Troubleshooting Centerfire Rifles Lesson: 2175

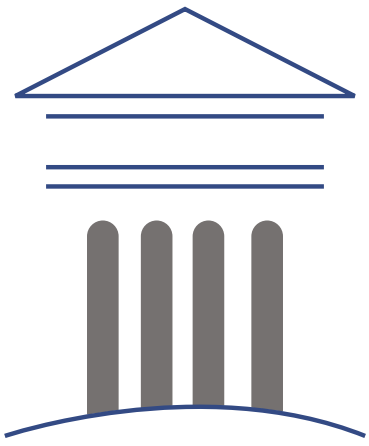
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Objectives

After completing this lesson, you should

1. Be familiar with the variation of the Winchester Model 1885 single-shot rifle.
2. Understand the term "falling-block."
3. Know how to repair a dull extractor.
4. Know how to repair worn gun parts.
5. Be able to determine the probable cause of a bolt-action rifle that will not feed.

Introduction

Much of the work performed by gunsmiths involves the repair and maintenance of centerfire rifles. To keep these firearms in good shooting condition, the gunsmith must have a thorough knowledge of what is commonly known as troubleshooting, the ability to determine the cause of any gun problem and correct it without wasting time or using unnecessary new parts.

Troubleshooting centerfire rifles covers a wide range of problems, from replacing an ejector spring to diagnosing why a rifle is not shooting accurately. In any case, troubleshooting usually requires a good knowledge of basic firearm design and the use of tools, and a systematic and methodical approach to the problem.

Those involved in the maintenance and repair of firearms, either at home or in the gunshop, should remember that every gun problem can be solved regardless of its nature. This lesson is designed to help you solve the more common problems that occur with centerfire rifles.

Single-Shot Rifles

Single-shot, centerfire rifles vary widely in design and quality, the simplest designs malfunctioning the least. Single-shot actions have been made in regular *falling-block* (Figure 1), *rolling-block*, and *drop-block* versions. Among the best of the single-shot actions are the famous Winchester high and low sidewall and the relatively new Ruger Model 1, which is based on the excellent falling-block action and is quite complex in design.

FALLING-BLOCK DESIGN. This type of single-shot action was designed so that the breechblock travels vertically in the channel. It is exceptionally strong and provides a perfect gas seal.

The direct ancestor of most modern single-shot rifles was the Sharps rifle, employing a falling-block design. The original Sharps had an exposed hammer, but a number of hammerless variations followed including the Ballards and Farquharsons, while the Winchester Model 1885 single-shot rifle, shown in Figure 3, on next page, retained the exposed hammer. This latter model, designed by John M. Browning, is known in its many versions as high wall, low wall, thick wall, and thin wall, which refer to the receiver dimensions.

In general, falling-block actions operate by a pivoting trigger guard (or lever behind the guard), which drops the breechblock when the lever is moved forward, exposing the chamber for loading. The lever is then pulled back to close the block for

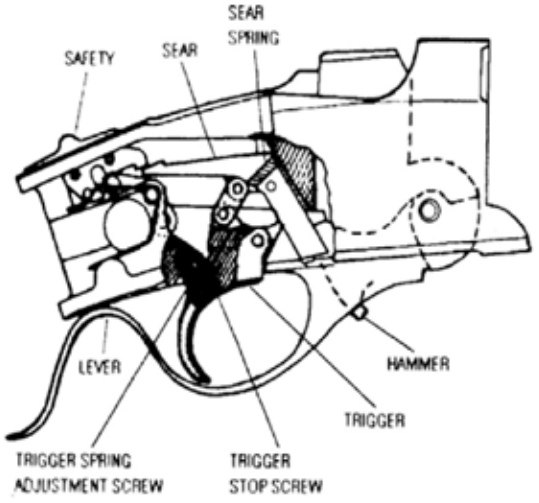


Figure 1: *The Ruger Model 1 is a modern example of the falling-block single-shot rifle action.*

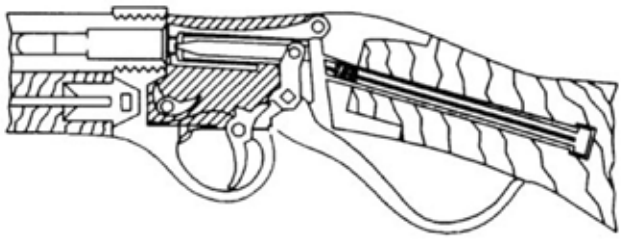


Figure 2: *The tipping-block system employs a block hinged at the rear which, when activated by a lever, lowers the front edge and exposes the chamber.*

firing. After firing, extraction (and ejection in some cases) is accomplished by opening and/or snapping the lever.

ROLLING-BLOCK DESIGN. The rolling-block system is the simplest of all single-shot designs and consists basically of two pivoting breech-locking mechanisms, one mounted directly behind the other, attached to the frame by large axis pins.

The primary mechanism is the breechblock, which also contains the firing pin. It can be rolled up and down from the chamber (when the hammer is cocked) by means of a thumb spur or extension. When flush against the chamber, the breechblock is spring supported, but not locked into place. The locking occurs a split second before the hammer hits the firing pin by means of a projection under the surface of the hammer assembly, which slides into place behind and under the breechblock.

The Remington rolling-block was used for military purposes by several countries in calibers such as 7 x 57 mm, .45- 70, .43 Egyptian, and several others.

TIPPING-BLOCK SYSTEM. The tipping-block system is used in the famous Martini-Henry action and employs a block hinged at the rear which, when activated by a lever, lowers the front edge and exposes the chamber, shown in Figure 2. A lever arrangement in the Martini action also cocks a concealed hammer when the action is opened.

In modem hammerless single-shot actions, the gun is usually cocked as the striker mechanism is pushed back against the spring tension of the mainspring until the striker is caught and held by the sear. This motion also unlocks and drops the breechblock, exposing the chamber for feeding and loading. When the lever is brought back up, the block rises behind the cartridge, locks the action, and is ready for firing. Once fired, the downward and forward motion of the lever lowers the breechblock, extracts and ejects the fired cartridge case from the gun, and is again ready for reloading by hand.

Hammer models work essentially the same way except that the hammer must be cocked manually after the cartridge is chambered and the action is locked. Actually, the hammer is usually cocked before the action is opened, and then the hammer is lowered to half-cock until the gun is ready for firing.

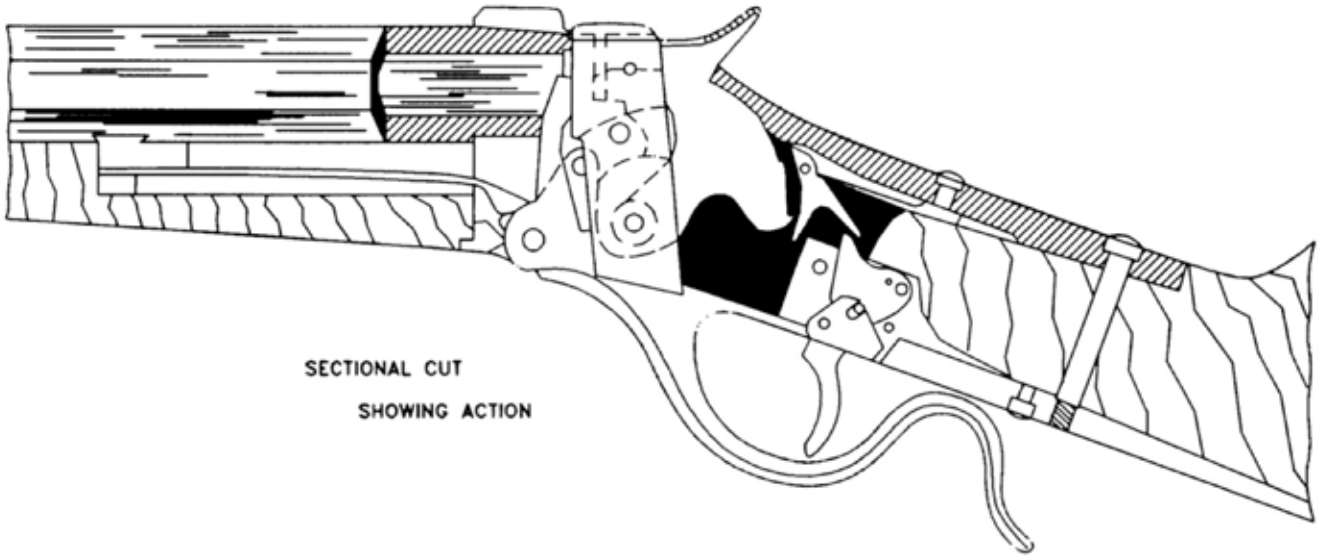


Figure 3: *Winchester Model 1885 single-shot action. The rifle opened a working relationship with John M. Browning and Winchester that lasted for over 20 years. Practically every firearm manufactured by Winchester during this period was a Browning design.*

The many single-shot rifles manufactured by the Stevens Arms Company utilize a variety of designs, but all of them are based on the actions described here to some extent.

COMMON MALFUNCTIONS

Unlike .22-caliber rimfire single-shot rifles (of the bolt-action design), single-shot centerfire rifles are sometimes very complex in design, often more than their repeating counterparts. Of the half dozen or so models currently in production, the Browning '78, Hyper-Single Rifle, Ruger No.1, and the Wickliffe all use the falling-block design. The Riedl single-shot rifle utilizes a rack-and-pinion action, while Harrington & Richardson uses the break-open action almost exactly like its single-barrel (single-shot) shotguns. There are also replicas of rolling-blocks and Springfield rifles currently available.

Since Harrington & Richardson uses the break-open single-shot shotgun design in their single-shot rifles, the same troubleshooting methods as described under single-shot shotguns in the next lesson may be used; however, the remaining models are unique.

Ruger Single-Shots. The Ruger No.1 single-shot rifle and the Ruger No.3 single-shot carbine, shown in Figure 4, have essentially the same type action except that the carbine has a different lever. Loading and ejection on both models are accomplished by lowering the lever (which opens the breech) and inserting a cartridge fully into the chamber. The lever is then raised until the lever latch engages; this action closes and locks the breech. The operation of the lever opens and closes the breech, automatically ejects the fired cartridge, and cocks the hammer, which is concealed within the mechanism. On this model, the breech is fully in position and locked before the lever latch engages, but firing the rifle with the lever latch disengaged is not recommended.

The safety on the Ruger Models 1 and 3 can be engaged only when the hammer is cocked. These rifles can be loaded and unloaded while the safety is on. The mechanism not only blocks movement of the sear, but also retracts the hammer.

When the hammer is cocked, it protrudes slightly from the lever, serving as a cocking indicator that can be felt and seen.

When engaging the safety (by sliding it to the rear), be sure that it is moved all the way to its extreme rear position. There is an extra resistance to the safety movement about halfway back, and some may confuse this resistance with the true safety position. The word "safety" should be clearly visible when the safety is on.

The trigger sear is preset at the factory to provide a recommended minimum sear engagement with the hammer. The safety is fitted after the sear is adjusted. The minimum weight of pull is established by the sear spring and this spring should not be modified. On the other hand, the weight of pull can be increased beyond this minimum by tightening the adjustment screw on the trigger mechanism.

In the event that snap-action automatic ejection is not desired, the ejector spring can be removed by taking off the forearm by removing the forearm takedown screw, and backing off on the ejector strut adjustment screw. The ejector will then function as an extractor only, and the cartridge will be partially removed from the chamber by the final downward motion of the lever.



Figure 4: *The Ruger No. 1 single-shot rifle is considered to be one of the best manufactured in the United States. Although it is a single-shot rifle, the mechanism is rather complicated.*

Should the snap-action mechanism be replaced at a later date, do not over-tighten the adjustment screw because this will bind the action. The force of ejection can be altered to some extent by the adjustment screw.

