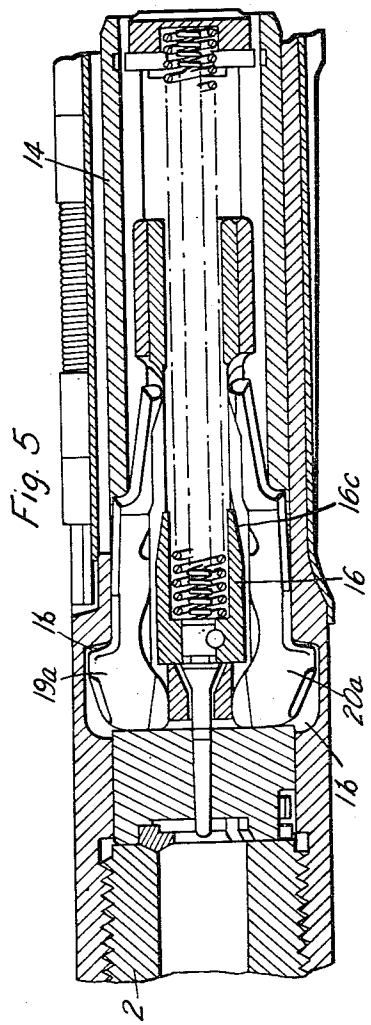


Fig. 5

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PIVOTED BREECH BOLT LOCK FOR GAS PISTON FIREARMS

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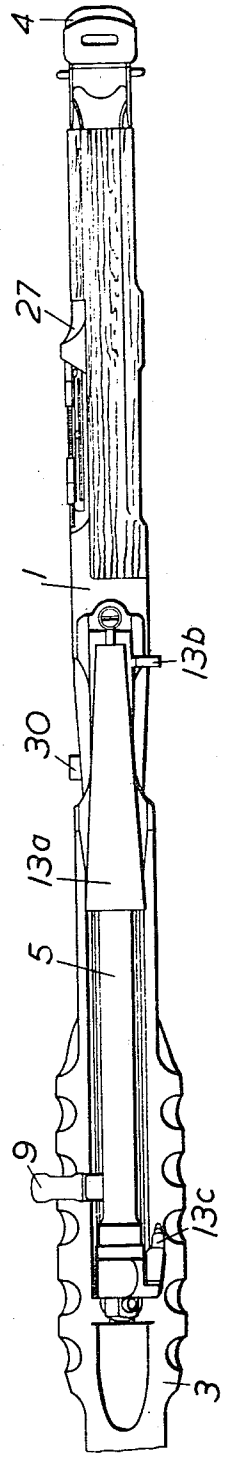


