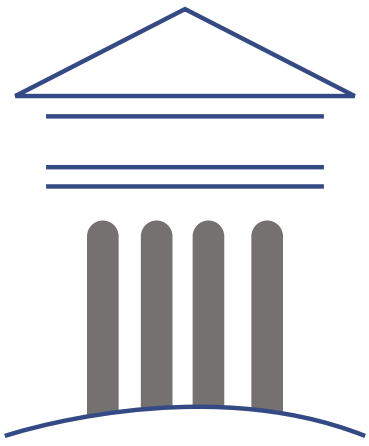
Troubleshooting Handguns
Lesson: 2177

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Objectives

After completing this lesson, you should

1. Know how to disassemble a Colt revolver.
2. Know how the safety lever of a Colt revolver operates in connection with the hammer pin boss.
3. Be able to determine what causes a misfire and poor rebound in a revolver.
4. Know the procedures used to lighten the trigger pull of a revolver.
5. Know how to correct the headspace of a revolver.

Introduction

The revolver is perhaps the oldest form of repeating firearm. Wheel-lock ignition revolvers were in use as early as the fifteenth century, but the first true working revolver is generally credited to Samuel Colt.

Traditionally, the handgun has been a weapon of self-defense. However, in recent years, it has been used extensively for big-game hunting, target shooting, and metallic silhouette competition. Modern cartridge handguns are manufactured as single-shot, revolver, or semi-automatic. Revolvers are either single- or double-action. Semi-automatic pistols are made as both recoil-and gas-operated.

This lesson is designed to give you a working knowledge of handgun operation and how to put handguns back in working order when they malfunction. You will also learn some useful customizing techniques to improve the smoothness of operation and to help make the handguns more accurate and more comfortable to shoot. Special tools required for handgun repairs are discussed, including those you can make in your own shop.



Figure 1: *Many operating characteristics of modern Colt revolvers were first introduced in 1898. The same basic design is still used today.*

Colt Handguns

The following information applies to Colt revolvers designed about 1898, like the one in Figure 1. This includes the Officers Model, Official Police, Police Positive special, Police Positive, Detective Special, Bankers Special, New Service, Police Positive and Shooting Master, and Model S. This information also applies to other Colt models. Figure 2, identifies the parts of the Colt revolver, which will help you in the disassembly instructions.

Disassembly. Remove the crane lock screw and the crane lock. Press back on the latch, push the cylinder to the left, and remove the cylinder and crane assembly by pulling the crane to the front. Remove the grip stocks.

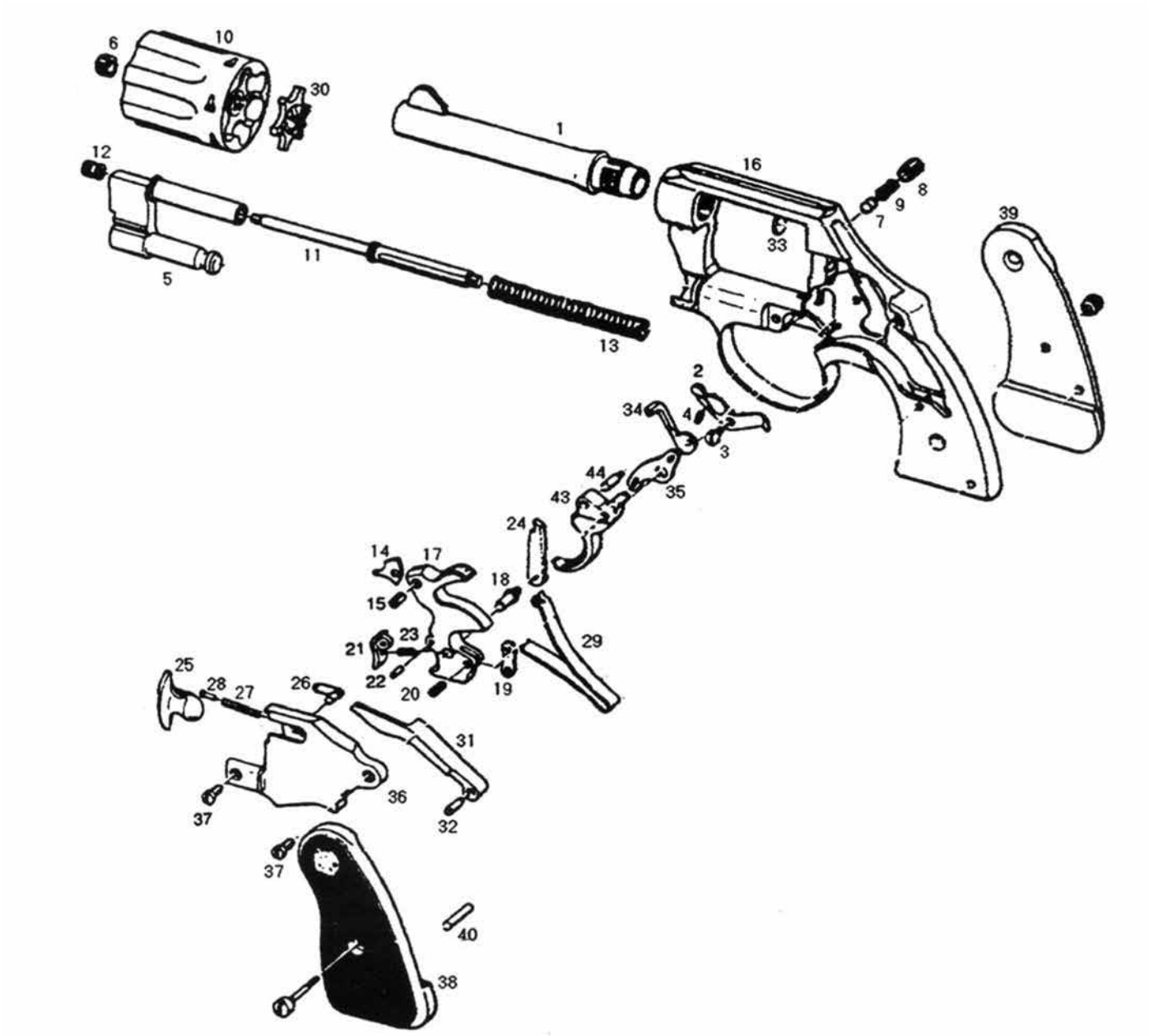
Remove the sideplate screws and the sideplate before removing the latch and spring from the sideplate. Remove the mainspring by lifting its rear end from the seat and disengaging the long end from the hammer stirrup. Remove the hand detent.

Drive out the rebound lever pin to the right, and remove the rebound lever. Remove the trigger. Draw the hammer to the rear and lift from the hammer pin. Remove the safety lever and safety from their seat in frame. Remove the bolt screw and the bolt.

The cylinder can be disassembled by first unscrewing the ratchet and ejector-rod head from the ejector rod. Remove the crane bushing from the crane with the special wrench. Remove the ejector rod and the spring.

Function. As the hammer of these revolvers is pulled to the rear, the hammer engages the trigger, pulling it rearward. The hand, which is attached to the trigger, also rises during this operation, which causes the rebound lever to release the locked cylinder. The hand further engages the ejector notches in the cylinder and causes the cylinder to rotate. The lever attached to the trigger pulls the safety from between the frame and hammer. The bolt is then released and allowed to engage the cylinder lock.

Malfunctions. Many parts of a revolver wear out or break after a great deal of use. The rebound lever and the cylinder bolt are subject to wear and have to be replaced often. The latch and latch pin can also wear out. The crane and frame sometimes bend out of shape. Mainsprings occasionally break. During rapid double-action firing, the cylinder might skip, requiring a new bolt spring. You can find new and used parts from gun part suppliers, such as the Numrich Gun Part Corporation, 226 Williams Lane, Kingston, NY 12401. Phone: 866.686.7424 (www.gunpartscorp.com)



Key No.	Description	Key No.	Description	KeyNo.	Description	Key No.	Description
1	Barrel	11	Ejector Rod	21	Strut	31	Rebound Lever
2	Bolt	12	Rod Head	22	Strut Pin	32	Lever Pin
3	Bolt Screw	13	Ejector Spring	23	Strut Spring	33	Recoil Plate
4	Bolt Spring	14	Firing Pin	24	Hand Detent	34	Safety
5	Crane	15	Roll Pin	25	Latch	35	Safety Lever
6	Crane Bushing	16	Frame	26	Latch Pin	36	Side Plate
7	Crane Detent	17	Hammer	27	Spring	37	Plate Screws
8	Screw	18	Hammer Pin	28	Guide Spring	38	Stock, Left
9	Crane Lock Spring	19	Stirrup	29	Mainspring	39	Stock, Right
10	Cylinder	20	Stirrup Pin	30	Ratchet	40	Stock Pin

Figure 2: *Exploded view and parts list for a Colt Police Positive revolver. This will assist you with identifying parts during disassembly and for ordering replacement parts.*

Basic Tools for Colt Repairs. For more than just minor maintenance on Colt revolvers, the following tools are recommended:

- Ratchet wrench
- Crane bushing wrench, mainspring clamp, or long-nose pliers
- Screwdriver
- Rawhide or plastic mallet
- Peening hammer
- Side-cutting pliers
- Assorted Swiss files
- Honing stone
- Bolt screw counterbore or dill
- Prick punch
- Drift punches
- 1/8" brass drift punch
- Bolt spring pusher
- Fine emery cloth
- Headspace gauge
- Feeler gauge
- Firing pin protrusion gauge

Inspection and Repair. To check any of the Colt models listed above, loosen the sideplate screws along with the crane and latch drop. Then, use the headspace and feeler gauge to check the headspace. Check the end-to-end cylinder play and also check for a loose barrel or barrel joint. Look for worn or loose trigger and hammer pins as well as loose bolts or screws.

When inspecting the revolver, you might find any of the following: a damaged or purposely filed safety; worn or short trigger sears; a defective firing pin or hammer notch; a strut that is the wrong shape or length, or that is out of position; a weak mainspring; a worn rebound lever cam; a bolt and rebound lever that are out of time; or a hand that is worn or out of time.

DIMENSIONS AND TOLERANCES

Firing Pins. Firing pin protrusion is measured with a firing pin gauge. With the hammer fully forward, place the gauge over the protruding firing pin and against the revolver's recoil plate. Lock the gauge's plunger and lift it from the firing pin. Use a micrometer to measure the overall length of the gauge. The difference between the original length (0.5000") and overall length of the body, including the plunger, is the amount of firing pin protrusion. Correct protrusion should be between 0.040-0.050 inches.

Long firing pins can be filed shorter, but short firing pins should be replaced. In some cases, the firing pin can be lengthened by welding and rehardening the pin, but this is not recommended.

Floating firing pins should have moderate up-and-down travel so that they do not damage the recoil plate. When the firing pin protrudes through the recoil plate, there should be some play, but not too much. The back side of the firing pin can be filed to correct the up-and-down movement. File the top for higher travel or the bottom for lower travel, as shown in Figure 3.

