Oct. 12, 1943. C. C. LOOMIS 2,331,405

FIREARM

Filed Feb. 27, 1941 2 Sheets-Sheet 1

Fig. 1

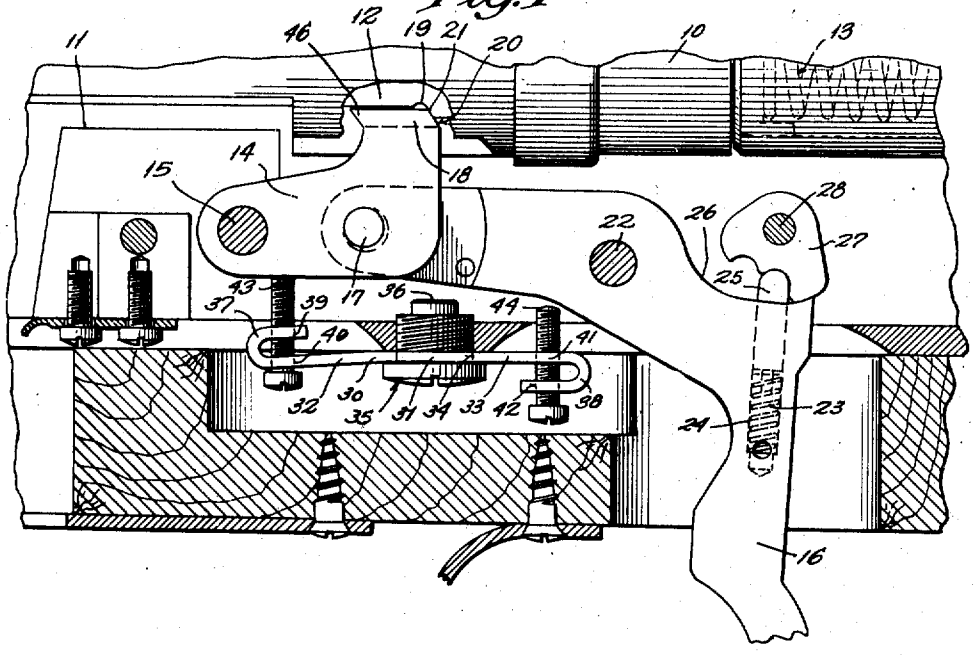
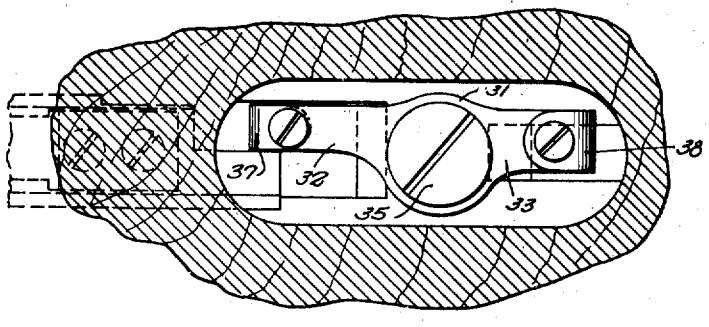


Fig. 2



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Filed Feb. 27, 1941 2 Sheets-Sheet 2

