

July 22, 1947.

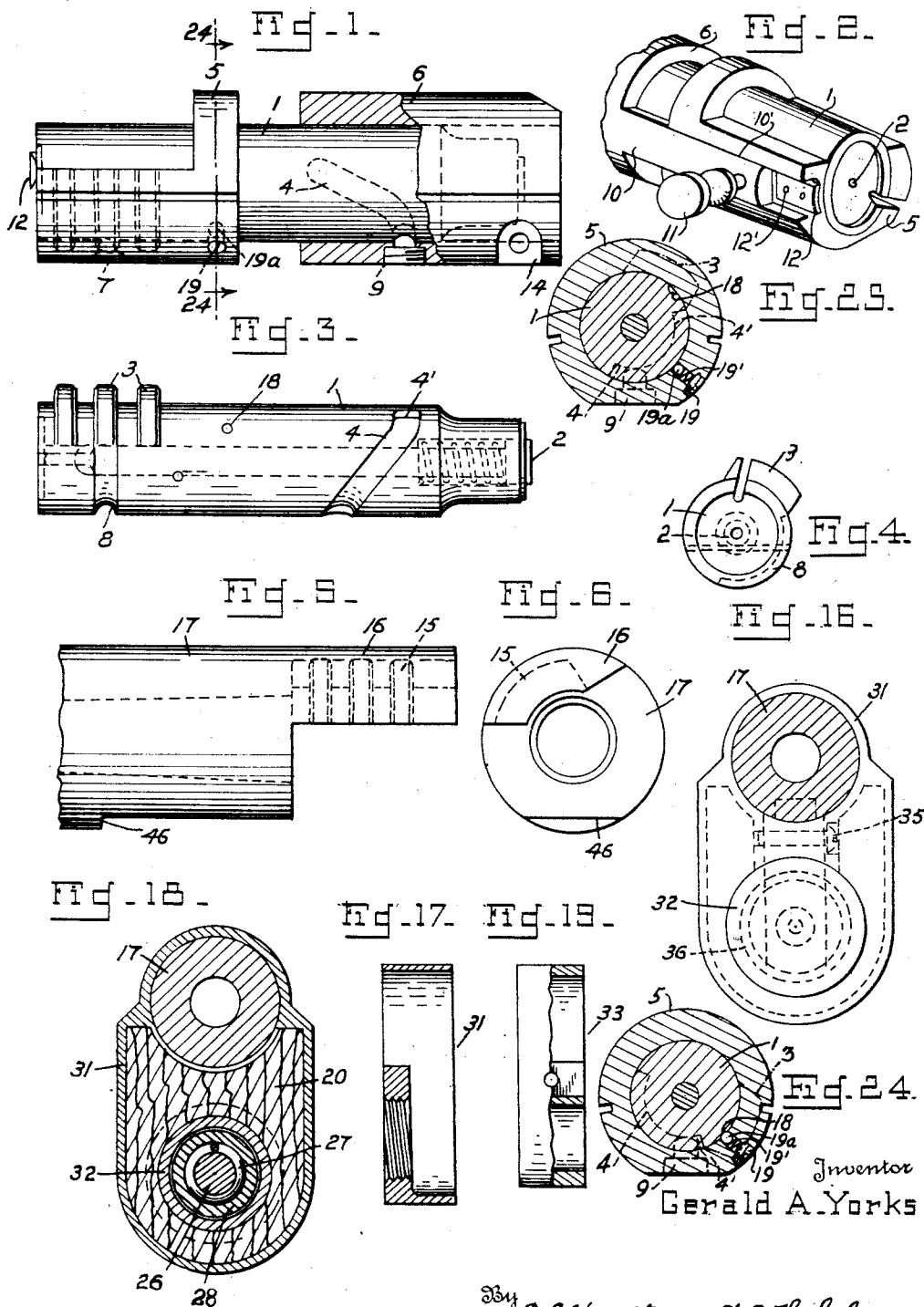
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2,424,264