When replacing a firing pin, slightly countersink the rivet hole in the hammer and use a new rivet. Peen both ends of the rivet, and then file them flush with the hammer surfaces.

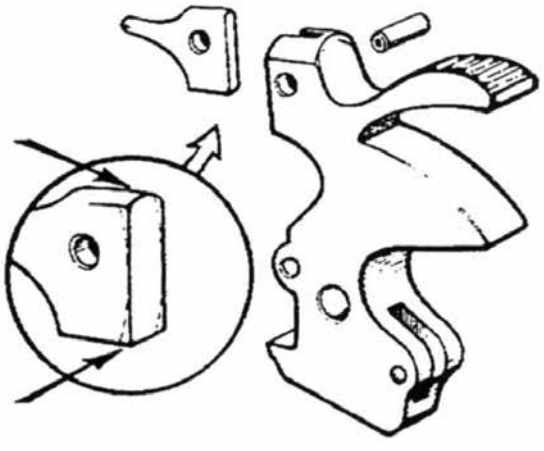


Figure 3: *Areas to file firing pin to correct up-and-down movement.*

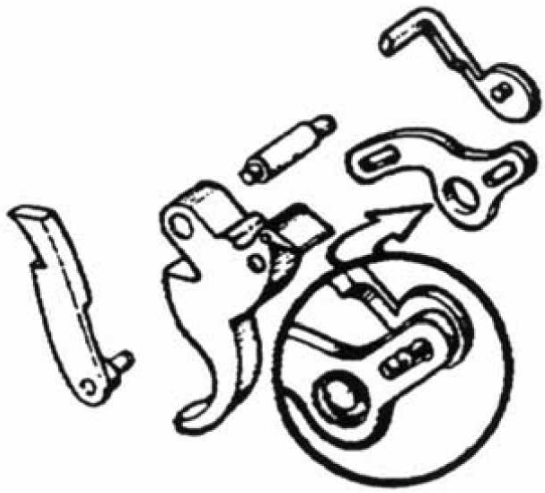


Figure 4: *Safety and trigger pins must work freely in safety-lever slots.*

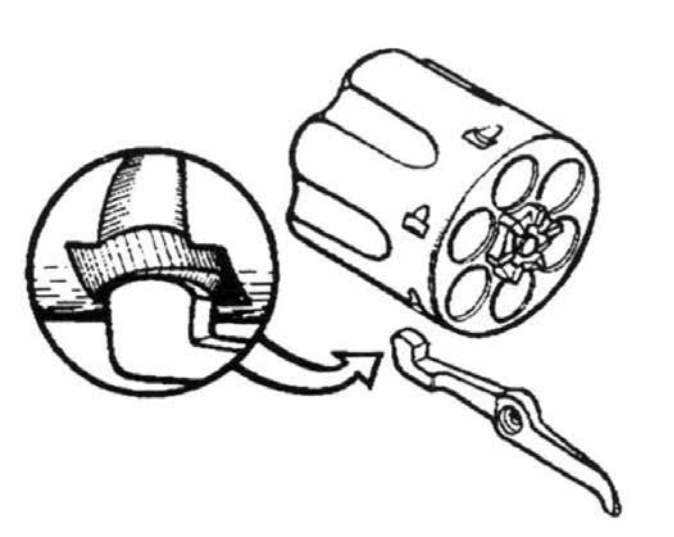


Figure 5: Top of bolt head should match contour of bolt leads.

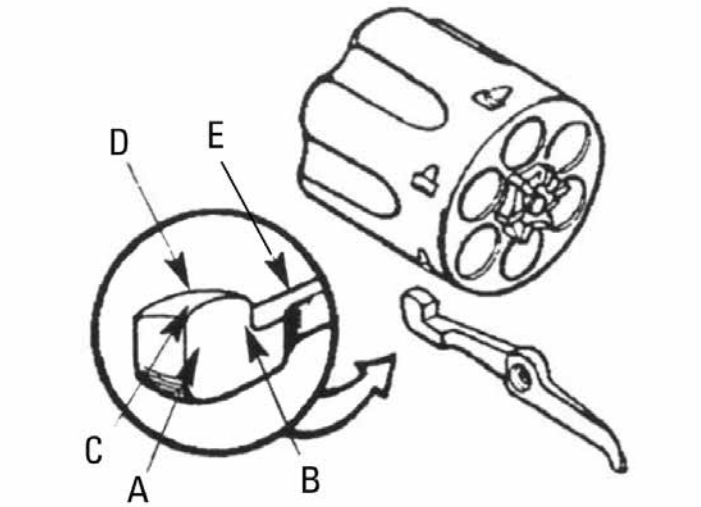


Figure 7: Points to file bolt head for correct fitting.

Safety Levers. The safety lever should work freely at the hammer pin boss. The safety and trigger pins must work freely in the safety lever slots, as shown in Figure 4.

Bolt. The top of the bolt head should match the contour of the bolt leads in the cylinder, as shown in Figure 5. The head of the bolt should be beveled approximately 10˚ in order to match the contour of the cylinder. The lower side of the head should contact the riding point, as shown in Figure 6. The bolt head should fit into the cylinder bolt cuts with as little tolerance as possible. Bolts that are loose due to wear should be replaced.

Figure 7 shows the correct place to file the bolt so it fits the cuts in the cylinder. The bolt screw must be seated tightly to the frame with a slight drag when the bolt is moved and the bolt spring is not in place. If the bolt is too light, file the underside of the bolt at the screw hole until the bolt works properly. If the bolt is too loose, counterbore the bolt screw hole in the frame until you feel a slight drag. Either a $^{3}/_{16}$" or ¼" drill can be used for this operation.

When the bolt cut is worn so that the bolt head moves from side to side, the cut needs to be peened. The bolt spring should be strong enough for the bolt to snap sharply into the cylinder bolt cuts, yet loose enough to allow the top of the bolt head to be flush with the bolt cut in the frame. The bolt head should enter the cylinder bolt cuts approximately $^{1}/_{32}$ inches.

If the bolt head is short, the cylinder will not lock. Correct this fit by filing the bolt at point E, as shown in Figure 7. If the bolt head is too long, the bolt cannot clear the cylinder when cocking. Correct this by filing the bolt at points D and C. Polish the bolt head with a fine emery cloth. Refer to Figure 8 for the proper shape of the bolt tang.

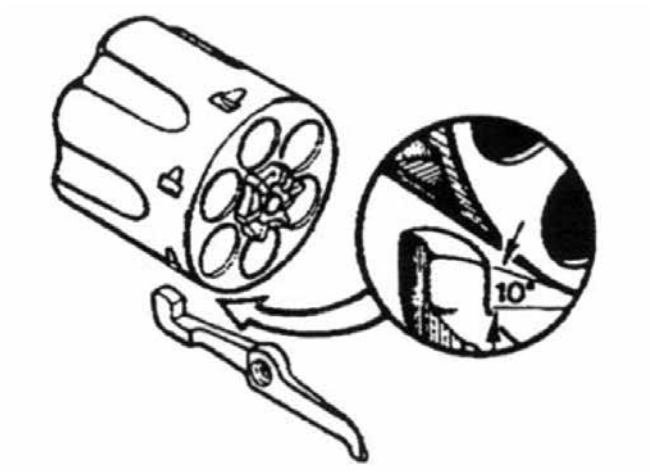


Figure 6: The bolt head should fit freely into the bolt cuts in the cylinder.

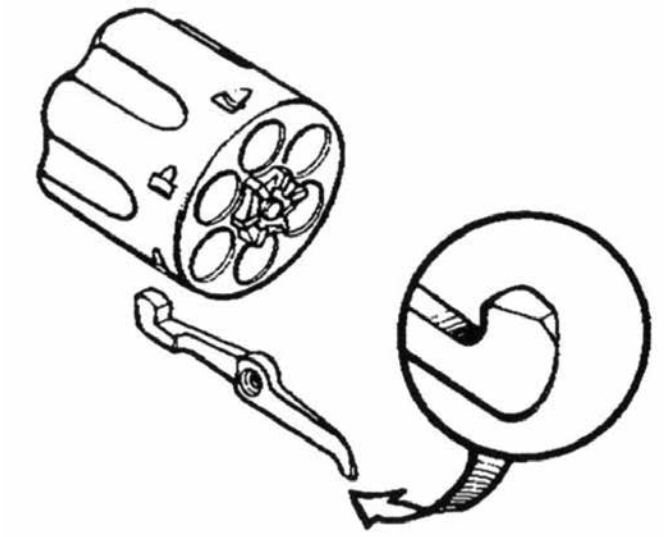


Figure 8: The proper shape of the bolt tang when polishing or shaping.

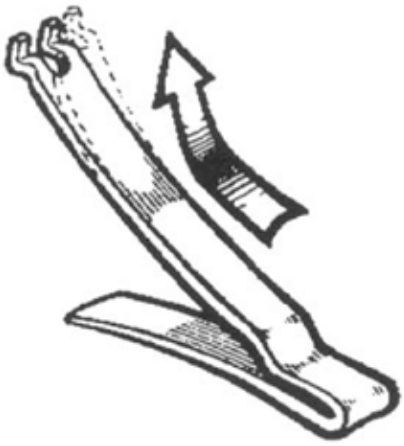


Figure 9: A weak or stiff mainspring can usually be corrected by slightly bending it near the center of its arm.

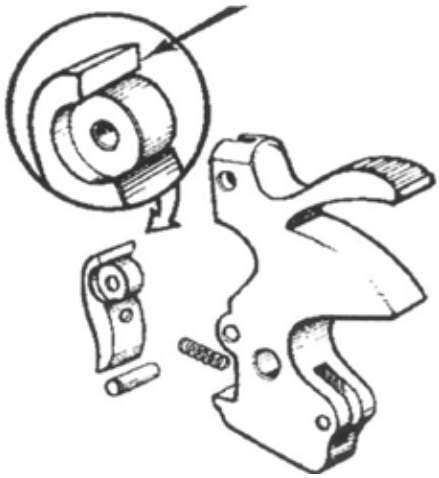


Figure 10: The strut should be sharp and smooth, but never blunt.

Mainspring. A weak mainspring causes misfires and poor rebound in any revolver action. A stiff spring increases single- and double-action pull. A properly tuned mainspring has a lot to do with accuracy.

In some cases, a weak mainspring can be corrected by bending the upper arm at its center. A stiff mainspring can be loosened some by inserting a small drift pin between the spring arms and then cocking the revolver (Figure 9).

Strut. The strut should be long, but be as far away from the hammer as possible so that it does not interfere with the sear end of the trigger during its exit from the hammer notch. The strut should be sharp and smooth—never blunt. To sharpen the strut, file it as shown in Figure 10.

If the strut is out too far, it may be bent at the center. Set or peen holes in the hammer to prevent the pin from coming out. Note that a short strut will cause the hammer to fall before the cylinder has indexed when used with a double-action barrel. This also causes a weak hammer blow, resulting in a misfire.

Safety. The revolver's safety should move smoothly in and out of its safety cut without excess play. To remove excessive play, slightly bend or file the ball of the safety. Never reduce the dimensions of the part of the safety bar that blocks the hammer (Figure 11).

