



AUG 2009

DIGITAL ARCHIVE
EDITION

PRECISION ARMS WORKSHOP

AND THE AMERICAN GUNSMITH ARCHIVE

A TECHNICAL JOURNAL OF CRAFT, REPAIR & RESTORATION

08

ARCHIVE ISSUE NUMBER

INSIDE THE ARCHIVE

DISASSEMBLY AND REASSEMBLY OF THE RUGER LCR REVOLVER

SALES BOOM HAS GUN AND AMMO MAKERS AT FULL CAPACITY • MODIFYING THE HAMMER/SEAR JIG FOR FUNCTION T...

ORIGINAL METHODS. MODERN ACCESS.

ARCHIVE EDITION 068

DIGITAL ARCHIVE EDITION

Preserved for the bench.

This edition presents the original American Gunsmith editorial work in a modern, searchable layout while preserving its issue, author, and source-page history.

ABOUT THIS EDITION

The article text comes from the original issue and has been reflowed for legibility. Obsolete subscription, ordering, association-service, and house-advertising pages are not reproduced.

Original article images appear only where permission has been confirmed. All other image positions remain visibly reserved so approved art can be restored without rebuilding the issue.

Report corrections or rights information to editor@gunsmithmag.com.



AMERICAN GUNSMITH

DIGITAL ARCHIVE EDITION • AUGUST 2009

ISSUE RECORD

ORIGINAL DATE	August 2009
VOLUME	Archive volume not stated
ISSUE NUMBER	08
SOURCE ID	ag-0b586495e68cbb77551c06af

DIGITAL EDITION

PUBLICATION	American Gunsmith
EDITION	Digital Archive Edition
ARCHIVE STEWARD	Innovation Network LLC
CONTACT	editor@gunsmithmag.com

Editorial fidelity. Article titles, author attribution, issue relationships, source-page references, and article text remain bound to the archive corpus. Layout, covers, navigation, and conversion notes are newly produced for this edition. Historical statements remain part of the original editorial record.

IN THIS ISSUE

Contents

A complete guide to the searchable editorial work preserved from August 2009.

2 Sales Boom Has Gun and Ammo Makers at Full Capacity

AMERICAN GUNSMITH EDITORS • ORIGINAL PAGES 2

3 Disassembly and Reassembly Of the Ruger LCR Revolver

CHICK BLOOD • ORIGINAL PAGES 3-7

8 Modifying the Hammer/Sear Jig For Function Testing

JOE GRISAFI • ORIGINAL PAGES 8-9

10 The M1 Garand: A Troubleshooting Checklist

ROBERT K. CAMPBELL • ORIGINAL PAGES 10-13

14 Firearm Finishing Methods: A to Z

RICHARD MACLEAN • ORIGINAL PAGES 14-18

20 Making and Installing Decorative Metal Overlays

NORMAN E. JOHNSON • ORIGINAL PAGES 20-21

22 Reader Forum

AMERICAN GUNSMITH EDITORS • ORIGINAL PAGES 22-24

METALWORKING

Sales Boom Has Gun and Ammo Makers at Full Capacity

BY AMERICAN GUNSMITH EDITORS AUGUST 2009

ORIGINAL PP. 2

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1389-P02-F01. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1389-P02-F01

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1389-P02-F02. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1389-P02-F02

The big news in the firearms, ammo, and accessories business continues to be the sales boom following on the heels of last November's election of an anti-gun president and a gun-control-friendly Congress. While sales have slowed a bit since last spring—which is normal in the summer months—sales are up sharply over on a month-by-month basis over last year. In the most recent quarter, Smith & Wesson Holding Corp. reported a 45-percent increase in handgun sales over the same period in 2008.

Sturm, Ruger & Co. reported a quadrupling of net income over the same period last year. And sales are brisk at the smaller, privately held manufacturers that comprise the bulk of the industry, with backorders and waiting lists being common. Data released by the FBI's National Instant Criminal Background Check System (NICS) reported 1,023,102 checks in May 2009. This figure represents a 15.4-percent increase from the 886,183 checks reported in May 2008.

As you know, FBI background checks are required under federal law for all individuals purchasing either newly manufactured or used firearms from federally licensed retailers. These background checks serve as a gauge of actual sales, but don't reflect the actual number of firearms sold.

The May increase follows a 30.3-percent increase in April, a 29.2-percent gain in March, and increases of 23 percent in February, 28 percent in January, 24 percent in December, and 42 percent in November when a record 1,529,635 background checks were performed. The increase coincides with an increase in excise taxes reported by firearms and ammunition manufacturers, which is another key economic indicator for the firearms industry.

The total number of background checks reported since the beginning of NICS is now over 102,000,000. My guess is, with the focus on the economy, the health-care system, the war on terror, and the growing threat of a nuclear-armed Iran and North Korea, it's likely to be some time before the president turns his attention to gun-control. And by that time, he'll have to be thinking about reelection. Thus, I think we can count on continued record sales and no new legislation for the time being. Knock on wood.