Fig. 2

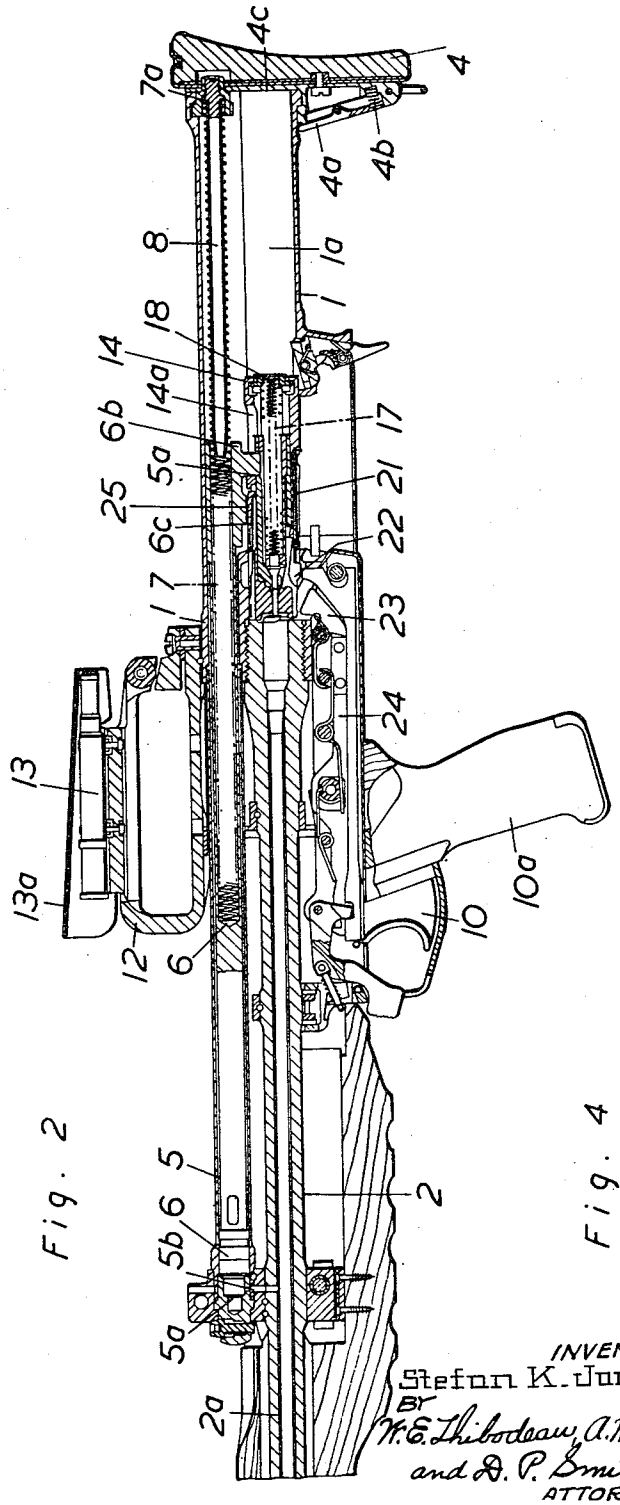


Fig. 4

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PIVOTED BREECH BOLT LOCK FOR GAS PISTON FIREARMS

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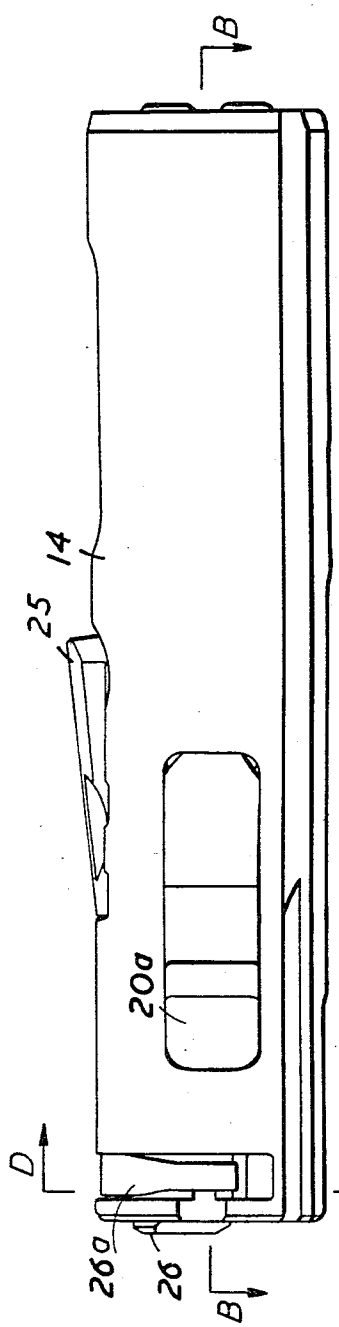