COMPOSITE BOLT STRUCTURE FOR SEMI-AUTOMATIC RIFLES

Filed Oct. 27, 1942

4 Sheets-Sheet 1



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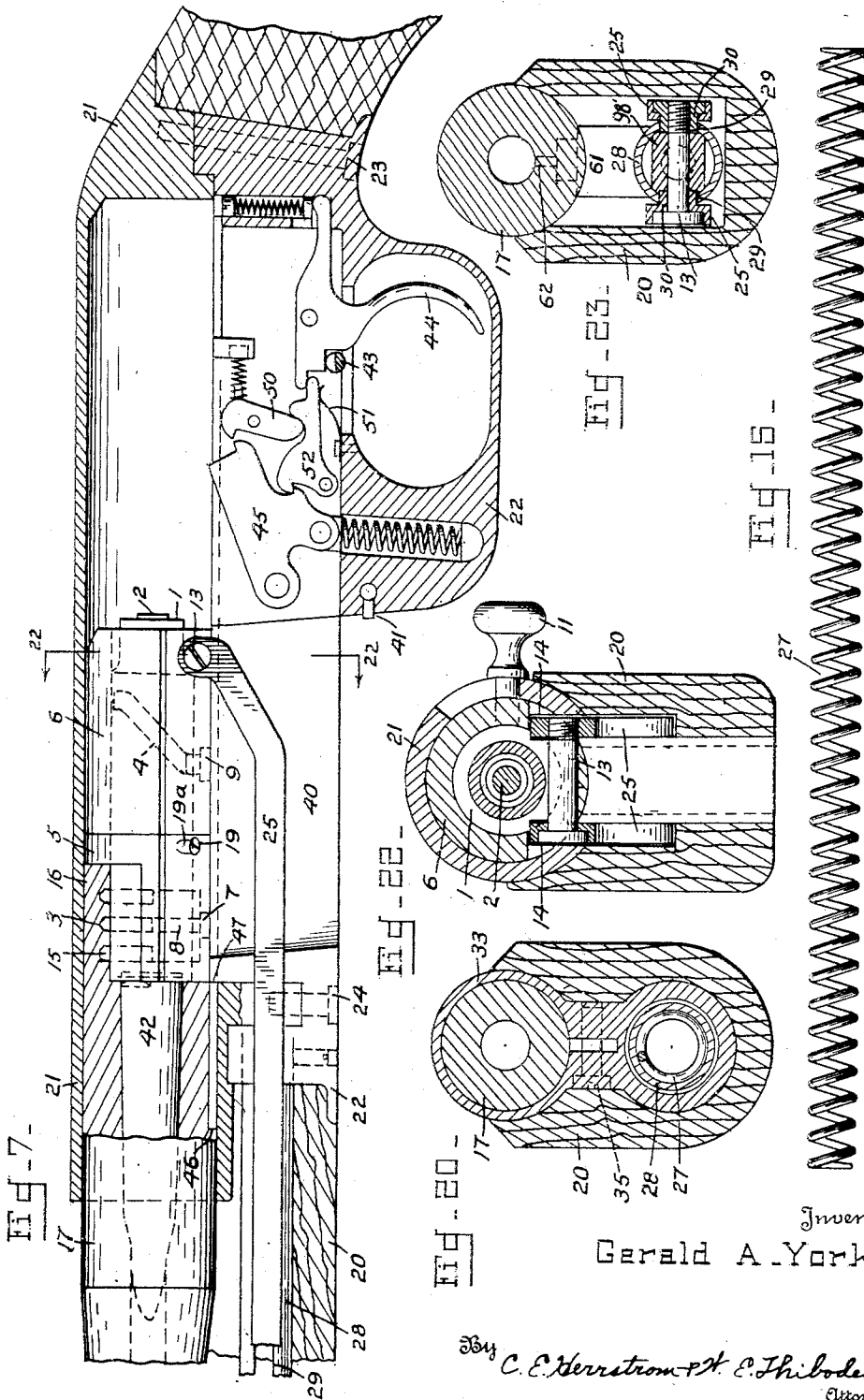
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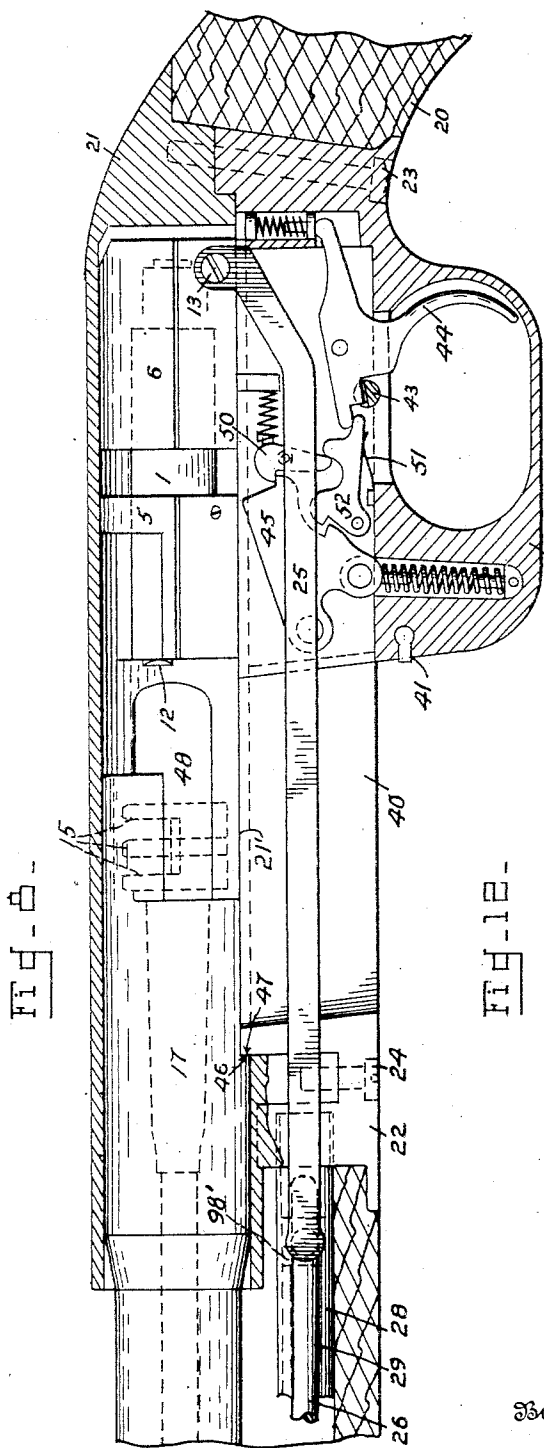