To disassemble the Ruger Model 1, first make sure the gun is unloaded and then remove the forearm by removing the forearm takedown screw. With the hammer cocked, insert a slave pin through the hole in the hammer strut and pull the trigger to release the spring tension. Remove the spring and strut as an assembly. Lower the lever and remove the lever pivot screw and the lever pivot pin. Remove the hammer. Raise the lever to close the breech before lowering the lever about halfway and then pull downward on the lever, removing the breechblock, breechblock arm, and the linkage as a unit. Remove the ejector, ejector plunger, and spring in the receiver.

To reassemble, insert the ejector, ejector plunger, and spring the receiver. Assemble the breechblock, breechblock arm, ejector roller, and linkage shown in Figure 5 and replace them as a unit in the receiver while holding the ejector against the inside receiver wall. Position the hammer in the lever and engage the lever and link shown in Figure 6. Now hold the ejector against the inside receiver wall and insert the lever into the receiver opening. Move the lever to its closed position while depressing the trigger. Replace the pivot pin and retaining screw.

Replace the hammer spring and strut assembly before cocking the hammer and removing the slave pin installed earlier. Finish by reassembling the forearm.

The Ruger No.1 rifle is an exceptionally well-built gun with many hand-fitted parts. If the owner of such a rifle does his part, such a gun will last several lifetimes without a single malfunction. Following is the maintenance recommended by the manufacturer.

The mechanism should be lubricated with light gun oil, but not too heavily. As a rust-prevention measure, all surfaces, including the bore of the barrel, should be wiped with oil after use. But again, do not flood the bore with oil.

A comprehensive field cleaning of the mechanism is not required more than once a season unless obviously necessary. The purpose of such cleaning is only to remove powder residue from internal components and as a rust prevention procedure in the event that the gun has been soaked or submerged in water. The barrel should always be cleaned after each use.

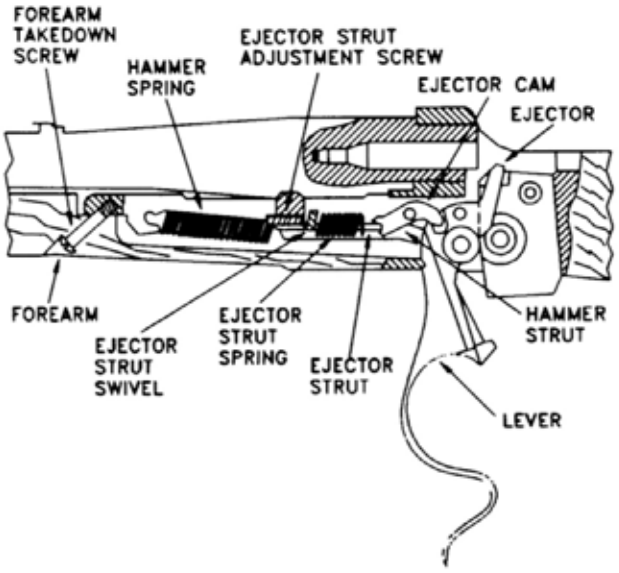


Figure 5: *Assembling procedure for the breechblock, breechblock arm, ejector roller, and linkage of the Ruger Model 1.*

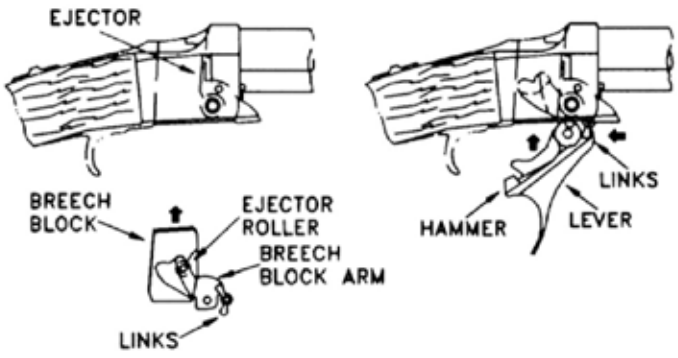


***Figure 6**: Positioning the hammer in the lever and engaging the lever and link of the Ruger Model 1.*

If sand or other foreign matter in any appreciable quantity enter the mechanism, the reliability of functioning will probably be impaired until the gun is dismantled and thoroughly cleaned.

Malfunctions in the Ruger Model 1 can usually be traced to dirty and gummed-up action, worn or broken parts, or parts assembled incorrectly. Unless the problem is obvious, the rifle should be disassembled as described previously and thoroughly cleaned and degreased. Inspect every part for wear, breakage, burrs, etc. Note your findings. The exploded view, shown in Figure 7, should serve as a guide to ascertain that the rifle is assembled correctly. Broken parts should be obvious and worn parts can be detected by rounded edges and bright spots where mating surfaces were rubbing. Replace or rebuild any broken or cracked parts, assemble, and test fire. Remove any burrs and polish the surface smooth.

REMINGTON ROLLING-BLOCK

The Remington rolling-block action has been around for a long time and is chambered for a long list of cartridges. The rifles were used mainly by foreign governments desiring an inexpensive, serviceable, and simple military weapon. Many of these actions have found their way back to this country, some 50 to 100 years later, and have been distributed by arms dealers.

The Remington rolling-block is a relatively simple action with the main points of wear being the springs, including the lever spring, the trigger spring, and the mainspring. If the parts are not worn and are assembled correctly, only one part gives serious trouble: the firing pin. Most rifles of this type are stored with the hammer down, holding the firing pin in its forward position. If left to remain in this position for extended periods of time, especially in humid weather, the firing pin is likely to rust tightly in this position. When such a frozen firing pin is slammed shut on a live round, chances are it will set the cartridge off. Due to the design of the action, there is nothing but your thumb to hold the block closed. A few years back, one shooter discovered this when his rolling-block chambered for the 7 mm Mauser discharged upon closing the block. This sheared off part of the breechblock and seriously injured his right hand.

Protruding firing pins have also caused trouble in other types of rifles, firing prematurely (firing before the action is locked) and causing semi-automatic guns to fire fully automatic!

The Model 1902 rolling-block action is the largest and strongest of the rolling-block lines, but the 7 x 57 mm Mauser is still about the hottest cartridge that one would want to put through it. The 1½ action (1888-1897) will handle some of the low-powered centerfire cartridges like the .22 Hornet and .25-20 if the action is tight and the firing pin is bushed.

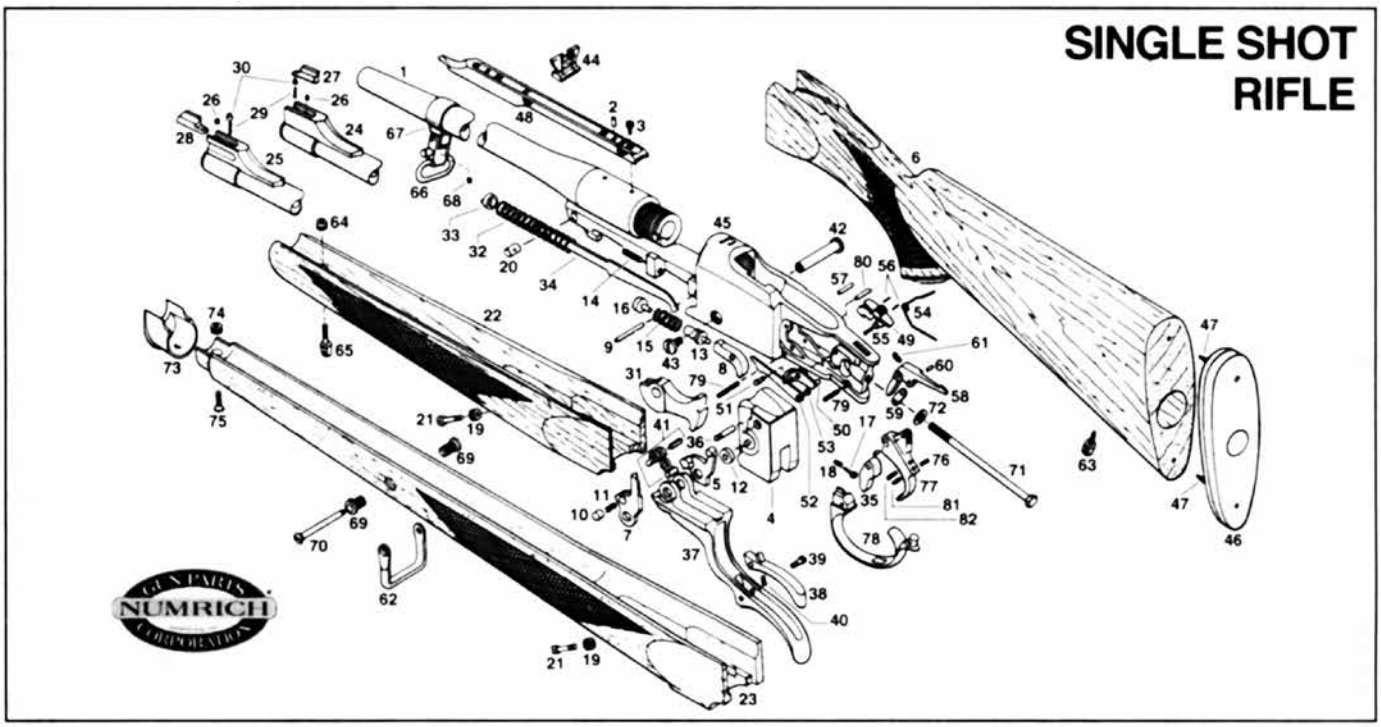
Some of the worn actions can be given a facelift and put back into service by using one or more of the following suggestions.

Bush the Firing Pin. On all rolling-blocks made before 1902, the firing pin hole should be bushed and the big firing pin tip replaced with a smaller one.

Refacing Breechblocks. If breechblocks are slightly pitted, they can be carefully filed down with a wide mill file. However, if the pits are deep around the firing pin hole, a large bushing should be fitted rather than trying to file down the face and taking a chance on not getting it square.

Adjusting Trigger Pull. The heavy trigger pull on most rolling-block actions can be remedied somewhat by honing the sear notch in the hammer and the sear tip of the trigger, but first lighten the hammer and reduce the tension on the mainspring. Usually a lighter trigger pull will result without further ado. If honing is still necessary, it should be done with extreme caution.

The hammer can be made considerably lighter by thinning the spur and drilling a hole or holes in the body. The surplus metal can be ground away, the surface polished, and the spur checkering re-cut with a metal checkering file. The holes will be covered if drilled in the rear part of the action only.



