April 20, 1954 L. R. CRITTENDON 2,675,638

FIRE CONTROL FOR FIREARMS

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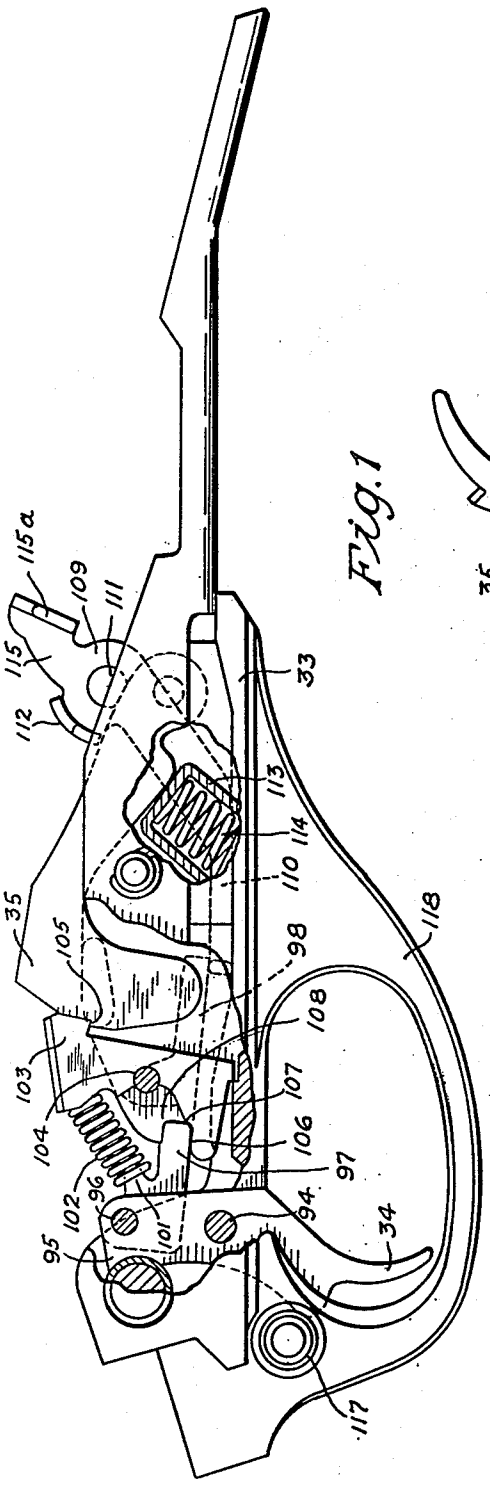


