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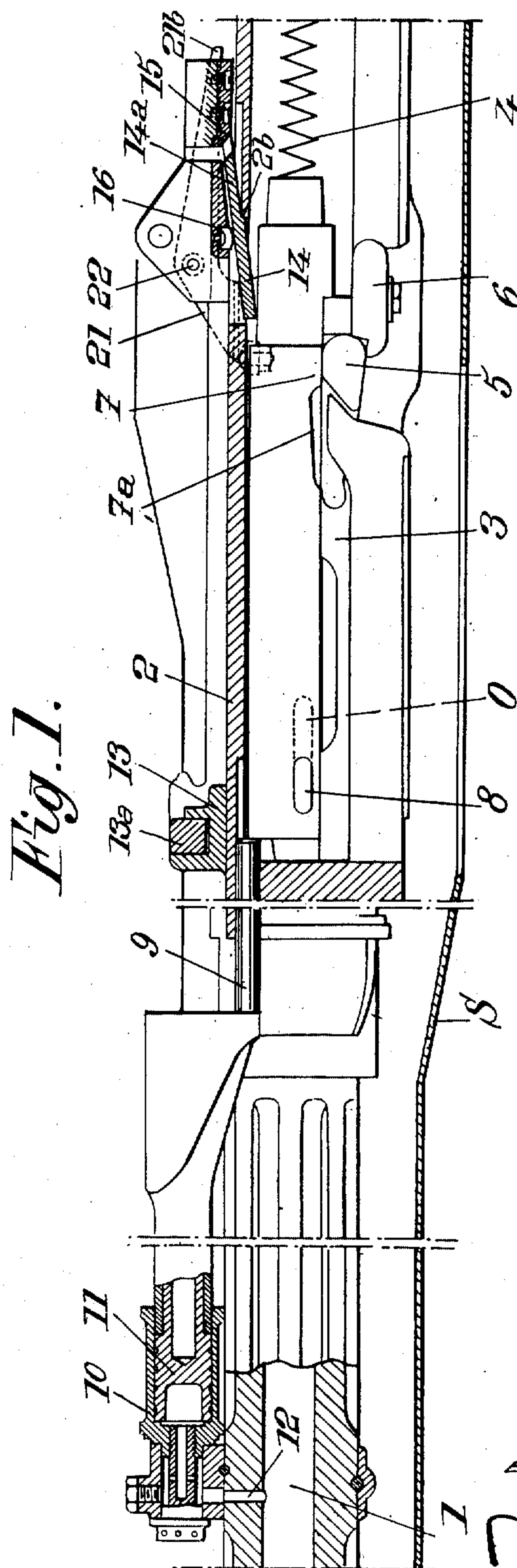
B. MAILLARD