Fig. 3

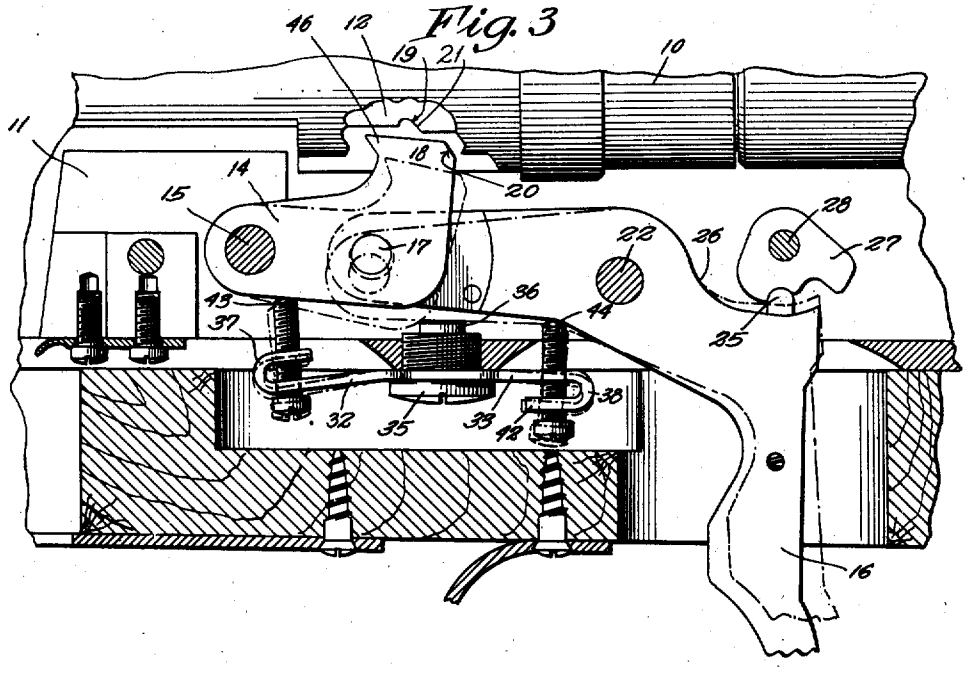
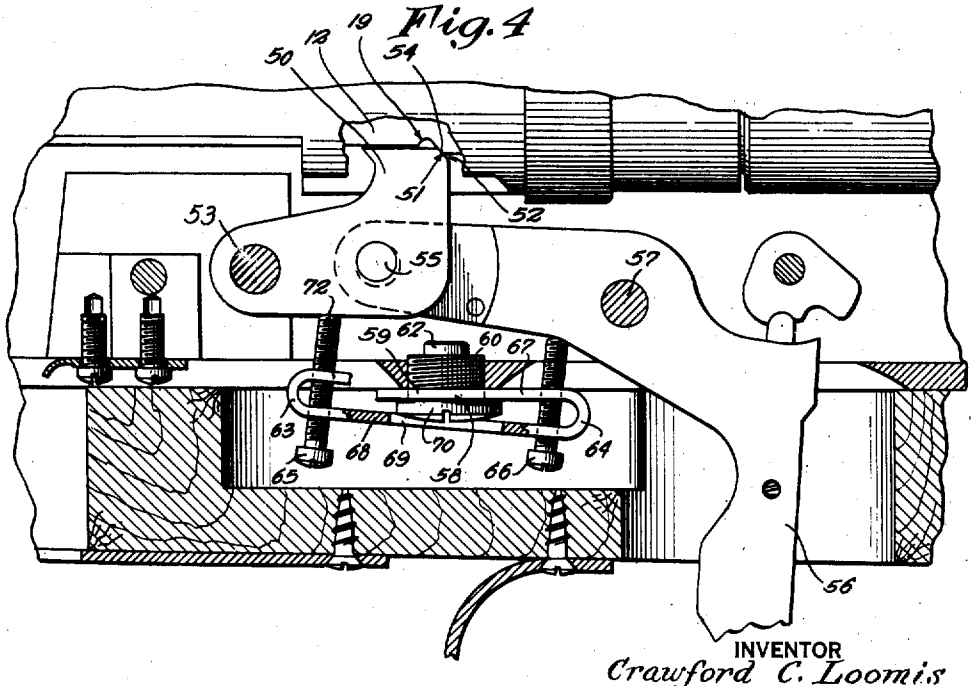


Fig. 4



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2,331,405

FIREARM

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Application February 27, 1941, Serial No. 380,801

16 Claims. (Cl. 42—69)

This invention relates in general to firearms and more particularly to fire control mechanism therefor.