Hammer and Trigger Pins. Both of these pins are drive fit pins and should be replaced when loose. Drift out the pins with a brass drift punch and hammer. In an emergency situation, temporary repairs can be made by reversing the pins.

Trigger and Hammer. The proper angle and thickness of the sear end of the trigger determines the feel and weight of the single-action trigger pull. Refer to Figure 12.

A blunt trigger sear causes a light, uneven trigger pull whereas too sharp an angle causes poor cocking action and a heavy trigger pull. If the pull is too light, the sear end can be thinned by filing the underside of the sear, as shown at point B in Figure 12. When the pull is too heavy, reduce the depth of the hammer notch by honing, as shown in Figure 13. In either case,

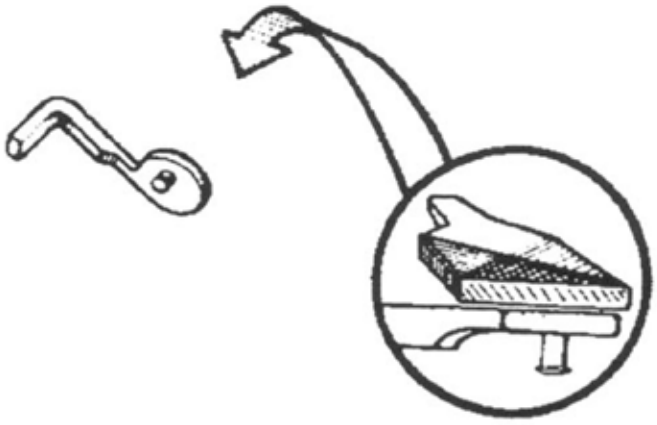


Figure 11: In fitting the safety bar to the revolver, never reduce the dimensions of the part that blocks the hammer. However, the remaining portion can be filed to the proper fit.

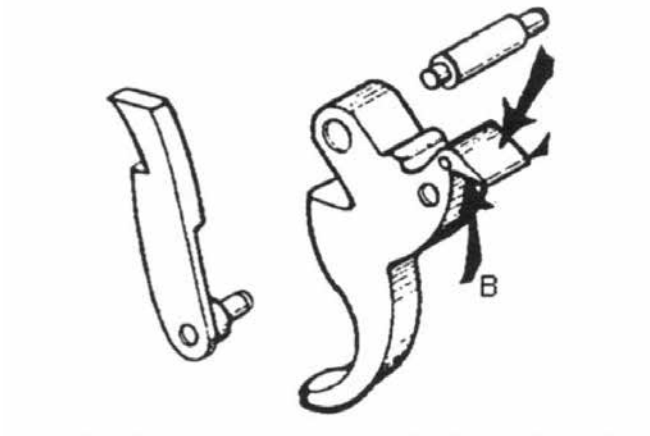


Figure 12: The points on the sear that will determine the weight and feel of the trigger pull.

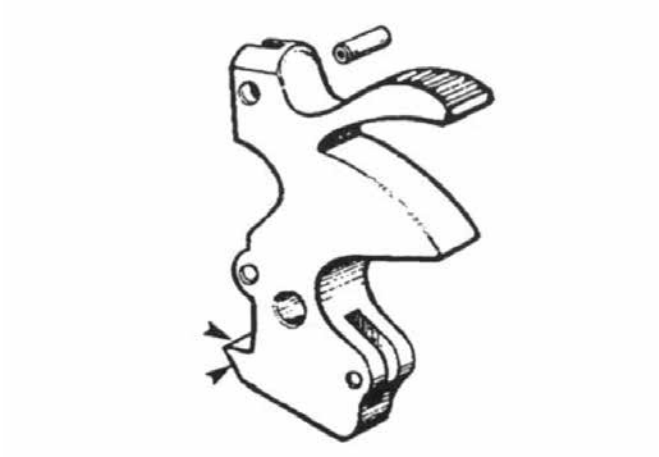


Figure 13: Reducing the depth of the hammer notch with a honing stone at the points indicated by the arrows lightens the trigger pull.

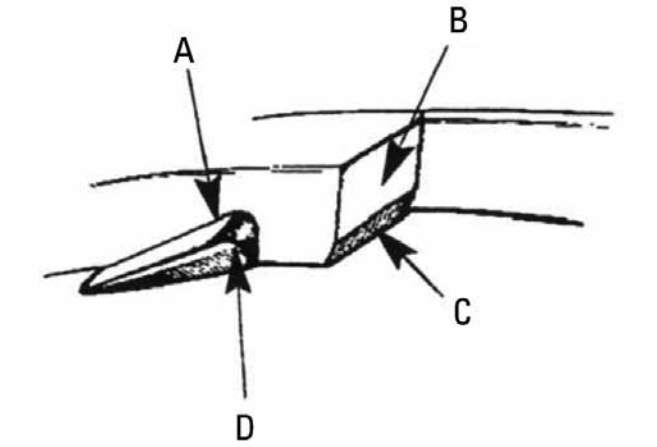


Figure 15: The triangular-shaped notch in the rebound lever should be smooth and slightly rounded at the outer edge.

always polish both the top and underside of the sear with a fine emery to maintain a smooth cocking action.

If the hammer can be pushed off with your thumb when the revolver is in the cocked position, the trigger is too light, which is very dangerous. The pull for most revolvers should be 3-4 pounds. The sear and the hammer notch determine the weight of trigger pull.

An excessive amount of play between the back of the hammer and the revolver frame indicates that the sear end of the trigger is too short and needs to be replaced. When this condition exists, the revolver cannot be timed correctly. When any of the above operations are performed, the indexing of the cylinder must be checked to ensure proper functioning.

Rebound Lever. The rotating piece, or cam, of the rebound lever determines the proper lifting and dropping action of the bolt. The lever must return to a position low enough to pick up the bolt tang. Refer to point A in Figure 14. The cam can be lowered by bending the rebound lever at the center, filing the front, flat lever part of the rebound, or by filing the underside of the front angle. There should be no resistance or variation between the cam and bolt tang; otherwise, the bolt will not clear the cylinder.

In all cases, the bolt should respond immediately when the hammer or trigger is moved. Any tolerance can be removed by bending the rebound lever up at the center. However, this can cause the safety to get caught under the hammer when it is rebounding. If this is the case, you need to replace the lever.

The top point of the cam should be straight and slightly rounded, as shown at point A in Figure 15. The triangular-shaped notch should be smooth and rounded at the outer edge (point D).

The bolt tang should not drop lower than $^1/_3$ of the narrow part of the bolt head in the cylinder. Otherwise, the bolt will not drop in time to lock the cylinder during rapid fire. To drop the bolt earlier, shorten the cam by filing the front triangular-shaped notch. If the bolt drops too early, the rebound lever should be replaced.

Sometimes the trigger will not clear the strut when rebounding. You can correct this by filing the front, flat part of the lever (B in Figure 15), but make sure that the safety will clear the hammer. If the safety catches on the hammer, then the front, flat part is too short and the rebound lever will have to be replaced.

To test for a bouncing hammer, bring the hammer to full cock and then push forward on the hammer with your thumb. If the hammer bounces in the frame, file the comer of the front, flat part at point C, as shown in Figure 15, until the bounce is gone.

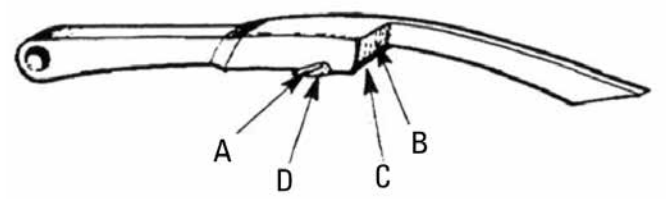


Figure 14: The filing or honing points on the rebound lever.

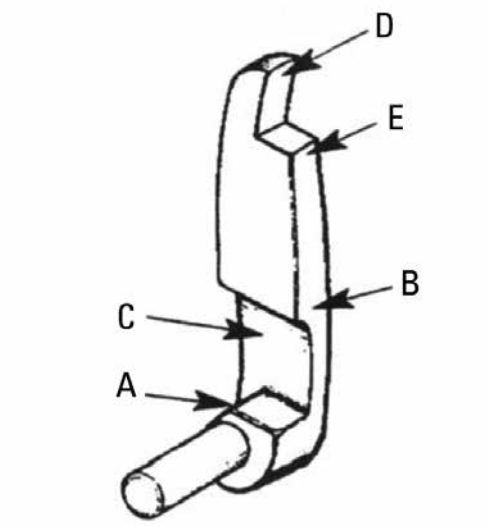


Figure 16: *Points of fitting on the hand.*

Hand. Spring tension of the hand is determined by the rebound lever fit on the cam of the hand. When no tension is noted, file the rear angle of the cam to increase the angle (Figure 16). During operation, if the hand misses the ratchet on the cylinder, file the front center portion of the hand (point B) to let the hand protrude farther. Furthermore, the hand must be free in the frame and as close to the frame as possible. To do this, bend the hand at its center.

When the cylinder does not rotate far enough to index properly, the hand is probably too short. Stretch the hand by peening it with the chisel end of a cross-peen hammer at point C. When the lower portion of the hand is too long, the cylinder will index before the trigger locks in the hammer notch. The indexing should be made uniform by filing the particular ratchet lug.

If the bolt head does not clear the cylinder, but the bolt and rebound lever are adjusted correctly, the top finger of the hand can be filed slightly to delay the rotation of the cylinder. If the top finger is too short, the cylinder will bind between chambers. If this condition exists only when the gun is loaded, and you are sure that headspace is correct, the top or bottom finger lever may be interfering with the cartridge casings. Use one dummy or empty cartridge case to check the position of the chamber where the bind occurs. The front of the top finger might need to be filed back or the top front edges rounded, as shown at point D in Figure 16. If the bottom finger is causing the problem, reduce the depth at point E.

Latch. The latch pin should work freely in the frame. Weak latch springs need to be replaced. The spring hole in the sideplate can be enlarged if the spring fits too tightly. Excess side play in the latch can be removed by peening the underside of the latch cut in the sideplate. Repair any up-and-down movement by peening the latch-guide ribs in the direction of the latch. Refer to point A in Figure 17. Should the latch bind, file the underside of the latch at point B in Figure 17.

Crane. A latch that works smoothly but does not lock properly when the cylinder is closed is an indication that the crane is either loose or has sprung. Bend the crane slightly to correct this problem. To determine the direction to bend the crane, press in on the cylinder. Push up or down on the cylinder until the latch drops in place. Bend the crane accordingly.

With the cylinder closed and the latch in place, an excessive amount of play between the front of the crane and frame indicates that the cylinder and crane must be sprung outward. To correct this condition, open the crane fully and then tap sharply outward from the frame with a rawhide or plastic mallet. Do this until the play between the crane and frame is corrected, allowing the latch to drop (Figure 18).