FIG-12-

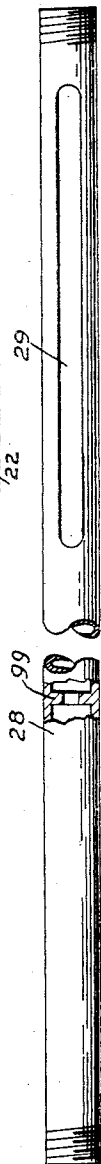


FIG-13-

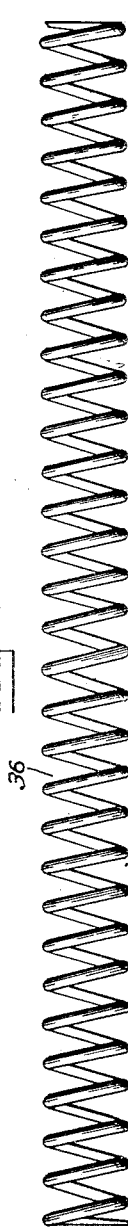
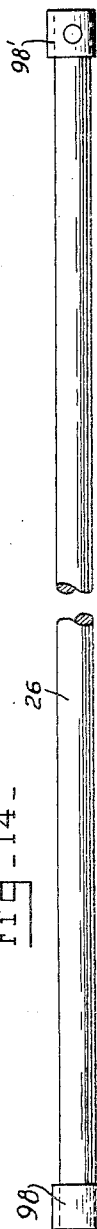


