

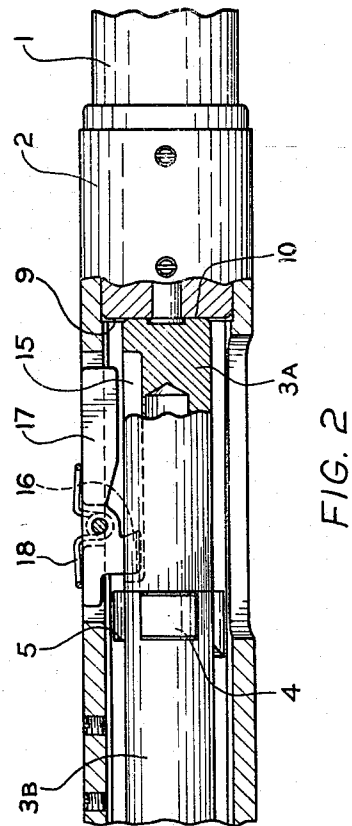
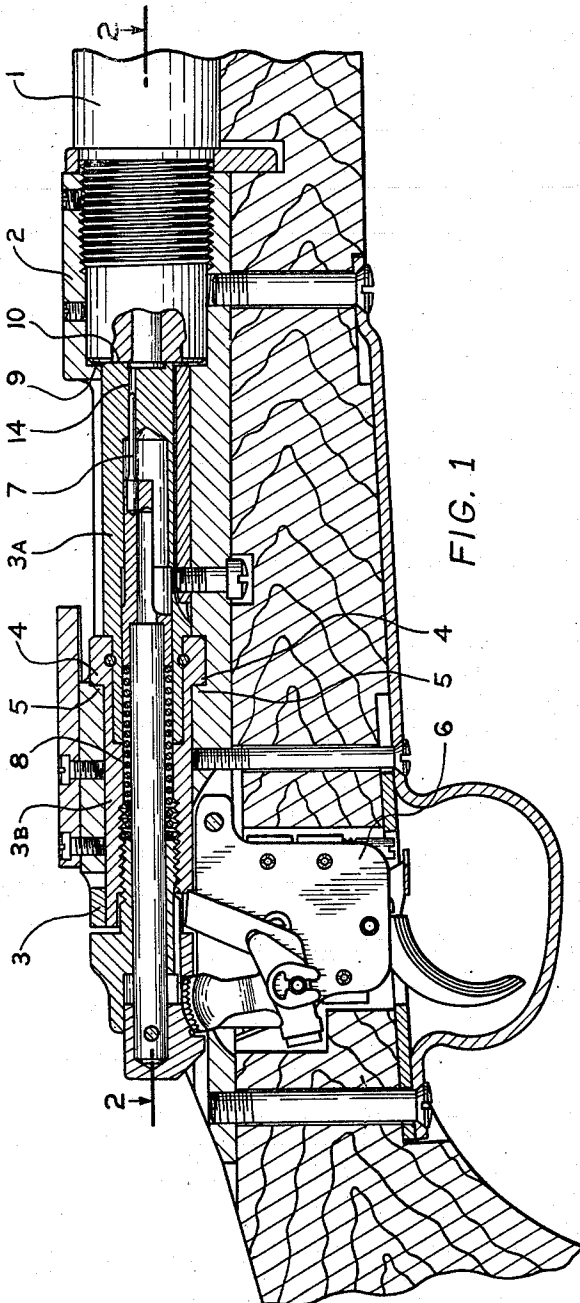
Nov. 17, 1959

R. T. CATLIN ET AL
FIREARM WITH MEANS FOR EXTRACTION AND
EJECTION OF RIMFIRE CARTRIDGES

2,912,779

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2 Sheets-Sheet 1



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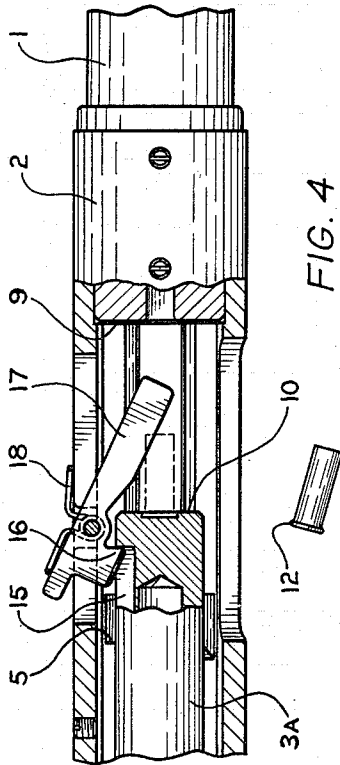