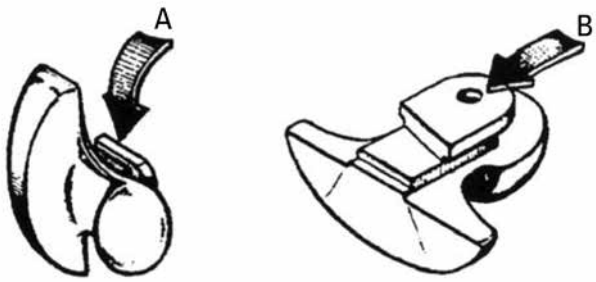


Figure 17: *Points to correct latch problems by either (A) peening) or (B) filing.*

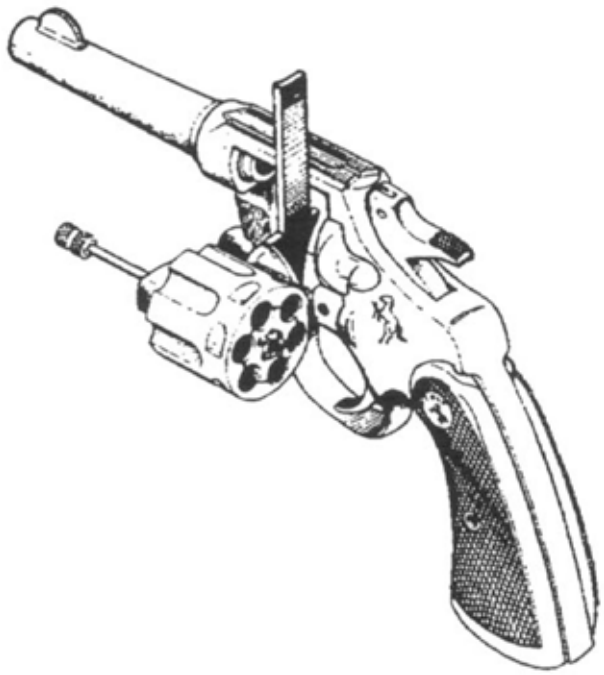


Figure 18: *Method of connecting a crane that is sprung forward.*

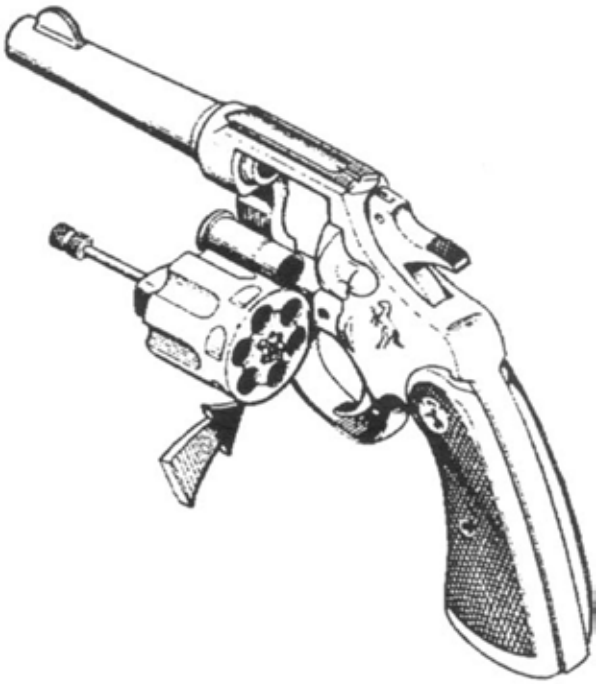


Figure 19: *Method of springing a cylinder inward.*

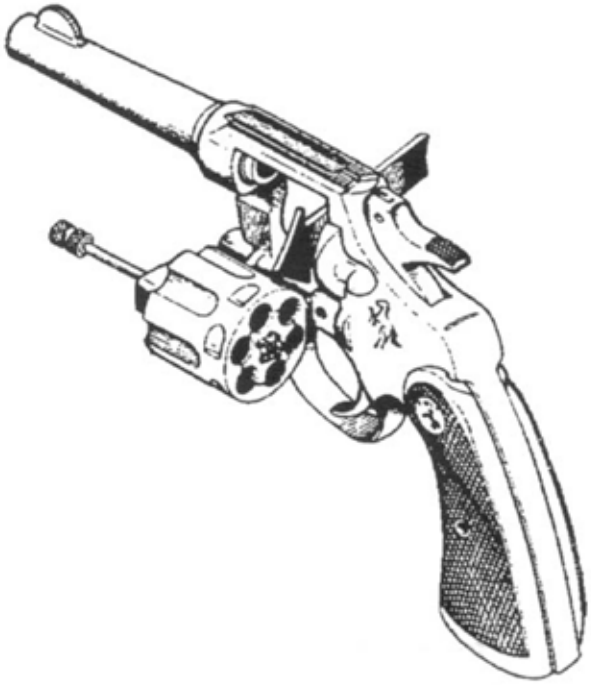


Figure 20: *Method used to spring a cylinder upward.*

When the cylinder has to be sprung inward, place an empty cartridge case between the frame and crane. Tap the cylinder inward towards the frame as shown in Figure 19.

If the cylinder must go up, open the crane fully and use the wooden handle of a mallet to tap the cylinder from the right side, accessing the cylinder by the cylinder opening in the frame (Figure 20).

Cylinders that must be sprung downward require removing the crane from the frame. Place the cylinder on a workbench with the crane directly above the cylinder. Tap the crane downward towards the cylinder with a rawhide or plastic mallet.

Cylinder, Ratchet, and Ejector Rod. Headspace for Colt Official Police revolvers should be 0.060-0.065 inches. When checking the headspace, the cylinder should be pressed forward. A tight headspace can be corrected by reducing the length of the cylinder collar, as shown in Figure 21. Excessive headspace can be corrected by stretching the cylinder collar. After this headspace correction has been made on older models, there is often excessive end-to-end play in the cylinder.

If this occurs, the ratchet must be replaced. The headspace should always be corrected before fitting a new ratchet. If the new ratchet causes problems, such as difficulty in closing the cylinder, file the ratchet evenly until the cylinder closes freely with no end play. It is recommended that you slightly stake the ratchet and end of the ejector rod to keep them from coming loose.

The end of the ejector spring should be crimped so that it will not jump the collar of the ejector rod. The ejector rod sometimes bends during operation and during repair jobs. If this happens, remove the ejector rod and straighten it.

Barrel. The barrel joint between the breech and front of the cylinder should be spaced between 0.002–0.008 inches. The barrel should have a moderate throat that has a slightly flared opening at the breech. If the throat is too small, the revolver might spit lead, or shave a portion of each bullet as it is fired. On the other hand, if the throat is too large, the bullets may keyhole upon firing.

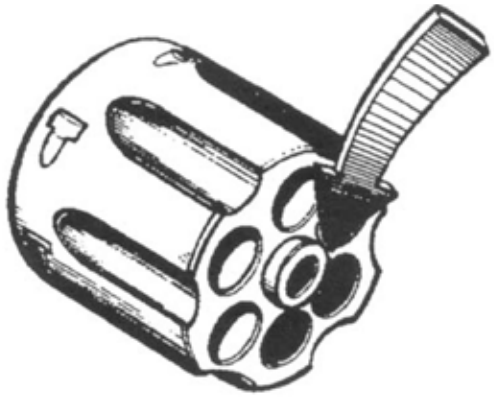


Figure 21: *Headspace can be corrected by changing the length of the collar.*

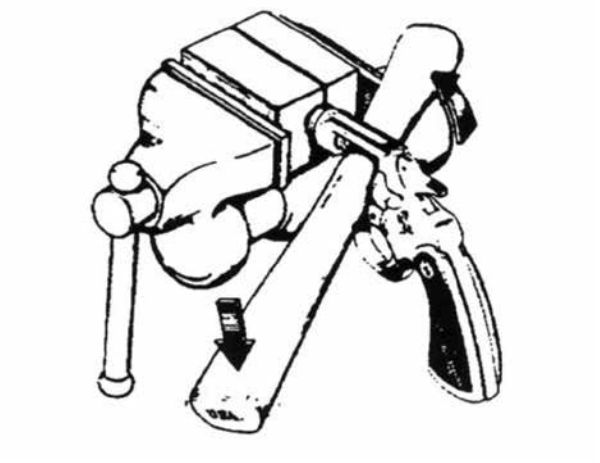


Figure 22: *Equipment needed for removing revolver barrels.*

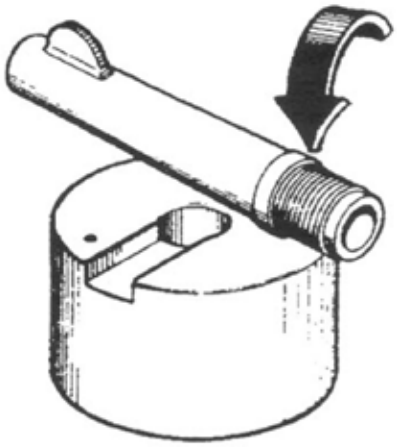


Figure 23: *Loose barrels can be temporarily corrected by peening down the barrel shoulder.*

Most revolver barrels can be removed by making a set of wooden blocks, as shown in Figure 22, which are used to tightly secure the barrel in a vise. Powdered rosin is used on the barrel to keep it from turning when pressure is applied to the frame. With the barrel tightly secured and the crane and cylinder removed, insert a wooden bar through the cylinder opening in the frame and twist the frame counterclockwise to remove it, or clockwise to tighten it.

To correct a loose barrel or open barrel joint, the shoulder of the barrel should be turned on a lathe. Turn the shoulder enough to allow the barrel to be screwed in at least one more thread. The barrel must then be rejointed to form the proper gap between it and the cylinder. During an emergency situation, a loose barrel can be corrected by removing the barrel from the frame and peening down the shoulder of the barrel before refitting.

You can make a relatively even peen by using a ball-peen hammer and a wooden block. To do this, remove the barrel from the frame, and hold the barrel by the muzzle end. With the threaded end resting on the wood block, lightly peen the shoulder of the barrel as it is slowly revolved on the block, as shown in Figure 23.

A simpler method to peen the shoulder is to use a tubing cutter with a roller bearing installed in the place of the round cutting blade. With the barrel secured in a padded vise, rotate the tool on the barrel shoulders, tightening the pressure screw on the tool after each complete revolution. Apply only slight pressure with each revolution or the tool might be damaged.