FIG-14-



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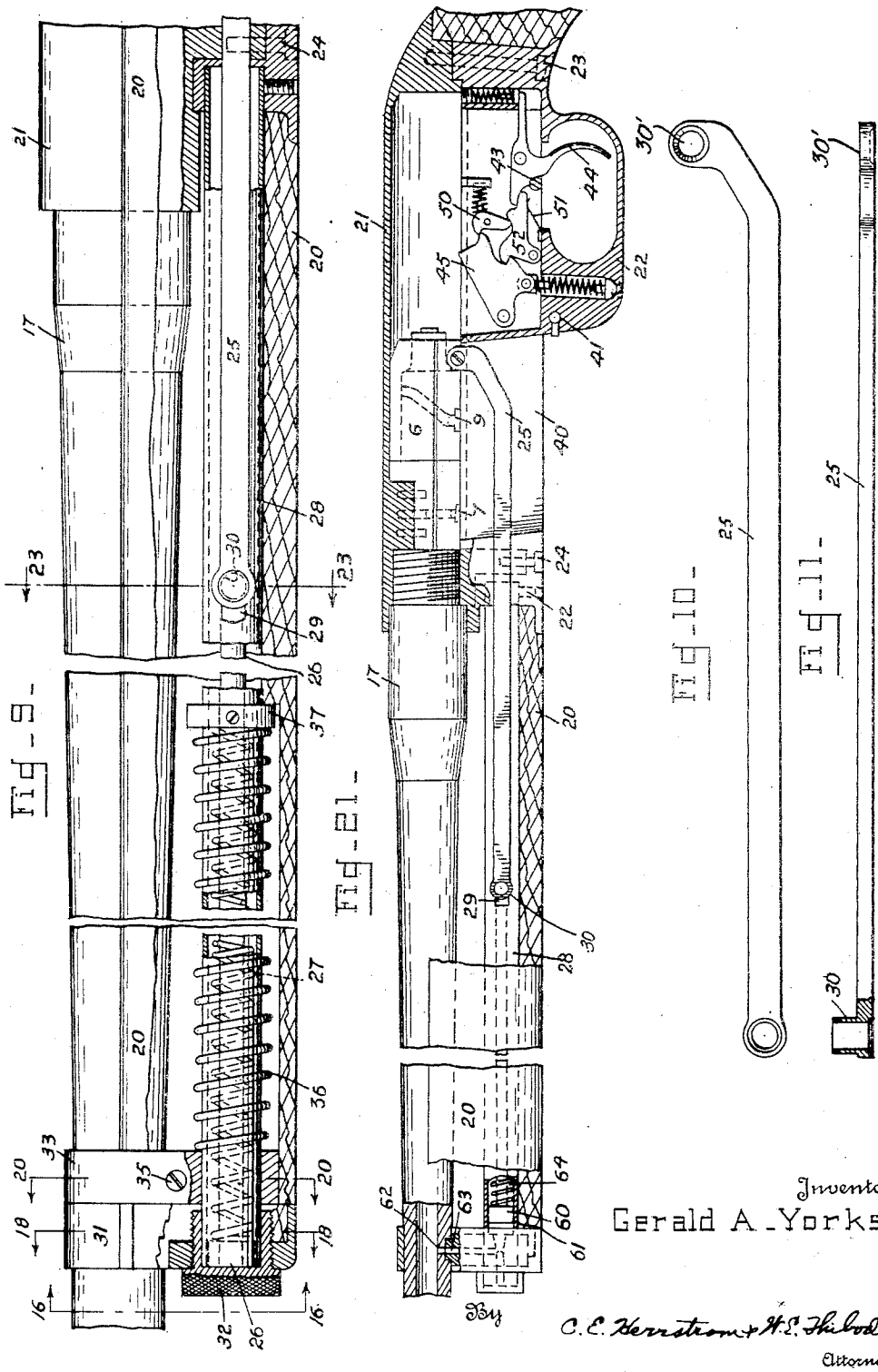
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4 Sheets-Sheet 4



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COMPOSITE BOLT STRUCTURE FOR
SEMI-AUTOMATIC RIFLES

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Application October 27, 1942, Serial No. 463,471

2 Claims. (Cl. 42—3)

(Granted under the act of March 3, 1883, as
amended April 30, 1928; 370 O. G. 757)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

The present invention relates to a rifle and more particularly to an improved breech-locking assembly therefor.

One of the objects of the present invention is to provide a new and improved breech-locking assembly suitable for use in any type of rifle, but particularly adapted for use in an automatic or semi-automatic weapon of either the recoil- or gas-operated type.

A more particular object is to provide an automatically operable breech-locking mechanism which incorporates the advantages of a disengageable bolt-action locking means disposed at the forward end of the bolt, thereby assuring positive gas-tight abutment of the bolt with the barrel opening.

A further object is to provide an improved semi-automatic weapon of either the gas- or recoil-operated type, having a breech-locking mechanism of the character described.