Fig. 1

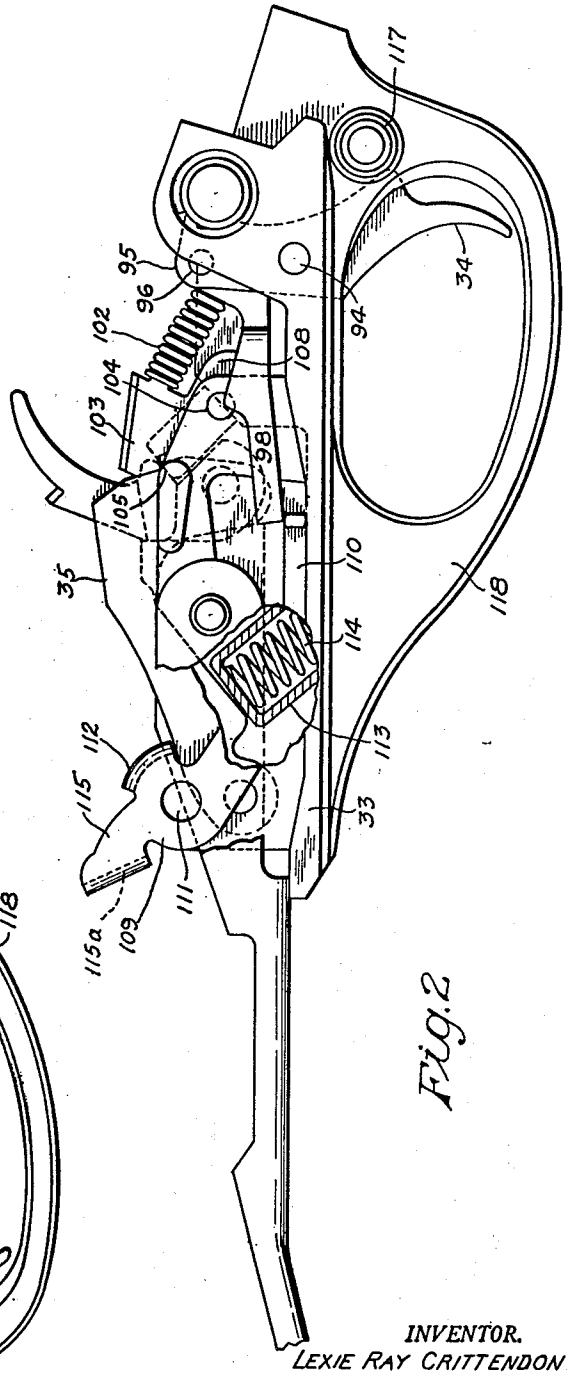


Fig. 2

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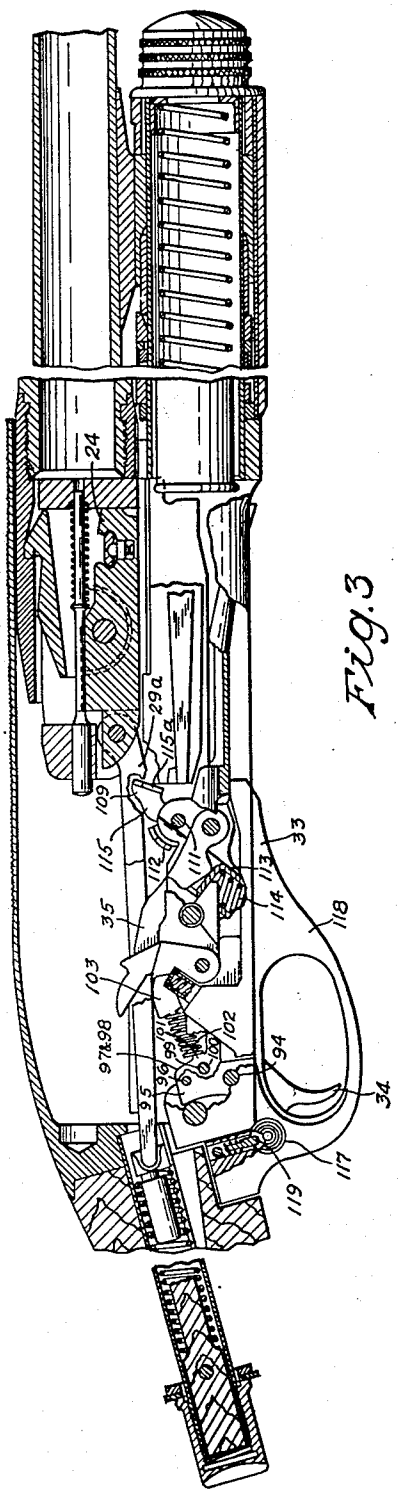