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PIVOTED LOCK FOR BREECH BOLT LOCKING MEMBERS

Filed Dec. 8, 1949

4 Sheets-Sheet 1



INVENTOR
BERNARD MAILLARD,

BY Robert B. Larson
ATTORNEY

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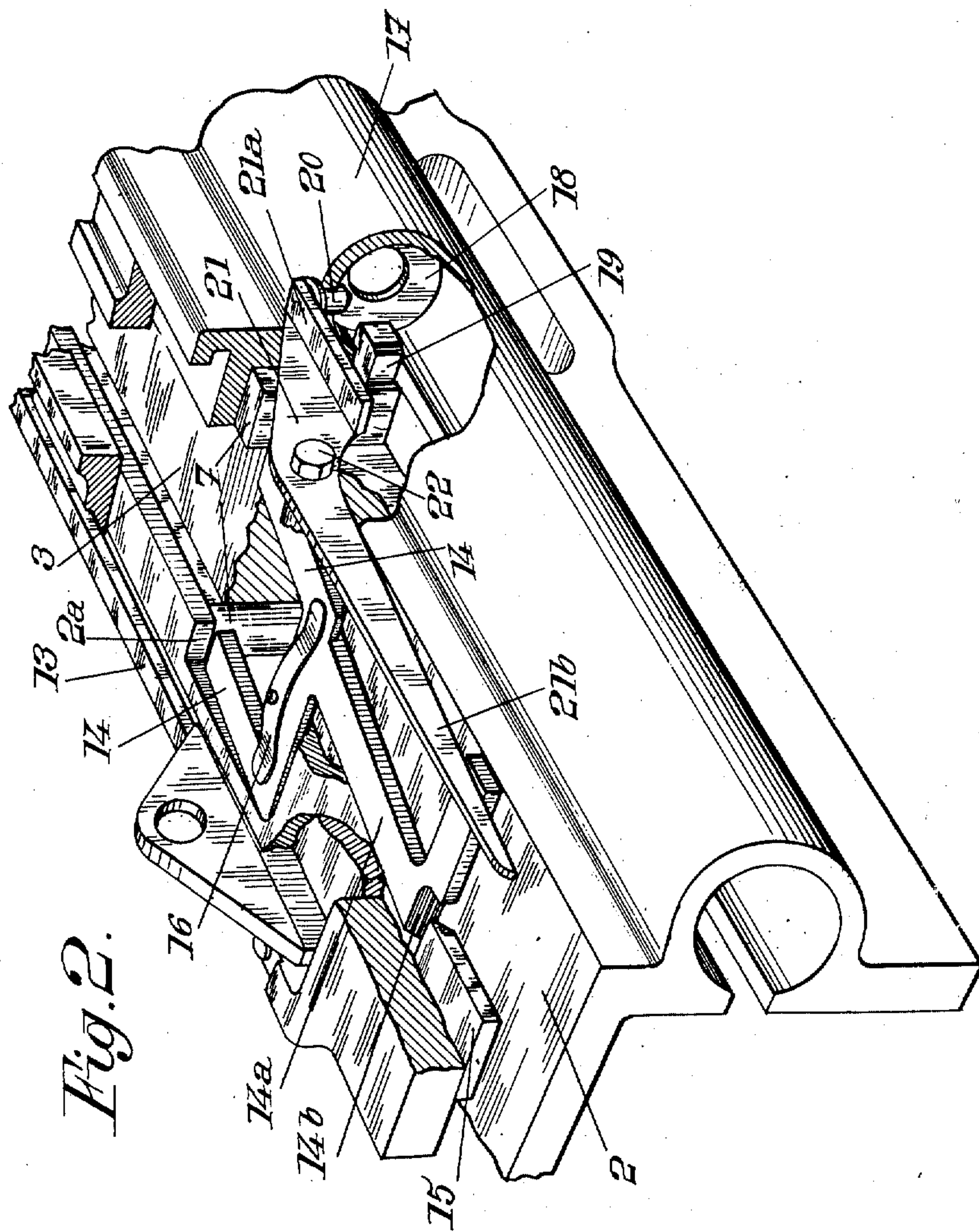
B. MAILLARD