The foregoing and other objects may be attained in accordance with the present invention, a preferred embodiment of which is diagrammatically illustrated in the several figures of the appended drawings, wherein:

Figure 1 is a side elevation view of the breech-locking assembly with a portion broken away showing the positioning cam pin in the cam groove when the rearward sleeve is in extended position;

Figure 2 is a fragmentary perspective view of the breech-locking assembly of Figure 1;

Figure 3 is a side elevational view of the bolt proper rotated 90° from the position shown in Figure 1;

Figure 4 is an elevational view of the forward end of the bolt as viewed from the left of Figure 3;

Figure 5 is a side elevation of the barrel extension;

Figure 6 is an end elevation of the barrel extension shown in Figure 5;

Figure 7 is a longitudinal section taken on a vertical plane through the breech mechanism of a recoil-operated semi-automatic gun, the parts being shown in the firing or in battery position;

Figure 8 is a view of the same gun in longitudinal cross section showing the barrel in the recoil or out of battery position with the breech open;

Figure 9 is a view of the same gun in longitudinal cross section through the barrel and forestock

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section, showing the barrel mounting and action spring assembly;

Figure 10 is a longitudinal side elevational view of one of the bolt actuating rods employed in the gun shown in Figures 7, 8 and 9;

Figure 11 is a plan view of the actuating rod of Figure 10;

Figure 12 is a longitudinal side elevation of the tube which houses the action control spring and the control rod employed in the gun shown in Figures 7, 8 and 9;

Figure 13 is a side elevation of the spring controlling the recoil of the barrel of the gun shown in Figures 7, 8 and 9;

Figure 14 is a longitudinal view of the action-control rod employed in the gun shown in Figures 7, 8 and 9;

Figure 15 is a longitudinal view of the action-control spring employed in the rifle shown in Figures 7, 8 and 9;

Figure 16 is a detailed front elevational view and partially in cross section of the fore end and barrel mounting of the rifle taken along the line 16—16 in Figure 9;

Figure 17 is a cross sectional view of the barrel mounting cap of the rifle shown in Figure 9;

Figure 18 is a cross sectional view taken on line 18—18 in Figure 9;

Figure 19 is a side elevational view partially in cross section of the barrel band or guide member shown in Figure 9;

Figure 20 is a detailed cross sectional view of the barrel band or guide member taken along the line 20—20 in Figure 9;

Figure 21 is a longitudinal view partly in cross section taken on a vertical plane through the breech mechanism of a gas-operated rifle in accordance with the present invention, the breech-locking mechanism being shown in closed or in battery position;

Figure 22 is a transverse cross sectional view taken along the line 22—22 in Figure 7;

Figure 23 is a transverse cross sectional view taken along the line 23—23 in Figure 9;

Figure 24 is a sectional view through line 24—24 of Figure 1; and

Figure 25 is a view similar to that of Figure 24 but showing the position assumed by the bolt when rotated into engagement with the barrel extension.

Referring now particularly to Figures 1, 2, 3 and 4, the improved breech-locking assembly of the present invention comprises a bolt 1, carrying a firing pin 2 and provided at its forward end with bolt-action disengageable lugs 3. Adjacent

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the rearward end of the bolt is a spiral cam groove 4 ending in a circumferential slot 4', the slot terminus 4' providing a clearance means for a purpose to be hereinafter more particularly described.

Disposed rearwardly of the lugs 3 is a cup-shaped depression 18 adapted to be engaged by a ball 19a. A forward sleeve 5 has a hole drilled in the lower portion thereof, and a compressed spring 19' and a threaded plug 19 holds the ball 19a resiliently against either depression 18 or the rotatable bolt 1. When the bolt 1 in the forward sleeve 5 is rotated to the position shown in Figures 1 and 24, the depression 18 in the bolt will be in alignment with the plug 19, so that the ball 19a will seat in the shallow depression 18, thereby providing a snap lock.

The bolt is supported by means of two sleeves, namely, the forward sleeve 5 and a rearward sleeve 6 slidably mounted in the guideway 21' of the receiver 21—22. A pin 7 passing through the body of the forward sleeve 5 engages a circumferential slot or groove 3 in the bolt 1. The slot or groove 3 extends about the bolt 1 for a distance slightly greater than 90 degrees, as shown in Figure 4, whereby the bolt 1 can be rotated a quarter turn in the forward sleeve 5, but prevented from longitudinal displacement relative to the sleeve 5. The rearward sleeve 6 is provided with a cam pin 9 which engages the cam groove 4 in the bolt proper for the purpose of rotating the bolt 1 a quarter turn when the rearward sleeve 6 is displaced axially with reference to the bolt proper. The rearward sleeve 6 is further provided with a forwardly extending axially parallel portion 19 (Figure 2) which is adapted to slide in a corresponding groove 10' milled in the side of the forward sleeve 5, thereby maintaining a fixed alignment between the forward sleeve 5 and the rearward sleeve 6, during axial displacement of the latter from the former. A bolt handle 11 is affixed to the extension 10 as shown in Figure 2. In the groove 10' is positioned an extractor 12 having a hook on its rear end which rests in a milled groove in the side of the forward sleeve 5, the extractor being secured by pins 12'. The rearward sleeve 6 has a recess 14 milled in each side thereof, these recesses being adapted to connect to the actuating rods 25 by means of a threaded pin 13 as shown in Figures 7 and 22.