Fig. 3

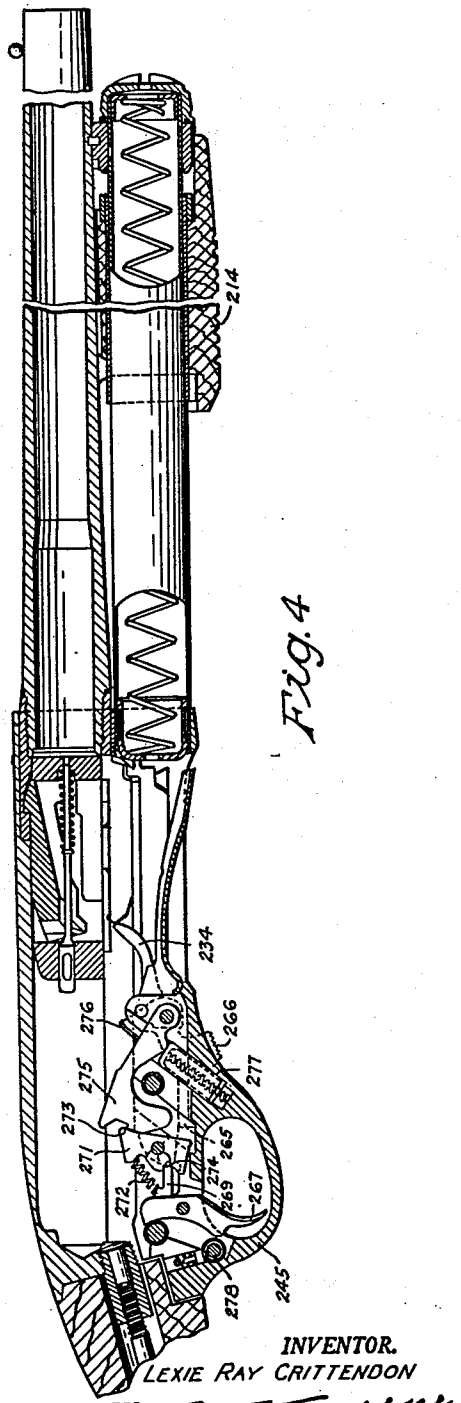


Fig. 4

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FIRE CONTROL FOR FIREARMS

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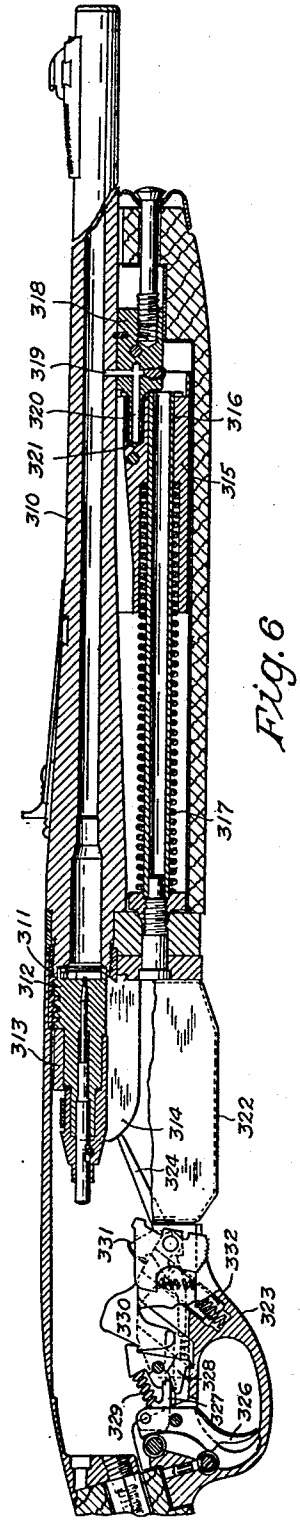