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PIVOTED LOCK FOR BREECH BOLT LOCKING MEMBERS

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INVENTOR
BERNARD MAILLARD,

BY
Robert B. Hanson
ATTORNEY

Feb. 6, 1951

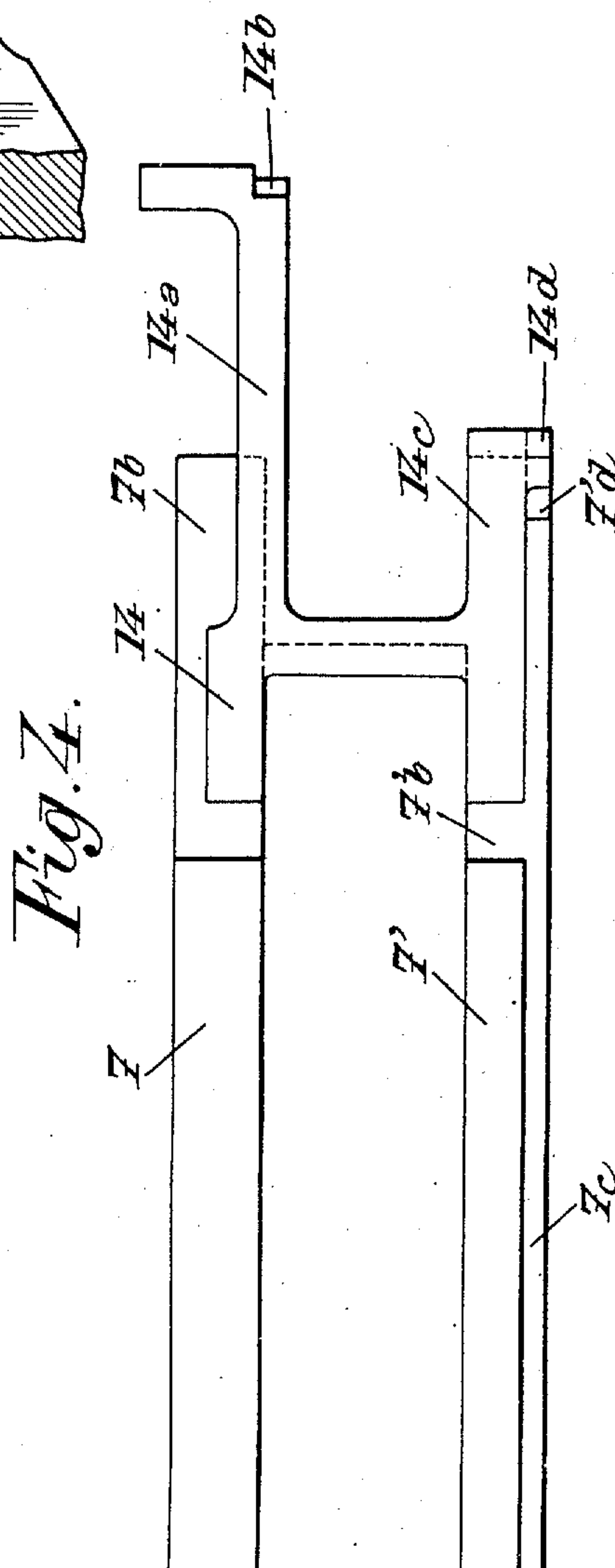
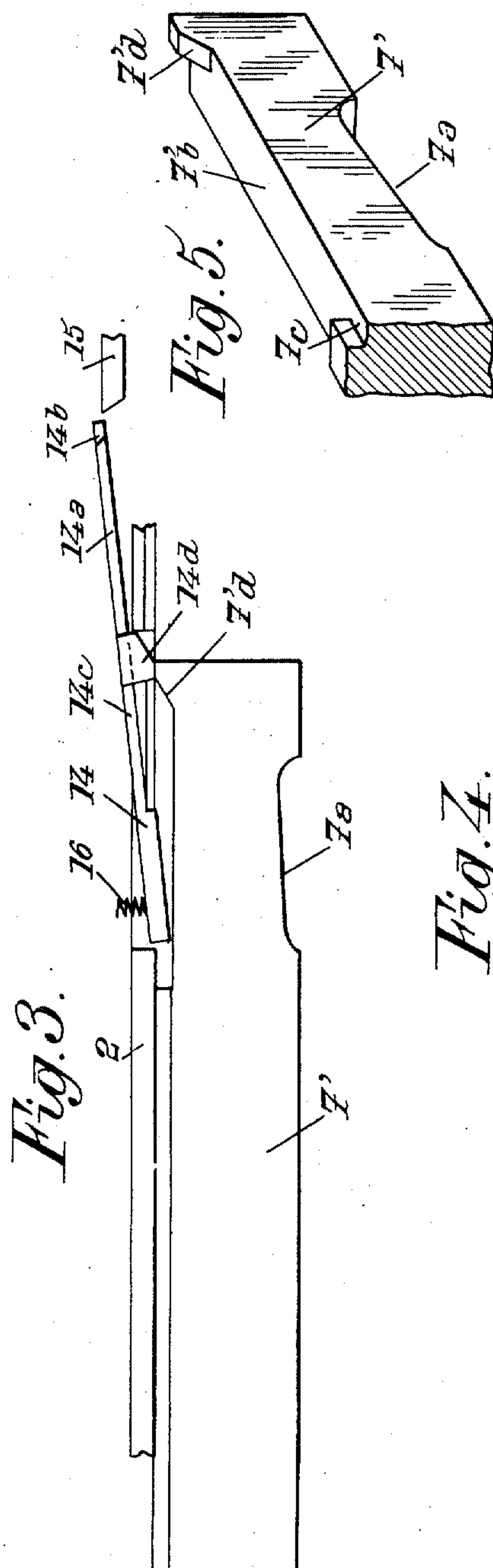
B. MAILLARD

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PIVOTED LOCK FOR BREECH BOLT LOCKING MEMBERS

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4 Sheets-Sheet 3



INVENTOR
BERNARD MAILLARD,

BY
Robert B. Pearson
ATTORNEY

UNITED STATES PATENT OFFICE

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PIVOTED LOCK FOR BREECH BOLT
LOCKING MEMBERSBernard Maillard, Geneva, Switzerland, assignor
to Society "Brevets Aero-Mecaniques," S. A.,
Geneva, Switzerland, a society of SwitzerlandApplication December 8, 1949, Serial No. 131,754
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The present invention relates to automatic firearms including a breech casing in which is slidably mounted a movable breechblock which can be temporarily stopped in firing position by at least one retractable locking member carried by said breech casing. This locking member is shifted from active to neutral position under the action of a locking control system a portion of which is housed in the breech casing and the working of which is theoretically determined by the firing of a shot. My invention is more particularly but not exclusively concerned with firearms of this kind in which the locking control system is operated by gases tapped from the arm barrel.