Need Some Extra Cash? If you would like to turn your gunsmithing ideas and expertise into cash (we pay pretty handsomely), I would like to discuss your article ideas with you. Contact me, Keith Lawrence, Editor, at: American Gunsmith, Merritt Island, FL 32954; email editor@gunsmithmag.com; voice fax Editor Keith Lawrence Technical

PEOPLE & COMPANIES

Disassembly and Reassembly Of the Ruger LCR Revolver

Designed to handle .38 Special +P ammo, Ruger's new hammerless lightweight is expected to be popular for concealed carry or lawenforcement backup.

BY CHICK BLOOD AUGUST 2009

ORIGINAL PP. 3-7

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1390-P03-F01. Know the rights holder? Please ask them to contact us.
AG-77551C06AF-A1390-P03-F01

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1390-P03-F02. Know the rights holder? Please ask them to contact us.
AG-77551C06AF-A1390-P03-F02

Once a year, manufacturers, distributors, dealers and a large assortment of media types fill a huge space to display, discuss, and place orders for anything and everything even remotely connected with the shooting sports and law enforcement. It's called the Shooting, Hunting, and Outdoor Trades Show, or simply SHOT. Upwards of 40,000 people walk the long aisles of the cavernous exhibit hall over a four-day period to discover what's what with firearms and what's new.

In the "what's new" category, gunmakers compete for one or more of the prestigious "Shooting Industry Academy of Excellence" gun-of-the-year awards in several categories. In 2008, Ruger's LCP (Light Carry Pistol), reported on in the September 08 issue, walked off with the handgun award. And in 2009, the Ruger LCR (Light Carry Revolver) has been nominated in the handgun category, but we'll have to wait until January to see if this little hammerless double-action revolver makes it two-in-a-row for the Ruger line.

The LCR's light weight (under a pound) comes from a frame made of aluminum alloy and a fire-control system made of glass-fiber-reinforced nylon. The cylinder and barrel are of stainless steel. The frame has a flatblack coating that works with the aluminum substrate to pro-

vide corrosion and abrasive resistance exceeding Mil-A-8625F. The stainless-steel cylinder and barrel have been tumbled to a semi-gloss gray finish.

If the frame suffers an impact scar or wear spot, the damage can be touched up with an aluminum-blackening compound such as the one sold by Birchwood Casey. The LCP is chambered for .38 Special and .38 Special +P. Field Stripping By now you may have noticed the four schematics here instead of the usual one. The primary LCR exploded view shows the overall relationships of the revolvers' subassemblies.

The other three schematics are of those sub-assemblies, which are the fire- If it wins, it would join the company's LCP (Light Carry Pistol), which won the 2008 award. control housing, the cylinder, and the frame. Referring to the first exploded view, you'll see that the Hogue grip (#4) is shown. The screw attaching it to the fire-control housing is not shown, but it can be found under the grip frame of the fire-control housing. Back out the screw and slide the grip down and off the housing.

This will expose a portion of the mainspring and its seat in the internal lock located in the lower right of the housing. (Never, under any circumstance, remove the internal lock from the revolver.) That's it. The revolver is field

DISASSEMBLY AND REASSEMBLY OF THE RUGER LCR REVOLVER CONTINUED

ORIGINAL PAGE 4

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1390-P04-F01. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1390-P04-F01

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1390-P04-F02. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1390-P04-F02

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1390-P04-F03. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1390-P04-F03

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1390-P04-F04. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1390-P04-F04

stripped. Now swing open the cylinder and it's ready for basic cleaning. But wait a minute, I'm going to have to take exception to one of the instructions in the owner's manual about cleaning the barrel. It says to insert a rod with patch attached from "muzzle to breech." I have never swabbed, brushed, or patched a barrel in any way except from breech to muzzle. How is that possible in this case? There are two ways, actually.

The first method is to insert a plastic or plastic-coated rod in the muzzle until its threaded end reaches the middle of the cylinder opening in the frame. Attach the slotted accessory tip with the patch installed to the rod. Apply a polymer-safe cleaning solution. The internal lock (A) blocks the hammer when engaged, rendering the gun impossible to fire. Go to the patch and pull it out the muzzle.

On badly fouled barrels, substitute a bore brush for the slotted accessory tip and scrub from breech to muzzle without completely

pulling out the brush. Then switch to the slotted tip and keep running patches until one comes out clean. Remove the slotted tip, reinsert the rod, apply gun oil to the patch, attach it to the rod, and pass it through the barrel two or three times. The second method is easier than using a rigid rod.