FIG. 4

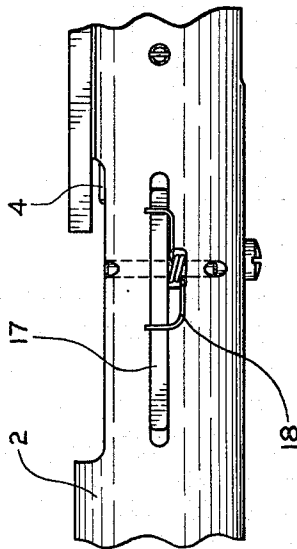


FIG. 3

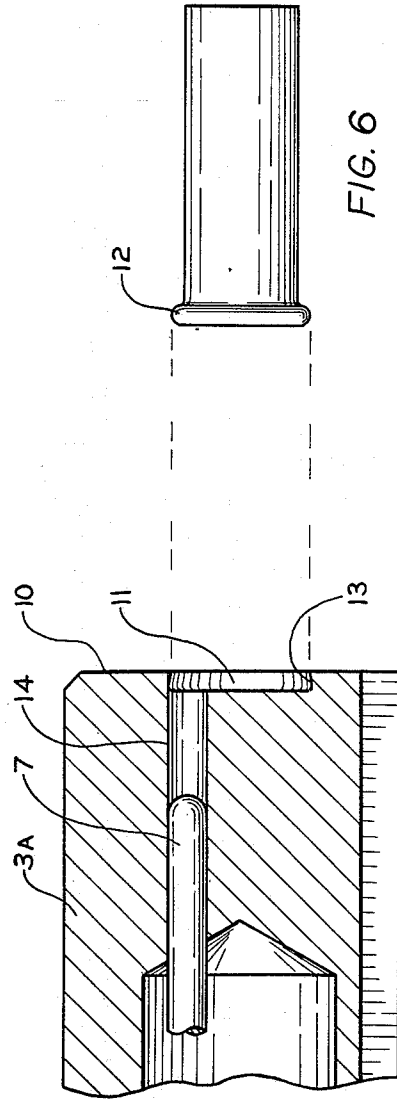


FIG. 5

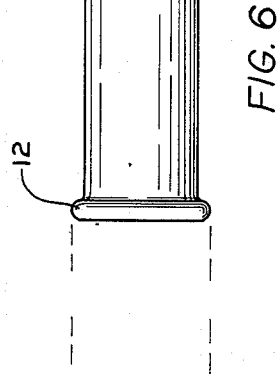


FIG. 6

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**FIREARM WITH MEANS FOR EXTRACTION AND
EJECTION OF RIMFIRE CARTRIDGES**

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2 Claims. (Cl. 42—25)

This invention relates to an improved breech closing construction for the barrel of a device actuated by the combustion of a charge of propellant powder housed within a conventional cartridge case. As examples of such devices, there are cited a firearm, a stud driver, and a captive piston tool. This invention has particular reference to the means employed in such a construction for supporting the head of the cartridge case and for extracting it after firing.

In the course of the research which culminated in the highly successful developments disclosed in Patent No. 2,473,373 granted to John D. Howell on June 14, 1949, for a "Bolt Head and Extractor for Firearms," and in Patent No. 2,585,195 granted to M. H. Walker on February 12, 1952, it was amply established that the strength of the breech closure of a firearm which fails to completely support the head of a cartridge case is no greater than the strength of the cartridge case. The construction shown in those patents proved to be highly effective when applied to centerfire type of cartridges. In the development of cartridge powered stud drivers and captive piston tools, it has also been demonstrated that the provision of adequate support for the head of a cartridge case permits even the small and inexpensive rimfire type cartridge cases to withstand tremendous pressures. In fact, with a stud driver such as is shown in the application of M. H. Walker et al., Serial No. 517,192, filed June 22, 1955, it has been established that conventional rimfire cartridge cases such as the .22 long, .22 long shot, and .32 long, may be used with charges developing pressures as high as 100,000 p.s.i. without producing any tendency toward burst heads or other serious cartridge case casualties.

It is an object of this invention to provide a breech closing construction which will provide adequate all-around support to a cartridge case and permit even inexpensive rimfire cases to be used at pressures formerly generated only by proof test loads.

As has been previously demonstrated, the provision of any clearance cut in bolt head or barrel for the reception of a conventional extractor or ejector is fatal to performance at high pressure levels, but the constructions previously developed have not been such as to permit the provision of the necessary degree of support for small rimfire cartridge cases. It is therefore an additional object of this invention to provide extracting means for such cartridge cases which will not detract from the support afforded to the case during firing, yet will provide for positive extraction thereof.

A further object of this invention is the provision of an ejector which will function with the extracting means discussed above and without detracting in any way from the support of the cartridge case.