Its chief purpose is to provide firearms of this kind which are better adapted to meet the requirements of practice than those existing at the present time and, in particular, such that there is no risk of the breechblock being untimely released by an accidental working of the locking control system.

According to my invention, the firearm being mounted slidable on a support with the interposition of a shock absorber system capable of limiting recoil of said arm with respect to said support when a shot is fired, I provide along the path of recoil of the portion of the locking control system which is housed in the breech casing, a retractable abutment device which remains in active position as long as the recoil of the arm with respect to its support has not reached a predetermined value for which it is sure that the projectile will be effectively and normally expelled from the barrel, this abutment device being disposed in such manner that it prevents, when it is in active position, movements of the locking control system of an amplitude which would permit the breechblock to be effectively released.

Preferred embodiments of my invention will be hereinafter described with reference to the accompanying drawings, given merely by way of example and in which:

Fig. 1 diagrammatically shows, in axial longitudinal section and with parts cut away, an automatic firearm according to my invention;

Fig. 2 is a perspective view of the breech mechanism of this arm, certain parts having been removed and others cut away so as better to illustrate the part function of the various elements;

Fig. 3 is an elevational view of a modification of the firearm shown by Figs. 1 and 2, this view showing only a portion of this firearm;

Fig. 4 is a plan view corresponding to Fig. 3;

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Fig. 5 is a perspective view, with parts cut away, of an element of the structure of Figs. 3 and 4;

Fig. 6 is an elevational view, in section on the line VI—VI of Fig. 8, of a portion of an automatic firearm made according to another modification;

Fig. 7 is a horizontal sectional view on the line VII—VII of Fig. 6;

Fig. 8 is a cross section on the line VIII—VIII of Fig. 6;

Fig. 9 is a perspective view of one of the elements of the structure of Figs. 6 to 8.

The firearm, as a whole, is of any suitable construction, for instance as follows:

It includes a barrel 1 at the rear end of which is provided a breech casing 2 in which is slidable, in a direction parallel to the axis of said barrel, a movable breechblock 3 subjected to the action of a recuperator spring 4 which constantly urges it in the frontward direction.

Movable breechblock 3 is fitted with a bolt 5 adapted to bear, when said breechblock reaches the end of its frontward displacement, against an abutment key 6 rigid with the breech casing 2, the contacting surfaces of said bolt and said key being so inclined that they give rise, when the shot is fired, to a reaction which tends to release the bolt.

In order to prevent this release of bolt 5 from taking place untimely, I provide a locking control system operated by gases tapped from barrel 1.

Such a control system may, for instance, be made in the following conventional fashion:

I dispose, on either side of movable breechblock 3, two sliding side pieces 7 connected together by a transverse key 8 which carries the arm firing pin and extends through an elongated slot 9 provided in the movable breechblock and permits a complementary displacement of the sliding pieces toward the front after the breechblock has reached its front position, i. e. the end of its frontward stroke, where it is to be locked.

The under edge of each of these sliding pieces 7 cooperates with the top of bolt 5 to keep it in active position as long as sliding pieces 7 remain in front position with respect to breechblock 3 (as shown by Fig. 1). But said under edges of sliding pieces 7 are provided with notches 7a arranged, when sliding pieces 7 have moved a predetermined distance toward the rear, to come opposite bolt 5 which they release and enable to retract into breechblock releasing or neutral position.

Sliding pieces 7 are given their recoil move-

ment, by longitudinal push pieces 9 carried by breech casing 2 and actuated by a system including cylinder 10 and piston 11 and mounted on the barrel 1 of the arm, this system being periodically supplied, owing to a port 12, with the combustion gases which fill the portion of said barrel at the rear of the projectile that is being driven off.

A firearm made as above described is mounted longitudinally slidable in a fixed support S, with the interposition of a shock absorbing system (not shown by the drawing) capable of limiting the recoil of the arm with respect to said support, which support may be either pivotally mounted or rigidly fixed to the framework of the device or machine which is equipped with the firearm.

Advantageously, I provide, slidable on breech casing 2, a loader carrying sliding member or part 13 made rigid with the arm support S, for instance by means of a key 13a. In operation, the firearm recoils with respect to its support and sliding member 13, rigid with said support, is thus given a relative longitudinal displacement with respect to the arm, which displacement is of the same amplitude, but in the opposed direction, as that of the arm with respect to its support (recoil).