Fig. 6

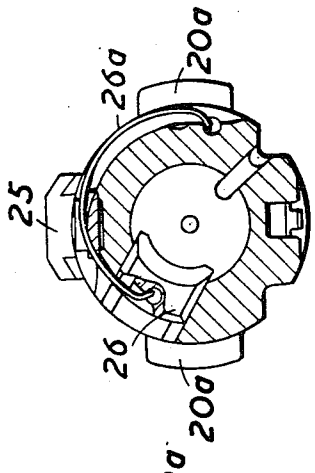


Fig. 11

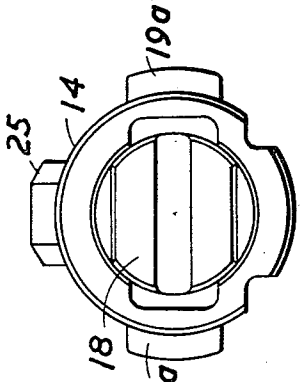


Fig. 8

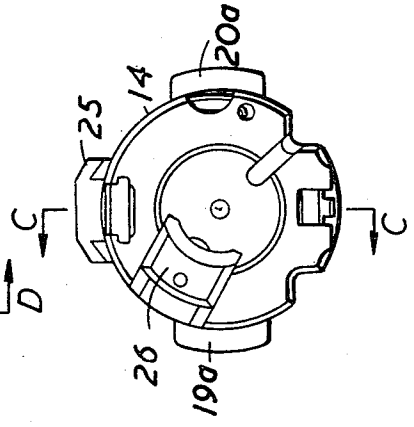


Fig. 7

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PIVOTED BREECH BOLT LOCK FOR GAS PISTON FIREARMS

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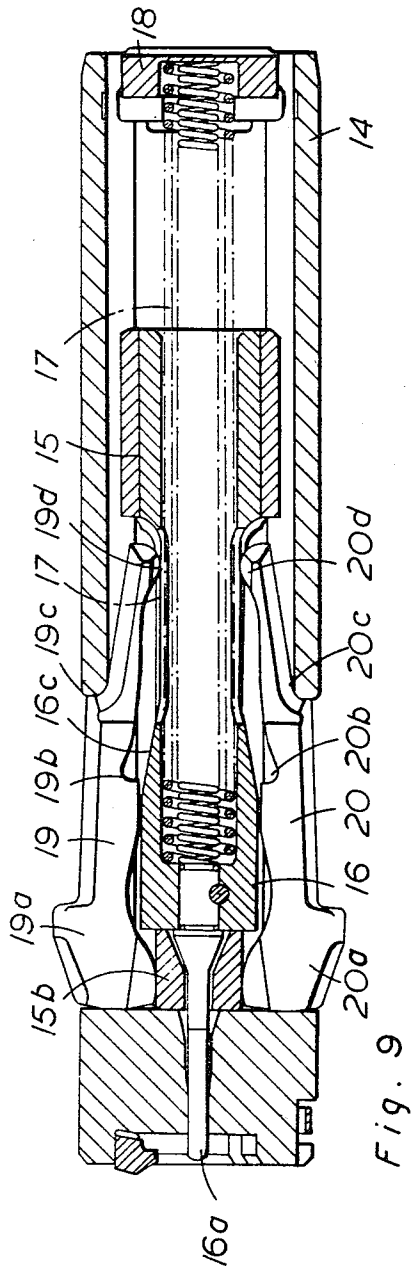