As disclosed in the prior art, the fire control mechanism of firearms and more especially firearms of the bolt action type embody, in most instances, an impact device or striker spring-urged to a position where it or a member actuated by it, such as a firing pin, strikes the primer of a cartridge. The impact device is usually held against the action of the firing spring by a holding device or sear which is, in turn, urged into striker holding position by some suitable restraining means and released from such position by the trigger. In addition to these fundamental elements, restraining means such as springs and adjustable screws may be associated with the sear and trigger assembly for varying the weight of the trigger pull, for effecting a positive but adjustable stop for the trigger and for limiting the movement of the trigger before and after release of the sear, etc. Heretofore these restraining elements have been mounted usually in holes or securing means drilled or otherwise formed in or on the firearm receiver or stock—the dispersion of the holes or securing means being determined more or less by the proximity of adjacent portions of the respective fire control elements. This practice has proven disadvantageous in that the restraining and adjusting elements have often been located in inconvenient or substantially inaccessible places in the assembled gun so that the rifleman experiences considerable difficulty in making necessary adjustments. Furthermore, the requirement of a plurality of drilled holes to seat the several restraining means or adjusting screws tends to weaken the gun receiver or stock and also adds to the cost of construction and assembly.

The present invention has been conceived to overcome these characteristics of the prior art by combining all of the restraining and/or adjusting elements into a single device constructed and arranged to be readily attached to or detached from the firearm by a single fastening means and located conveniently in the firearm whereby all necessary adjustments may be quickly made.

It is an object of this invention to provide in a firearm a new and novel device constructed and arranged so that it combines, in the unitary structure, a plurality of restraining and adjusting elements for maintaining the proper operation of the fire control mechanism.

A further object is to combine sear restraining means and trigger restraining means in a single device constructed and arranged so that it may be removably secured to a firearm by a single fastening means comprising a positive trigger stop.

Another object of this invention is to provide in a firearm a sear holding device arranged so that it combines both an adjustable trigger restraining element for taking up excessive movement of the trigger immediately following "let-off" and an element for adjusting the weight of the trigger pull.

Other objects, features and advantages of the invention will become apparent from the following description taken in connection with the accompanying drawings in which

Fig. 1 shows a side elevation, mostly in section, of a portion of a firearm having a trigger cushion spring assembly mounted thereon.

Fig. 2 is a plan view of the underside of the spring cushion trigger assembly.

Fig. 3 shows a side elevation of the spring cushion assembly of Fig. 1 when the striker has been released. Dotted lines indicate relative positions of trigger mechanism when bolt is being withdrawn.

Fig. 4 is a side elevation of a modified spring cushion assembly in combination with a modified sear.

Referring to Fig. 1, the invention in its present embodiment is shown for the purpose of illustration applied to a rifle of the bolt action type, embodying a bolt 10 mounted for sliding movement in the rifle frame or receiver, indicated generally by numeral 11, and having the usual striker or firing pin 12, the bolt 10 being capable of manual retraction against normal urging of its spring 13 and maintained in retracted position by restraining means such as a sear 14 pivoted at 15 between the side walls of the receiver frame 11. The sear 14, as embodied in this invention, projects rearwardly and upwardly from its support 15, being pivoted to the trigger 16 by a floating pivot 17 and comprising a nose 18 adapted to engage a sear notch 19 formed in the underside of the striker 12. In the particular sear nose shown in Fig. 1 the angle of the contacting surface 20 of the sear nose is substantially at right angles to a radius through the pivot 15 so that the surface 20 lies substantially tangent to an arc about center 15. It is to be understood, however, that the angle of the surface 20 relative to the radius through the pivot 15 may be varied or made negative, whereby the surface 20 and the surface 21 of the striker notch 19 contact

each other at substantially the angle of repose. The trigger 16 is constructed to be supported between the side walls of the receiver on a pivot pin 22 and is urged forwardly by a trigger spring 23 preferably housed in a well 24 in the trigger, which well also receives part of a spring pilot 25 projecting upwardly from the upper surface 26 of the trigger. The trigger spring 23 exerts a constant force tending to swing the floating pivot 17 of the trigger 16 in a clockwise (Fig. 1) direction about the pivot 22 so as to urge the sear 14 in a counterclockwise direction about its pivot 15 and hence hold the sear surface 20 in engagement with the adjacent surface 21 of the sear notch 19 to prevent the release of the striker which is under the constant urge of the striker spring 13. The aforesaid pilot 25, urged by the trigger spring 23, controls the usual safety member 27 mounted on a stud 28. The parts above described constitute the usual features of bolt action firearms and in themselves are not herein claimed as novel.