It employs the plastic-coated flexible aircraft-control cables included with the Otis Technologies cleaning kits (available from Brownells). These also make cleanup of lever-action rifles less of a head-

DISASSEMBLY AND REASSEMBLY OF THE RUGER LCR REVOLVER CONTINUED

ORIGINAL PAGE 5

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1390-P05-F01. Know the rights holder? Please ask them to contact us.
AG-77551C06AF-A1390-P05-F01

Ruger LCR Double-Action Revolver (Specifications subject to change without notice)
1 Frame Subassembly 2 Fire Control Housing Nut 3 Fire Control Housing Subassembly 4 Hogue Grip (including screw) 5 Fire Control Housing Screw 6 Cylinder/Crane Assembly 7 Crane Pivot Screw
ache, because you don't have to dismantle the receiver to get at the cable and attach whatever tip is appropriate.

Perhaps I'm being too fussy about cleaning from breech to muzzle, but I've run many pistol and rifle matches and have never seen a serious competitor going at a gun from its business end. Anyway, if removing the grip is all there is to field stripping the LCR, how do you lube it without taking it down further? Answer: Open the cylinder and support the frame between two wooden blocks thick enough to keep the open cylinder above your bench top.

Then gently push down on the hammer-pivot pin with a 1/8-inch or smaller punch until the large head of the pawl pin (#10) clears its cutout. (See drawings on page 4.) Apply two or three drops of polymer-safe gun oil in the pin hole as shown in the drawing. Let it drain down into the action. Rotating the large head of the hammer-pivot pin will encourage distribution of the lube.

When you are reasonably certain the oil has been disbursed, align the hammer-pivot head with its recess and reseal it through the fire-control housing. Close the cylinder, dry fire the LCR as many as ten times to further lubricate the action, and wipe off any excess oil from both sides of the hammer pivot pin. The drawing says to tighten the crane-pivot screw to 23 to 27 inch/pounds of torque when reinstalling the crane and its retaining screws.

If you don't have a torque wrench, hand tighten both screws, but be careful to avoid stripping out their heads. Detailed Disassembly To get at the subassemblies, look at the exploded view and find the fire-control housing screw (#5) and the crane-pivot screw (#7). Back them out with a T10 Torx driver or wrench and place both in a magnetic parts tray. You may have to give the housing screw a nudge to the right after it disengages its nut (#2).

Don't lose the nut; it's likely to fall off the housing when the screw is loosened. From here on, check the individual subassembly schematics for parts identification. Hold the frame and housing in one hand. Remove the cylinder assembly toward the muzzle. Switch hand positions. Hold the housing and trigger in one hand without allowing the trigger to return forward from

its "at rest" position. Grasp the frame with your free hand and use a finger to depress the cylinder latch (#7) as far as you can into the frame.

Keep the downforce on the latch while you pivot the barrel upward to about the level of the housing-screw hole. Since the fire-control housing overlaps the frame tightly, you may encounter some resistance to this rotation. When the barrel has reached an upward attitude of 15 degrees or so, pull up and forward to separate the frame from the housing. Try to use the built-in rear curvature of the frame to achieve this divorce.

The transfer bar (#11) often falls out immediately after the frame and housing are separated. If you feel anything "catching" during the parting, it's likely to be the pawl. Resolve the problem by reversing yourself and moving the trigger back and forth slightly. (Did I mention that the "pawl" in all Ruger revolvers is called the "hand" in most other revolvers?) If the transfer bar hasn't escaped, make certain it's nested under the front edge of the hammer face.

In case it isn't, pull back the hammer a little bit to position it there. Release the ham-

DISASSEMBLY AND REASSEMBLY OF THE RUGER LCR REVOLVER CONTINUED

ORIGINAL PAGE 6

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1390-P06-F01. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1390-P06-F01

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1390-P06-F02. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1390-P06-F02

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1390-P06-F03. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1390-P06-F03

Frame Subassembly 1 Barrel, .38+P 2 Front Latch Cap 3 Front Latch Spring 4 Front Latch Pin 5 Front Sight 6 Front Sight Cross Pin 7 Frame Sub-Assembly 8 Firing Pin Bushing* 9 Firing Pin Spring 10 Firing Pin 11 Firing Pin Plug 12 Crane Release Retaining Screw amount of heat. Backing out the plug will require you to fabricate a spanner. This will resemble the wrench mer and the LCR has been reduced to its primary components.

Detailed Disassembly Of the Primary Components Refer to the frame-subassembly drawing for this step. The barrel (#1) is threaded at its front, and retains the front latch cap (#2), the cap spring (#3), and its pin (#4). The barrel can't be removed without special tooling. This tooling may or may

not be made available by Ruger at some future date. For now, the cap and its associated parts have to remain where they are.

The firing-pin plug (#11) is secured with a mild thread-locking compound that can be defeated with only a small The transfer bar (D) often drops out at this stage of disassembly. used to tighten or take out the spikes from golf shoes. Depending on the width of the part to be spanned, a suitable spanning tool can be made by notching a screwdriver blade to resemble a two-prong table fork. Once the plug is no longer blocking them, the firing pin (#10) and its spring (#9) come out the rear.