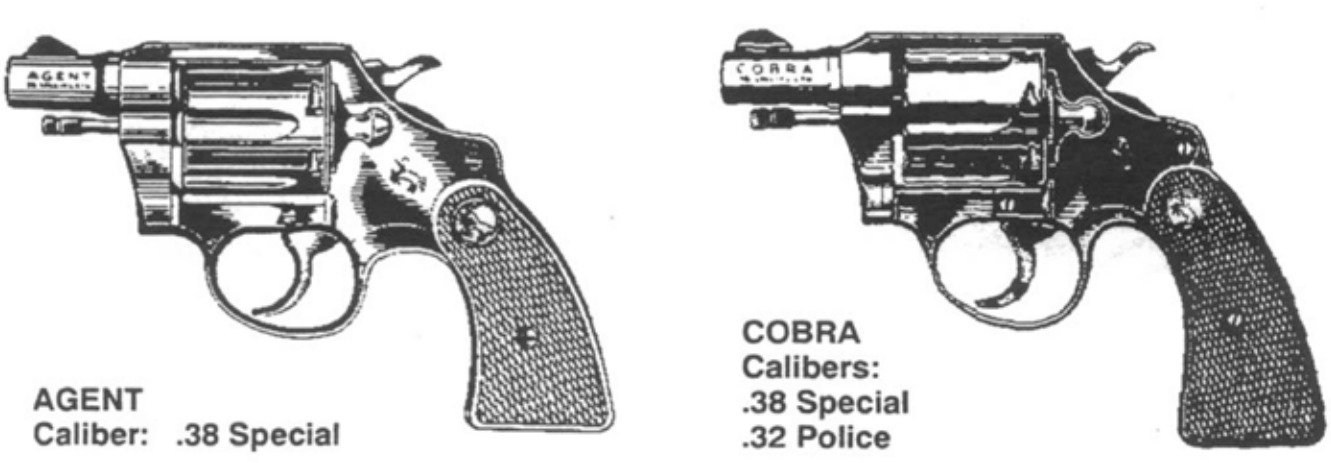


Figure 24: *Although these Colt revolvers are designated as different models, they all function in the same way.*

Malfunction	Cause	Corrective Action
Misfires	Excessive head space Insufficient firing-pin protrusion Weak mainspring	Repair Replace pin Replace
Hard extraction	Rough or very dirty chambers	Clean and polish
Hard cylinder rotation when gun is empty	Bent crane Insufficient barrel/cylinder gap Rough or burred recoil shield	Straighten or replace File larger gap Polish smooth
Trigger won't return after firing	Broken trigger return, rebound spring, or lever	Replace
Hammer won't cock	Broken trigger nose or hammer	Replace
Hammer won't come all the way back	Burrs or parts interference inside	Inspect and repair or replace parts
Hammer won't stay cocked	Chipped or worn sear notch	Recut notch or replace hammer
Crane won't open	Bent or broken crane lock Bent crane Primer extruded into firing-pin hole	Replace Replace Replace firing-pin bushing

Figure 25: *Troubleshooting chart for Colt revolvers.*

TROUBLESHOOTING

Many Colt revolvers look the same and are referred to by different names, like the ones in Figure 24; however, in operation they are the same.

The troubleshooting chart in Figure 25 covers most problems that will develop with Colt revolvers. This chart is meant as a quick reference for spotting problems, and provides the corrective action. Details of repairs can be found elsewhere in this lesson.

SELF-TEST QUESTIONS

Please check your answers on page 23.

1. **When were many operating characteristics of modern Colt revolvers introduced?**
2. **What is the dimension range for correct headspace on Colt revolvers?**
3. ***True or False.*** **Trigger pull on Colt revolvers should be 3-4 pounds.**
4. **Which part of the Colt revolver should match the contour of bolt leads in the cylinder?**

Smith & Wesson Revolvers

Smith & Wesson (S&W) revolvers that were manufactured within the last 60 years function essentially the same way as Colt revolvers. As the hammer is pulled to the rear it rotates the trigger against the compressed rebound lever spring. At the same time, the cylinder bolt is disengaged from the cylinder notch. The hand attached to the trigger is pushed upward, rotating the cylinder. When the hammer is approximately halfway back, the cylinder bolt is disengaged by the trigger. The force of the cylinder bolt spring pushes the cylinder bolt against the cylinder. When the cylinder chamber is in line with the barrel, the cylinder bolt engages in the cylinder notch, locking the cylinder in place for firing. The sear on the trigger engages the hammer, holding it in its cocked position, ready to fire. This basic operation is valid for most S&W revolvers.

When the trigger is released by pulling or squeezing, the hammer and trigger are disengaged and the hammer falls upon the firing pin. As the trigger is released, the force of the compressed rebound lever spring pushes the rebound lever forward. A lug on the rebound lever engages the hammer, camming the hammer back enough to withdraw the firing pin, while at the same time forcing the trigger to return to its normal position.

When a double-action S&W revolver is fired, the sear end of the trigger engages the strut which cams back the hammer. All other operations are the same as described previously.

FITTER'S BLOCK

In addition to the tools listed earlier in this lesson, a part-fitter's block, as shown in Figure 26, is recommended for the repair of Colt revolvers. The drawings and dimensions given should enable anyone with machine-shop experience to turn a part-fitter's block on a metal-turning lathe easily. If 2½" stock is available, cut off a 2" piece and use a drill press and files to finish the block according to the drawings in Figure 26. Although it takes a little longer without machine tools, a fitter's block can save much time if you have a lot of revolver work. If you do not want to make the block yourself, you can purchase a ready-made S&W block from Brownells. However, they are fairly expensive.

TROUBLESHOOTING

An exploded view of an S&W revolver and a list of its parts are shown in Figure 27. You might need to refer to this figure frequently until you can recognize all the parts and part names.

One of the most common problems in some of the older S&W revolvers is that the extractor rod head loosens when firing. When the head is loose, the ejector rod is lengthened, which causes the cylinder to bind to the extent that the cylinder cannot be rotated or opened.

To correct this problem, use a pair of soft-jawed pliers to screw in the ejector rod (right-hand thread) until it is short enough to swing out of the cylinder. Tighten it further to prevent loosening.

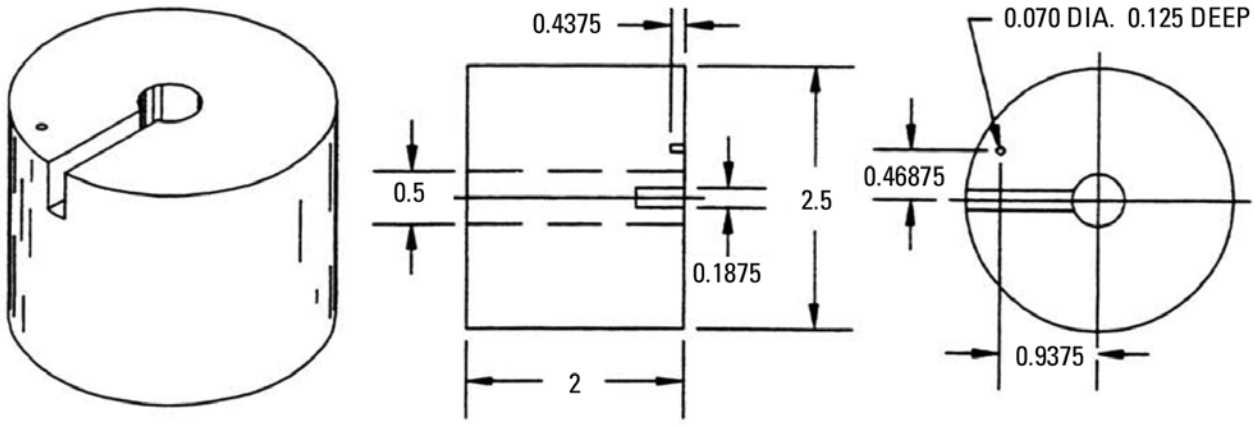
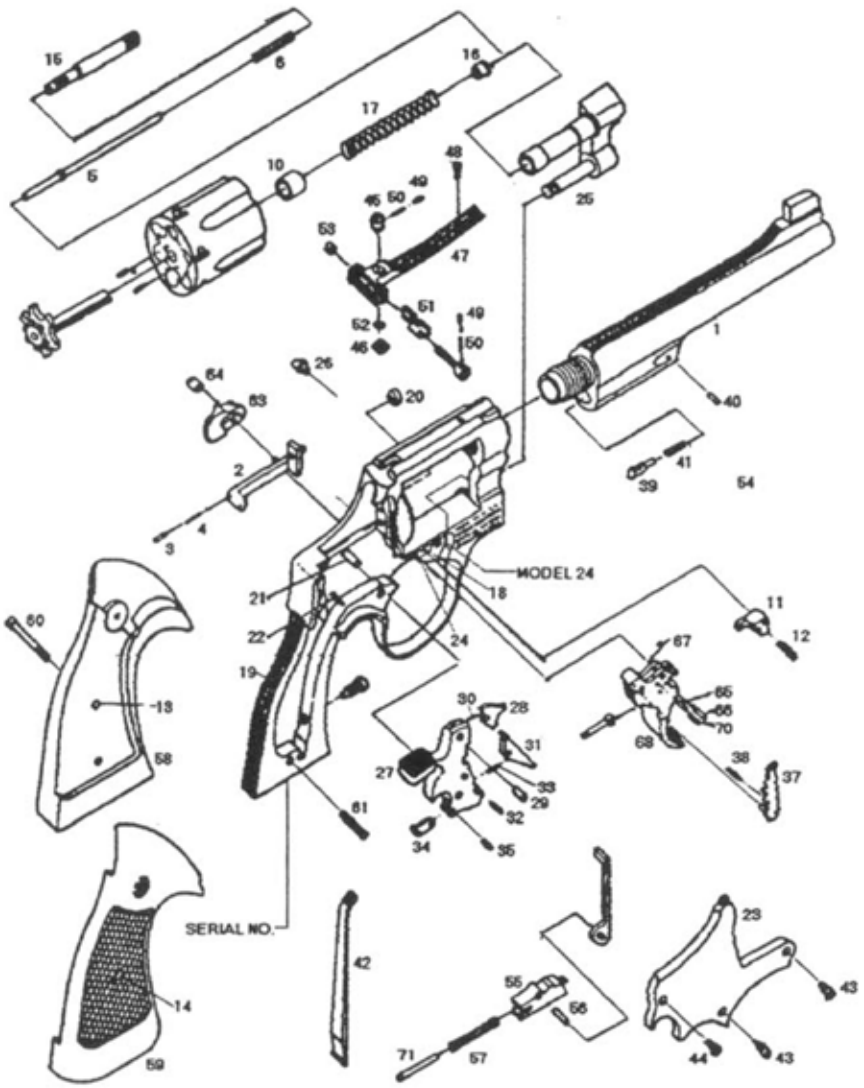


Figure 26: Dimensions for Smith & Wesson part-fitter's block. This block can be purchased from Brownells, Inc.