Fig. 9

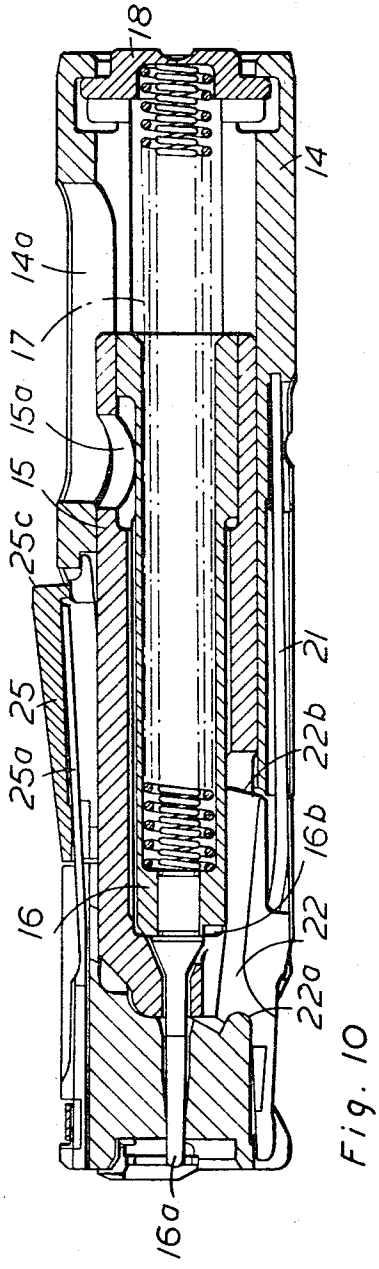


Fig. 10

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PIVOTED BREECH BOLT LOCK FOR GAS PISTON FIREARMS

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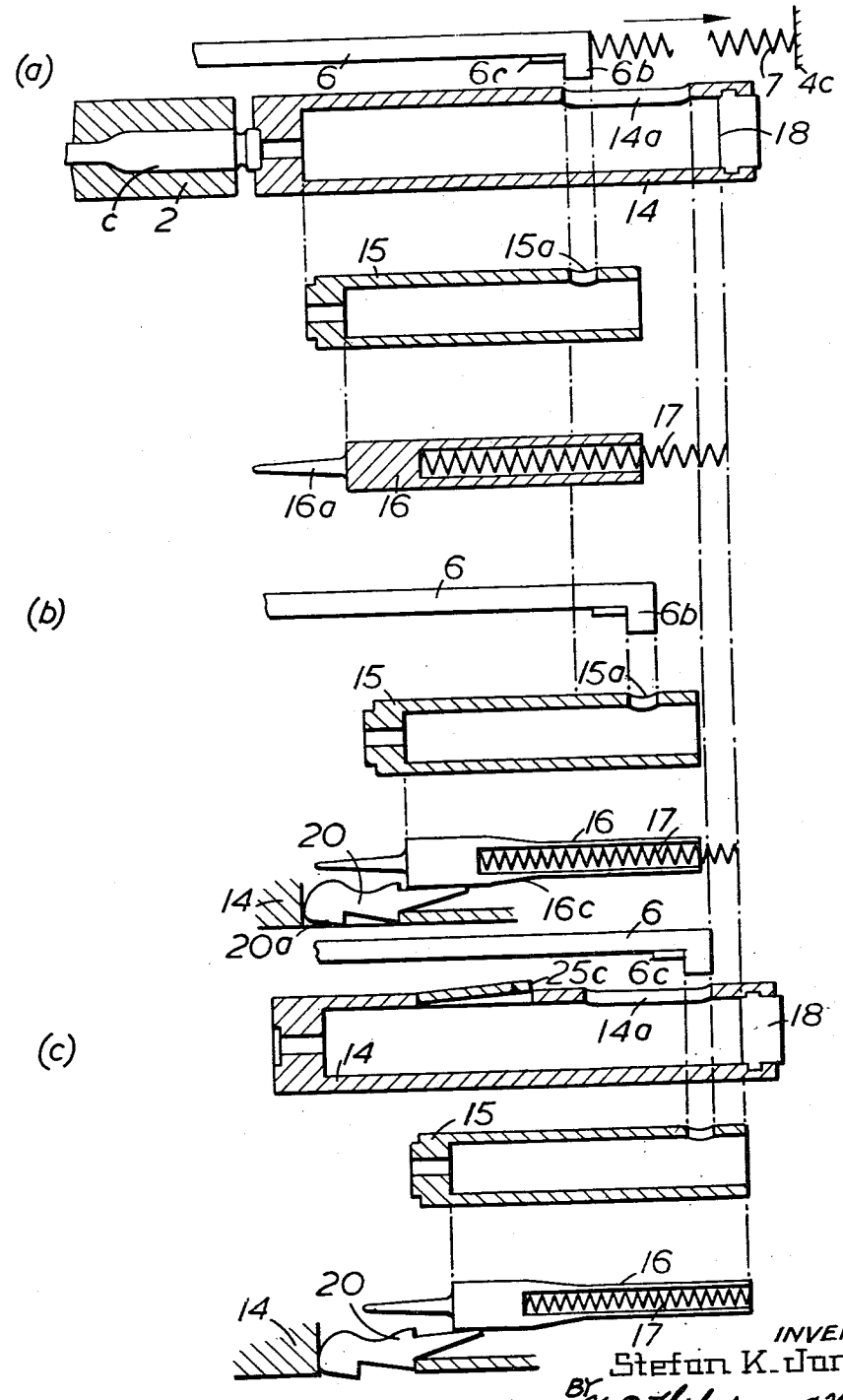