KEY#	MFR#	ITEM#	DESCRIPTION	PRICE
1	S-3	222250	Barrel, .22-250, 26", Medium (Normally Factory Fitted; 1-B)	120.20
1	S-3	222190	Barrel, .243, 26", Medium (Normally Factory Fitted; 1-B)	120.20
1	S-3	222180	Barrel, .25-06, 24", Heavy (Normally Factory Fitted; 1-V)	120.20
1	S-3	849610	Barrel, .25-06, 26", Medium (Normally Factory Fitted; 1-B)	120.20
1	S-3	222110	Barrel, .270 Cal., 22", Lightweight (Normally Factory Fitted; 1-A)	120.20
1	S-3	221890	Barrel, .270 Cal., 24", Medium (Normally Factory Fitted; 1-B)	120.20
1	S-3	221980	Barrel, .270 Cal., 26", Medium (Normally Factory Fitted; 1-B)	120.20
1	S-3	222370	Barrel, .270 Weatherby Mag, 26", Medium (Normally Factory Fitted; 1-B)	120.20
1	S-3	222160	Barrel, .300 Mag, 26", Medium (Normally Factory Fitted; 1-B, 1-S)	120.20
1	S-3	222080	Barrel, .30-06, 22", Lightweight (Normally Factory Fitted; 1-A)	120.20
1	S-3	849620	Barrel, .30-06, 26", Medium (Normally Factory Fitted; 1-B)	120.20
1	S-3	222340	Barrel, .338 Mag, 26", Medium (Normally Factory Fitted; 1-B, 1-S)	120.20
1	S-3	222380	Barrel, 6mm Mag, 26", Medium (Normally Factory Fitted; 1-B)	120.20
1	S-3	222200	Barrel, 7 x 57mm, 22", Lightweight (Normally Factory Fitted; 1-A)	120.20
1	S-3	222230	Barrel, 7mm Mag, 22", Lightweight (Normally Factory Fitted; 1-A)	120.20
1	S-3	222400	Barrel, 7mm Mag, 24", Heavy (Normally Factory Fitted; 1-H)	120.20
1	S-3	222360	Barrel, 7mm Mag, 26", Medium (Normally Factory Fitted; 1-B, 1-S)	120.20
2	S-151	232440	Barrel Rib Dowel, Front & Rear (1-A, 1-B, 1-H, 1-RSI, 1-S)	4.30
2	S-152	232430	Barrel Rib Dowel, Front & Rear (For .458, .416, .404 Cal. Only; 1-B, 1-H)	4.30
2	S15101	232490	Barrel Rib Dowel, Front (For .45-70 Only; 1-S)	4.30
-	S-138	231980	Barrel Rib Screw, Front & Rear (1-B, 1-H, 1-S)	4.30
-	S-139	231770	Barrel Rib Screw, Front, NI (1-A, 1-RSI)	4.30
3	D06101	737940	Barrel Rib Screw, Rear (1-A, 1-B, 1-RSI, 1-S)	4.30
3	S-137	232080	Barrel Rib Screw, Rear (For .375 Cal. Only; 1-H)	4.30
4	S-10	224460B	Breech Block	41.10
5	S-9	224520B	Breech Block Arm	10.60
6	S-4	230700	Stock, Complete (w/ Pistol Grip Cap & Recoil Pad)	241.85
7	S-125	231400	Ejector (1-A, 1-B, 1-RSI, 1-S, 1-V)	14.10
7	S12501	231680	Ejector, .218 Bee (1-B, 1-S)	11.55
7	SC-125	231490B	Ejector, .22 Hornet & .223 Rem (1-A, 1-B, 1-V)	11.90
7	S-126	231530C	Ejector, .338 Mag, 7mm, .38-55, .30-40 Krag & .300 Win Mag (1-S)	11.90
7	S-126	231530B	Ejector, .375, .404 Jeffrey, .458 & .416 Rem (1-H)	11.90
7	SC-126	231660A	Ejector, .416 Rigby (1-H)	11.90
7	SC-126	231660B	Ejector, .45-70 (1-S)	11.90
7	S-126	231530A	Ejector, 7mm, .270 Weatherby, .300 Win Mag, .338 Mag & .300 Weatherby (1-B)	11.90
8	S-13	224550B	Ejector Cam	8.15
9	S-45	224570B	Ejector Cam Pivot Pin	4.30
10	S-29	224590B	Ejector Plunger	4.30
11	S-30	224610	Ejector Plunger Spring	4.30

CONTINUED

NI = NOT ILLUSTRATED

Figure 7: Partial example of exploded view of Ruger No. 1 single-shot rifle. Such views are extremely useful to the gunsmith to see the relation of the various parts to each other.

TROUBLESHOOTING CHART
Centerfire Single-Shot Rifles

Malfunction	Probable Cause	Corrective Action
Poor Accuracy	Loose sights	Tighten sights
	Worn rifling	Lap barrel; install new barrel; rebore to new caliber or reline
	Rough trigger mechanism	Hone contact points to smooth
Rifle fires when block is closed	Protruding firing pin	Shorten, round, and reharden firing pin
Hard trigger pull	Heavy mainspring	Grind mainspring to lighten
	Rough sear notch in hammer and/or sear tip of trigger	Hone to smooth
Misfires	Firing pin worn or broken	Replace
	Weak mainspring	Replace
	Dirty and gummed-up mechanism	Clean thoroughly

***Figure 8**: Troubleshooting chart for centerfire single-shot rifles.*

You can reduce the tension of the mainspring by loosening the mainspring screw a turn or two, testing after every half turn or so. However, if the mainspring is ground or filed a bit thinner, the hammer will be smoother and easier to cock.

If you still feel that the trigger pull is too heavy, hone the sear notch with a fine knife-edged Arkansas stone, using plenty of honing oil. Try the pull frequently and never have less than 3½ pounds of pull on this type of action; however, four pounds is better.

Troubleshooting the remaining single-shot actions is a matter of understanding how the action operates first, and then inspecting the gun to see what is not functioning correctly. However, before the initial inspection, make certain that the gun is thoroughly cleaned and degreased. Then inspect each part individually. Older guns should be given an especially close examination to detect any hairline cracks in the parts. Refer to the troubleshooting chart in Figure 8.

SELF-TEST QUESTIONS

Please check your answers on page 27.

1. **What name is given to the single-shot action that utilizes two pivoting breech-locking mechanisms, one mounted directly behind the other?**
2. **What type of system is used in the Martini-Henry single-shot action?**
3. ***True or False.*** **The safety on the Ruger Model 1 and Model 3 cannot be engaged when the hammer is cocked.**
4. **What is the model number of the Winchester single-shot rifle designed by John M. Browning?**

Bolt-Action Rifles

Bolt-action rifles seldom give trouble even if misused, but occasionally a problem will develop that requires the attention of an expert. Some of the more common problems include poor accuracy; binding of the breechbolt; the cartridge not feeding into the chamber; the breechbolt pulling out of the receiver or overriding the cartridges in the magazine; the firing pin following down; misfiring; a defective safety; the magazine cover failing to open; failing to extract; and failing to eject. These categories cover just about every malfunction possible in the conventional bolt-action rifle.

Poor Accuracy. The bolt-action rifle (Figure 9), has the reputation of being the most accurate rifle ever made, so when one does not group as it should, you know that something is wrong. If the rifle is old or shows signs of hard use, you can assume that the rifling is shot out or pitted so badly that accuracy has been affected. Of course the only way to be sure is to check the rifling carefully with a bore light.

At the first sign of poor accuracy, the stock should be the first area to check over thoroughly. If the stock is warped and the barrel does not line up properly in the barrel channel, coat the bottom of the barrel with Prussian blue or inletting black, applied in a thin, even coat, and insert the barrel into the barrel channel of the stock. Any high spots or interference in the barrel channel will be clearly marked so that they can be scraped away. Of course, if the stock is too badly warped, it should be replaced.

In most cases, the barrel of bolt-action rifles should bear on the bottom of the barrel channel in the stock only at the forend tip. This bearing point can be from a contact point up to about a ½ inch. Glazed spots in the channel indicate barrel contact with the wood. Again, Prussian blue coated on the barrel should show these spots readily. Any such interference points found should be scraped away using conventional inletting tools. Note particularly the area around the point where the barrel joins the receiver.

If these checks turn up okay and the accuracy still is not up to what it should be, continue checking the rifle to see if any of the screws holding the stock to the action are loose. Then inspect the crowning on the muzzle for eccentricity of crowning to bore and for any upsetting of the rifling at the muzzle. If the latter problem is discovered, place the barrel in a lathe and turn back the barrel and recrown.

Metal fouling is not too common in the larger center- fire calibers, but just the opposite is true for the small- caliber, ultra-high velocity cartridges. When metal fouling does occur, accuracy is badly affected. A metal fouling solution that has been around for a long time consists of the following:

- 1 oz. ammonium persulphate
- 200 gr. ammonium carbonate
- 6 oz. stronger ammonia
- 4 oz. water

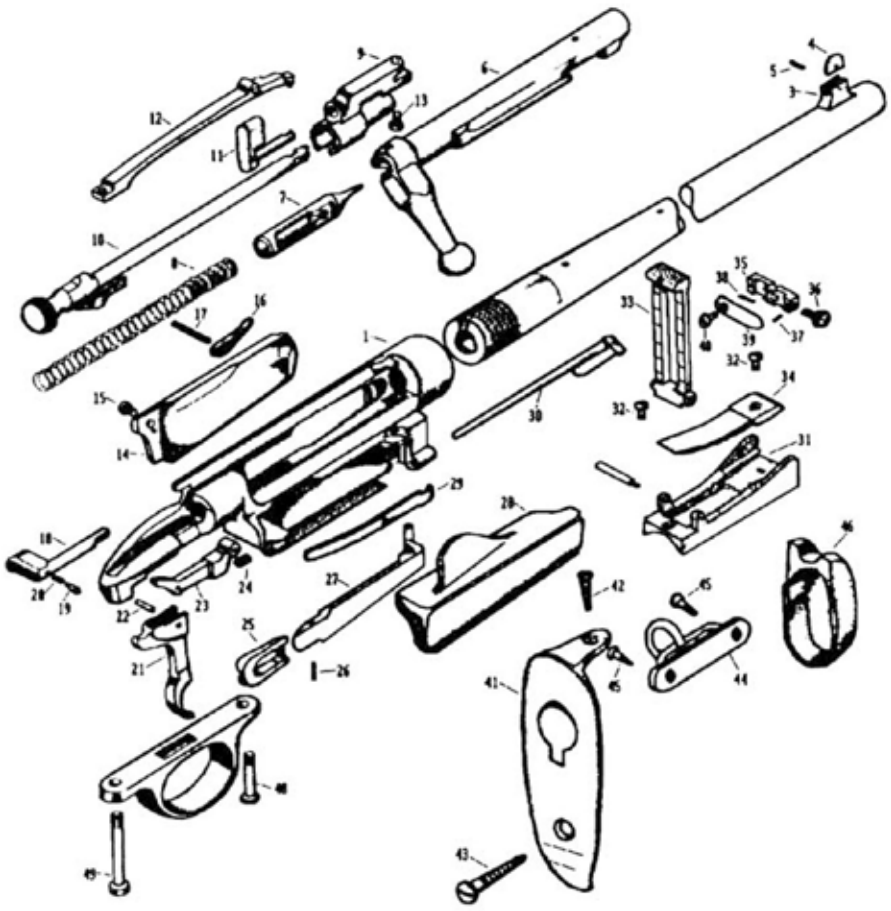
Mix these ingredients in a large glass bottle and let stand. Then plug the chamber end of the barrel with a rubber plug or cork. Secure the barrel and action in a position so that the muzzle is pointed upward. Carefully pour the solution into the barrel until it is full, but be careful not to get any of the solution on the outside of the barrel as it might damage the bluing. If the solution is allowed to remain in the bore about 30 minutes, all metal fouling should be removed. Then pour all of the solution out and rinse the barrel thoroughly with hot water, the hotter the better. The barrel should dry almost instantly due to the heat generated by the water. When dry, lightly oil the bore to protect it from rust.

After removing the metal fouling, boresight the rifle and check accuracy with ammunition from different lots.

Breechbolt Binds. A tight bolt can indicate burrs on the action mating surfaces, or the bolt may be fitted too tightly in the receiver. A small amount of filing, followed up with honing and polishing with crocus cloth, will relieve tightness where interference is confined to one or two small areas but not enough to loosen a snug fit in a receiver.

The extractor ring may be high, causing the bolt to ride tight. To correct this problem, remove the ring and remove any high spot on the ring channel. Refit the ring and try for smoothness. If this does not solve the problem, a new ring will have to be fitted.

Failure to Feed. The most probable cause of this malfunction is a tight extractor. In altering the extractor, extreme care should be used and any adjustments made should be done on a trial-and-error basis; that is, take only one or two file strokes at a time, then try the extractor for fit. With some experience, you will be able to look at the degrees of tightness and then know almost exactly how much metal to remove. Too much filing may cause further malfunctions.