The firingpin bushing (#8) is pressed in and should not be disturbed. Now give your attention to the frame-subassembly schematic. A thin-blade screwdriver will undo the crane-release screw (#12). This frees the crane-release button (#13), its plunger spring (#14), and plunger (#15), which normally remains within the button. The front sight (#5) is secured by a roll pin (#6).

It can be drifted in either direction. 13 Crane Release Button 14 Release Button Plunger Spring 15 Release Button Plunger *must be factory fitted. Now switch over to the fire-control housing schematic. The trigger pin (#13) and cylinder-latch pin (#8) are solid and identical. Drift out the latch pin, push the latch (#7) forward and out of the housing. The latch spring

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1390-P07-F01. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1390-P07-F01

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1390-P07-F02. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1390-P07-F02

(#6) shouldn't fly away. If it does, and you find it, the spring centers on a pin within the latch. Drift out the trigger pin. Move the entire trigger group (#11 through 16) forward, upward and out of the firecontrol housing. Push the hammer pivot (#10) out to the left. Lift the complete hammer assembly (#1 through 5) from the housing. This assembly is made to specifications that allow it to be interchangeable with any LCR. The same is true of the trigger group.

Both are available from Ruger only as complete sub-assemblies. So, if your customer suffers from the common tendency to mess around with triggers, you'll want to examine the parts relationships inside the trigger group in detail. Special attention should be given the trigger spring (#15), its bushing (#14), the transfer bar (#12), and pawl (#11). Assuming no part has been damaged, you should be able to put this back together and put a smile back on the distraught owner's face.

Returning to the hammer assembly, take note of the mainspring seat (#5) at its bottom end. What you're looking at rests inside a dedicated pocket atop the locking mechanism. If you keep the housing tilted to the left while working with it, the mainspring seat will not

fall out. When engaged, the mechanism blocks the hammer strut. If this mechanism is tampered with or removed, the LCR becomes a paperweight.

On the subject of the mainspring, you'll be pleased to note that the LCR's mainspring falls far short of equaling the strength of the like-named springs you've struggled with in other Ruger revolvers. The hammer-strut pin (#2) is shaped like a dog biscuit or a dumbbell, and is not press fit. When under spring tension, the upper lug of the hammer strut (#3) is prevented from popping out due to the odd shape of the pin.

Now let's switch to the (continued on page 13) Fire-Control Housing Subassembly 1 Hammer Subassembly 2 Hammer Strut Pin 3 Hammer Strut 4 Mainspring 5 Mainspring Seat 6 Cylinder Latch Spring 7 Cylinder Latch 8 Trigger/Cylinder Latch Pivot Pin 9 Fire Control Housing/Lock Subassembly 10 Hammer Pivot Pin 11 Pawl 12 Transfer Bar 13 Trigger/Latch Pivot Pin 14 Trigger Spring Bushing 15 Trigger Return Spring 16 Trigger Cylinder Subassembly 1 Ejector Extension 2 Lock Pin Spring 3 Lock Pin Extension 4 Center Lock Pin 5 Crane 6 Ejector Spring Bushing 7 Ejector Spring 8 Cylinder Sub-Assembly 9 Ejector

DISASSEMBLY AND REASSEMBLY OF THE RUGER LCR REVOLVER CONTINUED

ORIGINAL PAGE 13

cylinder-subassembly schematic. If it looks familiar it should. The LCR setup is very similar to that of the older Ruger Security Six, the typical S&W, and Taurus revolvers. Start the takedown with the ejector extension (#1). This has a left-handed thread and unscrews clockwise from the lockpin extension (#3) to which it's secured with low-strength thread-locking compound. You'll need no heat to defeat the compound if you grasp the ejector extension between padded vise jaws.

This is smart thinking on the part of the gun's designer, because just aft of the ejector extension is the lock-pin spring (#2), and you know what a little too much heat can do to the integrity of a spring. The pin spring is followed off the subassembly by the extension and center lock pin (#4). This leaves the crane (#5), ejector-spring bushing (#6), and ejector spring (#7) still in the cylinder (#8). Withdraw them. Swivel the cylinder around to its rear end, and grasp and pull out the extractor (#9).

By this time, you've realized you've been working with some very small parts. They all belong in the magnetic parts tray until you need them for reassembly. This is accomplished by reversing the steps just taken to disassemble the cylinder subassembly. Reassembly Tips Make sure the transfer bar nests under the front ledge of the hammer in the fire-control housing. The trigger-return spring must have its long leg in the pawl groove. To be sure it does, you have to be able to see into the trigger.

Line up the pivot hole of the crane on the cylinder subassembly and the crane-pivot hole in the frame before fully installing the crane-pivot pin. Close the cylinder and install the cylinder lock. Hold the Ruger's cylinder/frame assembly in one hand and the fire-control housing in the other. Double check the position of the trigger spring. Hold the frame at a 15-degree muzzleup angle and note the tab at the frame's rear. Align the tab with the upper "ears" of the fire-control housing and make contact with them.