Fig. 12

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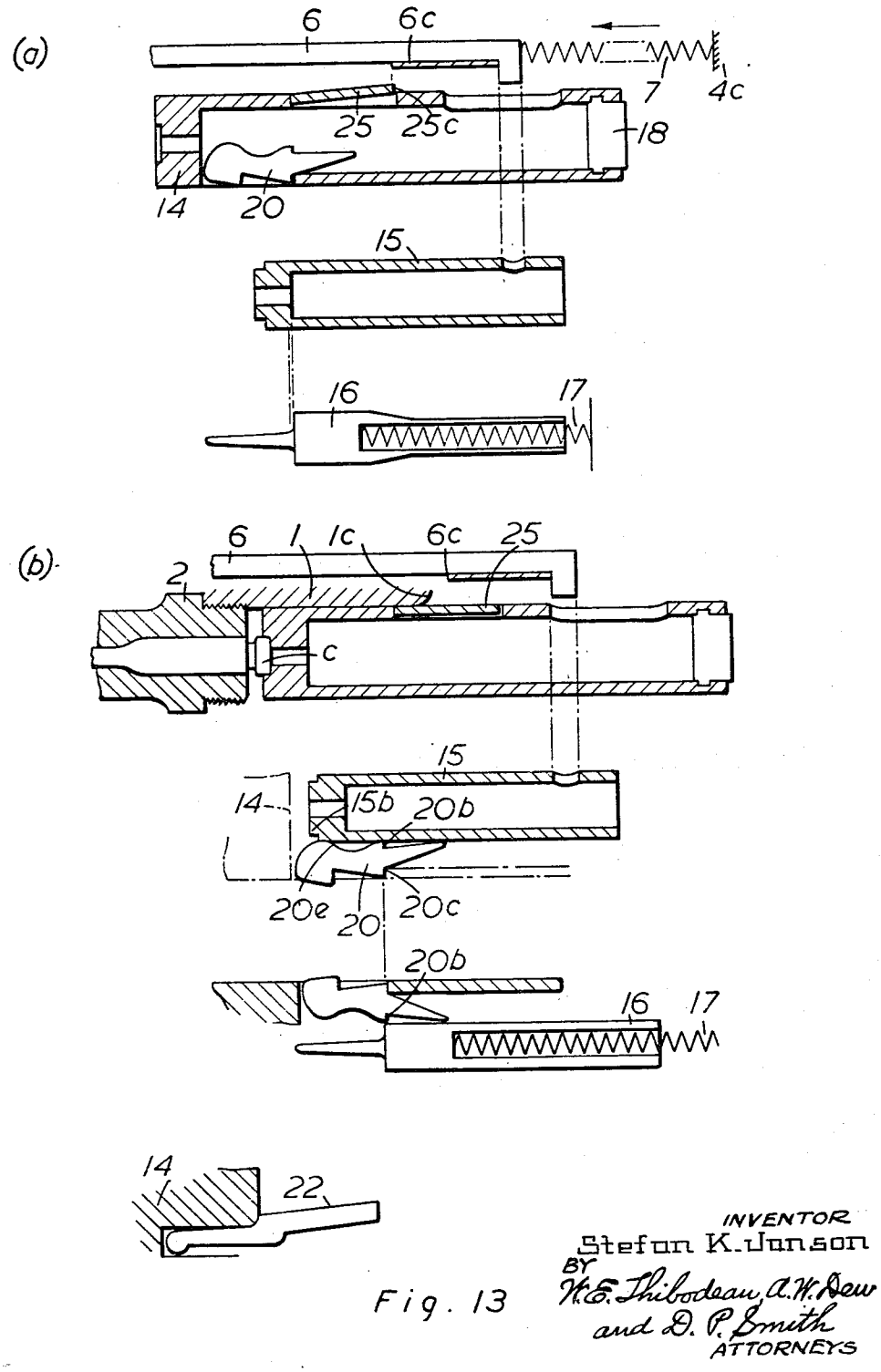


Fig. 13

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2,775,166

PIVOTED BREECH BOLT LOCK FOR GAS PISTON FIREARMS

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Application August 22, 1952, Serial No. 305,805

Claims priority, application Great Britain August 22, 1951

2 Claims. (Cl. 89—191)

This invention relates to a firearm of the kind taking the form of an automatic and self-loading rifle employing a piston the movement of which in a forward direction under the influence of a spring gives rise to the firing operation, whilst the rearward movement of the piston takes place in response to the action of gases which result from the firing of the round.

More especially, the invention is concerned with an improved form of firearm of the above-indicated character, according to which a breech mechanism is provided offering the advantages of being not only reliable in operation under adverse conditions, such for instance as exposure to mud (whether thick or thin), sea water and sand, or sand alone, or operation in a completely dry condition, or under low temperature weather conditions, but also being relatively simple and compact in design and enabling easy access for the control of the firing pin by the trigger mechanism especially where the latter is situated on the rifle at a position in front of the magazine (or equivalent belt or like device) from which the rounds are arranged to be fed successively into the rifle.

To the foregoing end, an automatic firearm of the kind already referred to comprises, in accordance with the invention, a recoiling breech block which itself incorporates a spring loaded sear adapted to control the firing pin, a further feature of the invention consisting in the provision of a piston catch so arranged as to prevent the return spring energy of the piston being applied to locking means, such as locking levers, during the axial travel of the breech block.

Thus, in carrying out the invention according to one convenient example, the rifle may be equipped with a breech mechanism comprising a gas operated piston housed in a cylinder lying parallel to and above the barrel, and a cylindrical breech block axially displaceable within the body of the rifle, the body being situated so that the axis of the breech housing is in line with the axis of the barrel, thus providing for straight through reaction, thereby minimising jump of the rifle on recoil. Within the breech block there are contained the components consisting of a firing pin, a firing sleeve, a firing pin spring, an end plate, a system of locking levers, a sear, a sear spring, a piston catch with its spring, and an extractor and extractor spring. The piston provides a housing for the main return spring that acts on the piston. The rear end of the piston carries an extension or lug which fits rigidly into the firing sleeve which is housed inside the cylindrical breech block. The firing sleeve provides a housing for the firing pin which is actuated by the firing spring, the latter being housed within the firing pin and retained in the breech block by the end plate. The breech is arranged to be positively locked during firing by two side locking levers housed in corresponding recesses in the front part of the breech block. These locking levers are provided with retaining shoulders which control the firing pin and permit its release only when the breech is in locked position. On run-out, the rocking levers are actuated by the firing sleeve