Fig. 6

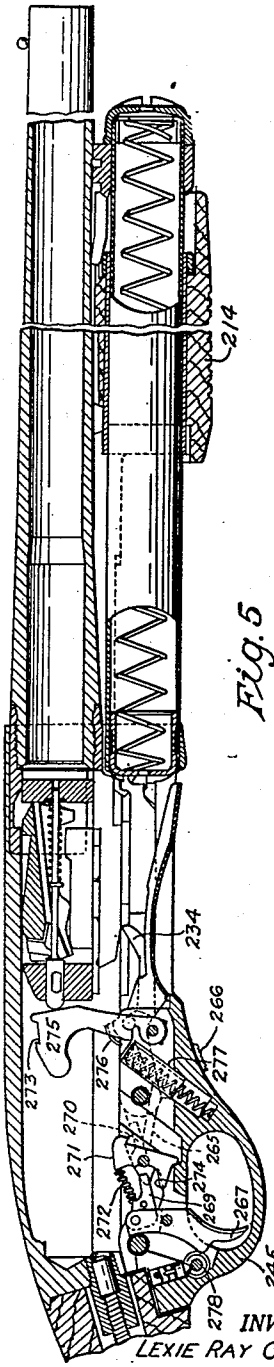


Fig. 5

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FIRE CONTROL FOR FIREARMS

Filed Jan. 6, 1951 4 Sheets-Sheet 4

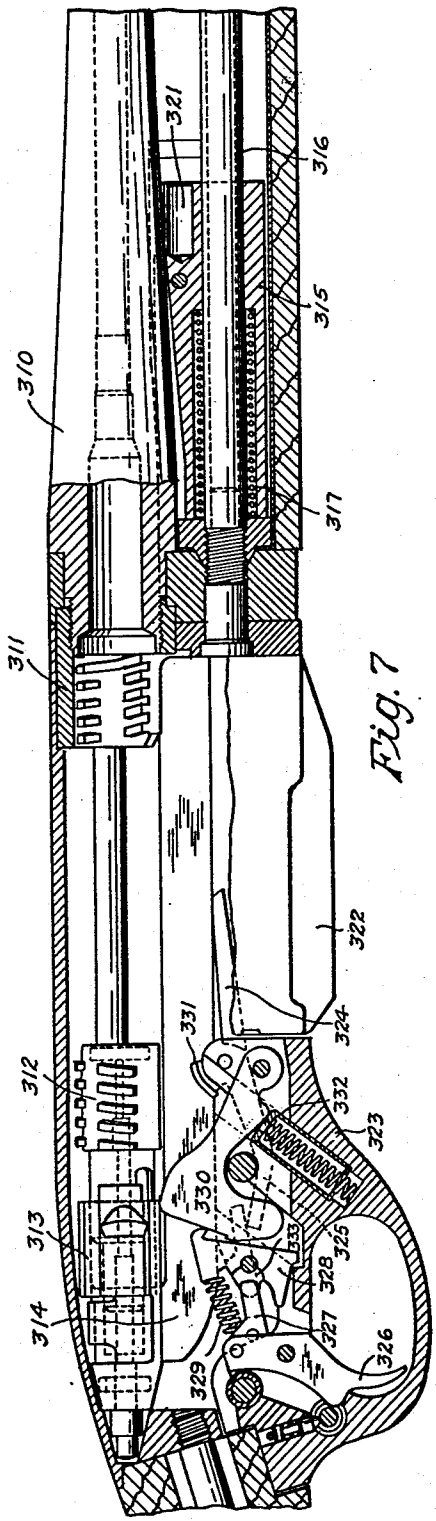


Fig. 7

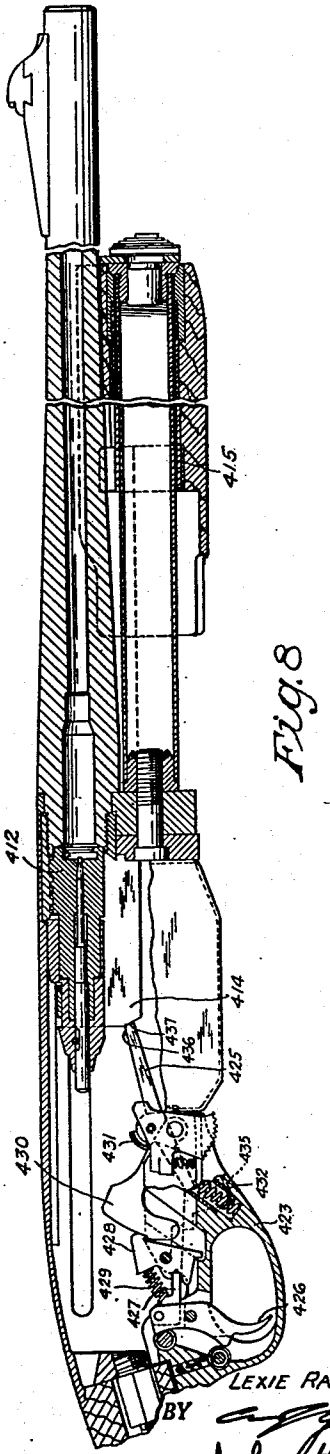


Fig. 8

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Patented Apr. 20, 1954

2,675,638

UNITED STATES PATENT OFFICE

2,675,638

FIRE CONTROL FOR FIREARMS

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Application January 6, 1951, Serial No. 204,706

4 Claims. (Cl. 42—69)

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This invention relates to fire control means for breech loading firearms and is adaptable with minor modifications to manually operated, gas operated, and recoil operated firearm actions.

This application is a continuation-in-part of my copending application Serial Number 79,368, filed March 3, 1949, now Patent No. 2,570,772, and adds to the disclosure there made specific showings of the modifications necessary to function with two different types of manually operated actions and with a gas operated autoloading action.

The principal objects of this invention are the provision of a safe and thoroughly dependable fire control which can be manufactured with the greatest economy.

Another object closely related to manufacturing economy is the production of a fire control mechanism which is, to the greatest possible extent, interchangeable throughout a series of several shotguns and rifles of different size and operating types.

These objects have been accomplished by the provision of a disconnector type fire control which, with a manually operated action, positively prevents firing from an unlocked breech and positively prevents firing at the instant of locking in case the trigger has not been released while the action was operated. With an autoloading gun the results noted above are achieved and, in addition, the disconnector fire control prevents the firing of more than a single shot for each time the trigger is pulled.