It is contemplated that the best way of providing for such complete support of a cartridge head is to provide opposed flat contacting faces on the rearward end of the barrel and the forward end of the bolt in an annular zone completely surrounding the mouth of the chamber in the barrel. The bolt face is formed to provide a shallow counterbore just sufficient in depth to receive the

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head of the cartridge case and just sufficient in diameter to receive the largest diameter cartridge case permitted in a range of tolerances for cartridge cases of the particular caliber. To provide for extraction, the circumferential wall defining the edge of the counterbore is undercut at a slight angle. Under the influence of the blow of the firing pin and the internal pressure generated by the combustion of the charge, the head of the cartridge case is sufficiently expanded to be gripped by the undercut wall of the counterbore and when the bolt is retracted the cartridge case will be extracted from the chamber. To provide for ejection, a member actuated by the bolt is provided and strikes the extracted case a sideways blow of sufficient force to dislodge the cartridge case head from the undercut recess.

The exact nature of the invention as well as other objects and advantages thereof will become more apparent from consideration of the following specification referring to the attached drawings in which:

Fig. 1 is a longitudinal sectional view through the receiver portion of a typical firearm embodying the improved breech closing construction.

Fig. 2 is a fragmentary horizontal sectional view taken in the plane 2—2 of Fig. 1, showing the breech bolt mechanism in closed position.

Fig. 3 is a fragmentary left side elevational view of the receiver showing the ejector mechanism of the invention.

Fig. 4 is a view similar to Fig. 2, but showing the breech bolt mechanism in retracted position after ejection of the fired cartridge case.

Fig. 5 is a magnified view of a portion of the bolt head taken in the plane of Fig. 1.

Fig. 6 is a magnified view of a cartridge case which may be used in such a construction.

Referring to the drawings by characters of reference, it will be seen that there is illustrated a single shot bolt action rifle comprising a barrel 1, a receiver 2, and bolt 3. The bolt includes a reciprocating bolt head 3a secured with capacity for relative rotation to the bolt body 3b which has locking lugs 4 for engagement with the locking lugs 5 of the receiver. The usual fire control assembly 6 is provided to control the release of the firing pin 7 under the force of the main spring 8.

To insure the completeness of cartridge case support necessary for high pressure performance, the rear end of the barrel 1 terminates in a smooth surface 9 (Fig. 4), such as would be generated by locating one end of a generatrix on the axis of the bore of the barrel and swinging the generatrix about that center. Conveniently, the surface 9 is a planar surface at right angles to the axis of the bore but the surface may be conical, parabolic, or of other form so long as there is provided a continuous annular smooth band immediately surrounding the mouth of the chamber in the barrel.

As best shown in Fig. 5, the front end of the bolt head 3a is formed to define an annular surface 10 which with the bolt locked in breech closing position is substantially in facial engagement with the surface 9 of the barrel with minimum clearance provided to prevent the extrusion between the facing surfaces of any part of the cartridge case under the urging of gas pressure therein. Although it is not necessary that these surfaces 9 and 10 be lapped together to insure substantial perfection of their engagement, care should be taken to insure that the maximum possible separation is not over about .004" or there may be a tendency to extrude brass into the gap, when very high pressure cartridges are used.

The front end of the bolt head 3a is also provided with a counterbored recess 11 of just sufficient depth to accommodate the rimmed head 12 of a cartridge case such as is shown in Fig. 6, and said recess is of such a diameter

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as to snugly fit the head 12 of the cartridge case. The side walls 13 defining this counterbore are undercut slightly, conveniently on about a 7° angle, so that the base of the counterbore is of greater diameter than the entrance thereinto.

The bore 14, in which the tip of the firing pin 7 reciprocates, intersects the recess 11 adjacent one edge thereof to pinch the rim of the head 12 of the rimfire cartridge between the tip of the firing pin and the rear face of the barrel adjacent the mouth of the chamber therein.

As best shown in Fig. 4, the side of the bolt head 3a is provided with a longitudinal groove 15 which receives the hooked end 16 of an ejector 17 which is pivotally mounted in the side wall of the receiver 2. The hooked end of the ejector serves in part as a key to prevent the rotation of the bolt head 3a relative to the receiver and in part as a bolt stop, but its major function is to serve as the actuator for swinging the ejector about its pivot in the receiver when the hooked end is caught by the forward end of the groove 15 as the bolt is reciprocated rearwardly. A spring 18 serves as the means of restoring the ejector to its normal position parallel with the axis of bolt movement, when the bolt is moved forwardly to closed position.

In considering the operation of the invention, it will be noted that under the pressure released within the cartridge case by the combustion of the charge therein, the head expands and secures itself within the undercut counterbored recess in the bolt head. As the bolt is retracted the ejector is swung into the receiver to strike a sidewise blow on the body of the cartridge case and knock it laterally out of the receiver. The engagement of the cartridge head in the counterbored recess is rendered more certain by the deformation incidental to the impact of the firing pin and even in those cases where the expansion is not adequate to fill the counterbore, the deformation adjacent the firing pin indent will engage the undercut wall 13 and will be held thereagainst by the hemispherical firing pin tip and the indent thereof in the cartridge head.