In the case of a recoil-operated rifle as shown in Figures 7, 8 and 9, the lugs 3 on the forward end of the bolt 1 (Figure 3) are adapted to engage corresponding grooves 15 (Figure 5) in a barrel extension 16 on the barrel 17. When the bolt and associated mechanism is in battery position, the rearward sleeve 6 abuts the forward sleeve 5 as shown in Figure 7 and the lugs 3 of the bolt 1 are in engagement with the grooves 15 in the barrel extension 16, as shown in Figure 25. When the rearward sleeve is moved rearwardly, the bolt 1 and the forward sleeve 5 are temporarily held in position by the engagement of the lugs 3 with the grooves 15 and by the action of the ball 19a in the depression 18. However, as the rearward sleeve 6 moves rearwardly, the cam pin 9 sliding in the cam groove 4 causes the bolt 1 to rotate a quarter turn, thereby disengaging the lugs 3 from the grooves 15 in the barrel extension 16. When the lugs 3 are completely disengaged, the continued rearward motion of the rearward sleeve 6 withdraws both the bolt 1 and the forward sleeve 5, and at the end of its rearward motion, the assembly is in the out

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of battery position shown in Figures 8 and 24. When the rearward sleeve is in its extended position, the cam pin 9 is disposed at the rearwardmost portion of the cam groove 4, as shown in Figure 24, where the cam groove ends in the circumferential slot 4'. This terminal slot 4' of the cam groove provides clearance for the pin 9 so that the same can force a complete quarter turn of the bolt 1 when the rearward sleeve 6 is moved in recoil to the rear of the weapon. The circumferential length of the slot 4' is slightly less than the radius of the pin 9 thereby allowing the pin 9 to complete the full quarter turn of the bolt 1. When the bolt pin 9 has a portion thereof in the slot 4', the slot 4' with the snap lock 18, 19 and 19a provides a temporary disengageable locking means so that when the rearward sleeve 6 begins to move forwardly, the two sleeves 5 and 6 maintain their extended relationship until the head of the bolt 1 strikes the end of the barrel 17, this impact overcoming the action of the snap lock 18, 19 and 19a and causing the cam pin 9 to slide out from its temporary locked position in the end 4', of the cam groove 4. As the rearward sleeve continues to advance forwardly, the cam pin 9 sliding in the groove 4 causes the bolt 1 to rotate a quarter turn, thereby bringing the lugs 3 into engagement with the grooves 15 in the barrel extension 16, locking the gun in battery position, as shown in Figures 7 and 25.

Referring now to Figures 7, 8 and 9, the recoil-operated rifle diagrammatically shown therein, in addition to the breech-locking mechanism hereinbefore described, comprises a stock 20 on which is mounted the barrel 17 and a separable two-piece receiver 21 and 22 (Figure 7), the two parts of the receiver 21 and 22 being held together by two screws 23 and 24 which also affix the receiver to the stock 20. The forward sleeve 5 and rearward sleeve 6 are mounted for reciprocation in the receiver 21—22.

In order to actuate the breech-locking mechanism automatically, the rearward sleeve 6 is connected by means of the threaded pin 13 to the ends 30' of two actuating rods 25, the details of one of which are shown in Figures 10 and 11. The forward end 30 of the actuating rod is operatively connected to a control rod 26, the details of which are shown in Figure 14. The control rod 26 is surrounded by a strong compression spring 27 (Figures 9 and 15) substantially throughout its length. Both the rod 26 and the spring 27 are housed in an elongated tube 28, the details of which are shown in Figure 12. The forward end of the spring abuts an enlarged collar 98 formed integrally with the rod 26. The tube 28 is provided at an internal mid-portion thereof with an abutment 99 against which the rear end of the spring 27 abuts. The tube 28 (Figure 12) is provided with a longitudinal slot 29, adjacent that end of the tube which screws into the receiver. Through this longitudinal slot 29, extend bosses 30 (Figure 11) on the actuating rods 25, these bosses being fastened to the collar 98' of the control rod 26 by pin 13 (Figure 23). The bosses 30 slide in the longitudinal slots 29 (Figures 12 and 23) during recoil and counter-recoil of the weapon. The tube 28 is held in position at its forward end by means of a barrel mounting cap 31 (Figure 9) and a threaded nut 32, the details of the cap being shown in Figures 16 and 18. A barrel band 33, the details of which are shown in Figures 19 and 20, is undercut to provide for expansion and is slipped over and rigidly clamped to the barrel 17, by means of a