when locking, and on the recoil stroke by the firing pin when unlocking. The front underside of the breech block contains a flat sear spring and a sear which controls the firing pin during the single shot action of the rifle. The front end of the sear is arranged to be operated in locked position of the breech by a stationary sear lever forming part of the trigger mechanism, the latter being attached to the body of the rifle in front of the feeding magazine. The rifle is fired off the sear during single shot action, and during automatic bursts the sear is kept permanently depressed in the locked position of the breech block and the rifle fires straight off the retaining shoulders on the locking levers. The front top side of the breech contains a spring loaded piston catch, which by means of engagement with a corresponding bent on a rear portion of the piston enables, on run-out, the return spring energy to be transferred straight into the breech block, thus providing reliability of the mechanism under adverse conditions. Prior to the locked position of the breech, the piston catch is arranged to be depressed on run-out by corresponding cams on the body of the rifle and enables the firing sleeve and locking levers to lock the breech in the body.

The invention will now be described by way of example with reference to the accompanying drawings, wherein:

Figure 1 represents a side elevational view of an automatic rifle embodying the invention according to one suitable example;

Figure 2 is a plan of Figure 1;

Figure 3 is an end elevation of Figure 1;

Figure 4 is a longitudinal section of a part of Figure 1, on an enlarged scale;

Figure 5 is an enlarged sectional view taken at the line A—A of Figure 1, showing parts of the breech block construction;

Figure 6 is an enlarged view, in elevation, of the breech block;

Figure 7 is a front elevation of Figure 6;

Figure 8 is a rear elevation of Figure 6;

Figure 9 is a section taken through the line B—B of Figure 6;

Figure 10 is a section taken through the line C—C of Figure 7;

Figure 11 is a section taken through the line D—D of Figure 6;

Figure 12 is a schematic representation of the behaviour of parts of the breech mechanism during the recoil stroke, whilst

Figure 13 demonstrates schematically the behaviour of parts of the breech mechanism as run-out occurs.

Referring now to these drawings, and initially to Figures 1, 2, 3 and 4, the numeral **1** designates the main body of an automatic rifle of the character hereinbefore referred to. Suitably fitted to the body **1** is a barrel **2** having a foregrip **3** fitted thereon. At the rear of the body **1** is releasably applied a butt **4**, the release being ensured by means including a catch **4***a* (Fig. 4) acting against a spring **4***b*.

Above the level of the barrel **2** is mounted the cylinder **5** for an axially slidable piston **6**. Within a bore **6***a* at the tail of the piston **6** (Fig. 4) is accommodated a main spring **7** the rear end of which is guided on a rod **8** extending from the butt **4** and bears against the butt as indicated at **7***a*. At the head of the cylinder **5** is formed a chamber **5***a* in communication with the bore **2***a* of the barrel **2** through a port **5***b*, thus enabling the passage of gases (resulting from firing of a round) from the bore **2***a* into the chamber **5***a* after a bullet has passed the port **5***b* when firing has occurred, and enabling the gas pressure to act on the piston **6** and move the same against the action of the spring **7**. Manual movement of the piston **6**, for cocking purposes, is effected through a cocking

handle **9** extending laterally of the piston **6** as shown in Figures 2 and 3.

To the underside of the body **1** is fitted a trigger mechanism, indicated generally at **10**, and an associated hand grip **10***a*, whilst at a position behind the trigger mechanism suitable provision is made for the attachment of a magazine **11** (Fig. 1).

Above the level of the cylinder **5** is mounted a loop-shaped bracket **12** which serves both as a carrying handle for the rifle and as a support for an optical sight **13** over which is applied an open-ended guard **13***a*. The rifle is also fitted (Figs. 1, 2 and 3) with an aperture sight **13***b* and an erectable emergency fore-sight **13***c*.

Within a bore **1***a* in the body **1** is mounted a movable breech block **14** which, under given conditions described later herein, can execute axial displacements between the position as shown in Figure 4 and the butt end **4***c*. As will be seen from Figure 4, the breech block **14** comprises a cylindrical body having therein an elongated aperture **14***a* through which extends a lug **6***b* formed as an integral part of the piston **6**. During the course of reciprocation of the piston **6**, the lug **6***b* can impart axial movement to the breech block **14** in one direction or the other by making driving engagement with one or other of the ends of the elongated aperture **14***a*, assuming the breech block **14** to be free when such engagements occur.