The exact nature of my new fire control will become apparent upon consideration of the following specification referring to the attached drawings in which:

Fig. 1 is a right side elevational view of the trigger plate assembly of the shotgun of my aforementioned application. Portions of the shell carrier and of the trigger plate body, not material to this invention, have been broken away for clarity in illustration.

Fig. 2 is a left side elevational view of the same unit shown in Fig. 1, also having certain immaterial supporting structure broken away for clarity in illustrating the working parts.

Fig. 3 is a vertical longitudinal sectional view showing the subject trigger mechanism in an autoloading shotgun.

Fig. 4 is a view similar to Fig. 3, showing a modification of the subject trigger mechanism installed in a slide operated shotgun. The action is locked and the hammer is cocked.

Fig. 5 is a view corresponding to Fig. 4 with

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the mechanism in positions occupied just after firing and the commencement of the unlocking movement of the slide.

Figs. 6 and 7 are views similar to Fig. 3, showing in two different positions a modification of the subject trigger mechanism assembled in a gas operated autoloading centerfire rifle.

Fig. 8 is a view similar to Fig. 3, showing a modification of the subject trigger mechanism assembled in a slide operated centerfire rifle.

Referring to the drawings, it will be noted that Figs. 1 and 3 are figures of the drawing of my prior application above referred to and that Fig. 2 is a left side view of the assembly viewed from the right in Fig. 1. In the following detailed description of this mechanism, the reference numerals and so much of the discussion as is applicable will be identical with that of the afore-mentioned application.

Referring particularly to Figs. 1, 2, and 3, it will be observed that the trigger plate 33 forms with the carrier and fire control mechanism a complete sub-assembly which is removably secured in the receiver of the shotgun. This construction greatly facilitates manufacture, inspection, and assembly. The trigger plate proper is conveniently a die casting upon which a minimum of machine operations are necessary.

The trigger 34 is supported on a pivot pin 94 and is provided above the pivot with a pair of laterally spaced upwardly extending arms 95. A pivot pin 96 passes laterally through these arms and serves to pivotally mount a connector assembly comprising a right hand arm 97 and a left hand arm 98, both extending generally forward from a point below the pivot pin 96. These arms are secured together to act as a unit by means of their common engagement upon pivot 96 and between the trigger arms 95, while they are required to rotate together as a result of the engagement of a button 99 struck up from the left hand arm with a hole 100 in the right hand arm. Intermediate the forwardly extending arms 97 and 98 and the pivot 96, a spring seat button 101 is formed to receive one end of the combined trigger and sear spring 102. The other end of the sear spring has a similar engagement with the sear 103 which is swingably supported on sear pin 104 and arranged to engage a hammer hook 105 formed on the hammer 35. Obviously, the spring 102 acts between the trigger and sear to urge the finger engaging portion of the trigger forward and to urge the sear forwardly into hammer retaining position. At the same time, it acts to rotate the connector assembly clock-

wise as viewed in Fig. 10, with the result that the toe at the forward end of the right hand connector arm 97 tends to engage the bottom surface 106 of a recess cut in the sear below the sear pivot and in rear of a connector abutment 107 formed in the sear surface 106. In this condition a normal pull upon the trigger serves to move the end of connector arm 97 into engagement with the abutment 107 and further movement causes the sear to turn counter-clockwise on the sear pivot and release the hammer.

Doubling or the firing of repeated shots from one operation of the trigger is prevented by the provision of a clearance recess 108 in the sear to receive the end of the connector arm after it has been disconnected from the abutment 107. When this has occurred, the trigger may be held back without effect upon the sear, which will catch and retain the hammer the next time it is cocked. Disconnection at each fall of the hammer is brought about by the disconnector 109, which has a rearwardly extending tail 110 formed to engage beneath the forward end of the left hand arm 98 of the connector assembly. The disconnector is supported by a disconnector pin 111 fitted in the trigger plate in a position which disposes an arm 112 on the disconnector in the path of the hammer spring plunger 113, which communicates the force of the hammer spring 114 to the hammer. Whenever the hammer falls, the plunger 113 engages the arm 112, raising the tail 110 and thus swinging the connector assembly counter-clockwise to disengage it from the sear. To furnish additional safety, the disconnector 109 is also provided with a safety arm 115, which extends forwardly and upwardly into a position which will be over-run by the breech bolt slide 24 whenever the slide is materially to the rear of its fully locked position. To insure that this control is maintained at all times except when locking is substantially complete, an inturned extension 115*a* is provided on the arm 115 and disposed beneath a cam 29*a* formed on the breech bolt link. Before the cam 29*a* disengages from the extension 115*a*, the lower face of the slide will have engaged the arm proper.