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screw 35. As the barrel 17 recoils, the barrel band 33 slides on the tube 28, and thereby compresses a recoil spring 36, which surrounds the tube 28 against the spring stop 37 (Figure 9) which is rigidly mounted on the tube 28.

In order to prepare the firearm for the first shot, a conventional single-row type cartridge magazine (not shown) is inserted in the magazine well 40 (Figures 7 and 8), where it is secured in position by a spring catch 41 of conventional design. Thereafter the bolt handle 11 (Figure 2) is withdrawn rearwardly all the way and then released. Inasmuch as the spring 27 is compressed between the collar 98 on the rod 26 and the abutment 99 in the tube 28 by this rearward pull on the bolt handle, the bolt, upon release of the handle is carried forwardly, the face of the front sleeve 5 carrying a cartridge 42 (Figure 7) into the chamber of the barrel 17, in position for firing.

Where desired, the weapon may be made safe by means of a conventional sliding cross bolt safety 43. When this safety 43 is pushed through to the off position, the trigger 44 can be pulled, releasing hammer 45 for striking the firing pin 2, and exploding the cartridge 42. The resulting recoil causes the barrel 17 and composite bolt to move rearwardly. As the shoulder 45 (Figure 8) comes in contact with the projection 47 on the receiver 22, the barrel 17 is abruptly brought to a stop. However, the momentum imparted to the composite bolt and associated mechanism causes the rearward sleeve 6 to continue in motion rearwardly for a short distance. In traveling this short distance, the cam pin 9 moving in the cam groove 4 in the bolt 1 causes the bolt 1 to rotate a quarter turn, thereby disengaging the three lugs 3 on the front end of the bolt 1 from the corresponding grooves 15 in the barrel extension 16. After the lugs have been disengaged, the bolt 1, the forward sleeve 5 and the rearward sleeve 6 continue rearwardly, the cartridge case being extracted from the chamber and ejected through port 48 (Figure 8) in the right side of the receiver 21. Meanwhile, the barrel recoil spring 36 carries the barrel 17 back to its normal position after the barrel is released from the bolt 1.

During the rearward movement of the composite bolt 1, 5 and 6 (Figure 8), the hammer 45 is depressed and engaged by the interceptor 50. When the rearward sleeve 6 comes in contact with the rear of the receiver 21, action control spring 27 (Figure 9), having been compressed during the recoiling action, acting upon the control rod 26 and the connected actuating rods 25, moves the composite bolt forwardly. During this return cycle of the operation, the bolt 1 is held against rotation by the snap lock 18, 19 and 19a and the rearward sleeve 6 is locked in extended position by the terminal portion 4' of the cam groove 4. Accordingly, when the leading face of the forward sleeve 5 contacts a cartridge in the magazine, the extended position of the rearward sleeve is maintained. A cartridge is carried into the chamber of the barrel 17 and when the leading face of the forward sleeve 5 comes in contact with the rear of the barrel 17, the ball 19a is forced out of the depression 18 permitting the cam pin 9 to become disengaged from the slotted portion 4' of the cam groove 4, thereby permitting the rearward sleeve 6 to move forwardly. As the cam pin 9 moves forwardly in the cam groove 4, the bolt 1 is rotated a quarter turn thereby bringing the lugs 3 into engagement with

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the corresponding grooves 15 in the barrel extension 16.

The interceptor 50 holds the hammer until the pressure on the trigger 44 is released, at which time pressure of the sear spring 51 causes the sear 52 to rise, creating a camming action on the lower end of the interceptor 50, disengaging it from the hammer and permitting the sear 52 to engage the hammer 45 as shown in Figure 7, thereby permitting the firearm to be fired with the next pull of the trigger 44.