It should now be noted that, with this construction, there might happen, in particular in the case of hang fire, an untimely and accidental release of the breechblock, which occurrence would have as its unavoidable consequence the partial or total destruction of essential parts of the arm if the shot now happened to be fired after said breechblock was accidentally released.

As a matter of fact, a certain rebounding of sliding pieces 7, after their full frontward movement is practically unavoidable, if of limited amplitude. Unfortunately, this rebounding risks, in certain conditions, of having an amplitude such that recesses 7a come opposite bolt 5, thus permitting retraction thereof into neutral position and, consequently, release of the breechblock.

It will be readily understood that, if the shot is fired after this premature release (case of hang fire), the breechblock will be suddenly subjected to the maximum pressure of the gases and will be driven in the rearward direction with a force much higher than that ensuring recoil of the breechblock during normal operation of the arm. The return system intended to brake the recoil stroke of said breechblock and to bring it back toward the front will be torn away, all the rear portion of the arm being thus more or less seriously deteriorated.

According to my invention, this drawback is obviated by providing a safety device capable of limiting the rebounding of sliding pieces 7 to a permissible amplitude (i. e. one which does not permit release of the breechblock) as long as the recoil of the whole of the arm with respect to support S has not reached a value for which it is sure that the shot has been normally fired.

I preferably constitute this safety device in the form of a retractable abutment 14 carried by the breech casing 2 and adapted, in active position, to project across the path of recoil of sliding pieces 7, so that rebounding of these pieces is limited to a permissible value. Return of said abutment 14 into neutral or retracted position is achieved, at the proper time, by a cam 15 carried by the loader carrying sliding part 13.

Advantageously the safety device is made ac-

ording to the embodiment illustrated by the drawings:

Abutment 14 is given the shape of a fork the interval between the branches of which corresponds to the distance between sliding pieces 7.

I provide, in the upper face of breech casing 2, a recess or housing 2a in which said fork can fit, in its retracted position; the transverse portion of fork 14 (i. e. the portion extending between its branches) rests upon the sharp edge 2b of recess 2a forming a pivot axis for said fork, whereby, when fork 14 pivots downwardly, under the action of return spring 16, the ends of its branches come across the path of recoil of sliding pieces 7.

Fork 14 includes an arm 14a the bevelled edge 14b of which is arranged to engage cam 15 when the amplitude of the recoil stroke of the firearm (i. e. of breech casing 2) with respect to support S reaches the predetermined minimum value for which the breechblock may be released without risk.

This automatic firearm works as follows:

When firing takes place without incident, the firing of a shot is immediately followed by a recoil of the firearm with respect to support S, which recoil has for its effect, due to the cooperation of cam 15 (fixed on the loader carrying sliding part 13) with bevelled edge 14b carried by fork 14, of causing said fork to be retracted into its housing 2a and, therefore, of letting sliding pieces 7 free to recoil until they permit the breechblock to be released. On the contrary, when the return of the breechblock into closing position is not immediately followed by the firing of the shot (case of hang fire), the recoil of the arm is zero or anyway insufficient to bring bevelled edge 14b into contact with cam 15 and fork 14 then remains in active position, that is to say in the position for which it permits only limited rebounding of sliding pieces 7, but not breechblock release.

Anyway, and whatever be the embodiment that is adopted, such an arm has the considerable advantage of being free of any risk of untimely release of the breechblock.

For the sake of clarity, I have willfully omitted, in what precedes, to mention the resetting device which is generally included in firearms of this kind.

It should now be noted that when the arm is fitted with such a resetting device, it will be necessary to arrange it so that its operation, and even the mere fact of fitting it in position (if the device in question is removable and fitted on the arm only at the time of a resetting operation) causes fork 14 to be retracted into its housing 2a and therefore permits release of the breechblock although the arm has not recoiled with respect to support S.

In order to illustrate this feature, the drawings show, by way of example, a pneumatic resetting device essentially constituted by a unit including a cylinder 17 and a piston 18, this unit being mounted on one side of the breech casing 2, the piston 18 of said unit acting, during the recoil stroke, upon a finger rigid with one of the sliding pieces 7 and serving to drive said sliding pieces (for releasing the breechblock), then breechblock 3 toward the rear through the intermediary of said sliding pieces.