Key No.	Description	Key No.	Description	Key No.	Description	Key No.	Description
1	Barrel	21	Hammer Stud	41	Locking Bolt Spring	61	Stock Pin
2	Bolt	22	Rebound Slide Stud	42	Mainspring	62	Strain Screw
3	Bolt Plunger	23	Side plate	43	Plate Screw, Crowned	63	Thumbpiece
4	Bolt Plunger Spring	24	Trigger Stud	44	Plate Screw, Flat Head	64	Thumbpiece Nut
5	Center Pin	25	Yoke	45	Rear Sight Elev. Nut	65	Hand-Spring Pin
6	Center-Pin Spring	26	Frame Lug	46	Rear-Sight Elev. Stud	66	H-S Torsion Pin
7	Cylinder	27	Hammer	47	Rear-Sight Leaf	67	Hand Torsion Spring
8	Extractor	28	Hammer Nose	48	Rear-Sight Leaf Screw	68	Trigger
9	Extractor Pin	29	Hammer Nose Rivet	49	Rear-Sight Plunger	69	Trigger Lever
10	Gas Ring	30	Hammer Nose Spring	50	Rear-Sight Plun. Spring	70	Trigger Lever Pin
11	Cylinder Stop	31	Sear	51	Rear-Sight Slide	71	Trigger Stop Rod
12	Cylinder Stop Spring	32	Sear Pin	52	Rear-Sight Spring Clip		
13	Escutcheon	33	Sear Spring	53	Rear-Sight Windage Nut		
14	Escutcheon Nut	34	Stirrup	54	Rear-Sight Wind. Screw		
15	Extractor Rod	35	Stirrup Pin	55	Rebound Slide		
16	Extractor Rod Collar	36	Hammer Block	56	Rebound Slide Pin		
17	Extractor Spring	37	Hand	57	Rebound Slide Spring		
18	Cylinder Stop Stud	38	Hand Pin	58	Stock, Left		
19	Frame	39	Locking Bolt	59	Stock, Right		
20	Hammer Nose Bushing	40	Locking Bolt Pin	60	Stock Screw		

Figure 27: *Exploded view of Smith & Wesson revolver.*

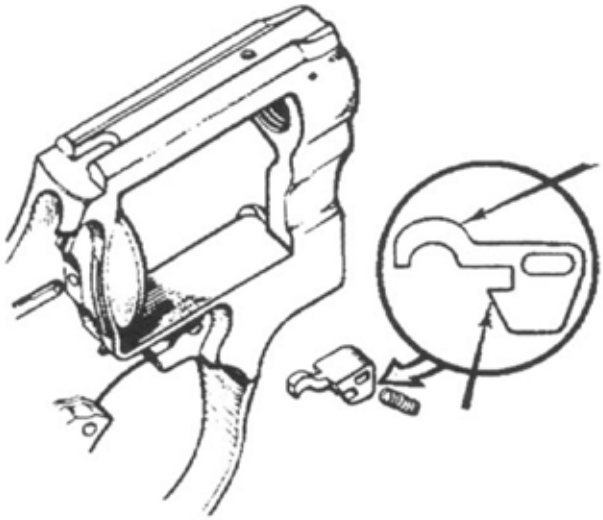


Figure 28: Points on S&W revolver cylinder stop that can cause it to catch.

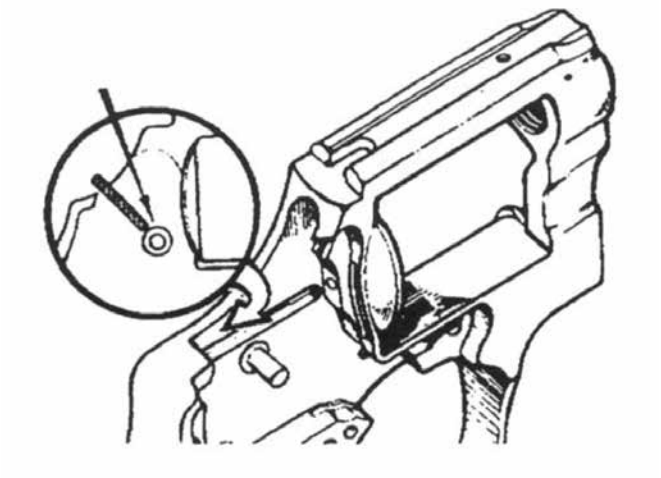


Figure 29: Filing the sear bevel to correct sear click.

All later model S&W revolvers (those with a dash number after the model number) are supposed to have a left-hand thread, which will prevent this malfunction. Listed below are some descriptions of other S&W malfunctions.

Cylinder Stop Catches. When the cylinder stop catches, the hammer cannot be pulled back in either single or double-action operation. Many times the point and bevel of the cylinder stop have been filed too much. This causes the stop to move back into the notch where it had previously rested before the hand has a chance to move it to the next cylinder notch. This problem can also be caused by an oversized ball, which will stick in the cylinder notches. If this happens, install a new cylinder stop (Figure 28).

Push-Off. To check for push-off, cock the gun in the single-action position, making certain that the sideplate is in place. Place your thumb in back of the hammer. With a normal amount of pressure, push the hammer forward. If the hammer disengages from its cocking notch, you have push-off.

Push-off can be caused by a chipped or broken cocking notch on the hammer, a broken bevel on the trigger, or a point of the bevel that is dull. During repair, all adjustments should be made to the trigger. Do not work on the hammer.

Creep. Creep is a condition in which a crisp fall-off does not occur when the trigger is pulled. Check for creep only in the single-action position. There will be a little jump from the bevel in the cocking notch caused by a rough cocking notch or a rough bevel. To repair, try stoning the bevel as you would to correct push off.

Hammer Block. The hammer block of S&W revolvers is a safety feature like the rebound and the hammer seat. If the revolver operates better without the hammer block in place, check to see if the hammer block is damaged. It might be bent or burred, or have rough edges. Check to see if the top of the rebound or hammer seat is too low. This causes the hammer to move too far forward and close the opening of the flag or the hammer block. If the hammer seat is too low on rebound, replace it with a new rebound.

Rough Cylinder Opening. When the cylinder opens or closes hard, the problem could be one or more of the following:

- Loose rod
- Short or longer center pin on knurled end of rod
- Yoke out of line
- Sticky center pin
- Tight yoke screw
- Bent or crooked rod
- Locking bolt too big and sticks in the rod
- Dirt behind short bolt of the front leg or on the frame
- Long hand
- Cylinder hits on closing
- Leaded breech
- End shake on cylinder and yoke

Stubs. Stubs are generally caused by too much play between the sear and bevel of the trigger during double- action operation. As a result, the cam of the trigger hits the bottom of the cocking notch. To repair, install a new regular sear or a long sear. A long sear might need to be cut so the trigger bevel will return in and under the sear. Letting the sear out too much can cause stubs.

Rough Double-Action Operation. Items to look for when this malfunction occurs are:

- Cylinder cramp
- Loose or bent rod
- Locking bolt top fitted too tightly
- Yoke out of line
- Not enough space between barrel and cylinder
- Leading around breech
- Pins are not down and/or not in place
- Hand is not free
- Sticky hammer nose
- Check hammer boss along with trigger boss

Sear Clicks. If the sear has a click or jump in it during double-action operation, an improper angle at the end of the sear might be the cause. This can happen if the sear is not being let out enough.

During repair, try to change the angle at the sear bevel or let the sear out by filing the seat as shown in Figure 29.

Cylinder Stop Problems. When a cylinder stop sticks, look for the following:

- Stop sticks in notch of cylinder
- Stop sticks inside frame
- Stop travels too far below frame
- Point of stop is too long, which causes it to travel below the frame

When the cylinder stop does not recover, the hook of the trigger is not getting back into the slot of the stop. It will feel like a stubber, or stop-catch problem. To repair a long stop, file the bevel and point of the stop as shown in Figure 30.

Loose Rod. A loose rod causes the cylinder to open hard. First, try tightening the rod with your fingers. If this does not help, push the thumbpiece forward to push the locking bolt out. With a pair of pliers, grasp the locking bolt and pull it toward the muzzle. Tap the cylinder lightly on the bench. If the cylinder still fails to open, pull back on the hammer until the stop is out of the cylinder notch. At this point, take a piece of paper and slip it between the cylinder and stop. This lets you turn the cylinder while holding onto the rod. After the rod has been tightened check it for rod run-out.

Rod run-out is a bent rod that can cause rough extraction. It can also cause rough opening and closing of the cylinder. After the rod has been straightened, check the alignment of the yoke with the yoke liner.

Rough Extractor. Check to see if the extractor pins are missing. If they are missing, replace them by fitting them through the top of the extractor. Also check the internal parts of the cylinder.

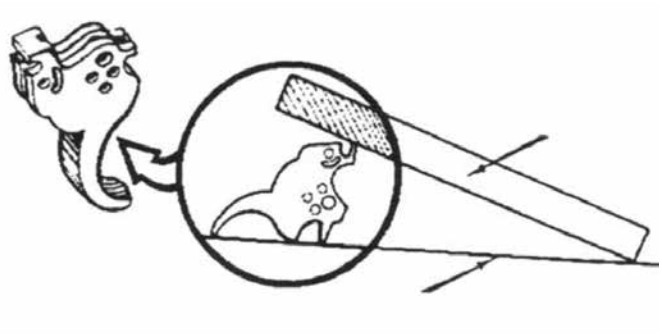


Figure 30: *Stop bevel points to file to correct stop recovery.*

Rough Center Pin. This condition could be caused by rod run-out, a crushed or knurled end rod, or a weak or missing center-pin spring.

Cylinder Hits on Closing. This condition pertains to the cylinder and yoke-end shake. To check, hold the barrel in your left hand with the muzzle facing down. Take the rod in your right hand and close the cylinder until it hits the rear of the frame with the center pin. Turn the cylinder to see if there is an opening or a space between the barrel and the cylinder. At this point, check the gun for end shake on the cylinder and on the yoke. Also, check the breech for lead buildup.

Rough Hammer. Check for a sticky hammer nose. Also, make sure that the sear pins are flush in position. Check for a worn hammer stud.

To correct a rough hammer, file the hammer seat on top of the rebound slide, as shown in Figure 31. However, too much filing can cause too little space for the hammer block. If too much is filed, a new rebound slide will have to be installed.

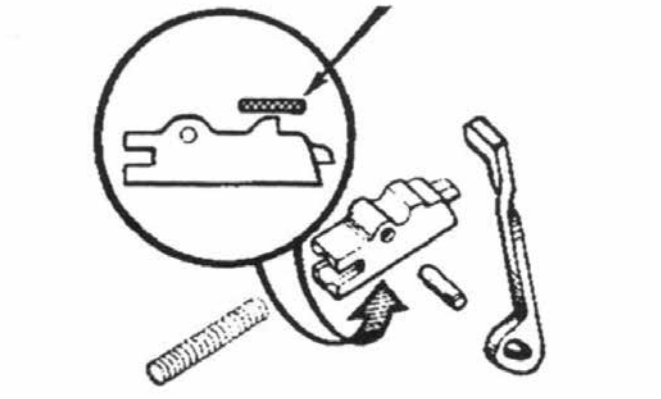


Figure 31: *Filing the top of the hammer seat can often correct a rough hammer problem*



Figure 32: Swaging tool used to correct a binding hammer in S&W revolver.

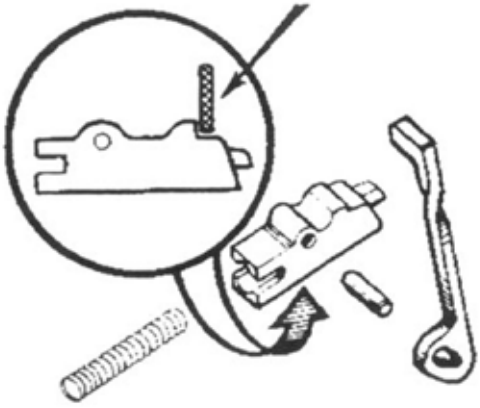


Figure 33: File the front part of the hammer seat to correct a hammer hitting the rebound slide.