In the foregoing detailed description, the improved breech-locking assembly of the present invention has been illustrated in conjunction with a recoil-operated semi-automatic firearm. Figure 21 illustrates the application of the breech-locking mechanism to a gas-operated semi-automatic weapon. The construction of this gun is substantially identical to that previously described, with the exception of the gas-operable mechanism. Referring to this figure where parts identical to those used in the recoil-operated gun have been designated by similar reference numerals, the breech-locking mechanism, shown in battery position, is actuated by an actuating rod 25 which slides in a tube 28, the bosses 30 on the actuating rod 25 extending through a slot 29 in the tube 28. The bosses 30 are operatively connected to a piston 60 mounted for reciprocation in a piston cylinder 61. A port 62 in the barrel 17 permits some of the gas created by the explosion of the cartridge to pass through the gas channel 63 and thence into the forward end of the piston cylinder 61. The gas pressure within the cylinder 61 forces the piston 60 rearwardly, and simultaneously compresses a spring 64. The rearward motion of the piston 60 forces the actuating rod 25 in the same direction, thereby operating the breech-locking mechanism in the manner described above. After the breech-locking mechanism has moved to its rearwardmost position, and the cartridge has passed from the barrel 17, thereby reducing the gas pressure in the gas cylinder 61, the compressed spring 64 moves the piston and connected parts forwardly, returning the breech-locking mechanism to battery position.

The term "bolt-action" as used in the specification and appended claims, is employed to designate disengageable locking means of the type wherein a rotatable bolt is provided with lugs or equivalent means, adapted to engage and disengage corresponding grooves in the barrel extension or the barrel receiver, upon rotation of the bolt. It should be understood moreover, that the term does not indicate the nature of the force used to rotate the bolt—i. e., the bolt may be rotated by manual action or by automatic means, as desired.

In the foregoing detailed description of the present invention it will be apparent that many variations may be made without departing from the spirit and scope thereof, I therefore intend to be limited only in accordance with the following patent claims.

I claim:

1. In a firearm, the combination of a barrel provided with a barrel extension, a rotatable and reciprocable bolt having locking elements projecting therefrom and engageable with the barrel extension, said bolt adapted to be rotated in one direction and in a reversed direction for engaging and disengaging, respectively, the locking elements with and from, respectively, the barrel extension, a first and a second sleeve mounted in

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the firearm for sliding axial movement therein relative to each other, the said sleeves surrounding and rotatably supporting the bolt and being disposed for abutting relationship when the bolt is in battery position and for relative axial displacement upon recoil, means for releasably locking said first sleeve to the bolt for temporarily restraining said bolt from rotating, means for securing said first sleeve against axial displacement relative to the bolt, cam means between the bolt and said second sleeve for oscillating said bolt whereby substantially at the end of recoil of the bolt, said sleeves are axially separated and so maintained until the bolt and sleeves are returned to battery position, and means for yieldingly opposing movement of said sleeves away from battery position and for returning the bolt and sleeves to battery position.

2. A composite bolt structure for a firearm having a receiver, comprising a first sleeve slidably mounted in the receiver for forward and rearward movement, a second sleeve longitudinally and axially aligned with said first sleeve slidably mounted in the receiver for forward and rearward movement, a bolt carried by said sleeves for angular movement, cam means cooperable between said bolt and said second sleeve for rotating said bolt respectively in either a forward or reverse direction upon forward or rearward movement, respectively, of said second sleeve, and

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means for temporarily locking said bolt to said first sleeve against the rotation relative thereto whereby said first sleeve is moved rearwardly with said bolt and second sleeve a predetermined distance.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
Re. 15,801	Rychiger	Mar. 25, 1924
15 696,306	Benet et al.	Mar. 25, 1902
783,123	Mauser	Feb. 21, 1905
1,096,324	Stamm	May 12, 1914
1,128,180	Orman	Feb. 9, 1915
2,035,539	Dicke	Mar. 31, 1936
20 1,142,896	Lewis	June 15, 1915
1,365,355	Thompson	Jan. 11, 1921
1,043,670	Chronis	Nov. 5, 1912
1,039,922	Frommer	Oct. 1, 1912
1,056,056	Randall	Mar. 18, 1913
25 1,228,827	Saalfeld	June 5, 1917
1,349,675	Johnson	Aug. 17, 1920
2,098,562	Browning	Nov. 9, 1937
659,507	Browning	Oct. 9, 1900
659,786	Browning	Oct. 16, 1900
30		