Parts List

Key No.	Part Name				
1	Frame	18	Magazine Cutoff	34	Elevation-Bar Spring
2	Barrel	19	Cut-off Plunger	35	Sight-Slide Adjustment
3	Front-Sight Base	20	Cut-off Plunger Spring	36	Sight-Slide Adjustment Screw
4	Front-Sight Blade	21	Trigger		
5	Front-Sight Blade Pin	22	Trigger Pin	37	Adjustment-Screw Pin
6	Bolt Body	23	Sear	38	Slide-Tension Spring
7	Striker	24	Sear Spring	39	Sight-Cover Plate
8	Mainspring	25	Follower	40	Sight-Cover Plate Screw
9	Bolt Sleeve	26	Follower Pin	41	Butt plate
10	Cocking Piece	27	Carrier	42	Butt-plate Screw (upper)
11	Safety	28	Magazine Gate	43	Butt-plate Screw (lower)
12	Extractor	29	Magazine Spring	44	Saddle-Ring Rail
13	Extractor Rivet	30	Magazine-Gate Hinge Pin and Lock	45	Saddle-Ring Rail Screws (2)
14	Side-plate Cover			46	Front-Stock Band
15	Side-plate Screw	31	Rear-Sight Base	47	Trigger Guard
16	Ejector	32	Rear-Sight Base Screws (2)	48	Trigger-Guard Screw, Front
17	Ejector Pin	33	Elevation Bar	49	Trigger-Guard Screw, Rear

***Figure 9** : The .30-40 Krag was the first bolt-action rifle adopted by the U.S. Government. The Springfield followed in the early 1900s and remained the service rifle of the U.S. armed forces for nearly 40 years.*



Figure 10: When feeding problems develop in bolt-action rifles, always check the magazine-follower spring.

If the extractor is fitted correctly, check the magazine follower spring, as it may be too weak. To correct, remove the spring and open it (stretch it) slightly but carefully to avoid overspreading and damage to the spring, as shown in Figure 10. Again, use the trial-and-error method until it functions properly.

The follower could be binding in the magazine due to the spring leaves canting sideways. This will cause the follower to bind on the inner wall of the magazine. Straighten it with care and watch for this point when opening up the spring.

Breechbolt Pulls Out of Receiver. The bolt stop is not functioning properly when this malfunction occurs. Check to be sure it is free in the slot in the receiver and that the trigger pin, on which the stop pivots on some bolt-action rifles, is not loose in the receiver. Make sure the spring functions freely in its seat and does not bind or is too weak. If necessary, replace either or both spring and stop.

Breechbolt Overrides Cartridges In Magazine. A weak follower spring is probably the culprit. It can be remedied by removing the spring and spreading the three angles slightly to increase the tension on the follower. This should be done on a trial-and-error basis as explained before. Make sure the spring is not twisted, causing the follower to bind on the side of the magazine.

Firing Pin Follows Down. Possible cause is the sear may not be engaging the firing pin enough to retain it. Make sure the sear and sear spring are not binding in the receiver.

Headspace Problems. Headspace is the distance between the head of the case and the seating portion of the case as shown in Figure 11. This distance is measured differently depending on the type of cartridge.

Insufficient headspace is seldom encountered in modern American firearms but is found on some of the older military weapons. Many bolt-action rifles were used for military

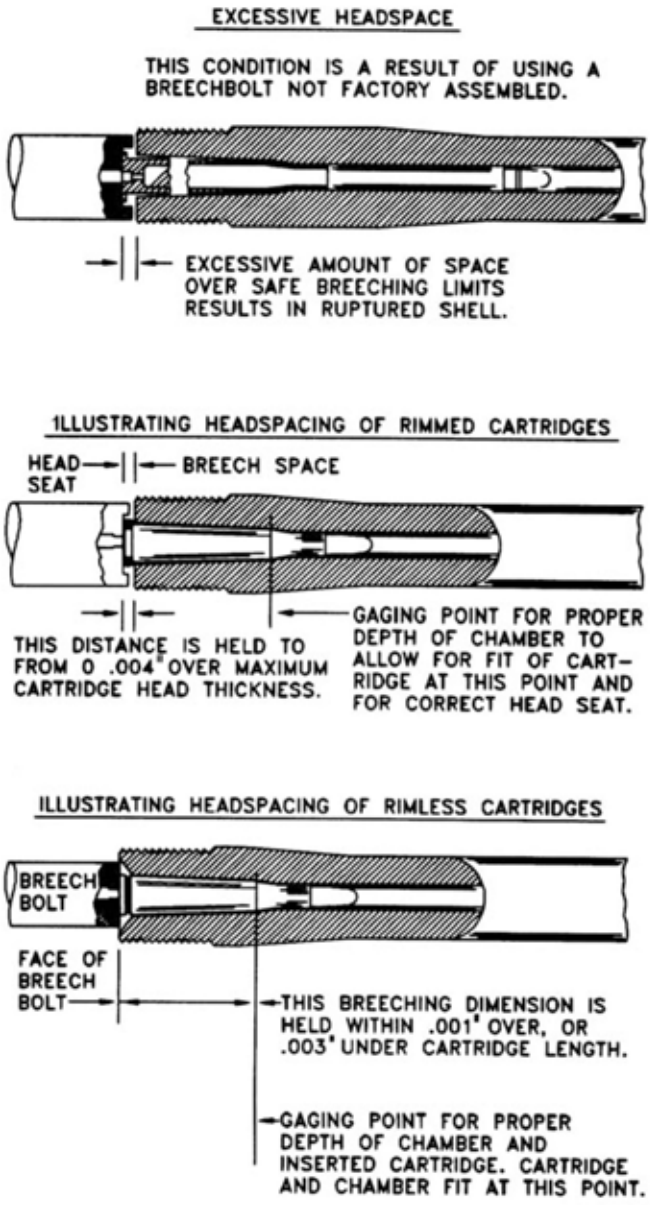


Figure 11: Headspacing for rimmed and rimless cartridges.

purposes in foreign countries. These were imported to the United States, distributed through gun dealers, and have since fallen into the hands of many shooters. The majority of these guns were checked by the distributor, and the bad ones were rejected and dismantled for parts. The better ones were sold for shooting. However, some of these weapons have dangerously excessive headspace. Therefore, before firing any of the older military weapons, check the headspace. If it is excessive and the gun is a common inexpensive piece, you are better off not using it.

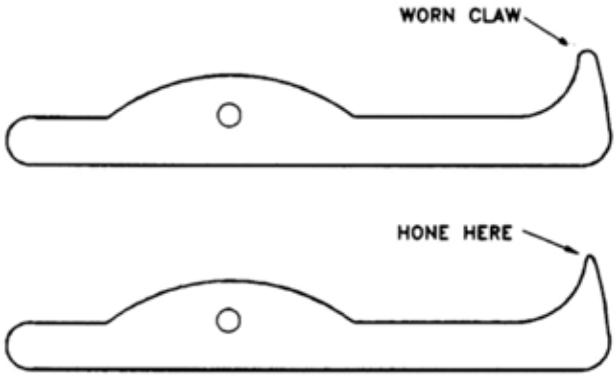


Figure 12: Worn or dull extractors may sometimes be corrected by honing the extractor hook angle.

However, if you are working with a basically good and/or desirable firearm, you may wish to set the barrel back to correct the headspace problem. Sometimes, you may be able to correct a headspace problem, especially on the Springfield and Mauser bolt-action rifles, by finding a slightly over-long bolt and substituting this for the original. Otherwise the problem will have to be solved by setting the barrel back.

To set the barrel back, you will need access to a heavy barrel vise. If you do not have one, do not attempt the job. Once the barrel is removed, it is inserted in a lathe and metal is removed from the shoulder equal to one full turn of the threads. This is to make sure the sights, extractor slots, etc., will line up perfectly as before. However, this cutting should be done on a trial-and-error basis, being careful not to remove too much metal.

When a barrel is set back, the chamber is usually shortened and must be lengthened to the proper tolerance with a finishing chamber reamer. The reaming operation is sometimes done on a lathe, but more often it is done by hand. Once completed, the action is threaded forward on the barrel until the bolt can be easily closed on the gauge with a slight feeling of resistance.

Excessive headspace, even if not to the point of being dangerous, can affect accuracy considerably. So check the headspace on all guns that complain of poor accuracy. Both headspace and barrel removal are covered in detail in a later lesson.

Failure to Fire. Here is another problem that can be caused by excessive headspace — so excessive that the firing pin cannot reach the primer with sufficient force to puncture it. However, the most probable cause of this malfunction is a short firing pin. Remove the firing pin assembly from the bolt and examine it closely for breaks or a worn firing pin tip. At the same time, check for a broken or weak firing pin spring. Replace all broken or worn parts. Of course, debris in the bolt can cushion the firing pin as it moves forward, restricting the force of the plunger. So always give the bolt assembly a good cleaning and degreasing when it is torn down.

Defective Safety. In most cases, this problem can be traced to a worn or altered cam on the firing pin. If the safety binds, try filing the bearing point on the firing pin, taking only a small amount of metal away at a time until the problem is corrected. If the safety is tight in the bolt sleeve, it may be fitted, but usually a new safety is suggested.

Fails to Extract. Most centerfire cartridge cases swell when fired, and if the chamber is dirty or pitted, the case will have a tendency to stick. When an extractor hook is somewhat worn, it can slip over the case rim when the bolt is withdrawn, leaving the fired case in the chamber. Sometimes, if the wear is not too bad, the problem may be corrected by honing the extractor hook angle, as shown in Figure 12. Do not remove too much metal, as described previously. Proceed on a trial-and-error basis until the extractor functions properly. Also check the extractor ring for tension and adjust it to acquire bite. In rare cases, it may be necessary to replace either or both the extractor ring and extractor.

Fails to Eject. The ejector is probably not free in its cut in the receiver; the cut may be too narrow or the ejector may be bent. A binding ejector spring may not be functioning properly, or the slot for the ejector in the bolt may not be in line with the ejector. See that the parts are free and functioning properly or replace as needed.

Refer to the troubleshooting chart in Figure 13, on the next page, for more information on troubleshooting bolt-action rifles.

SELF-TEST QUESTIONS

Please check your answers on page 27.

5. **What problem is usually present when a rifle barrel needs to be lapped?**
6. **Is metal fouling found the most in larger or smaller centerfire calibers?**
7. ***True or False*. When a breechbolt binds, one problem could be the presence of burrs on the action mating surfaces.**

TROUBLESHOOTING CHART
Centerfire Bolt-Action Rifles

Malfunction	Probable Cause	Corrective Action
Breechbolt binds	Breechbolt may be fitted too tightly in receiver	A small amount of filing will probably relieve tightness where interference is confined to one or two small areas, but not enough to loosen a snug fit in a receiver.
	Extractor ring may be high, causing bolt to ride tight	Remove ring and remove any high spots on ring channel. Refit ring. If trouble is not remedied, substitute a new extractor ring.
Failure to feed	Extractor too tight	In altering the extractor, extreme care should be used and any adjustments should be made on a trial-and-error basis, filing a small amount of stock at a time. Overadjustment may cause further malfunctions.
	Magazine follower spring too weak	Spring may be removed and opened up slightly. This should be done carefully, by trial, to avoid overspreading and injury to the spring.
	Follower could be binding in magazine	Spring leaves could be canted sideways, causing follower to bind on inner walls of magazine. Straighten with care and watch for this point when opening up the spring.
Breechbolt over-rides cartridge in magazine	Weak follower spring	Remove the spring and increase the tension on it by spreading the three angles slightly on a trial-and-error basis. Make sure the spring is not twisted, causing the follower to bind on the side of the magazine.
Misfire	Caused by a short or weak firing pin Very loose headspace condition	Replace Correct headspace
Fails to extract	Loose extractor, or extractor without proper bite on cartridge	Check extractor ring for tension and adjust to acquire bite. In rare cases, replace either or both the extractor ring and extractor.
Fails to eject	Ejector not free in receiver cut Spring binds and does not function properly	Cut may be adjusted or ejector bent Replace spring

Figure 13: Troubleshooting chart for centerfire bolt-action rifles.