Hammer Hits Bolt. When this occurs, the cylinder does not open. It is usually caused by the tail of the hammer hitting the rear leg of the bolt. Check this by pushing the thumbpiece forward to see if it clears the hammer tail.

Loose or Binding Hammer. If the hammer is very loose, the cause could be over-grinding on the hammer. In this case, a new hammer must be installed. If the stud hole is too big due to wear, swage (or reduce the diameter of) the hammer stud hole with a swaging tool, shown in Figure 32, but never over-swage. This could make the hammer bind. Use a tapered reamer to open the hole to the correct size.

Hammer Hits Rebound Slide. This problem causes misfires. To check for this condition, pull the trigger back while holding the hammer forward. There should be a little play between the front of the rebound and the back of the hammer. If no play is found, the hammer could hit the front of the rebound, which would hinder the hammer nose from coming through the frame to hit the primer.

To repair, file the front of the hammer seat as shown in Figure 33. After filing, always smooth with an Arkansas stone. Too much play will prevent the safety feature from operating correctly.

Hammer Hits Trigger. While holding the hammer back (in single-action operation), release the trigger from the hammer's cocking notch and then gradually move the hammer forward to see if the hammer foot is hitting the cam of the trigger. If this happens, it may impede the trigger return, which can cause misfires.

The hammer hitting the trigger is sometimes caused by the trigger stop on Combat S&W models or by the hammer not cocking fully. The same two parts involved in a stubber are involved in the hammer hitting the trigger malfunction. Light stoning on the trigger cam will help (Figure 34), but never stone the hammer.

Hammer Nose Hits. If the hammer nose is bent, the hammer hits off center of the firing pin hole, causing damage to the frame. Bend the nose back to its normal position to correct.

Knuckles. Knuckles—when the end of the spring hits under the hammer—occur when the strain screw has been loosened or filed too much, or when the mainspring is alternated. Knuckling occurs in double-action firing when the gun frequently misfires.

To check for knuckles, hold the trigger back, and then move the hammer all the way back. If the hammer has a rough feeling, you need to replace the strain screw or mainspring. Tightening the strain screw can also help.

Poor Recovery. If the revolver has a poor trigger recovery after it has been fired, the rebound spring is cut off too much. Also, check to see if the hammer block has room to return in front of the hammer and frame. If not, the hammer seat, located on the rebound slide, might be filed too much. If this is the case, replace it with a new slide. Also, check for recover points on the stop and trigger hook, rebound friction points, and check the sear. Polishing any recover points will help. Never cut more than two coils off of any rebound spring. For better double-action operation, hone the cylinder hook located on the trigger.

Bolt Locks Hammer. Check this condition with the gun closed. Push the thumbpiece forward and see whether it returns to its original position when you release the thumb pressure. Repeat this check on all chambers. If it does not return on all six, check for rod run-out. The cause might be a sticky locking bolt or an out of line yoke.



Figure 34: Light stoning on the cam of the trigger usually helps prevent the hammer from hitting the trigger.

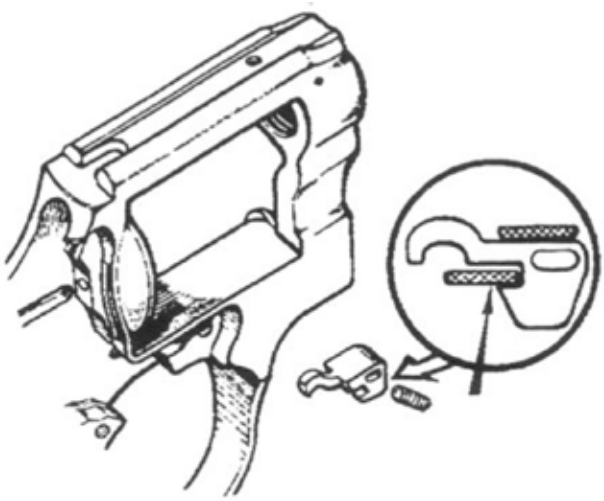


Figure 35: Filing the top of the revolver stop can correct a non-holding stop.

Stop Does Not Hold. Using normal pressure, try to lift the cylinder off the ball of the stop. If the cylinder lifts off, you need to repair it. To correct this, file the top of the stop as shown in Figure 35. This condition may only exist on one cylinder notch but check them all.

Hand Sticks. Spin the cylinder and see if the gun sings. The hand might be sticking in the hand slot or disengaged from the torsion spring. Check for buildup of lead, carbon, or other foreign material in the hand slot in the frame.

Long Hand. This condition causes the cylinder to close hard. Check to see if the throat of the hand is above the face of the frame. If so, file the hand throat until it is flush with the frame. Be careful not to file the hand too much because a short hand will not pick up the cylinder to turn it.

Shaving Lead. When the revolver shaves lead from the edge of the bullet, check for a loose cylinder stop, a loose locking bolt, extra space between the barrel and cylinder, lead buildup in the cone, and yoke alignment.

SELF-TEST QUESTIONS

Please check your answers on page 23.

5. **What is one way that trigger-click can be corrected on an S&W revolver?**
6. **When the stop sticks in the notch of the cylinder on an S&W revolver, what problem will this cause?**
7. ***True or False*. A loose rod on an S&W revolver will often cause the cylinder to open or close hard.**
8. **Name the problem that can develop when the yoke is out of line on an S&W revolver.**

Semi-Automatic Pistols

Semi-automatic pistols are divided into two systems based on the operating method of the action. The types that use low-powered rimfire and centerfire cartridges usually utilize a blowback system. The pistol does not use a locking mechanism to hold the breechblock in place; instead, the weight of the breechblock and the power of the recoil spring keep the breech in place while the pistol is being fired.

The slide on an automatic pistol can extend over the barrel, as in the case with the .45-caliber and .32-caliber Colts. The slide can also extend toward the rear of the receiver with the barrel remaining stationary as with the Colt Woodsman and similar rimfire pistols.

Semi-automatic pistols that incorporate a slide that extends over the barrel operate on a breechblock or delayed blowback system. These pistols are more powerful because they use center-fire ammunition, like the .45 Colt. With this system, the barrel and breech travel rearward together for a short distance, then separate after the bullet has cleared the muzzle. The slide completes its trip to the rear of the gun, allowing the spent casing to be ejected, and as the slide returns, picks up a new cartridge. When the breech contacts the barrel, they lock together and the pistol is ready to fire again.

Other types of semi-automatic pistols include the short-recoil design or a combination of short-recoil and blowback systems. These pistols operate and complete all functions of firing in the same way as semi-automatic rifles. After chambering the first round manually, the shooter only needs to put pressure on the trigger. The gun completes all the other functions automatically.

Possibly one of the most familiar semi-automatic pistols is the Colt .45 Models 1911 and 1911-A1; the type used by our armed forces for over 50 years.

The Model 1911 is very dependable in operation and almost jam-proof in its various refined versions. Furthermore, it is one of the most accurate models used by competitive target shooters. The accuracy in the Colt .45 semi-automatic pistol is due to the bushing, or barrel sleeve. The bushing of the Colt .45 semi-automatic lets the barrel move back and forth while firing and returns the barrel to the same position after each shot.

The Colt Model 1911 is a short-recoil design. After firing, the barrel and receiver travel together to the rear for about $^{3}/_{8}$", then the barrel unlocks from the rest of the recoiling

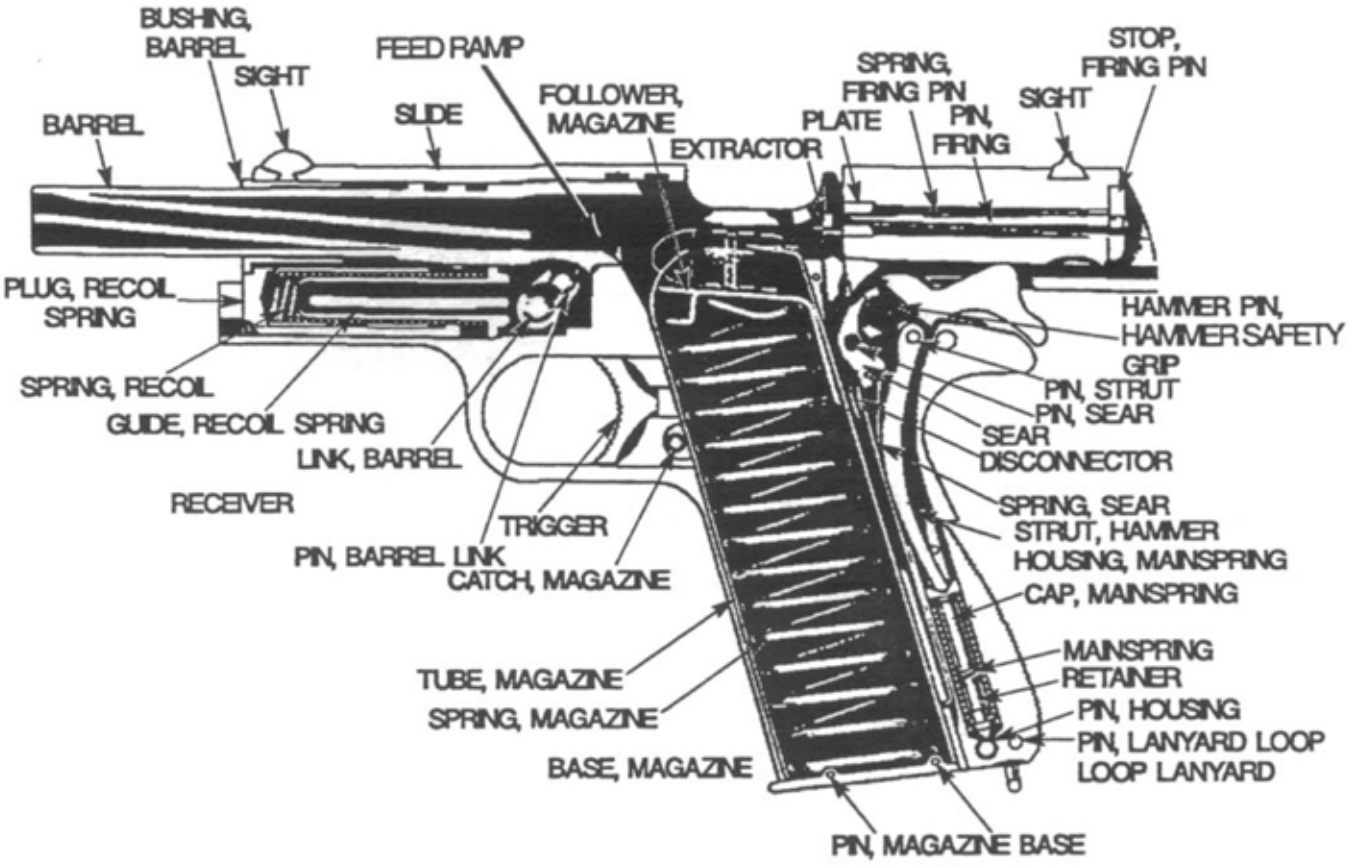


Figure 36: *Sectional view of Colt Model 1911 semi-automatic pistol.*

mechanism and the action is opened. The barrel, which is attached to the receiver by a small, oval-shaped pivoting link, is stopped in its rearward travel, and moves down and away from the slide as the slide proceeds to the rear. Once the barrel stops, the slide, in its rearward movement, extracts the fired case from the chamber. The case is then ejected out of the gun by an ejector mounted at the top-left rear of the frame.