With such a device, it is possible to obtain retraction of fork 14 at the proper time, by disposing, across the path of travel of piston 18, a push-piece 20 which cooperates with the end 21a

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of a lever 21 pivoted, by means of an axis 22, to the loader carrying sliding part 13, the other end 21b of said lever bearing upon the end portion 14a of fork 14 and causing said fork to retract into its housing as soon as a resetting operation is started.

It should be noted that it will be necessary to provide, both for the end 21a and for the end 21b of lever 21, bearing surfaces of a substantial length so that said ends remain in contact, during firing, respectively with push piece 20 and with part 14a, which participate in the arm recoil movement.

It has been supposed, in the preceding description, that abutment member 14 is urged toward its active position by spring 16, or even possibly by the mere action of its own weight.

According to a modification, in order to improve the safety of operation, abutment member 14 is imperatively brought into active position, when sliding pieces 7 are nearing the end of their frontward displacements, by the very movement of said pieces, which, reciprocally, cannot finish their frontward movement if, for any reason whatever, member 14 has not been brought into active position.

Such an arrangement constitutes an important improvement because, as the system formed by sliding pieces 7 generally carries the striking pin, percussion of the cartridge in the barrel is made impossible when abutment member has not been previously brought into active position, since in this case sliding pieces cannot complete their frontward stroke. Therefore, when the safety obtained by the bringing of abutment member 14 into active position ceases to exist, for any reason whatever, the shot is not fired, so that any risk of accident is avoided.

A construction corresponding to this principle is illustrated by Figs. 3 to 5 inclusive.

On these figures, the sliding pieces are designated by reference numbers 7 and 7' respectively.

Now, according to this embodiment of my invention, the upper edges of sliding pieces 7 and 7' are provided with recesses 7b, 7'b, respectively against the front edges of which the branches of fork-shaped member 14 come to bear to prevent undesirable rearward displacements of said sliding pieces.

Member 14 is provided with an arm 14c, substantially parallel to arm 14a but shorter than it, carrying, at its rear end, a kind of lug 14d the rear face of which is bevelled in a frontward and downward direction so as to cooperate with a similarly inclined cam surface 7'd carried by sliding piece 7' at the rear of its notch 7'b.

Breech casing 2 is of course provided with recesses for accommodating arm 14c and lug 14d. As for sliding piece 7', it is provided with a groove 7c to accommodate lug 14d.

The operation of such a safety system is as follows: The breechblock being supposed to be held in rear position, when the sear is retracted, said breechblock is driven frontwardly by the action of its recuperator spring, lug 14d travelling in groove 7c. Sliding pieces 7 and 7' are also driven frontwardly. When they are nearing the end of their frontward stroke, abutment member 14 is pivoted into active position by the action of spring 16 and also by that of cam surface 7'd cooperating with the rear bevelled face of lug 14d. If, for any reason whatever, member 14 is prevented from pivoting into active position, its lug 14d stops sliding piece 7' (and therefore also 7)

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before the end of its frontward stroke, so that the cartridge is not fired.

According to another embodiment of my invention, the abutment member, instead of being pivoted to the breech casing, is pivotally carried by the sliding piece with which it cooperates. This member, in the active position thereof, projects from the outline of the sliding piece so as to strike a corresponding projection of the breech casing and therefore to limit the amplitude of the rearward displacements of said sliding piece. On the contrary, in neutral position, the abutment member is retracted inside the outline of said sliding piece which can therefore move freely toward the rear with respect to the breech casing. Advantageously, there is one abutment member for each sliding piece.

Preferably, in this case also, when the sliding pieces are nearing the end of their frontward stroke, the abutment members are imperatively brought into active position.

If A is the recoil stroke of the sliding pieces with respect to the firearm support S necessary to start the retracting of the abutment means;

If B is the recoil stroke of the sliding pieces with respect to the breech casing necessary to bring the abutment means into contact with the breech casing; and

If C is the length of overlapping of the cooperating means of the abutment member and of the arm support for keeping said abutment member in active position, then

C must be smaller than or at most equal to B so that the abutment means can be retracted before, or just as, said means can strike the breech casing, and

A must be greater than B so that the abutment means can, when necessary, strike the breech casing before their retracting movement is started.

Actually, A should be equal to the sum of A and the limit amplitude of recoil of the sliding pieces just when a shot is being fired.

An example of such an embodiment is illustrated by Figs. 6 to 9.

In this construction, each of the sliding pieces 7 carries an abutment member 114 pivoted thereto about a transverse axis. These members are urged toward active position (as shown by Fig. 6) by springs 116.