Referring now also to Figures 6–11 inclusive, the cylindrical breech block body **14** houses concentrically therein an axially slidable firing sleeve **15** within which is concentrically housed a firing pin **16** having a striker **16***a*. The pin **16** houses part of a double column spring **17** which acts between the pin and an end plate **18** fitted in bayonet-like connection to the body **14**. Two side locking levers **19**, **20** (for positively locking the breech during firing) are housed in corresponding recesses in the front part of the body **14**. The levers **19**, **20** are formed with lugs **19***a*, **20***a*, retaining shoulders **19***b*, **20***b*, and are shaped also to rock about fulcrum points **19***c*, **20***c*. The lugs **19***a*, **20***a* of the locking levers **19**, **20** are shown in the locking position that is caused by engagement of a cam surface on the front end portion **15***b* of sleeve **15** with the levers themselves.

The front underside of the breech block **14** (Fig. 10) contains a flat sear spring **21** which bears against a sear **22** fulcrumed at the point **22***a*. The sear **22** acts, by its surface **22***b* engaging with the end surface **16***b* of the firing pin **16**, to hold the pin in withdrawn position as will be apparent hereinafter. In Figure 4, the sear **22** is shown with its front end portion adapted to be engaged by a sear lever **23** which is urged in an upward direction by rearward movement of a trigger bar **24** when the trigger **10** is depressed.

The front top side of the breech block **14** contains a piston catch **25** engaged by a spring **25***a* which tends to hold the catch in a position projecting outwardly of the block **14**, in order to ensure engagement between the face **25***c* of the catch (Fig. 10) and a protuberance **6***c* on the piston **6**. When the block **14** is in the position shown in Figure 4, the piston catch **25** is held inwardly compressed by a suitably shaped ramp (not shown) forming part of the body **1**.

At the front end of the breech block **14** a conventional form of extractor **26** is arranged, with a co-operating spring **26***a* as shown. The cartridge case, after being ejected in a conventional manner through a suitable ejection opening (not shown) in the body **1** is disposed of in suitable direction by way of the deflector **27** shown in Figure 2.

By means of aperture **15***a* formed in the firing sleeve **15** within the breech block **14**, a rigid driving connection is made between the piston **6** and the sleeve **15** through the continual completely fitting engagement of the lug **6***b* within the aperture **15***a* as shown in Figure 4.

The locking of the breech block **14**, when in the firing position, is shown more clearly in Figure 5 wherein the lugs **19***a*, **20***a*, being spread apart by the cam surface **15***b*, engage within a body recessing as at **1***b* near to the rear end of the barrel **2**. Unlocking of the breech block **14** is performed by movement of the firing pin **16** in a rearward sense during which a ramp **16***c* (Figs. 5 and 9) urges against the tail portions **19***d*, **20***d* of the levers **19**, **20**, thus turning these levers about the respective fulcrum points **19***c*, **20***c*.

The action of the rifle when recoil (from the position represented in Fig. 4) occurs will now be considered. In the fully fore condition indicated schematically at (*a*) of Figure 12 the firing pin **16**, fully within the firing sleeve **15** which in turn is within the breech block **14** occupies the position where its striker **16***a* is assumed to have fired a cartridge C which has been chambered in the barrel **2**. In this exploded view of the parts the piston **6** is about to be moved rearwardly towards the right, against the action of the spring **7**, the lug **6***b* of the piston being rigid (through aperture **15***a*) with the firing sleeve **15** and engaging only the left-hand end of the elongated slot **14***a* in the breech block **14**. The firing pin **16** is shown with its spring **17** assumed to be bearing against the end plate **18** and the breech block **14** is to be understood as being in the locked position, i. e. with the lugs **19***a*, **20***a* of the locking levers occupying the position shown in Figure 5.

As the piston **6** is moved back (by the gas pressure) over the distance *a* as indicated at (*b*) of Figure 12 it moves the sleeve **15** correspondingly and therewith the firing pin **16** whereupon its ramp **16***c* acts on the tail portion as at **20***d* of the locking levers, only one of which (**20**) is shown, so that their respective locking lugs, as at **20***a*, are brought into unlocked position. For an initial period at this stage the breech block **14** remains practically stationary, owing to inertia. The next stage, as represented at position (*c*), shows the piston **6** after it has travelled into engagement with the right hand end of the elongated aperture **14***a*, thence taking the breech block towards the rear and for some period both the piston **6** and breech block **14** travel together. At this point the firing pin spring **17** is fully compressed and exerting a pressure against the end plate **18**, thereby constituting a source occasioning movement of the breech block **14** relatively to the piston **6** until the exposed piston catch **25** stops against extension **6***c* of the piston **6**. In such relative position of piston **6** and breech block **14** these two components travel up to the end of the recoiling stroke which accords with the position indicated schematically at (*a*) of Figure 13 representing the run-out position.