In the drawings the novel trigger cushion spring assembly of this invention is indicated, in general, by the numeral 30 and comprises a blanked and formed member made of spring steel or equivalent material having a central hub or shoulder portion 31 and two substantially diametrically opposed resilient arm portions 32 and 33 respectively. The hub 31, as shown in Fig. 2, is of relatively large overall area as compared to the width of the resilient arms 32 or 33, and is punched or drilled out to have a smooth walled hole 34. A headed screw 35, kerfed to take a screw driver, is adapted to pass through the drilled hole of the hub and to be threadedly engaged in a tapped hole in the bottom wall of the receiver so as to secure the spring assembly thereto and form in effect a fulcrum for each resilient arm 32 and 33. The screw 35 is further designed to pass clear through the wall 35 of the receiver and is provided on its projecting end with a substantially flat bearing surface 36 for the purpose hereinafter described. The arms 32 and 33 are of different dimensions, as shown, the arm 32 being somewhat narrower and longer than the arm 33 so that its inherent stiffness is substantially less than that of the relatively short broad spring arm 33. The terminal portion or end of each arm 32 and 33 is bent or otherwise formed into a U as indicated by 37 and 38 respectively, the reverse bend at the end of the arm 33 being in a downward direction as shown, while the reverse bend on the end of the arm 32 is upward. These U-shaped ends 37 and 38 of the aforesaid arms are adapted to be drilled and tapped as at 39, 40 and 41, 42 respectively of the drawings and suitable adjustable screw bolts 43 and 44 assembled therein. By slightly compressing each U-shaped end or loop when assembling its respective screw therein, a constant tension is maintained on the screw to prevent it from loosening. Each screw 43 and 44 comprises, in combination with its respective spring arm 32 and 33, adjustable restraining means for effecting a restraining force against the movement of co-operating elements of the fire control mechanism. More particularly the screw 43 is constructed and arranged so that the end 45 thereof bears directly and continuously against the underside of the sear 14 and rearward of its pivot 15, whereby the latter is restrained against clockwise movement about said pivot. In this respect the screw 43 and its resilient arm 32 comprise, in effect, a sear restraining means, the tension of which may be readily varied by turning the screw bolt 43 so as to flex the spring arm 32 from its fulcrum point 35. It will be seen that inasmuch as the weight of the trigger pull is, in accordance with the sear-trigger connection 17, directly proportional to the resiliency of the sear restraining means, the same screw and spring arm 43—32 also comprise the restraining means for adjusting the weight of the trigger pull—this adjustment being similarly obtained by turning the screw bolt 43. In accordance with the device of Fig. 1 a variation in trigger pull of from approximately three to seven pounds is possible, but it will be appreciated that slight changes in shape and dimensions of the device may be made within the scope of this invention whereby other minimum and maximum limits may be obtained. The adjustable screw bolt 44 is adapted, as shown, to underlie the underside of the trigger 16 and may be readily arranged to contact continuously therewith. If this is done the screw 44 and its co-operating spring arm 33 comprise restraining means which assist the force of the trigger spring 23 in holding the sear nose 18 in the sear notch 19 of the firing pin 12. A further function of the restraining means 44—33 is carried out (see Fig. 3) when the screw bolt 44 is backed off from the trigger just sufficiently to be engaged by the trigger immediately after "let-off," i. e. the instant when the sear nose has just disengaged the striker notch 19, whereby substantially all further movement or overtravel of the trigger is prevented. To this latter end the spring arm 33 is relatively short, being fulcrumed at bolt 35 so as to have a stiff restraining force such that the trigger is arrested by what is, for this purpose, a solid or positive stop. However, as hereinafter described, in order to withdraw the bolt 10 the trigger 16 may be pulled back further against the restraining force of the spring 33 so as to lower the bolt-stop 46 from the path of the usual bolt-lug. A final positive stop to limit the maximum movement of the trigger-sear assembly (indicated by dotted lines in Fig. 3) is obtained by the aforementioned surface 36 of the screw 35 which is constructed and arranged to be engaged by the underside of the trigger-sear assembly when the latter is drawn down far enough to permit removal of the bolt.