The rear ends of the abutment members in active position are adapted to come into contact with a surface 150 belonging to the breech casing, to limit, in these conditions, the rearward movements of the sliding pieces.

Each of the abutment members 114 is provided, at the rear part thereof, with lateral projections or lugs 114b adapted to cooperate, when the sliding pieces move rearwardly, with respect to the firearm support, with a surface 115 rigid with said support, so as to retract said abutment members 114, for normal operation.

At their front parts, abutment members 114 are provided with lugs 114c adapted to cooperate, when the sliding pieces are nearing the end of their frontward strokes, with inclined surfaces 151 carried by the firearm support, so as imperatively to bring members 114 into active position.

A groove 2f is provided, in the breech casing, for passage of lugs 114b and 114c.

Distances A, B and C, above referred to, are shown on Fig. 6.

This construction works in the following manner:

Under normal conditions of operation, the re-

coil of the firearm with respect to its support is sufficient to bring lugs 114b into contact with surfaces 115, which causes members 114 to be retracted and to permit further rearward movement of the sliding pieces.

When the sliding pieces are nearing the end of their frontward stroke, lugs 114c cooperate with fixed surface 151 to bring abutment members 114 into active position, in which they remain for a frontward displacement equal to C.

If, for some reason (for instance hang fire), the arm does not recoil sufficiently with respect to its support, abutment members 114 are not retracted before their rear edge comes against surface 150. Therefore, they prevent further rearward displacement of the sliding pieces, and the breech block cannot be released.

If, during the forward displacement of the sliding pieces, abutment members 114 cannot be brought into active position, surfaces 151 prevent the sliding pieces from finishing their forward movement and the shot is not fired.

In a general manner, while I have, in the above description, disclosed what I deem to be practical and efficient embodiments of my invention, it should be well understood that I do not wish to be limited thereto as there might be changes made in the arrangement, disposition and form of the parts without departing from the principle of the present invention as comprehended within the scope of the accompanying claims.

What I claim is:

1. In combination, a support, a firearm slidably mounted on said support for recoil with respect thereto and including a barrel, a breech casing at the rear end of said barrel, a breechblock slidable longitudinally in said breech casing, at least one locking member retractably carried by said breechblock to secure it to said breech casing in firing position, control means partly housed in said casing for temporarily holding said locking member in active position thereof, and retractable abutment means between said control means and said breech casing for preventing said control means from releasing said locking member, said abutment means being responsive to relative displacements of said firearm and said support so as to be retracted only when the amplitude of recoil of said firearm with respect to said support is beyond a predetermined value, corresponding to the projectile having left the barrel.

2. In combination, a support, a firearm slidably mounted on said support for recoil with respect thereto, said firearm including a barrel, a breech casing at the rear end of said barrel, a breechblock reciprocable longitudinally in said breech casing, at least one locking member retractably carried by said breechblock to secure it to said breech casing in firing position, control means for temporarily holding said locking member in active position including at least one longitudinal sliding piece movable in said breech casing and mounted for limited longitudinal displacement with respect to said breechblock, said sliding piece being arranged to cooperate with said locking member to release it for shifting into retracted position in response to a given rearward displacement of said piece with respect to said breech casing, and means for moving said sliding piece rearwardly in response to the firing of a shot, an abutment member arranged to be interposed in active position between said sliding piece and said breech casing for limiting the rearward displacements of the first of said two

last mentioned elements with respect to the other to values smaller than said given rearward displacement, said abutment member being retractable into one of said two elements to clear the other, means for urging said abutment member toward active position, and cam means carried by said firearm support for bringing said abutment member into retracted position in response to rearward displacements of said firearm with respect to said support of an amplitude at least equal to a predetermined value.

3. A combination according to claim 1 further comprising means operative by said control means for positively bringing said abutment means into active position just after said locking member has been held in active position by said control means.

4. In combination, a support, a firearm slidably mounted on said support for recoil with respect thereto, said firearm including a barrel, a breech casing at the rear end of said barrel, a breechblock reciprocable longitudinally in said breech casing, at least one locking member retractably carried by said breechblock to secure it to said breech casing in firing position, control means for temporarily holding said locking member in active position including at least one longitudinal sliding piece movable in said breech casing and mounted for limited longitudinal displacement with respect to said breechblock, said sliding piece being arranged to cooperate with said locking member to release it for shifting into retracted position in response to a given rearward displacement of said piece with respect to said breech casing, and means for moving said sliding piece rearwardly in response to the firing of a shot, an abutment member arranged to be interposed in active position between said sliding piece and said breech casing for limiting the rearward displacements of the first of said two last mentioned elements with respect to the other to values smaller than said given rearward displacement, said abutment member being retractable into one of said two elements to clear the other, means operative by said sliding piece for positively bringing said abutment member into active position at the end of the frontward movement of said sliding piece, and cam means carried by said firearm support for bringing said abutment member into retracted position in response to rearward displacements of said firearm with respect to said support of an amplitude at least equal to a predetermined value.