Summarizing, disconnection will take place as a result of hammer fall, and during the period in which the automatic loading cycle is being completed, will be maintained by the engagement of the link cams or the lower face of the slide with the arm 115. The connector can only re-engage the sear after the breech is closed and locked, and even then, it cannot re-engage until the trigger has been released and allowed to return to its normal position. If, at any time thereafter, the breech is partially or fully opened, the cam 29*a* and the lower rear corner 116 of the breech bolt slide act in succession to urge the disconnector to operate and disconnect the trigger from the sear, thus preventing inadvertent firing from an open breech.

The normal type of cross bolt safety comprising a slidable bolt 117 in the trigger guard 118 is provided. This bolt is, in the usual way, provided with a body portion having two diameters and when disposed to extend to the right of the guard and obstructing the usual position of a trigger finger, the large diameter portion will obstruct the rearward movement of the trigger finger piece. A spring-urged detent 119 mounted in the trigger plate releasably retains the safety in either position selected.

The modified fire control assembly shown in Figs. 4 and 5 is, in most respects, identical with that shown in Figs. 1 to 3, inclusive, and is identical with that illustrated in the copending application of myself and Philip R. Haskell, Serial No. 141,532, filed January 31, 1950, now Patent No. 2,645,873. In this case, the only substantial change from the construction shown in Figs. 1 to 3 has been to make the action bar lock 234 integral with the disconnector 265 and to provide an action bar lock finger piece 266 extending through a slot in the bottom of the trigger plate 245.

To briefly review the operation of this fire control as applied to a slide operated gun and thus minimize the need for reference to the above-identified copending applications, it may be pointed out that the trigger 267 is pivotally mounted in the trigger plate 245 and provided at a point above its pivotal mounting with means arranged to pivotally receive a connector assembly comprising a right hand connector arm 269 and a left hand connector arm 270, both extending in a generally forward direction. When assembled to the trigger, these arms act as a unit. A sear 271 is also pivotally mounted in the trigger plate and at its upper end engages a compression spring 272 which acts at its rear end upon the connector assembly. The spring thus serves to urge the upper end of the sear forwardly and the upper end of the trigger rearwardly while simultaneously urging the arms of the connector to swing downwardly. The upper end of the sear is also formed to engage a hammer hook 273 and thereby to releasably retain the hammer in cocked position. The right hand connector arm 269 is arranged to act on a step 274 on the sear and, when the trigger is pulled, will urge the sear to swing upon its pivot and release the hammer 275. A clearance recess is also formed in the sear adjacent the step 274 to receive the end of the arm 269 and to permit the trigger to be held back without effect upon the sear. The connector may be moved to this inactive position by means of a disconnector 265 which is pivotally mounted near the forward end of the trigger plate and engages beneath the forward end of the left hand connector arm 270. The disconnector may be actuated manually by means of depression of the action bar lock finger piece 266 which, at the same time, operates the action bar lock 234, permitting the action bars to be drawn rearwardly, unlocking the action. The disconnector is also operated as a function of the fall of the hammer 275 by means which include a short arm 276 on the disconnector positioned in the path of the hammer spring plunger 277. The very last stage of hammer plunger movement in this way swings the disconnector into operation and releases the action bar. However, the end of the action bar lock and the action bar have a frictional engagement such that no component of pull on the action bar acts to swing the disconnector into disconnecting position. Instead, the engagement is, at a minimum, arranged so that a rearward pull on the fore-end 214 will apply sufficient frictional force at the engaging faces to prevent the disconnection from taking place until that rearward pull is relaxed. At a maximum, the surfaces may engage at such an angle that actual forward movement of the action bars is required before disconnection is possible. When the gun fires normally, such a relaxing or actual forward movement is involuntary as the gun recoils relative to its support by the fore-end. In a misfire, or hangfire, this rela-

tionship prevents unlocking the action involuntarily with the hazard of a hangfire exploding with an unlocked breech. When the disconnector has operated, the trigger will remain inoperative until the action has been again closed and completely locked with the action bar lock in its proper place. Thus, the trigger cannot be accidentally pulled to fire the shell as the breech is being closed. Further, if the trigger is held back while the action is operated, the sear will retain the hammer until such time as the trigger has been released and the action bar lock engaged. The usual type of manually operable cross bolt safety 278 is also provided to positively block inadvertent trigger operation when the gun is carried loaded and locked. This fire control for a slide action gun is as safe as possible in that it may be positively locked, cannot fire on an open breech, cannot fire a second shot without deliberately releasing, and cannot be involuntarily opened during a hangfire. Further, it will be noted that the sear and trigger are centrally pivoted and thus almost perfectly balance with respect to jolts and jars from any direction. Substantially the only condition which could cause accidental firing if the gun were dropped or otherwise jarred with the safety off would be an actual physical impact of the trigger upon some relatively fixed object.