On run-out, as shown at (*a*) of Figure 13, the piston **6** is acted upon by the spring **7** and therefore moves forward so that, owing to engagement between extension **6***c* and **25***c*, the catch **25** directly imparts the forward movement to the breech block **14**.

Prior to the fully forward condition shown at position (*b*) of Figure 13, the piston catch **25** is being depressed by a suitable ramp **1***c* of the body **1**, thus causing the extensions **6***c* and **25***c* to disengage and permitting further free forward movement of the piston **6** to take place. Meanwhile the breech block **14** is stopped against the base of the cartridge C to be fired. The further movement aforesaid of the piston **6**, rigidly connected with sleeve **15**, and after the breech block **14** has been stopped, causes the locking action of the breech block. This is effected by the cam surface on the face of the portion **15***b* of the firing sleeve **15** acting on the shaped part **20***e* of the locking lever **20** and turning the lever about its fulcrum **20***c*. Up to this, the firing pin **16**, being pressed by its spring **17**, is restrained from forward movement by

the retaining shoulder **20***b* of the locking lever. In the fully locked position the firing pin **16** is disengaged from the shoulder **20***b* and free to move forward. When the rifle is set for single shot firing, by actuation of a suitable mechanism pertaining to the trigger assembly in response to setting of a push button **30** (Figs. 2 and 3), which mechanism can also be set for automatic firing, the sear **22** is free to engage and arrest the firing pin **16**, so that when the trigger is pressed the sear releases the firing pin whence the shot is fired.

When the rifle is set for automatic firing, the sear **22**, in fully forward position of the breech block **14** sets itself in position by riding over the ramp portion of sear lever **23** (Fig. 4) out of engagement with the firing pin **16**, thus enabling the firing pin **16** to be released forward straight from the retaining shoulder **20***b* of the locking lever **20**.

I claim:

1. An automatic firearm comprising a body portion, a barrel extending forwardly from said body portion, a piston disposed to be moved rearwardly by propellent gases from the said barrel, a breech block mounted for translation in said body portion, an elongated aperture formed in said breech block, a firing sleeve within said breech block, said firing sleeve having a cam surface extending from the forward face thereof, a firing pin within said firing sleeve and extending through the said cam surface of said firing sleeve, a plurality of levers pivotally mounted within said breech block and arranged to lock the same to said body portion in battery position, a rigid connection between said piston and said firing sleeve, said connection passing through said aperture whereby upon discharge of a cartridge the said piston moves rearwardly carrying the said firing sleeve and firing pin therewith to unlock the said levers and upon engagement with an end of said elongated aperture to move the said breech block rearwardly to eject the cartridge, a piston catch pivotally mounted on said breech block, a spring normally urging against said catch to hold the same in a position projecting outwardly of said block, an extension integral with said connection abutting said catch upon forward movement of said connection whereby said block is forced into battery position before said sleeve reaches its forward position, said catch adapted to be cammed inwardly out of engagement with said extension substantially upon reaching battery position, thereafter said sleeve is moved forwardly by said connection to lock said block in battery position.

2. An automatic firearm comprising a body portion, a barrel extending forwardly from said body portion, a piston disposed to be moved rearwardly by propellant gases from the said barrel, a breech mechanism comprising, a hollow cylindrical breech block mounted for translation in said body portion, a hollow firing sleeve concentric with and slideable in said breech block, a cam surface extending from the forward face of said sleeve, a concentric firing pin slideable within said sleeve, said pin having a ramp formed medially thereon, a plurality of radially spaced levers, said levers having a lug formed at one end, a tail portion at the other end thereof and a retaining shoulder between said lug and a fulcrum point at the median portion of said levers about which said levers are pivotally mounted in said breech block, said lug portion of said levers acted upon by said firing sleeve cam to lock said breech block in battery position when said sleeve is in forward position, a rigid connection between said piston and said sleeve, said connection passing through an elongated aperture in said breech block whereby said sleeve is moved rearwardly to disengage said cam surface and said lugs, said sleeve drawing said firing pin rearwardly simultaneously whereby said firing pin ramp engages said lever tail portion to unlock said breech block, said connection engaging the rear end of said aperture to move said breech block, sleeve and pin simultaneously and eject a cartridge; on forward movement of said breech block, sleeve and pin in response to resilient means acting against said piston, said retaining shoulders engaging and restraining movement of said firing pin until said breech block is locked in battery position whereupon said firing pin is released by said shoulders.

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