Lever-Action Centerfire Rifles

The worst and most common problem that occurs with old Winchester and Marlin lever-action rifles is looseness caused by wear of moving parts. Original round holes in parts have become egg-shaped, channels cut in the receiver have become worn, and metal has been shed from mating surfaces. Any of these defects can lead to malfunctions making the gun unsafe to fire.

Feeding problems are often encountered that are caused by dented, dirty, or corroded magazine tubes and/or weak magazine springs. Recesses in the receivers of lever-action rifles are prone to collect all sorts of debris and foreign matter which, when combined with gun oil and grease, cake and gum-up the action, causing feeding, extraction, and ejection problems.

The third most common problem in the older lever-actions is excessive headspace. These rifles locked up at the rear of the sliding breechbolt and, after much firing, stretching occurred which caused excessive headspace.

Worn Parts. The easiest solution to worn parts is to replace them, assuming new parts can be found. Many of the recently produced lever actions, such as the Winchester Model 94 Angle Eject, latter Savage Model 99s, and the Marlin Models 336 and 1895, are similar to the same models produced nearly 100 years ago. While some parts are interchangeable, certain modifications to ease manufacturing have taken place, and all parts are not interchangeable.

Obtaining replacement parts for the older lever-action guns is becoming more difficult each year. They are out there, but costly. For example, a hammer for a pre-War Winchester Model 94 rifle or carbine is currently selling for over $50. A pistol grip lever for a Winchester Model 1886 will run from $60 to $90. A 22-inch carbine barrel for a Winchester Model 1886, in excellent condition, will run as high as $1000 — maybe more!

Many worn or broken parts can be made serviceable by welding, brazing, and honing. For example, worn contact surfaces on trigger sear and hammer notches can sometimes be put back into service by judicious notching with a file, then honing

TROUBLESHOOTING CHART
Centerfire Lever-Action Rifles

Malfunction	Probable Cause	Corrective Action
Cartridges fail to feed back into magazine	Loose finger lever at angle	Correct looseness or install new lever
Cartridges bind	Loose screw in cartridge guide	Tighten screws
Fails to extract	Broken or weak extractor	Install new extractor or put slight bend in extractor to strengthen
Carrier binds	Bent carrier	Install new carrier
Fails to feed	Dented magazine tube	Remove dents or replace tube
Fails to eject	Weak ejector spring	Replace spring

Figure 14: *Troubleshooting chart for centerfire lever-action rifles.*

smooth. The surface metal removed will often expose the soft interior metal and the part will have to be rehardened.

Many cracked or broken gun parts can be repaired by silver soldering. Other times the worn surfaces can be built up by welding, filing to shape, polishing, and heat-treating.

Oversized holes caused by excessive wear can also be repaired by welding the hole closed. Grind off any irregularities on each side; then drill a new hole. Or, if practical, merely drill a slightly larger diameter hole through the worn one to true it up, and use a larger-diameter pin or screw.

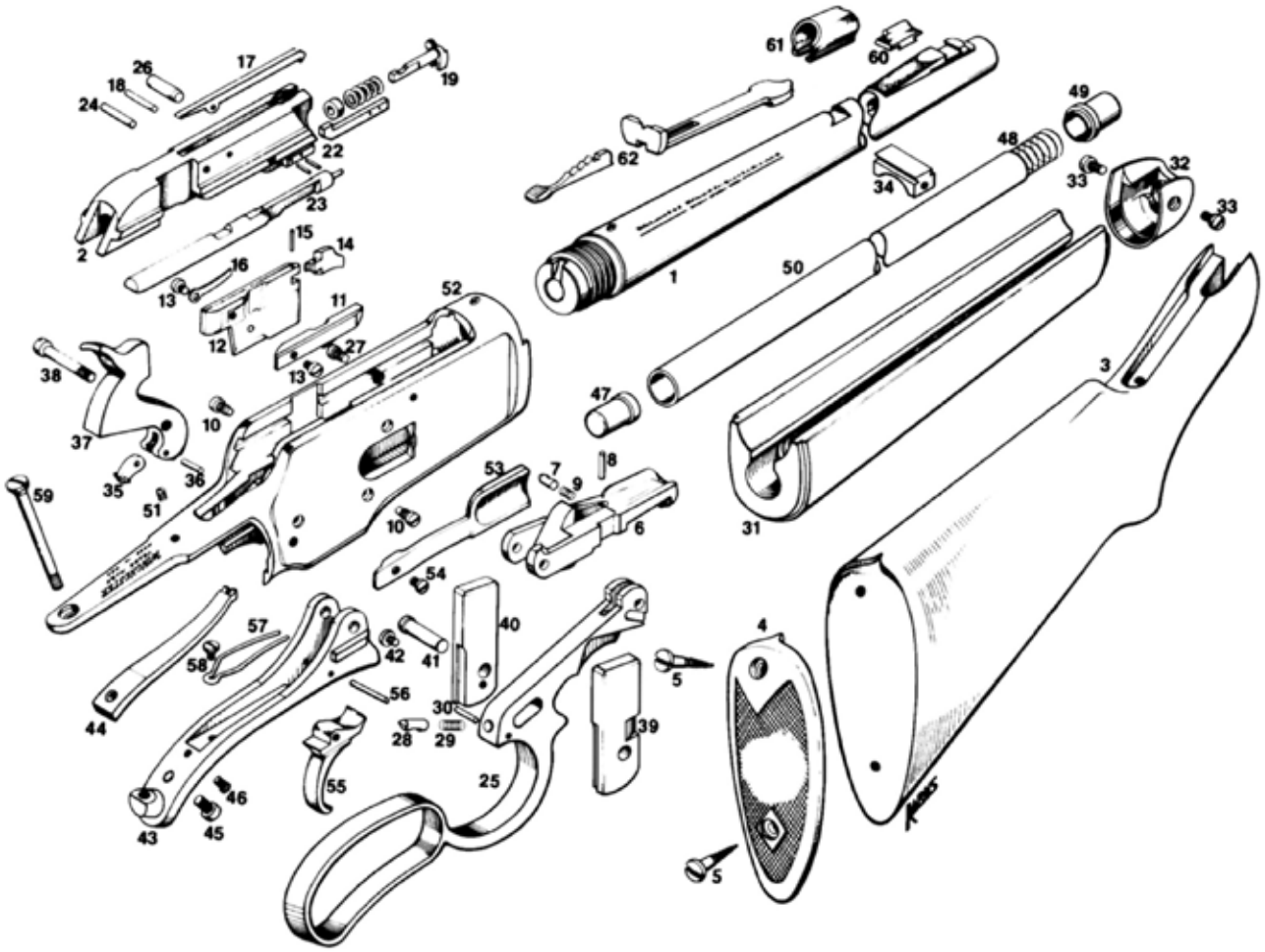
Feeding problems in lever-action rifles can often be cured by giving the action and magazine a thorough cleaning, removing any dents and replacing the magazine spring if weak or broken. Also look for burrs in all areas that the cartridge will contact. Remove any burrs with an Arkansas stone, using plenty of honing oil; coal oil will work fine.

The third most common problem — dirt — can be remedied easily by giving the entire gun a thorough cleaning. Completely disassemble the gun and then submerge all parts in a cleaning solution mixed with five parts water. Leave the parts in the solution for about 15 minutes before removing them from the tank, drying and finally oiling them. This cleaning will also help you detect worn surfaces. Refer to the troubleshooting chart in Figure 14.

SELF-TEST QUESTIONS

Please check your answers on page 27.

8. **Name the most common reason for malfunctions in the older lever-action centerfire rifles.**
9. **When a lever-action rifle fails to feed, what are the probable causes?**
10. ***True or False*. Parts for obsolete lever-action rifles are currently very inexpensive.**
11. **Are most of the older lever-action rifles locked at the front or rear of the breechbolt?**



Parts List

Key No.	Part No.	Part Name	Key No.	Part No.	Part Name	Key No.	Part No.	Part Name
1	265	Barrel	22	2665	Ejector Guide & (2) Pins	43	5165	Lower Tang
2	365A	Breechbolt	23	3065	Firing Pin	44	5464	Mainspring
3	664	Buttstock	24	3165	Firing-Pin Stop Pin	45	5564	Mainspring Screw
4	1064	Butt plate	25	3365	Finger Lever	46	5664	Mainspring-Strain Screw
5	1164	Butt-plate Screws (2)	26	2864	Finger-Lever Pin	47	5665	Magazine Follower
6	965	Carrier	27	2964	Finger-Lever Pin Stop Screw	48	5765	Magazine Spring
7	1065	Carrier Stop	28	3665	Friction Stud	49	5865	Magazine Plug
8	1165	Carrier-Stop Pin	29	3765	Friction-Stud Spring	50	5965	Magazine Tube
9	1265	Carrier-Stop Spring	30	3865	Friction-Stud Stop Pin	51	6464A	Peep-Sight Plug Screw
10	1364	Carrier Screws (2)	31	3164	Fore-end	52	6165	Receiver
11	1765	Cartridge Guide, Right	32	4065	Fore-end Tip	53	6365	Spring Cover
12	1865	Cartridge Guide, Left	33	3564	Fore-end Tip Screws (2)	54	7064	Spring-Cover Screw
13	1965	Cartridge-Guide Screws (2)	34	3664	Fore-end Tip Tenon	55	6565	Trigger
14	2065	Cartridge Stop	35	4365	Hammer Stirrup	56	6665	Trigger Pin
15	2165	Cartridge-Stop Joint Pin	36	4364	Hammer-Stirrup Pin	57	6765	Trigger Spring
16	2265	Cartridge-Stop Spring	37	4565	Hammer	58	6865	Trigger-Spring Screw
17	2365	Extractor	38	4665	Hammer Screw	59	7864	Upper Tang Screw
18	2064	Extractor Pin	39	4765	Locking Bolt, Right	60	7165A	Front Sight
19	2565	Ejector	40	4865	Locking Bolt, Left	61	7265B	Front-Sight Cover
20	2765	Ejector Collar	41	4965	Locking-Bolt Pin	62	7265	Rear Sight
21	2865	Ejector Spring	42	5065	Locking-Bolt Pin Stop Screw			

***Figure 15**: Exploded view of a Winchester Model 65 lever-action rifle.*

Slide-Action Rifles

The pump, slide, and trombone action are simply different names for the same type of rifle. This was the fastest-shooting rifle up until the introduction of the semi-automatic. However, it did not enjoy the same popularity of the bolt- and lever-action rifles.

The slide-action rifle has existed since the late 1800s, but these early models were adapted for use only with relatively low-pressure cartridges, and it was not until Remington introduced the popular Model 14 in 1912 that the pump action became a big-game rifle. The newer Remington Model 760 and its predecessors can handle many of the modern high-powered cartridges, such as the .30-06, .270, and .243 calibers.

Malfunctions in the pump rifles are second in frequency only to semi-automatics. The biggest cause of problems with both of these action types is the presence of dirt, dust, and assorted debris that, when combined with gun oil and grease, prevent proper operation. Therefore, at the sign of any malfunction, first strip the gun down to its basic action components and degrease — unless, of course, obvious symptoms dictate otherwise. Other problems found in pump rifles are a failure to feed properly; double-feeding; failure to retain cartridges in the magazine; action bars sticking; action failing to lock; failure to extract and eject; failure to fire; failure to cock; gun fires on closing of the action; and safety malfunctions. Refer to Figure 16, on next page, while reviewing the following sections.

. The most common cause of improper feeding is rust or corrosion within the magazine. The solution is simple. For rifles with a tube magazine, merely clean out the tube with a cleaning rod and brush of the proper size saturated with bore cleaner.

Now check for a weak, rusted, or badly bent magazine spring. Try stretching the spring, and then try the rifle for proper feeding. If this works, it is only a temporary solution, and a new spring should be installed.