5. In combination, a support, a firearm slidably mounted on said support for recoil with respect thereto, said firearm including a barrel, a breech casing at the rear end of said barrel, a breechblock reciprocable longitudinally in said breech casing, at least one locking member retractably carried by said breechblock to secure it to said breech casing in firing position, control means for temporarily holding said locking member in active position including a sliding system constituted by two longitudinal sliding pieces movable in said breech casing on either side of said breechblock and mounted for limited longitudinal displacement with respect to said breechblock, said sliding system being arranged to cooperate with said locking member to release it for shifting into retracted position in response to a given rearward displacement of said system with respect to said breech casing, and means for moving said sliding system rearwardly in response to the firing of a shot, a fork-shaped abutment member having its branches at a distance from

each other equal to the distance between said sliding pieces so that the ends of said branches cooperate with said sliding pieces, respectively, said fork-shaped member being arranged to be interposed in active position between said sliding system and said breech casing for limiting the rearward displacements of the first of said two last mentioned elements with respect to the other to values smaller than said given rearward displacement, said fork-shaped member being retractable by pivoting about a transverse axis into one of said two elements to clear the other, means for urging said member toward active position and cam means carried by said firearm support for bringing said abutment member into retracted position in response to rearward displacements of said firearm with respect to said support of an amplitude at least equal to a predetermined value.

6. A combination according to claim 2 further including a resetting device and means responsive to the operation of said device for bringing said abutment member into retracted position to permit release of the breechblock despite the fact that the firearm proper is not moved with respect to its support.

7. A combination according to claim 2 in which the means for moving the sliding piece rearwardly in response to the firing of a shot include at least one push-piece actuated by gases tapped from the firearm barrel.

8. In combination, a support, a firearm slidably mounted on said support for recoil with respect thereto, said firearm including a barrel, a breech casing at the rear end of said barrel, a breechblock reciprocable longitudinally in said breech casing, at least one locking member retractably carried by said breechblock to secure it to said breech casing in firing position, control means for temporarily holding said locking member in active position including at least one longitudinal sliding piece movable in said breech casing and mounted for limited longitudinal displacement with respect to said breechblock, said sliding piece being arranged to cooperate with said locking member to release it for shifting into retracted position in response to a given rearward displacement of said piece with respect to said breech casing, and means for moving said sliding piece rearwardly in response to the firing of a shot, an abutment member arranged to be interposed in active position between said sliding piece

and said breech casing for limiting the rearward displacements of the first of said two last mentioned elements with respect to the other to values smaller than said given rearward displacement, said abutment member being retractable by pivoting about a transverse axis into said breech casing to clear the sliding piece, means for urging said member toward active position, and cam means carried by said firearm support for bringing said abutment member into retracted position in response to rearward displacements of said firearm with respect to said support of an amplitude at least equal to a predetermined value.

9. In combination, a support, a firearm slidably mounted on said support for recoil with respect thereto, said firearm including a barrel, a breech casing at the rear end of said barrel, a breechblock reciprocable longitudinally in said breech casing, at least one locking member retractably carried by said breechblock to secure it to said breech casing in firing position, control means for temporarily holding said locking member in active position including at least one longitudinal sliding piece movable in said breech casing and mounted for limited longitudinal displacement with respect to said breechblock, said sliding piece being arranged to cooperate with said locking member to release it for shifting into retracted position in response to a given rearward displacement of said piece with respect to said breech casing, and means for moving said sliding piece rearwardly in response to the firing of a shot, an abutment member arranged to be interposed in active position between said sliding piece and said breech casing for limiting the rearward displacements of the first of said two last mentioned elements with respect to the other to values smaller than said given rearward displacement, said abutment member being retractable by pivoting about a transverse axis into said sliding piece to clear said breech casing, means for urging said member toward active position, and cam means carried by said firearm support for bringing said abutment member into retracted position in response to rearward displacements of said firearm with respect to said support of an amplitude at least equal to a predetermined value.

BERNARD MAILLARD.

No references cited.