Rotate the frame down and back, using its contour in the same manner as in disassembly until it is fully seated in the fire-control housing. The crane screw can be pushed forward during this move. Tighten the crane screw as tight as you can by hand. Then check the gun's function. Reinsert the retaining-screw nut into the hexagonal recess for it on the right-hand side. Insert the retaining screw from the left and tighten it with a Torx driver until the nut seems to be "biting" into the polymer.

Whether it walks off with the 2009 Handgun of the Year or not, don't be surprised if a profitable number of LCR cleaning jobs come your way. Ruger has a winner here for any civilian with a concealed-carry permit or any law-enforcement officer desiring a potent back-up. I

TOOLS & FIXTURES

Modifying the Hammer/Sear Jig For Function Testing

With a few springs and readily available parts, a stoning jig can be modified to allow the hammer and sear to function as they would inside the M1911 pistol, thus speeding up the smoothing process.

BY JOE GRISAFI AUGUST 2009

ORIGINAL PP. 8-9

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1391-P08-F01. Know the rights holder? Please ask them to contact us.
AG-77551C06AF-A1391-P08-F01

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1391-P08-F02. Know the rights holder? Please ask them to contact us.
AG-77551C06AF-A1391-P08-F02

If you're like me and I suspect you probably are—you're constantly trying to find ways to make something better, to improve its function, or to make it more versatile. That "something" might be a tool, a fixture, or a jig that you've purchased to improve the services you offer as a gunsmith. I do this all the time; my mind, it seems, is working on ways to improve both my own skills as well as the performance of my tools and fixtures. Here's a perfect example of what I mean.

I've always had trouble matching the hammer and sear surfaces on the M1911. There are fixtures on the market that will help you to smooth and polish these surfaces, and they work great. But these are "static" fixtures; no fixture that I know of actually allows the hammer and sear to function outside of the M1911 pistol.

Seeing these parts in a static condition is helpful, but it seemed obvious to me that the fixture would be greatly improved if it allowed me to see exactly what was happening to these parts as they work inside the 1911. This way, any drag between the surfaces could be detected and corrected, thus greatly reducing the number of

times the gun must be reassembled for testing. When matching the hammer and sear, often the sear or the hammer is a little too high or too low on this corner or that.

And typically, these parts are not as smooth as they should be. Moreover, it seems I can never get them square enough to satisfy my own standards of quality. Sure, I could buy matching parts from Wilson or some other quality supplier. But I like to do my own work, and I want the satisfaction that comes from knowing what I'm doing and knowing I can do it perfectly. I have been able to find the Brownells www.brownells.co their intended purposes, but I could never get used to the Yavapai 1911 auto sear tool.

Maybe it was my eyesight; I don't know for sure, but I sent it back with a note saying that it would be great if they sold only the magnifier. I didn't expect it, but a couple of weeks later the magnifier showed up. Now that's customer service. The other jigs available include the Ed Brown 1911 sear jig, the Power Custom Series I Stoning fixture, and

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1391-P09-F01. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1391-P09-F01

the Brownells trigger-adjustment pins. I can smooth and polish the hammer and sear and then use the pins to look at the results. One jig that I particularly like is the Wilson #5 jig. I purchased mine many years ago, and unfortunately it's no longer shown in the Brownells catalog. The Wilson jig is similar to these pins are mounted in their own base. This is the jig I modified for function testing of the hammer and sear, which is shown in the photo on the opposite page.

If you have or can find a Wilson #5 jig, you'll only need a few things to modify it like I did. First you'll need a 6- by 6-inch piece of wood about 1/2 inch thick, a 4-1/4-inch lag bolt, the 25x magnifier from the Yavapai 1911 auto sear tool (Brownells #080-835- 001DE), a set of springs—one for the hammer and one for the sear (Brownells #969-160-700), an Alley collimator extension (Brownells #034- 101-000AB), and some nails or screws. As you can see from the photos, the jig is straightforward.

I drilled a hole for the lag bolt and countersunk it to make it flush on the bottom. I placed the collimator extension on the lag bolt using the last slot and secured it with the thumbscrew. (You can make a similar extension from a piece of aluminum bar stock, but I had this extension on hand for

bore sighting scopes, so it was available.) I then put a sharpened pencil in the third slot and held it close to the wood base so I could scribe a circular mark by turning the extension from one side to the other.

Be sure the thumbscrew is not too loose, or else the arc will not be accurate. Two points on this mark are used for aligning the Wilson jig. The position of the pencil is where the magnifier goes. This allows you to clearly see the mating surfaces of the hammer and sear. Two slots are carved out ensuring the proper placement for the Wilson jig. First, be sure of the alignment by putting a hammer and sear on the jig. Then visually see where they mate through the hole.