The ordinary rimfire cartridge case is headed by an upsetting operation on the end of a cupped blank. Accordingly, the heads are not always absolutely symmetrical and in the table below the range of dimensions shown for head diameters are maximum and minimum diameters, measured on the same case. After firing and ejection the maximum diameter shown is that including the firing pin indent. All of these .22 caliber, rimfire cartridges were fired at a pressure level of between 40,000 p.s.i. and 45,000 p.s.i. with the entrance into the bolt counterbore being of .279 inch diameter and the side walls undercut at a 7° angle. After ejection the heads recover elastically to some extent, this being noted as explanation for the fact that diameters after firing are in some cases in excess of .279 inch.

Cartridge Number	Head Diameter—Unfired	Head Diameter—Fired
1-----	.2685-.270	.2805-.2822
2-----	.2695-.270	.278-.2798
3-----	.276-.2765	.2806-.281
4-----	.2713-.272	.2780-.2788
5-----	.2705-.2708	.280-.2803
6-----	.267-.267	.2685-.2706

The cartridge in Example 6 was actually of lesser diameter than permitted by normal manufacturing tolerances and obviously did not expand sufficiently to fill the counterbore. As a result of the engagement with the wall of the counterbore adjacent the firing pin indent, however, it extracted normally.

Although the description herein has been by reference to rimfire type cartridge cases, it will be noted that the same effects may be achieved with centerfire cartridges of solid or folded head construction. With such cases, however, the pressure required to cause a holding expansion

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of the head will be greater and extraction by this means will be facilitated by close control of head dimensions and in some cases by the elimination of the usual extractor cannellure of a rimless type of cartridge case.

The specific description herein has been confined to a single shot rimfire rifle but it should be obvious that the principles set forth are applicable to other uses, for example, the Animal Stunning Tool disclosed in application Serial No. 555,357, filed December 27, 1955, by Aitken et al., various types of stud drivers, and, in fact, any device using an explosive cartridge as a source of power.

The invention described is not therefore deemed to be limited by details of the rifle illustrated but should be broadly construed as set forth in the claims appended hereto.

What is claimed is:

1. In a device for firing rimfire cartridges, the combination comprising a receiver; a barrel secured to said receiver and having therein a chamber to receive the major body portion of a rimfire cartridge to be fired, a rearwardly facing, continuous, smooth annular face formed on said barrel surrounding the mouth of said chamber and forming a support for the projecting head rim of said cartridge, a breech bolt reciprocally mounted in said receiver and having a forwardly facing smooth face disposed for substantially abutting engagement with said annular face on said barrel at the forward extent of reciprocation of said breech bolt; means for locking said breech bolt at said forward extent of reciprocation; a forwardly facing, counterbored cartridge head receiving recess formed in said face of said breech bolt, said recess having a mouth diameter just sufficient to permit entry of the head of an unfired cartridge, and an internal maximum diameter greater than said mouth diameter defined by an unbroken perimetrical continuous undercut recess wall; a firing pin in said breech bolt disposed for impacting engagement with the head rim of a cartridge in said recess, said undercut wall of said recess forming an expansion area toward the base of said recess into which said cartridge head may expand when struck by said firing pin, thereby fixing said cartridge to said breech bolt for extraction from said chamber; and ejector means for dislodging said cartridge from said breech bolt, comprising a member pivotally mounted in said receiver for sidewise engagement solely with a portion of the body of a cartridge at a point spaced forwardly from that portion of the head of a cartridge fixed to said breech bolt by expansion into holding engagement with said perimetrical continuous recess, said member being capable of said sidewise engagement after the breech bolt has been reciprocated rearwardly a distance sufficient to withdraw the cartridge case from the barrel.

2. The combination described in claim 1, said ejector being provided with an arm extending into the receiver in the path of movement of said breech bolt, said ejector being so constructed and arranged that the engagement of said arm by a rearwardly moving bolt causes said ejector to swing into the receiver to strike a sidewise blow on the body only of the cartridge case.

References Cited in the file of this patent

UNITED STATES PATENTS	
904,646	Prinke ----- Nov. 24, 1908
1,089,621	Barnes ----- Mar. 10, 1914
1,403,133	Stokke ----- Jan. 10, 1922
1,464,864	Browning ----- Aug. 14, 1923
1,702,063	Swebilius ----- Feb. 12, 1929
2,514,422	Simpson ----- July 11, 1950
2,655,839	Ruger ----- Oct. 20, 1953
2,766,451	Gannon ----- Oct. 16, 1956

FOREIGN PATENTS

60,456	Germany ----- Jan. 9, 1892
588,998	Germany ----- Dec. 1, 1933