***Figure 17**: When feeding problems develop in the Remington Model 760 slide-action rifle, check for breakage or deformation of the two rear ears on the top surface and magazine spring locating lugs on the under surface.*

In box magazine pump-action rifles, like the Remington Model 760, check for deformation of the lug on the front end of the magazine box which would prevent holding the magazine firmly in place; that is, into its recess in the front section of the receiver. Also, check for deformation of the lug on the rear end of the box to prevent it from locking up securely with the magazine latch.

Check the lips on both sides of the top rim of the magazine for deformation. The magazine latch must rotate freely on its spring and be located properly on the right end of the hammer pin. It must also engage the notch in the rear of the magazine firmly and locate the magazine securely into its proper operating position. Any deformation or breakage of the locating lug of the magazine latch will hinder its function. Replace if necessary.

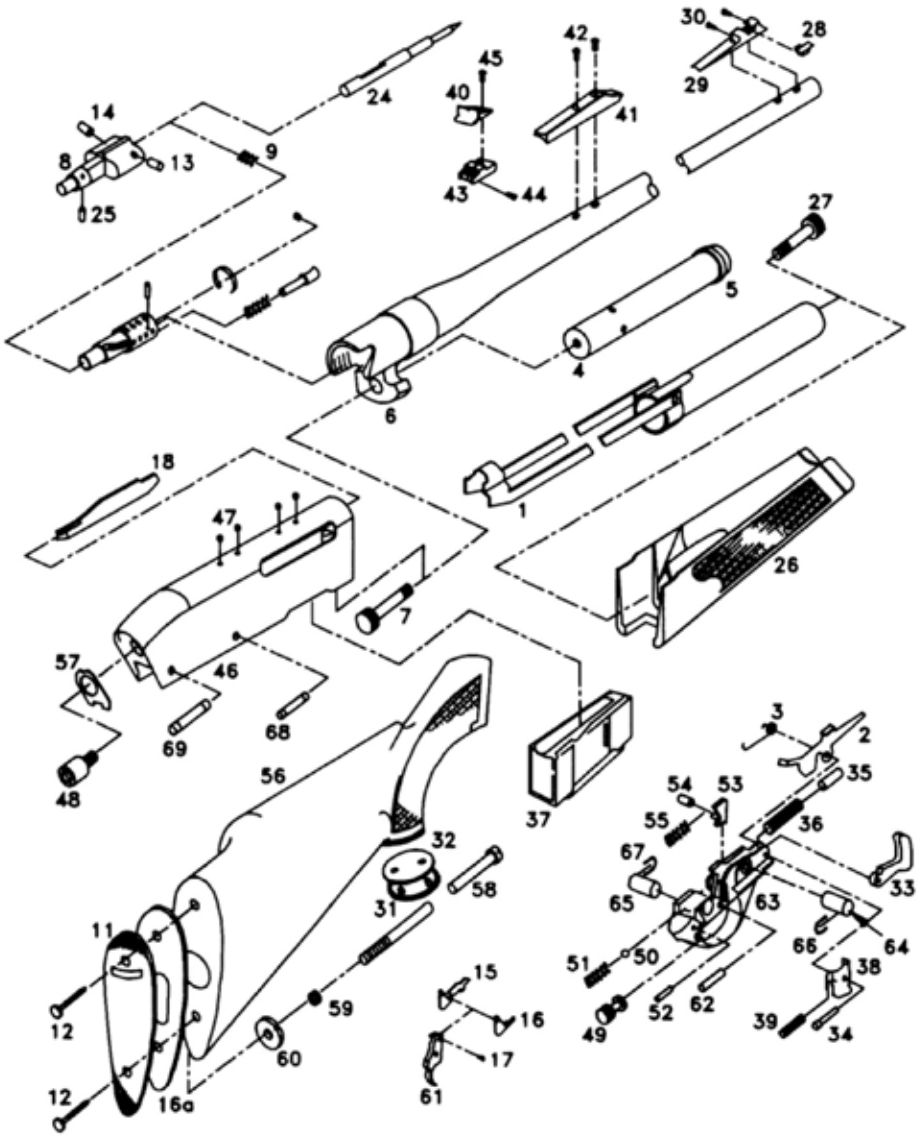
The movements of the magazine follower must be free to maintain a level pressure against the feeding shells. Check for breakage or deformation of the two rear ears on the top surface, shown in Figure 17, and the magazine spring locating lugs on the under surface of the magazine follower.

Check the magazine spring for free passage in the magazine and to insure that it is located securely to the undersurface of the follower. If the spring is weak or broken, it must be replaced.

The magazine filler piece, shown in Figure 18, must be properly assembled to allow the free passage of the follower or spring. If this part must be replaced, disassemble from the front end of the magazine.

A defective magazine can also prevent the gun from being loaded. The lips on both sides of the top rim of the magazine must be free of deformation or breakage. They must hold the cartridges securely in a level position. Also, the sides and ends of the magazine must be free of deformation, burrs, etc., for free passage of the magazine follower. Deformed lips can sometimes be bent and burrs can be removed by honing, but in most cases it is best to invest a few dollars and replace the magazine.

Part No.	Part Name
1	Action Bar Assembly
2	Action Bar Lock
3	Action Bar Lock Spring
4	Action Tube Assembly
	Action Tube Plug
5	Action Tube Ring
6	Barrel
7	Barrel Bracket Bolt
8	Bolt Carrier
9	Bolt Carrier Spring
11	Butt Plate
12	Butt-Plate Screw
	Butt-Plate Spacer
13	Cam Pin (lg.) (also used in old style Bolt Carrier)
14	Cam Pin (sm.)
18	Ejection Port Cover
19	Ejector
20	Ejector Retaining Pin
21	Ejector Spring
22	Extractor
23	Extractor Rivet
24	Firing Pin
25	Firing-Pin Retaining Pin
26	Fore-end Assembly, BDL Grade
	Fore-end Assembly
27	Fore-end Cap Screw
28	Front Sight
	Front Sight, Carbine
	Front Sight, Carbine (low)
29	Front Sight Ramp
30	Front Sight Ramp Screw
31	Grip Cap
	Grip Cap BDL Grade
32	Grip Cap Spacer
33	Hammer
34	Hammer Pin
35	Hammer Plunger
36	Hammer Spring
37	Magazine Assembly
38	Magazine Latch
39	Magazine Latch Spring
40	Rear Sight Aperture
41	Rear Sight Base
42	Rear Sight Base Screw
43	Rear Sight Slide
44	Elevation Screw
45	Windage Screw
	Receiver Assembly (Restricted)
46	Receiver Assembly, BDL Grade (Restricted)
47	Receiver Plug Screw
48	Receiver Stud
49	Safety Switch
50	Safety Switch Detent Ball
51	Safety Switch Spring
52	Safety Switch Spring Retaining Pin
53	Sear
54	Sear Pin
55	Sear Spring
	Stock Assembly



56	Stock Assembly, Right Hand, BDL Grade
	Stock Assembly, Left Hand, BDL Grade
57	Stock Bearing Plate
58	Stock Bolt
59	Stock Bolt Lock Washer
60	Stock Bolt Washer
61	Trigger Assembly (Restricted) [includes parts 15, 16 & 17]
62	Trigger Pin
63	Trigger Plate, R. H.
	Trigger Plate, L. H.
	Trigger Plate Assembly, R. H.
	Trigger Plate Assembly, L. H.
64	Trigger Plate Pin Bushing, Front
65	Trigger Plate Pin Bushing, Rear
66	Trigger Plate Pin Detent Spring, Front
67	Trigger Plate Pin Detent Spring, Rear
68	Trigger Plate Pin, Front
69	Trigger Plate Pin, Rear

***Figure 16**: Exploded view of a Remington Model 760 slide-action rifle.*

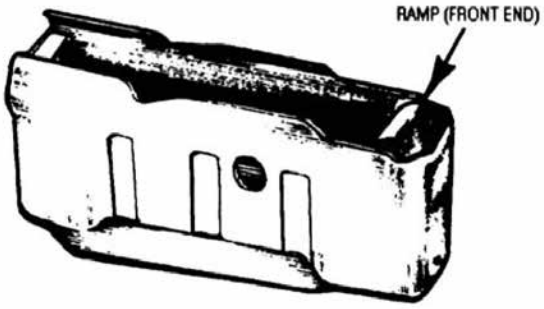


Figure 18: The magazine filler piece must be properly assembled to allow free passage of the follower and spring.

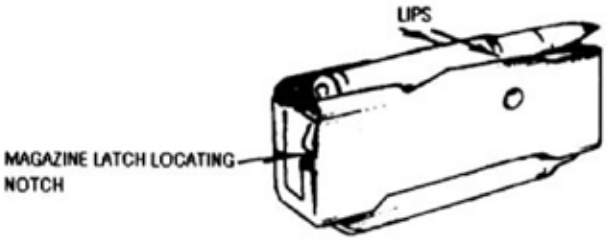


Figure 19: There must be no deformation or breakage of the lips on the top rim of the magazine to prevent the free forward-sliding motion of the feeding cartridges.

Gun Fails to Lock. In box magazine pump rifles the magazine latch may be locating the magazine too high, causing the action to bind. There must be no deformation or breakage of the lips on the top rim of the magazine to prevent the free, forward-sliding motion of the feeding cartridges (Figure 19).

Gun Fails to Open and Eject. Check the ejector to insure that it has free movement and is secure on its retaining pin with no breakage or deformation. The extractor must also be free of movement, secure on its rivet or pivot pin, and tight over the rim of the shell. The breechbolt must have free travel and proper heading with no deformation on the face, the lugs, the cam ways, or the shell rim. Both cam pins must be firmly in position. Also check the ejector spring.

A pitted or rusted chamber or deformed extension lugs can hinder the ejector on pump rifles. The action bar assembly is another possible source of trouble. The action bars must have free travel with no deformation of the bars of the receiver slots. The bolt carrier must be securely brazed to the action bars and cam pins properly staked — that is, not protruding.

Check to see that the magazine assembly is secure in its proper location and is not hindering the passage of the action bars. It must retain the oncoming cartridges firmly and in a level position.

Pump-action rifles, like all repeating firearms, have a tendency to collect dirt and debris in the action. When this mixes with oil or grease, a variety of malfunctions can occur. Therefore, all components should be thoroughly cleaned and degreased before attempting to diagnose any problems. In addition, pump-action rifles should be disassembled completely at least once a year and given a thorough cleaning, whether the gun is malfunctioning or not.

In disassembling any gun for cleaning or repair, have a good assortment of gunsmith's screwdrivers, drift punches, and a padded vise. Never use the wrong- sized driver when working on a gun, as unsightly burred or scratched screw heads are sure to be the result. Always mark screws so they will be returned to the proper holes. Screws may look alike and even be identical, but they should always be returned to the same hole for a proper set.

TROUBLESHOOTING CHART
Centerfire Slide-Action Rifles

Malfunction	Probable Cause	Corrective Action
Cartridges fail to feed in chamber	Carrier does not rise because of binding carrier plunger	Loosen carrier plunger to work freely
	Protruding firing pin	Replace firing pin if broken or firing-pin retractor
	Extractors too tight or binding	Round off bottom edge of extractor
	Bent carrier	Straighten and align carrier
	Carrier binds on action slide	Straighten action slide
Action slide sticks	Bent action slide bar	Straighten or replace action slide
Hammer fails to cock or slips	Foreign matter in sear notch or between trigger and hammer	Clean
	Hammer spring guide rod too straight or assembled improperly	Bend guide rod or reassemble
	Broken or weak trigger spring	Replace
Trigger safety lock sticks	Broken trigger lock plunger spring	Replace spring

Figure 20: *Troubleshooting chart for centerfire slide-action rifles.*

Any surface rust found can usually be removed with fine steel wool (000 or 0000 size) without damaging the bluing. However, first, spray the affected area with solvent, let stand for a few minutes, and go to work with the terry cloth towel. If this does not work, then use the steel wool very gently. Refer to the troubleshooting chart in Figure 20.