Place the jig carefully on the base so the arc can be seen through the hole, and align where the hammer and sear mate. Scribe the edge of the jig. Carve out this dimension to the depth of the thickness of the jig. I carved out two locations. The other location is so I can look at the other side of the hammer and sear. When placing the jig on the other location, turn the jig upside down. The photo above shows the jig reversed for looking at the other side.

Now that the fixture is essentially complete, you will need to place the two nails (or screws, if you prefer). You need to experiment with this part of the project. In the first photo, you can see where I placed

the nails so I could attach the springs, one to the sear and one to the hammer. The springs should be tight, but not so tight that they cause distortion in the alignment.

One spring pulls on the hammer waiting to be released, and the other spring is pulling on the sear, which is holding the hammer from dropping. By manually pushing on the sear base, you will get the hammer to drop. If the tension on both springs is just right and you slowly push on the sear base, you should be able to feel if there is any drag. If it doesn't feel smooth, you know what to do.

With this part complete, you can now put the magnifier in the slot, move it to the right location, and see the mating surface by either raising or lowering the magnifier or the extension on the lag bolt. Then move the jig to the other side, making sure you turn it upside down so you can see the other side of the mating surface. If you wish, you can add another nail and spring so it will be functional on this side also. There you have it. This jig has helped me and I hope it does the same for you.

With a light touch and a bit of practice, any drag between the surfaces will be easily felt. There are any number of ways the Wilson jig can be modified to accomplish the same thing, but even if you choose to do it some other way, I trust I have planted a seed in your mind. I

RIFLES

The M1 Garand: A Troubleshooting Checklist

Volumes have been written on accurizing the venerable M1 Garand. But when facing a rifle of unknown origin, first you have to ensure it's in reliable operating condition.

BY ROBERT K. CAMPBELL AUGUST 2009

ORIGINAL PP. 10-13

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1392-P10-F01. Know the rights holder? Please ask them to contact us.
AG-77551C06AF-A1392-P10-F01

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1392-P10-F02. Know the rights holder? Please ask them to contact us.
AG-77551C06AF-A1392-P10-F02

We've all seen many articles over the years on accurizing the Garand rifle. (I wrote one myself that appeared in these pages back in December 07.) In this report, however, I'm going to take a step backward and deal with common problems and basic troubleshooting of the Garand. After all, if the rifle isn't functioning properly, it can't be accurized until the problems are corrected. In other words, we have to get the piece up and running first.

Remember, most of the Garand rifles are over 50 years old, and many are quite "tired" by now. Some are made up from various "new" parts with older "kits" used to put them together, and even the high-quality Beretta version's basically a well-put-together peacetime rifle's getting pretty old. The new production Springfield M1 is a fine rifle, but given enough use this version can also suffer from a problem or two.

So let's get straight to the problem areas of the Garand and the various possible causes for each type of malfunction. Keep in mind that any given rifle can have several faults, which can, of course, confuse the issue and

disguise the source of the trouble. The first thing I should mention is proper loading. Since most Garand shooters are not ex-military people in this day and age, you might have to show your customer the proper loading procedure for the Garand so that they don't warp or bend parts.

To load the Garand, begin with the bolt locked to the rear. The hand moves to the bolt with the eight-round en-bloc clip held between the thumb and forefinger. As the hand lines the clip up with the slots in the receiver, the thumb presses down as the back of the hand nudges the bolt back. The clip locks in place just as the back of the hand nudges the bolt to the rear. The bolt then releases, flying forward to load the rifle.

With any other sequence, internal parts related to the magazine can be damaged, with malfunctions being the eventual result. In wartime Garands, there were several different gas-cylinder designs. They all work basically the same, but the later versions are the more desirable. The Chlorate priming

compounds used in military ammunition. This is one part that is seldom a source of trouble, often caused corrosion.

When corrosion attacks the gas cylinder, this causes short cycles as gas is allowed to flow past the piston. A stop-gap cure used in wartime was to cut about 3/8 inch at a time off the operating rod spring to produce more exuberant recoil and a greater possibility of function with less gas pressure. Another wartime fix and one I have no experience with was to clean up the corroded piston and weld up the front, then polish to a .527 inch diameter. With the availability's ger necessary.

Just the same, it can be done and done rather quickly. The gas piston should be .527 inch in diameter. The cylinder measures .532. Occasionally an oversize gas cylinder will be encountered. This situation causes the same problem as a corroded piston. Gas runs around the piston and pressure is lost. The minimum tolerance between the piston and cylinder is .005 inch. Don't attempt a tighter fit; there must be a certain amount of blow-by or the action will cycle too vigorously, result-

THE M1 GARAND: A TROUBLESHOOTING CHECKLIST CONTINUED

ORIGINAL PAGE 11

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1392-P11-F01. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1392-P11-F01

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1392-P11-F02. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1392-P11-F02

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1392-P11-F03. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1392-P11-F03

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1392-P11-F04. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1392-P11-F04

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1392-P11-F05. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1392-P11-F05

Above center: This is a bird's eye view of the gas port. The port is visible just ahead of the gas piston. ing in battering. A similar battering problem can come from overloaded or too-hot handloads. A bent ammunition follower is another cause of malfunctions. A common cause of a bent follower is an attempt to jam the loaded en-bloc clip into the magazine. The clip can't be jammed into place; it must be carefully lined up.