Figs. 6 and 7 show the application of my improved fire control to a gas operated autoloading centerfire rifle. This rifle, it may be noted, comprises a barrel 310 fitted with a barrel extension 311. Interrupted thread type locking lugs on the breech bolt 312 are arranged to lock to the barrel extension and a breech bolt carrier 313 is provided to guide and cause the rotation of the breech bolt between locked and unlocked position. The carrier 313 is joined by laterally spaced action bars 314 to an action sleeve 315 mounted for reciprocation on action tube 316 and urged forwardly by an action spring 317. The barrel is provided with a depending lug 318 which supports the forward end of the tube 316 and has formed within it a gas orifice 319 communicating with the barrel bore. From the orifice a short gas tube or piston 320 extends rearwardly into a blind hole or gas cylinder 321 in the action sleeve 315 with a loose enough fit to permit gas to reverse itself and pass forwardly around the gas tube, applying both impulse and reaction effects to the sleeve. This action, as well as any of the conventional gas operated actions, unlocks and carries the bolt rearwardly after the bullet has passed the gas orifice and is thereafter closed by the spring carrying into the chamber a fresh cartridge from the magazine 322.

My improved fire control for this rifle differs from that illustrated in Figs. 1 to 3 only in the provision of a trigger plate 323 adapted to accommodate and retain the magazine 322 and in shaping the safety arm 324 on the disconnector 325 to engage with the action bar 314. The trigger 326, connector 327, sear 328, spring 329, and hammer 330, may, in fact, be absolutely identical with the parts referred to in the discussion of the two previous modifications. Also, as in those modifications, the disconnector 325 is provided with an arm 331 arranged to be engaged by the hammer spring plunger 332 to disconnect the trigger from the sear each time the hammer falls. Obviously, the safety arm 324 will prevent a re-engagement until the action bar 314 has again returned to a position corresponding to a locked breech bolt, and the reception of the end of the connector 327 in the recess 333 in the sear will prevent a re-engagement until after the trigger has been released. Since the parts of the fire control mechanism responsible for this functioning have been discussed in detail in connection with the two preceding modifications, further discussion of this modification appears to be unnecessary.

Fig. 8 shows the application of my improved fire control to a slide actuated centerfire rifle. This rifle uses the same breech bolt mechanism discussed relative to Figs. 6 and 7, but actuates that mechanism by attaching the action bars 414 to an action sleeve 415 on which there is mounted a conventional wooden fore-end by which the breech bolt 412 may be manually operated. The trigger plate 423 may be identical to that shown in Figs. 6 and 7 except for the provision of a slot through which a finger piece 435 on the disconnector 425 extends for manual operation. The trigger 426, connector 427, sear 428, spring 429, and hammer 430 are, or may be, identical with those previously described. In this modification the disconnector 425 is similar in function to that shown in Figs. 4 and 5, in that it functions as an action bar lock under the control of the finger piece 435. As in the other modifications, an arm 431 is arranged to be engaged by the hammer spring plunger 432 to provide for automatic disconnection on hammer fall. Since the safety arm 424 is squared off at the end 436 and engages a squared face 437 on the action bar, it is obvious that the breech cannot be inadvertently unlocked when the hammer is cocked. The angular relationship of the surfaces 436 and 437 relative to the disconnector axis is governed by those principles discussed relative to Figs. 4 and 5 and may conveniently be made such as to provide "hangfire" protection. Further discussion of this modification appears to be unnecessary in view of the detailed discussion which has preceded.

From the above, it will be realized that my improved fire control is capable of wide application to various types of arms and that my invention is not limited to those modifications specifically illustrated. For a definition of the limits upon my invention, reference may be had to the appended claims.