From the foregoing description it will be noted that with the elements of the fire control mechanism in the positions shown in Fig. 1 the arm is in condition for firing. The force of the trigger spring 23, augmented by the force exerted on the sear 14 by adjusting the screw 43 so as to flex the spring arm 32, restrain the nose 18 of the sear 14 in the sear notch 19 of the striker 12. It will be manifest that the adjustable screw 43 and the spring arm 32, when flexed by the screw, comprise, in effect, a sear restraining means. Furthermore, inasmuch as the force of the trigger spring is constant the force necessary for the pivotal movement of the trigger or the "weight" of the trigger pull will be directly proportional to the sear restraining force and hence it will be clear that by turning the adjusting screw 43 and flexing its spring arm 32 the weight of the trigger pull may be readily controlled. As the shooter pulls back on the trigger he overcomes the weight of the trigger pull (or the restraining force of the sear restraining means) and also the force of the trigger spring so that the sear nose 18 is withdrawn from the

sear notch 19 and the striker 12 is released and springs forward due to the urge of the striker spring 13, whereupon the arm is discharged. Simultaneously with the release of the striker 12 the trigger brings up against the adjustable trigger restraining stop 44 (as shown in Fig. 3) whereby any trigger overtravel after "let-off" is prevented. The parts are now in the position shown by the full lines in Fig. 3 the striker having engaged the primer portion of the cartridge and exploded the charge. In this position of the fire control mechanism it will be noted that the sear spring 32 is flexed below its normal position (see Fig. 1) which puts a tension upon the pivoted sear, tending to return it to its original or cocked position. However no noticeable deflection of the spring 33 occurs at this time since the stiffness of the latter is such that it acts, in effect, as an immovable stop for the trigger. The firearm is reloaded in the well known manner by lifting the bolt handle and subsequently re-locking it, whereby the sear nose 18 is re-engaged in the sear notch 19 of the striker 12 by the tension of the flexed sear spring 32.

The dotted lines in Fig. 3 show the relative positions of the trigger-sear mechanism to permit removal of the bolt from the receiver. When the trigger is pulled back not only to "let-off" position but sufficiently far beyond so that the sear is rocked clockwise to the position shown by the dotted lines, the bolt-stop 46 is withdrawn from the path of the usual bolt-lug, thus permitting removal of the bolt. It will be noted that in this position the resilient trigger stop 33—44 has been flexed downwardly, as indicated by the dotted lines, the trigger pull necessary for flexing the spring to this position being considerably greater than the normal trigger pull at "let-off." Furthermore, in this position the sear-trigger assembly is at the limit of its downward movement and further movement is prevented by the positive stop 35.