The follower should probably be replaced if it is bent, although I've successfully straightened a few with needle-nose pliers. A sure tip-off to a bent follower is the ejection of the clip on the seventh round. (The Garand en-bloc clip holds eight cartridges.) This leaves a single unfired round in the ejected en-bloc clip. The fol- One is a disassembly pin; the other is actually a line-up pin that is not removable.

Also note the sharp, well defined edges of these hammer hooks'a sign of a rifle that's in excellent condition. lower guide that sticks can sometimes cause malfunctions. A thorough cleaning and lubrication might solve the problem. If not, replace the part. Other malfunctions can result from a dirty gas piston. A simple solvent wipe-down doesn't usually work with gas pistons. Gas pistons should be thoroughly cleaned with bore cleaner, which should also be used to clean the cylinder. Be sure to dry the gas

THE M1 GARAND: A TROUBLESHOOTING CHECKLIST CONTINUED

ORIGINAL PAGE 12

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1392-P12-F01. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1392-P12-F01

Original caption: Left top: The Garand receiver has grooves and guides that can store lots of dirt, debris, and congealed oil. Old lubricant can turn into varnish and stop the rifle from operating. Toward the rear of the receiver you will see two guides, one on each side.

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1392-P12-F02. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1392-P12-F02

Original caption: Left bottom: This is the bottom view of the Garand magazine. The follower and clip ejector should be examined for excessive wear and sharp edges.

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1392-P12-F03. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1392-P12-F03

piston after cleaning. Leaving the parts wet with lube can cause short cycles. In its proper place, lubrication of the Garand is essential. While lubrication is not an art form, certain procedures must be followed. Put a light film of oil on the locking lugs on the bolt, the rear of the bolt, and the cocking-lug recess that lies in the operating handle. If a light oiling doesn't keep these parts moving properly, you need to look elsewhere for the problem; more oil isn't going to help.

Another cause of malfunction is dirt, brass shavings, and/or varnished lubricant entering and becoming encased in the locking recesses of the receiver. This foreign matter prevents the bolt's proper action. Clearing and cleaning is the proper cure for this problem. The gas port can be cleaned after removing the gas cylinder. The Army method of cleaning the gas port sounds a bit rough, but it seems to work and old timers swear by this technique.

With the rifle fully assembled, two to three drops of oil are poured in the muzzle and allowed to seep down over the rifling and past

the gas port. The rifle is then fired twice, and the oil is forced through the gas port. Clear the rifle and lock the bolt to the rear after this procedure, then check the cylinder and swab the oil out. This can be repeated if necessary. If you can't fire the rifle, the port may be cleaned manually.

You can use a small rod to clean the port, taking care not to enlarge it in the process. The normal opening for the gas port is .0805 inch. Remember, rearward action (the cocking stroke) is controlled by gas pressure; enlarging the port would result in accelerated action and battering. You could even damage the rifling if you clean too aggressively. I mention this because power drills and all manner of improper tools have been used to clean these gas ports.

Whatever might have been used, I'm sure the idea seemed good at the time. While we're on the subject of gaspiston problems, don't neglect the piston alignment. If the rifle has been dropped, the gas piston may have been damaged, and if it's out of alignment, a proper gas seal is not possible even if all parts are

in specification. Moving to the bolt, the ejector must lay flush across the face of the bolt until the cartridge has been fired.

An ejector that is too long or that is blocked by debris can cause feeding problems. A sure sign of a too-long ejector is the point of the bullet contacting the area at the top of the chamber during cycling rather than cycling into the chamber properly. The first round must feed freely into the chamber. Check for debris under the ejector; congealed powder and other sticky things can prevent proper function. Replace the ejector if needed. The clip ejector is another part to be aware of.

It is not unknown for a clip ejector to have a sharp point. It might have come that way from the arsenal and the sharpness could have developed from wear. The ejector may not allow the clip to be fully depressed into the magazine if the ejection

These guide the loaded en-bloc clip into the magazine.

tor is too sharp. The tip of the ejector can be filed or ground off if necessary. More frequently, it's debris in the magazine that causes problems, but if that's ruled out, take a look at the clip ejector. I should insert a few words on function here. The clip latch moves the operating rod out of engagement as the rifle is loaded. If the rifle doesn't load properly, something is obviously wrong in the loading apparatus. The operating-rod catch may be sticking.

There are hooks on this catch that should be examined for breakage. A new part is the only solution I know of for broken hooks. As for ejection difficulties, there are several possible causes. A rough chamber is always a possibility that should be considered. For several reasons, the Garand's chamber is more prone to corrosion than that of a bolt-action rifle. Camming action in loading is not as strong with an automatic as with a bolt-action.