SELF-TEST QUESTIONS

Please check your answers on page 27.

12. **Name one common cause of misfeeding in slide-action rifles with box magazines.**
13. **Why must the magazine filer piece in the Remington Model 760 be assembled correctly?**
14. ***True or False*. A defective magazine can prevent a Remington Model 760 slide-action rifle from being loaded.**
15. **When the magazine latch locates the magazine too high in a slide-action rifle, what will usually happen?**

Semi-Automatic Rifles

Besides feeding problems, you will find autoloaders that fail to extract fired cases; some that will not eject; some that will not fire; and others that will not lock up properly. Following are the most common types of malfunctions, and their remedies, peculiar to auto-loading centerfire rifles.

Feeding Problems. Quite often, during the occurrence of a feeding problem in autoloading rifles, evidence of the cause may be found by carefully studying the cartridge case itself. Take a look at the brass case at the bullet end of an unfired cartridge. Frequently, a worn or broken part will mark the cartridge in some manner during the gun failure.

During the occurrence of a malfunction, damage may also show up on the components. Therefore, inspect the appearance of the components after the action has operated several times. Excessive mutilation of the components may point to the cause of the gun failure.

Semi-automatics with tubular magazines — like the Ruger 44 — are prone to the same feeding problems as other guns with under-the-barrel magazines. Dents, bends, dirt, and rust all prevent the rifle from feeding properly. Weak or bent magazine springs are also quite common. To correct a feeding problem caused by one or more of these faults, clean the magazine tube thoroughly, replace any weak or broken springs, and remove any dents.

Most semi-automatics use a box-type magazine. In these rifles the most probable cause for misfeeding is that the breechbolt overrides the cartridge in the magazine, as shown in Figure 22. This malfunction can be caused by the magazine assembly being too low in the gun; the front magazine lips bending outward too much; the rear magazine lips bending downward too much; the magazine sides bending inward; the breechbolt chambered too much at its front face; or the action failing to blow back far enough upon firing.

The lips of the magazine can be bent with needle nose pliers, but this must be done on a trial-and-error basis. If the magazine is positioned too low, replace it with a higher number size

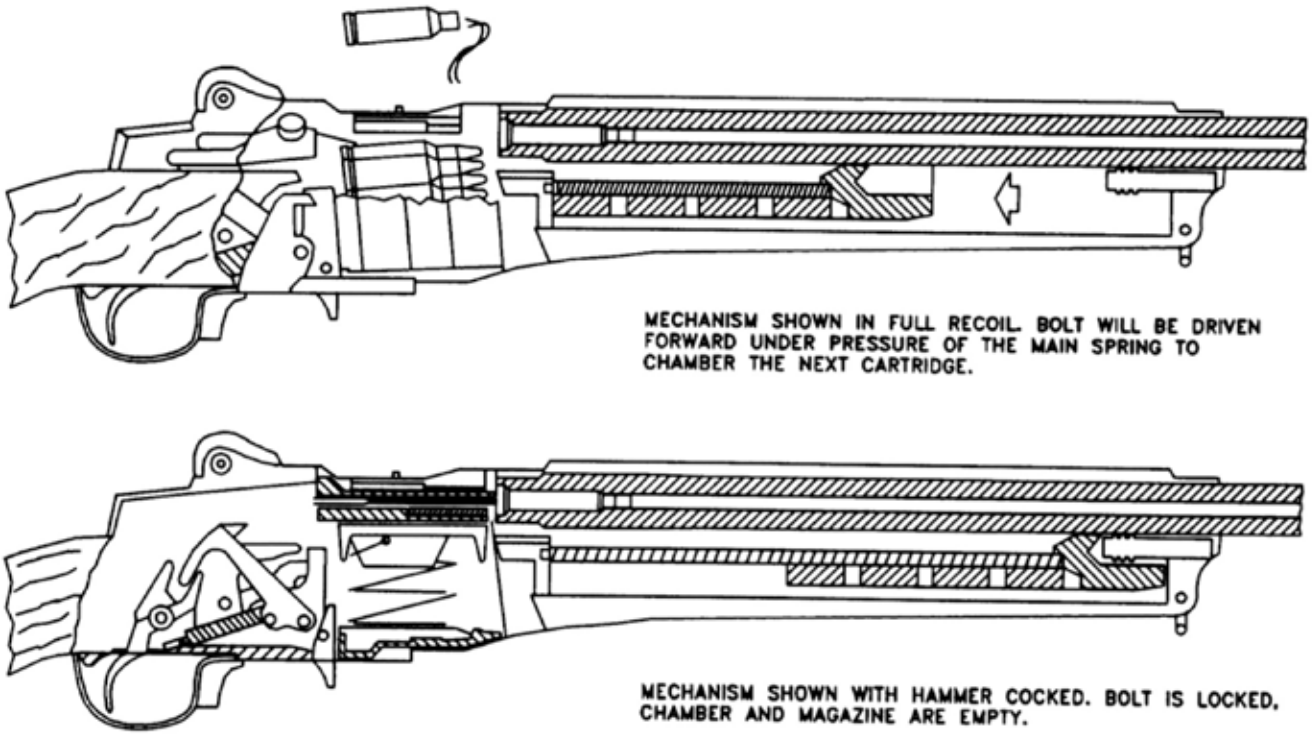


***Figure 21**: Sectional view of Ruger Mini-14 rifle.*

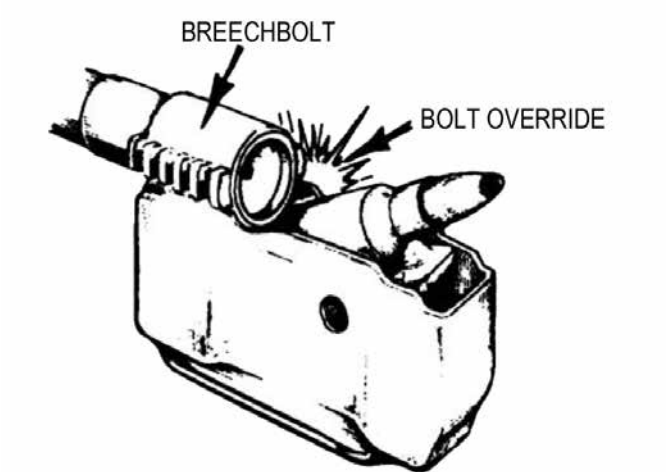


Figure 22: Misfeeding in semi-automatic rifles can be caused by the magazine assembly being too low in the gun.

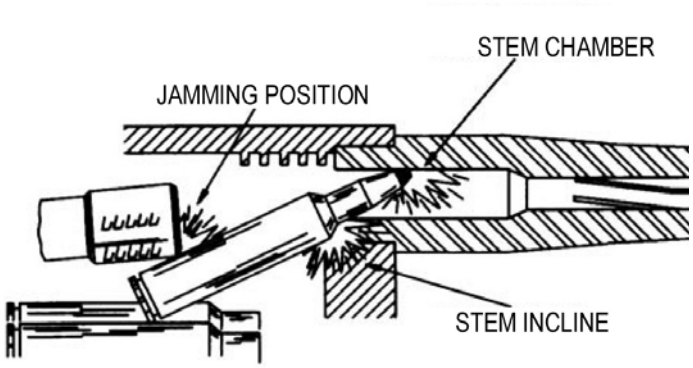


Figure 23: When a semi-automatic rifle fails to chamber, the most probable cause is the cartridge stems either the top or the bottom of the chamber.

so that it will ride higher, but not so high that it will bind the action. A chambered breechbolt will have to be replaced. Should the action fail to blow back far enough, it is caused by one of the reasons listed below:

- Action is binding
- Gas orifice is defective
- Gas nozzle or tube is defective
- Barrel chamber is rough or defective
- Gas nozzle hole in action sleeve has broken through into spring hole in receiver
- Failure to replace gas orifice ball and screw

These problems may be corrected by checking the gas orifice for the proper size according to the manufacturer's specifications. The barrel may have to be replaced. Also, check the gas tube opening for damage and adjust or replace the barrel. Replacing worn components may solve the problem; action sleeves and action springs are two parts that sometimes need replacing.

Gun Fails to Chamber. The most probable cause of this malfunction is that the cartridge stems either the top or bottom of the chamber, shown in Figure 23. If the cartridge stems the top of the chamber, check the barrel extension incline for a proper 45° angle; polish and blend smoothly. If the cartridge stems the bottom of the chamber, check the barrel extension for the proper 45° angle; polish and blend smoothly. You can also replace the magazine or adjust the front fold of the magazine lips to permit a higher angle of feed. Refer to Figure 24 during the rest of the discussion of semi-automatic rifles.

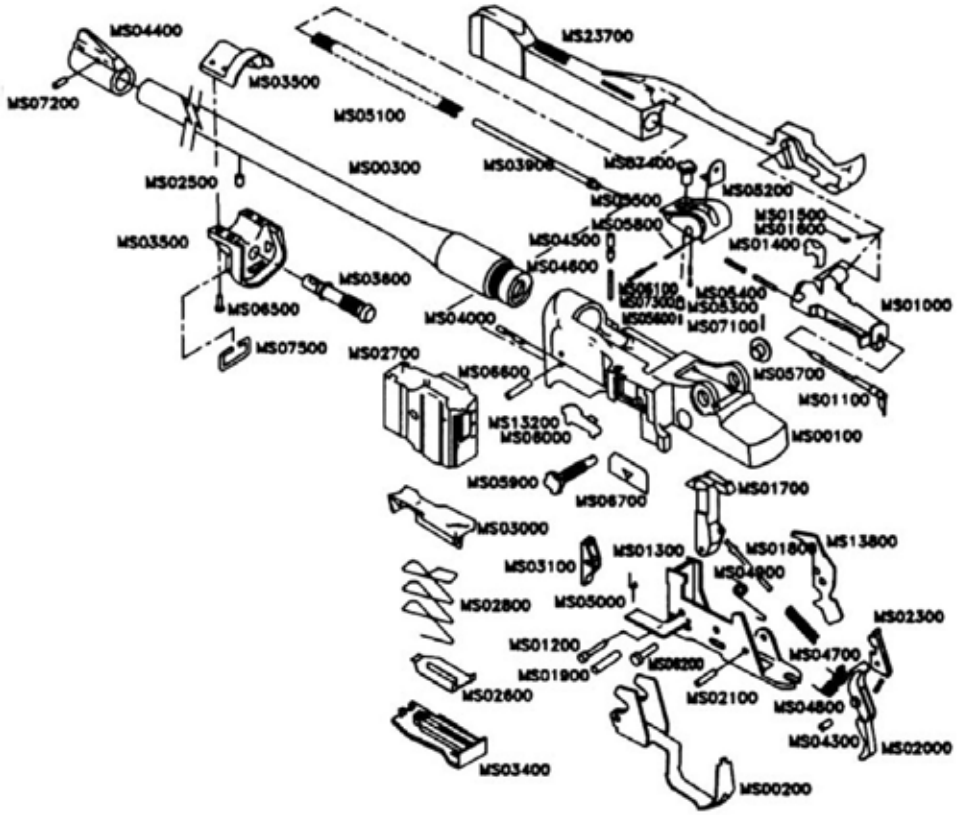
Action Fails to Close. This is usually due to a binding action caused by an ejector port cover out of alignment, an action spring jamming in the action bar sleeve, an ejector or ejector spring binding in the breechbolt, the action bar binding the fore-end, or a magazine that is out of alignment. The receiver, barrel extension, or bolt carrier could also be out of alignment, or perhaps the breechbolt jams in the receiver guide rails.