Fig. 4 shows a modified trigger cushion spring assembly in combination with a modified sear 50. The latter, as shown, is provided with a sear nose 51 having a face 52, the angle of whose plane is, relative to a radius through pivot 53, greater than 90°, such that the surface 52 and the surface 54 of the sear notch 19 of the firing pin 12 are substantially at the angle of repose for these surfaces. This construction is deemed desirable for decreasing the friction force between sliding parts to be disengaged and hence for effecting "let-off" or release of the striker by an extremely small initial movement of the trigger as hereinafter described. The sear 50 is connected to the trigger 56 by the usual floating pivot 55, said trigger being pivoted at 57 in the receiver frame and having the usual trigger spring (not shown). Other elements of the firing mechanism not shown are deemed to be well understood by those skilled in this art and not essential to the carrying out of the present invention, and hence are not described. The numeral 58 represents a modified trigger cushion spring which may be constructed from flat spring steel stock or other suitable resilient material and is formed or shaped substantially as an open or broken link having U-shaped ends or loops 63 and 64 joined by substantially parallel side elements or spring arms 67 and 68. Each spring arm 67 and 68 is provided with a drilled hole 69 and 69 respectively. A screw bolt 60 is adapted to pass through the drilled hole 69 of the spring arm 67 so as to secure the latter and hence the entire cushion spring to the lower side of the receiver. The drilled hole 69 of the spring arm 68 is constructed large enough and arranged so that the kerfed head 70 of the bolt 60 may pass therethrough and be easily accessible for assembly or adjusting purposes. As in the construction shown in Figs. 1 and 3, the bolt or screw 60 projects through the receiver wall 61 so that its projecting end 62 comprises a positive trigger stop. Each U-shaped end or loop 63, 64 is provided with an adjusting screw 65, 66 respectively in the manner and for the purpose already described in connection with the spring assembly of Fig. 1, the definition and function of each element of the modified cushion spring assembly being substantially identical to that of its corresponding part in that trigger spring assembly. However the modified spring is characterized by somewhat simpler construction in that the U-shaped ends are formed by reverse bends both made in an upward direction and so arranged that the adjustable screw 66 is adapted to act as the fulcrum for the resilient spring arm 68 of the adjusting screw 65, whereby the stiffness of said spring arm is considerably less than the stiffness which characterizes the corresponding spring arm 32 of the device of Fig. 1. This feature, taken in combination with the modified sear nose and sear notch construction, wherein the adjacent surfaces contact each other at an obtuse angle, effects an extremely sensitive restraining means for controlling the fire control mechanism. By arranging the adjusting screw 65 so that its end 72 just touches the underside of the sear 50, it will be noted that the force of the usual trigger spring (not shown) is substantially the only restraining means acting to hold the sear in contact with the striker. In this case it has been found that a trigger pull of as little as one and one-half to two pounds is effective to release the striker. In accordance with this invention the weight of the trigger pull may be uniformly increased in increments of substantially one pound for each turn of the adjusting screw 65.

The operation of the fire control mechanism in combination with the modified trigger cushioning device is essentially the same as described in connection with Figs. 1 and 3. It will be realized, however, that inasmuch as the slope of the surface 52 of the sear nose is obtuse, the pressure of the surface 54 of the sear notch upon the surface 52 of the sear nose 51 tends to move the sear 50 clockwise and trigger 56 counterclockwise, which movement is restrained substantially only by the force of the trigger spring. As the shooter pulls on the trigger a pressure is quickly reached sufficient to overcome the static friction of the surfaces 52, 54 and approximately equal to the force of the trigger spring, whereupon the restraining effect of the latter is overcome and at this point the thrust of the striker spring overbalances any dynamic friction or other restraining forces acting on the sear so that the surface 52 of the sear nose is rocked away from the surface 54 of the sear notch and the arm discharged. This subsequent action, i. e. the rocking away of the sear nose from the striker notch, occurs without any additional pull on the trigger and therefore, since there has been no sudden release of the resistance to the pull of the finger upon the trigger, there is no trigger "jump." This trigger action is due to the fact that when the shooter has applied sufficient pressure to the trigger to

permit the initiation of any movement whatever between the surfaces 52 and 54, the movement will go on automatically in view of the conversion of static friction into dynamic friction, a phenomenon which characterizes contacting surfaces substantially at the angle of repose; hence "creep" or substantial initial movement of the trigger prior to the release of the striker is absolutely prevented. Inasmuch as the initial trigger movement to effect release or "let-off" of the striker is obviated, and since the adjustable screw 66 may be readily adjusted to stop any movement or overtravel of the trigger immediately after "let-off," it will be appreciated that the overall movement of the trigger necessary to discharge the gun may be scarcely perceptible whereby trigger "creep" and "jump" will be entirely eliminated. Recocking of the firearm and removal of the bolt is carried out substantially in accordance with the above description of Fig. 3.

It will be understood that the constructions shown and described represent a desirable form of the invention for accomplishing the objects stated above but these constructions are only for the purpose of illustrating the invention and are not limiting thereof as other modifications may be made without departing from the invention as defined by the claims.