I claim:

1. A fire control mechanism comprising in combination a striker movable from a cocked position to a fired position; a thrust member engaged with said striker; a striker spring engaging the thrust member and acting therethrough to urge said striker to move from a cocked position to a fired position; a trigger pivotally mounted for manual displacement from a normal position to a fired position, the point of pivotal mounting of said trigger being intermediately placed with reference to the mass of the trigger; a sear comprising an abutment and a striker engaging member pivotally mounted at a position intermediate said abutment and said striker engaging member for movement between a striker retaining position and a striker releasing position; a connector pivotally mounted on a portion of said trigger remote from the manually engageable portion and extending therefrom into normal engagement with said abutment for transmitting movement of said trigger toward said fired position to said sear to move the sear toward striker releasing position; a single spring compressibly engaged between the striker engag-

ing end of said sear and a portion of said connector adjacent said trigger, the single spring simultaneously urging the sear to striker retaining position, the connector into position for engagement with said abutment, and the trigger into said normal position; and disconnector means engaged with said connector and positioned for engagement by said thrust member for displacing the connector from engagement with said abutment as the striker moves from cocked position to fired position.

2. A fire control mechanism comprising in combination a striker movable from a cocked position to a fired position; a thrust member engaged with said striker; a striker spring engaging the thrust member and acting to urge said striker from a cocked position to a fired position; a sear pivotally mounted intermediate its ends and having one end formed to define a striker holding hook and the other end formed to define an abutment, said sear being shiftable on its pivotal mounting between a striker holding position and a striker releasing position; a pivotally mounted trigger having a finger engaging portion positioned to permit manual displacement of the trigger away from a normal position; an arm on said trigger extending away from the point of pivotal mounting of the trigger; a connector pivotally mounted on said arm of the trigger and comprising an element extending therefrom into a normal position of engagement with said sear abutment and in that normal position operative to transmit movement of said trigger in a direction away from its normal position to said sear in a direction tending to move said sear to striker releasing position; a compression spring engaged between said connector and the end of said sear formed to define the striker holding hook, said spring tending to hold the sear in striker holding position and to hold the connector and trigger in their said normal positions; and disconnector means comprising a pivotally mounted member having a first arm disposed in the path of movement of said thrust member to be moved thereby as the striker moves to fired position and a second arm engaging the connector to shift same out of its position of normal engagement with the sear abutment as said first arm is moved in response to movement of the thrust member as the striker moves to fired position.

3. In a firearm of the type having a receiver, a breech bolt in said receiver movable between breech closing and breech opening positions, and a striker member operable to drive a firing pin to protrude from the front face of said bolt; the combination with said bolt and said striker member of fire control means including a trigger pivotally mounted for manual displacement from a normal position; a sear comprising an abutment and a striker engaging member pivotally mounted for movement from a striker retaining position to a striker freeing position; a connector pivotally mounted on said trigger and comprising an element normally positioned in engagement with said sear abutment normally acting to transmit the movement of said trigger to the sear; a spring interconnected between elements of said sear and of said connector acting to urge said sear toward striker engaging position and simultaneously acting to urge both said connector and said trigger to their said normal positions; and disconnector lever means pivotally mounted in engagement with the connector acting when said disconnector is moved to transmit movement to said connector for displacing said connector element from engagement with the sear abutment, said disconnector being provided with an actuating element associated with said striker and movable thereby to displace said connector as the striker operates upon the firing pin and with a second actuating element associated with said breech bolt and movable thereby to displace said connector when said bolt is moved away from breech closing position.

4. A fire control mechanism comprising a pivotally mounted hammer; a thrust member engaged with said hammer, a hammer spring engaging the thrust member and acting to urge said hammer from a cocked position to a fired position; a sear pivotally mounted intermediate its ends and having one end formed to define a hammer holding hook and the other end formed to define an abutment, said sear being shiftable on its pivotal mounting between a hammer holding position and a hammer releasing position; a pivotally mounted trigger having a finger engaging portion positioned to permit manual displacement of the trigger from a normal position; an arm on said trigger extending away from the point of pivotal mounting of the trigger; a connector pivotally mounted on said arm of the trigger and comprising an element extending therefrom into normal engagement with said sear abutment and operative to transmit movement of said trigger away from its normal position to said sear in a direction tending to move said sear to hammer releasing position; a compression spring engaged between the connector and the hammer holding end of said sear tending to hold the sear in hammer holding position and said connector and trigger in normal positions; and disconnector means comprising a pivotally mounted member having a first arm disposed in the path of movement of said thrust member to be moved thereby as the hammer moves to fired position and a second arm engaging the connector to shift same out of its normal engagement with the sear abutment as said first arm is moved by the thrust member.

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