In the order they are listed to the left, here are the corrections:

- Replace ejection port cover
- Replace magazine latch with one that assembles lower in the gun
- Replace action spring
- Replace ejector spring or clean ejector hole
- Replace action bar assembly or clean up rivet head
- Replace receiver, barrel, or bolt carrier, whichever is at fault
- Replace receiver

Gun Fails to Lock. The breechblock is improperly rotated forward, usually caused by a cartridge that is too long or a misalignment of the receiver, barrel, or bolt carrier. Try another cartridge of proper length; replace any of the faulty parts.

Part No.	Part Name
MS00300	Barrel
MS01000	Bolt
MS13200	Bolt Lock Assembly (with Buffer Spring)
MS06000	Bolt Lock Buffer Spring
MS06700	Bolt Lock Cover Plate
MS04500	Bolt Lock Plunger
MS04600	Bolt Lock Plunger Spring
B-63	Butt Plate (Plastic)
	Butt Plate (Alloy)
B-64	Butt-Plate Screw (2 Req'd.)
MS00800	Ejector
MS07000	Ejector Spring
MS01400	Extractor
MS01600	Extractor Plunger
MS01500	Extractor Spring
MS01100	Firing Pin
MS02200	Forearm Liner & Stock Cap Assembly
MS04400	Front Sight
MS07200	Front Sight Cross Pin
MS03500	Gas Block (Top & Bottom)
MS06500	Gas Block Screw (4 Req'd.)
MS02500	Gas Port Bushing
MS03900	Guide Rod
MS01700	Hammer
MS01900	Hammer Pivot Pin
MS04700	Hammer Spring
MS01800	Hammer Strut
MAG-5	Magazine, 5 Shot, Complete (not shown)
MAG-20	Magazine, 20 Shot, Complete (not shown)
MS04000	Magazine Catch, Front
MS06600	Magazine Catch Retaining Pin
MS03100	Magazine Latch
MS01200	Magazine Latch Pivot Pin
MS05000	Magazine Latch Spring
MS03600	Piston (Gas Pipe)
MS05501	Rear Sight Assembly, Complete
MS05500	Rear Sight Base
MS07300	Rear Sight Elevation Detent Plunger
MS05600	Rear Sight Elevation Detent Spring
MS07400	Rear Sight Elevation Screw
MS05300	Rear Sight Elevation Plunger
MS05400	Rear Sight Elevation Plunger Spring
MS05700	Rear Sight Nut
MS05200	Rear Sight Peep
MS06100	Rear Sight Windage Detent Plunger
MS05800	Rear Sight Windage Detent Spring
MS05900	Rear Sight Windage Screw
MS07100	Rear Sight Windage Screw Pin
MS00100	Receiver
MS05100	Recoil Spring (Slide Spring)
MS13800	Safety Assembly
MS04900	Safety Detent Spring
MS06200	Safety Spring Retaining Pin
MS02300	Secondary Sear
MS02400	Secondary Sear Spring
MS23700	Slide Assembly
MS07500	Sling Swivel, Front
B-120	Sling Swivel Assembly, Rear
MS00400	Stock (Wood w/Butt Plate attached)
MS00700	Stock Reinforcement
MS06900	Stock Reinforcement Screw (2 Req'd.) (pair)
MS08000	Stock Reinforcement Lock Washer (2 Req'd.) (pair)
MS08400	Stripper Clip
MS02000	Trigger
MS04300	Trigger Bushing
MS00200	Trigger Guard
MS01300	Trigger Housing
MS02100	Trigger Pivot Pin
MS04800	Trigger Spring



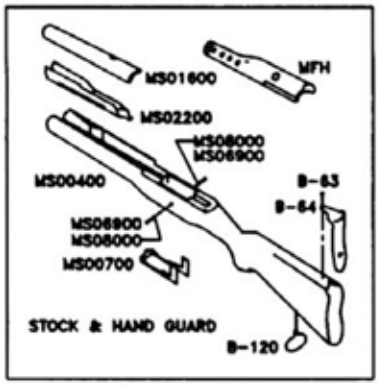


Figure 24: Exploded view of Ruger Mini-14 semi-automatic rifle.

Look for a disconnector that binds the action bar and adjust it to hug the receiver wall if defective. If the extractor closes hard over the chambering cartridge, smooth up the extractor with an Arkansas stone or adjust the tension on the cartridge. Replace the extractor if necessary.

If the fault still persists, smooth up the ejector. Also disassemble and clean the ejector hole. Replace the ejector or spring if necessary.

If the breech jams in the receiver rails, try smoothing up the rails. If this does not work, the receiver will need to be replaced. A cartridge primer could have been pierced on a previous round. This primer or piece of brass must be removed from the firing pin hole. Fouling in the barrel chamber is another possible cause. Clean the chamber, removing all grease and foreign deposits.

Gun Fails to Fire. When the firing pin fails to indent the cartridge primer properly, either the firing pin is defective, the bolt carrier fails to close completely to the breechbolt, the cartridge brass is lodged in the firing pin hole, or the hammer fails to cock. In the order given above, correct as follows:

- Replace firing pin. Check the protrusion of the bolt face with the bolt carrier completely closed to breechblock.
- See corrections for "Gun fails to lock."
- Remove brass from the firing pin hole.
- Check right connector for proper seat at rear of sear.
- Check disconnector for proper engagement with the action bar in front and rear with proper engagement under the left connector. Check hammer and sear notch engagement. Check hammer spring as well as the sear spring.

Gun Fails to Extract. A broken extractor with only the nub remaining should be obvious. However, a tiny, hard-to-detect chip out of one edge can also cause extraction problems. Examine the extractor hook carefully under good light and, if small chips are noticed, try smoothing them out with a file or Arkansas stone. However, in most cases, it is best to replace them.

To test for a worn extractor, which is not easily detected by a visual inspection, slip a cartridge case under the extractor and pull it straight away from the bolt face. It should be extremely difficult or impossible to free the shell if the extractor is good. If the cartridge slips away easily, you have a worn extractor, which should be replaced.

Other common causes of extraction problems are broken or weakened extractor springs, broken pins, and foreign matter in the spring/plunger/extractor recesses.

TROUBLESHOOTING CHART
Centerfire Semiautomatic Rifles

Malfunction	Probable Cause	Corrective Action
Feeding problems	Distorted magazine	Replace magazine
Fails to fire	Broken or worn firing pin	Replace firing pin
Fails to extract	Broken or jammed extractor	Replace
Fails to eject	Weak or worn ejector Weak or broken ejector spring	Replace Replace

Figure 25: *Troubleshooting chart for centerfire semi-automatic rifles.*

Gun Fails to Eject. Modern autoloading guns mostly use spring-loaded button ejectors mounted in the face of the bolt where a compressed spring forces the button or stud against the base of the cartridge, holding it in place until the bolt recoils all of the way to the rear. At that point, the stud tips the case out of the action. Malfunctions with this type of ejector are usually caused by a weak or broken plunger spring or debris in the plunger recess.

Gun Fails to Lock Open. Most semi-automatics are designed so the action locks back after the last cartridge is fired. When the gun fails to do so, the magazine follower is probably defective and should be replaced. However, the breechbolt could be rounded too much on its front edge, or the magazine follower binds down at the rear or front ends. In these latter cases, the defective part or parts should be replaced. Refer to the troubleshooting chart in Figure 25.

SELF-TEST QUESTIONS

Please check your answers on page 27.

16. **What type of magazine is normally used in semi-automatic centerfire rifles?**
17. **What problem normally occurs in a semi-automatic centerfire rifle when the box magazine is too low?**
18. ***True or False*. When troubleshooting semi-automatic rifles, a lot can be learned from studying the fired cartridge case.**
19. **When the breechbolt jams in the receiver rails, what should be your first attempt at correcting the problem?**

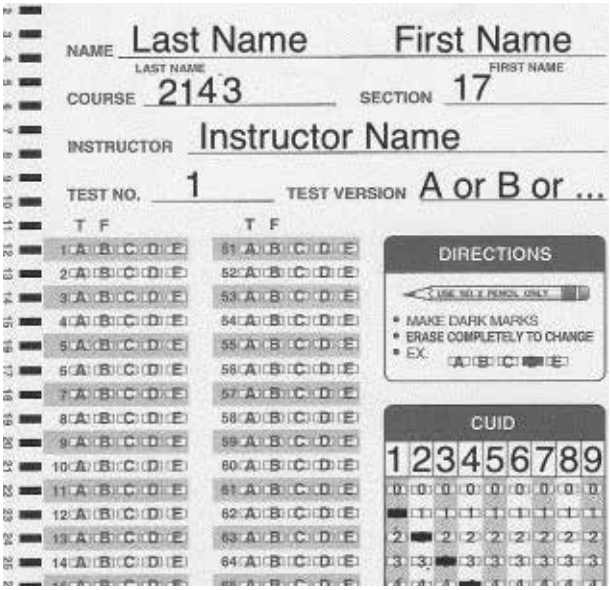
Answers to Self-Test Questions

1. Rolling-block.
2. Tipping-block.
3. False.
4. Winchester Model 1885.
5. Worn rifling.
6. Smaller centerfire calibers.
7. True.
8. Worn or loose parts.
9. Dented or dirty magazine tube.
10. False.
11. Rear.
12. Deformation of the lug on the front end of the magazine box.
13. To allow free passage of the follower and spring.
14. True.
15. The action will fail to lock.
16. Box.
17. Misfeeding.
18. True.
19. Smooth the rails with a honing stone.

Lesson Questions

THIS IS LESSON NUMBER 2175.

Make sure you print your name, student number, and lesson number in the space provided on the Lesson Answer Form. Be sure to fill in the circles beneath your student number. Code the lesson number as shown.



REMINDER: A properly completed Lesson Answer Form allows us to evaluate your answers and send the results and additional study material to you. Do not hold your Lesson Answer Forms to send several at one time. You may run out of study material if you do not send your answers for evaluation promptly.

You may also complete your exam online at www.sdi.edu, click on the *online exams* tab.

1. **The ability to determine the cause of any gun problem and correct it is known as**
   a. Firearm design.
   b. Maintenance.
   c. Inletting.
   d. Troubleshooting.

2. **What is the name of the single-shot rifle action whose breechblock travels vertically in a channel in the receiver?**
   a. Rolling-block.
   b. Falling-block.
   c. Tipping-block.
   d. Vertical-block.

3. **What are two variations of the Winchester Model 1885 single-shot rifle?**
   a. Dropping-block and falling-block.
   b. High wall and low wall.
   c. Vertical wall and horizontal wall.
   d. Tipping-block and dropping-block.

4. **The safety on the Ruger Models 1 and 3 can be engaged only**
   a. When the rifle is cocked.
   b. When the rifle is not cocked.
   c. When the rifle is half-cocked.
   d. When the rifle is being loaded.

5. **What are the main parts that wear on the Remington rolling-block receiver?**
   a. Barrel and hammer.
   b. Springs.
   c. Barrel bands.
   d. Stock and fore-end.

6. **Besides burrs on the action mating surfaces, what other problem can cause a breechbolt to bind in a bolt-action centerfire rifle?**
   a. An undersized bolt.
   b. A case-hardened bolt.
   c. A jeweled bolt.
   d. Bolt fitted too tightly.

7. **What is one way a dull extractor on a bolt-action rifle can be corrected?**
   a. Remove and discard the extractor.
   b. Hone the extractor hook angle.
   c. File the extractor until it is dull.
   d. Correct the headspace.

8. **What is one probable cause of a bolt-action rifle failing to feed properly?**
   a. Extractor too tight.
   b. Worn rifling.
   c. Faulty trigger sear.
   d. Undersized bore.

9. **What is the probable cause of a bolt-action rifle failing to eject?**

   a. Ejector is not free in the receiver cut, or the ejector spring binds and does not function properly.

   b. Loose extractor.

   c. Very loose headspace condition.

   d. Very tight headspace condition.

10. **Many worn gun parts can be made serviceable by welding or brazing.**

   a. True.

   b. False.