From the foregoing description it is believed clear that the present invention represents a new and novel contribution to the art, being characterized by simplicity of construction; the combination in a unitary structure of all of the restraining and/or adjusting elements necessary to the fire control mechanism of a firearm; being an arrangement of parts whereby the device may be readily attached to or detached from the firearm by a single fastening means conveniently located in the firearm so that all adjustments of the several fire control elements may be readily made; and effective to give a smooth trigger pull of imperceptible movement, and substantially no trigger "creep" or overtravel.

What is claimed is:

1. In a firearm, firing mechanism embodying an impact member; an actuating spring for the member; holding means for the member to resist the spring; a trigger having means engaging said holding means and shiftable to change the position of the holding means to be overcome by the spring in giving the member a firing throw; means having an adjustable member in engagement with said holding means for resisting the displacement of said holding means by said trigger; and means to mount said resisting means in said firearm comprising a positive trigger stop.

2. In a firearm, firing mechanism embodying an impact member; an actuating spring for the member; holding means for the member to resist the spring; a trigger having means engaging said holding means and shiftable to change the position of the holding means to be overcome by the spring in giving the member a firing throw; resilient means having adjustable elements threadedly secured therein in engagement with said holding means and said trigger respectively to resist the displacement of said holding means by said trigger and to vary the weight of the trigger pull; and means to mount said resilient means in said firearm comprising a positive trigger stop.

3. In a firearm, firing mechanism embodying an impact member; an actuating spring for the member; holding means for the member to resist the spring; a trigger having means engaging said holding means and shiftable to change the position of the holding means to be overcome by the spring in giving the member a firing throw; and a leaf spring for resisting the displacement of said holding means by said trigger, said spring having an adjustable member constructed and arranged to engage said holding means.

4. In a firearm, firing mechanism embodying an impact member; an actuating spring for the member; holding means for the member to resist the spring; a trigger having means engaging said holding means and shiftable to change the position of the holding means to be overcome by the spring in giving the member a firing throw; a leaf spring for resisting the displacement of said holding means by said trigger, said spring having an adjustable member constructed and arranged to engage said holding means; and means to mount said leaf spring in said firearm comprising a positive trigger stop.

5. In a firearm, firing mechanism embodying an impact member; an actuating spring for the member; holding means for the member to resist the spring; a trigger having means engaging said holding means and shiftable to change the position of the holding means to be overcome by the spring in giving the member a firing throw; a resilient element secured to said firearm; and members supported on said element constructed and arranged to resist the displacement of said holding means by said trigger and to resist the movement of the trigger respectively.

6. In a firearm, firing mechanism embodying an impact member; an actuating spring for the member; holding means for the member to resist the spring; a trigger having means engaging said holding means and shiftable to change the position of the holding means to be overcome by the spring in giving the member a firing throw; a resilient element secured to said firearm; members supported on said element constructed and arranged to resist the displacement of said holding means by said trigger and to resist the movement of the trigger respectively; and means for securing said resilient element to said firearm comprising a positive trigger stop.

7. In a firearm, firing mechanism embodying an impact member; an actuating spring for the member; holding means for the member to resist the spring; a trigger having means engaging said holding means and shiftable to change the position of the holding means to be overcome by the spring in giving the member a firing throw; a resilient element having extremities secured to said firearm; and adjustable members supported at the extremities of said resilient element adapted to engage said holding means and said trigger respectively for resisting the movement of said holding means and said trigger.

8. In a firearm, firing mechanism embodying an impact member; an actuating spring for the member; holding means for the member to resist the spring; a trigger having means engaging said holding means and shiftable to change the position of the holding means to be overcome by the spring in giving the member a firing throw; a resilient element having extremities secured to said firearm; adjustable members supported at the extremities of said resilient element adapted to engage said holding means and said trigger respectively for resisting the movement of said holding means and said trigger; and a bolt for securing said resilient element to said firearm

constructed and arranged to form a positive trigger stop engaging said resilient element intermediate the extremities thereof.

9. In a firearm, firing mechanism embodying an impact member; an actuating spring for the member; holding means for the member to resist the spring; a trigger having means engaging said holding means and shiftable to change the position of the holding means to be overcome by the spring in giving the member a firing throw; a positive trigger stop; and a leaf spring secured to said firearm by said stop, said spring having an extremity constructed and arranged to resist the displacement of said holding means by said trigger and a second extremity constructed and arranged to resist the movement of the trigger.