When the slide is in the rearward position, the hammer is cocked and the disconnector is depressed. The slide position also allows the magazine spring to force a new cartridge in line with the breech so that the slide, on its forward movement, strips this cartridge from the magazine and feeds it into the chamber. In its forward movement, the slide also engages the barrel and moves it forward and upward, pivoting on the oval link attached to the frame. The barrel is then cammed so that two ribs, cut at right angles to the axis of the barrel, lock into recesses that have been milled in the top of the slide, locking the action. The gun is now ready for firing (Figure 36).

TROUBLESHOOTING PISTOLS

Malfunctions, such as jams and failure to feed, extract, and eject, are some of the problems that occur in semi- automatic pistols. Use the same tools as mentioned earlier in this lesson.

In many cases, a good cleaning is all that is required to put an ailing semi-automatic pistol back into shooting condition, although other problems requiring more time will also be encountered.

Failure to Feed. When a semi-automatic pistol fails to feed, the first step is to clean and polish the chamber with a brass brush. A dirty or badly fouled chamber is the primary cause of jams and hang-ups in semi-automatic pistols.

If feeding problems persist after the chamber is polished, check the magazine for dents, weak springs, etc. Should the magazine be found defective, replace it with a new one if possible. Straightening a magazine or removing dents can be very time-consuming, and can cost more than a new magazine. However, you can try honing the inside of the feed lips that become burred and cause jamming; smoothing these can often solve the problem. A broken, rusty, or bent spring should be replaced.

If the pistol still fails to feed, examine the feed ramp. A badly fouled or burred feed ramp might be causing the trouble. Use a wire brush saturated with bore cleaner to scrub the ramp. Then, use a piece of crocus cloth wrapped around a small wooden dowel to polish the ramp. A Moto-Tool with a polishing head is ideal for this, but be careful not to change the contour of the ramp when polishing with power tools. If the ramp is badly burred, a round Arkansas stone or a half-round file should be used to remove the burrs before polishing. Burrs in the chamber will also cause problems, but these should be removed during chamber polishing.

Failure to Extract. The most common reason for extraction problems in a small-bore pistol, blowback design (.22 rimfire) is a dirty chamber. Cleaning it will solve the problem. However, in centerfire pistols, like the Model 1911 Colt, a weak extractor is almost always the reason for poor extraction. To test an extractor, place an empty case under the extractor claw so that the case is flush against the bolt face. Move the slide back and forth along the frame, not closed, but just an inch or so each way. If the shell case falls out, or if it can be easily jiggled out, the gun has a weak extractor that should be replaced.

Failure to Eject. An extractor for Browning-type pistols must have sharp edges in order to grip the head on the cartridge case securely (Figure 37). If these edges are dull, the result is poor ejection with hang- ups. Upon examination, if the shoulders or edges of the ejector look rounded or contain burrs, use a small, flat file and restore the extractor to its proper shape.



Figure 37: *Typical extractor for a Browning-type semi-automatic pistol.*

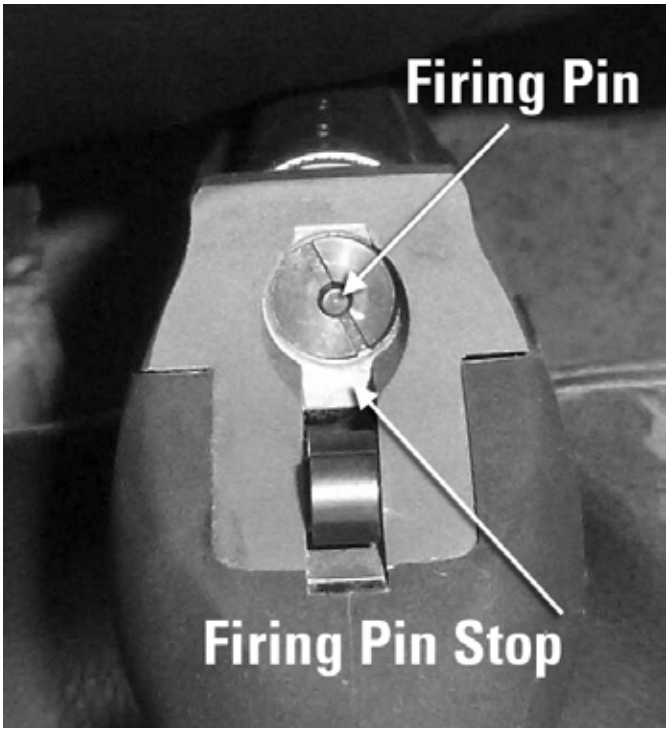


Figure 38: *To remove the firing pin, push in on the pin and slide the firing pin stop down.*

Failure to Fire. Headspace problems and grime on the face of the pistol bolts are two things that cause a semi-automatic pistol to misfire. A broken or burred firing pin, or a broken, bent, rusted, or dirty firing pin spring can also cause misfires. Disassemble the firing- pin mechanism by pressing on the end of the firing pin and sliding the firing pin stop down, as shown in Figure 38. Thoroughly clean all parts prior to inspecting them for wear or damage. The firing pin and firing pin spring may then be examined under a magnifying glass if necessary. Worn or damaged parts should be replaced.

On .22-caliber blowback actions, dirt may prevent the bolt from closing completely on the cartridge. Then when the hammer falls, the cartridge is pushed forward and away from the pin, resulting in a misfire.

The troubleshooting chart in Figure 39 describes most of the problems that will develop in semi-automatic pistols and how to repair them.

SELF-TEST QUESTIONS

Please check your answers on page 23.

9. **What kind of malfunction usually occurs in a semi-automatic pistol with excess headspace?**
10. **What kind of malfunction occurs in a semi-automatic pistol when there is excess grime on the bolt?**
11. ***True or False*. The most common reason for extraction problems in a .22-caliber semi-automatic pistol is a dirty chamber.**
12. **What should be done if the ramp on a semi- automatic pistol is burred?**

Malfunction	Cause	Corrective Action
Misfires	Broken or bent firing pin	Replace
	Weak mainspring	Replace
	Excess headspace	Replace barrel
	Defective cartridge	Check ammunition
Fails to extract	Broken extractor	Replace
	Rough chamber	Polish chamber
	Short recoil	Slide interference
Magazine falls out	Worn or broken magazine catch	Replace
Hammer won't cock	Broken sear or sear spring	Replace
	Broken hammer notch	Replace hammer
	Wrong sear angle	Replace sear and hammer
Hammer won't fall	Broken sear bar	Replace
	Disconnector jammed	Inspect and clear
	Sear jammed	Inspect and clear
	Foreign material in action	Clean

Figure 39: *Troubleshooting chart for semi-automatic pistols.*

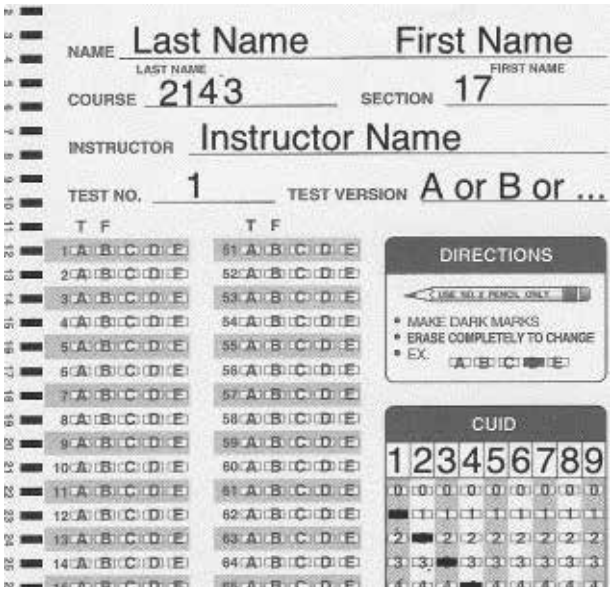
Answers to Self-Test Questions

1. 1898.
2. 0.060-0.065 inches.
3. True.
4. The top of bolt head.
5. Filing the sear bevel.
6. A stop problem.
7. True.
8. The cylinder will open and close hard.
9. Fails to fire.
10. Fails to fire.
11. True.
12. Use a round Arkansas stone or a half-round file to remove burrs before polishing.

Lesson Questions

THIS IS LESSON NUMBER 2177.

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 and lesson number.



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 first step in disassembling a Colt Police Positive Special revolver is to**
   a. Remove latch and latch spring from sideplate.
   b. Remove the crane lock screw and crane lock.
   c. Remove rebound lever.
   d. Unscrew the ratchet and ejector rod head.

2. **The firing pin protrusion in most Colt revolvers should be**
   a. 0.040-0.050 inches.
   b. 0.002-0.004 inches.
   c. 3 - 4 inches.
   d. 0.060-0.065 inches.

3. **How should the safety lever move on a Colt revolver at the hammer pin boss?**
   a. Tightly.
   b. Freely.
   c. Very loose.
   d. Extremely tight.

4. **Which of the following causes misfires and poor rebound in any revolver?**
   a. A stiff mainspring.
   b. Faulty up-and-down movement of the firing pin.
   c. A short bolt head.
   d. A weak mainspring.

5. **Which of the following causes poor cocking action and a heavy trigger pull on a revolver?**
   a. Too much headspace.
   b. A blunt trigger sear.
   c. Too sharp an angle on the trigger sear.
   d. Broken grips.

6. **Which of the following can correct a weak or stiff mainspring?**
   a. File the spring to make it thinner.
   b. Slightly bend the spring near the center of its arms.
   c. Polish the spring.
   d. Sandblast the spring.

7. **Which of the following corrective measures will lighten the trigger pull on a revolver?**
   a. Reduce the depth of the hammer notch.
   b. Increase the depth of the hammer notch.
   c. Increase the width of the hammer notch.
   d. Decrease the width of the hammer notch.

8. **Which of the following corrects the headspace on a revolver?**
   a. File down the extractor.
   b. Lighten the amount of trigger-pull.
   c. Adjust the length of the cylinder collar.
   d. Increase the length of the firing pin.

9. **Which of the following temporarily corrects loose barrels on revolvers?**
   a. File the barrel shoulders.
   b. Peen down the barrel shoulders.
   c. Flare the barrel shoulders.
   d. Use paper shims.

10. **When a revolver hammer will not cock, which of the following is the most probable cause?**
   a. Broken trigger nose.
   b. Broken trigger guard.
   c. Bent crane.
   d. Broken rebound spring.