10. In a firearm, firing mechanism embodying an impact member; an actuating spring for the member; holding means for the member to resist the spring; a trigger having means engaging said holding means and shiftable to change the position of the holding means to be overcome by the spring in giving the member a firing throw; a positive trigger stop; a leaf spring secured to said firearm by said stop, said spring having diametrically opposed extremities; holding means engaging means adjacent one extremity to resist the displacement of said holding means by said trigger; and trigger engaging means adjacent the opposite extremity to effect an extremely stiff resilient trigger stop.

11. In a firearm, firing mechanism embodying an impact member; an actuating spring for the member; holding means for the member to resist the spring; a trigger having means engaging said holding means and shiftable to change the position of the holding means to be overcome by the spring in giving the member a firing throw; a positive trigger stop; and a leaf spring secured to said firearm by said stop, said spring having an arm provided adjacent the end thereof with adjustable means engaging said holding means to set the weight of the trigger pull and having a second arm diametrically opposed to said first arm and provided adjacent the end thereof with adjustable trigger engaging means to effect a resilient trigger stop.

12. In a firearm, firing mechanism embodying an impact member; an actuating spring for the member; a sear for the member to resist the spring; a trigger having means engaging said sear and shiftable to change the position of the sear to be overcome by the spring in giving the member a firing throw; a positive trigger stop; a sear spring secured to said firearm by said stop, said sear spring comprising diametrically opposed arms having U-shaped extremities; and an adjusting screw in each extremity, one screw being constructed and arranged to resist the displacement of the sear by the trigger and the second screw being constructed and arranged to resist further displacement of the trigger following let-off.

13. In a firearm, firing mechanism embodying an impact member; an actuating spring for the member; holding means engageable with the member constructed and arranged to resist the spring when said means and member are in static frictional engagement but adapted to be displaced from engagement with said member by said spring when said means and member are in dynamic frictional engagement; a trigger having means engaging said holding means and shiftable to transform said static frictional engagement of said holding means and member to dynamic friction; and means having an adjustable member in engagement with said holding means for resisting the displacement of said holding means by said trigger.

14. In a firearm, firing mechanism embodying an impact member; an actuating spring for the member; holding means engageable with the member constructed and arranged to resist the spring when said means and member are in static frictional engagement but adapted to be displaced from engagement with said member by said spring when said means and member are in dynamic frictional engagement; a trigger having means engaging said holding means and shiftable to transform said static frictional engagement of said holding means and member to dynamic friction; means having an adjustable member in engagement with said holding means for resisting the displacement of said holding means by said trigger; and means to mount said resisting means on said firearm comprising a positive trigger stop.

15. In a firearm, firing mechanism embodying an impact member having an oblique surface; an actuating spring for the member; holding means having an oblique surface engageable with the oblique surface of the member to resist the spring when said oblique surfaces are in static frictional engagement but displaceable by said spring when said oblique surfaces are in dynamic frictional engagement; a trigger having means engaging said holding means and shiftable to impart movement to said holding means thereby transforming said static frictional engagement of said oblique surfaces to dynamic friction; a resilient element secured to said firearm having members supported thereon constructed and arranged to resist the displacement of said holding means by said trigger and to resist the movement of the trigger respectively.

16. In a firearm, firing mechanism embodying an impact member having an oblique surface; an actuating spring for the member; holding means having an oblique surface engageable with the oblique surface of the member to resist the spring when said oblique surfaces are in static frictional engagement but displaceable by said spring when said oblique surfaces are in dynamic frictional engagement; a trigger having means engaging said holding means and shiftable to impart movement to said holding means thereby transforming said static frictional engagement of said oblique surfaces to dynamic friction; a positive trigger stop; and a leaf spring secured to said firearm by said stop, said spring having an extremity constructed and arranged to resist the displacement of said holding means by said trigger and a second extremity constructed and arranged to resist the movement of the trigger.

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