A copper brush and a liberal dose of bore cleaner will remove any fouling in the chamber. Another tip for proper function is to polish the bolt. The bolt can be polished at the rear with a polishing cloth. The forward bolt lugs can be stoned for function and ejection. Extractors should also be checked at this point. Extractors are usually trouble free in the M1 Garand, but things happen, even with the best of rifles. There are some obvious problems with the Garand hammer.

When the hammer will not stay cocked, the hammer hooks are probably broken. The only recourse is replacement of the hammer. As for the trigger feel, the action can be smoothed to an extent. When the rifle is cocked, the hammer hooks to be filed are those toward the front of the engagement. These forward hooks can be filed with a needle file just until they're smooth. You're actually reducing engagement, so go easy with the file.

The Garand is a rugged and reliable old warhorse, but like any piece of machinery, it will wear eventually with use. To me, it's an honor to help keep such a piece of our history healthy and running strong. I

FINISHING

Firearm Finishing Methods: A to Z

Today's gunsmith can offer his customer choices in metal-finishing methods that range from traditional and "down to earth" to Space Age and literally "out of this world."

BY RICHARD MACLEAN AUGUST 2009

ORIGINAL PP. 14-18



Below: A Robar employee removes and rinses off a rack of freshly plated parts from the autocatalytic plating bath.

ORIGINAL ARCHIVE IMAGE • PERMISSION CONFIRMED

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1393-P14-F01. Know the rights holder? Please ask them to contact us.
AG-77551C06AF-A1393-P14-F01

Many shooters don't realize that a beautiful blue-black finish on a gun is primarily decorative and provides little protection against the elements. Rather, it's the oil that's doing the work of weatherproofing. In the days prior to bluing, guns were "browned" through the natural formation of red ferric oxide on iron. This oxide eventually formed a rich patina after it was repeatedly rubbed and re-oiled during use.

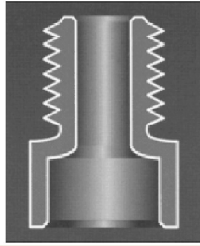
The qualities of natural browning prompted gunsmiths to develop techniques to speed up the rusting process and satisfy customer demand. The chemical bluing and browning methods that came next were quick methods that created an appealing lusterless finish that reduced the possibility that the glint off a gun would give away the shooter's presence to the enemy or to a game animal. The following horror story serves to illustrate the poor protective qualities of bluing.

Over several decades, a Class-3 FFL dealer from Arizona amassed a museum-quality collection of Model 1921 Thompson sub-machine guns. Early Thompsons are highly prized for, among other things, the quality of their deep blue finish. A wealthy individual in Tucson caught wind of the collection and made an offer the dealer could not refuse. While the paperwork was being processed by the ATF, the proud new owner built a concrete walk-in vault to house his entire collection.

The guns were transferred into the secure vault with the concrete as yet not fully cured and several days later it was opened to reveal dozens of guns with a fine coating of rust. The Evolution of Firearm Finishes By the 1800s, gunsmiths and manufacturers were already well along in perfecting methods to blue, brown, and color case-harden firearms. They also began to plate firearms, particularly handguns, with nickel and later with chrome to provide both esthetic appeal and corrosion resistance.

With the processes employed at the time, these metals did not adhere well to steel, and early coatings were known for peeling off. To plate with nickel or chrome properly, the steel had to be first copper plated or otherwise prepared with an intermediate coating. With the newest chemical processes, however, hard chrome can be plated directly to the base metal.

Used extensively since World War II, hard chrome has been used to line the bores of cannons and machine-gun barrels, as well as on engine parts such as valves, crankshafts, piston rings, and cylinders walls. Currently, the issue with hardchrome plating is that the solution contains hexavalent chrome (chrome +6), which is a known carcinogen. Hard-chrome plating has not been banned outright by the EPA and remains in use today, because of its superior hardness and durability for industrial applications where alter-



Right: Autocatalytic plating provides a uniform thickness. Far right: Electrolytic plating yields a less uniform coating with buildup on shoulders and less coverage on internal dimensions.
ORIGINAL ARCHIVE IMAGE • PERMISSION CONFIRMED

Far native coatings will not meet specifications. As recently as April 2009, Under Secretary of Defense John Young instructed the DOD to minimize the use of Chrome +6. The obligation is placed on the user to show that a proven substitute is not available. Some gun finishers such as Tripp Research have discontinued hardchrome plating. Cadmium and copper-cyanide plating are under similar, close scrutiny.

Zinc plating from an alkaline or acid bath is still considered benign and accepted by government agencies at this time. When alloyed with nickel or aluminum, zinc is replacing cadmium in many applications. Parkerizing was another quick and cheap method developed to dull the finish of military weapons and provide some corrosion protection. Parkerizing is a zincironor manganesephosphating process invented in 1869 but not widely used until WWII.

The added protection over bluing or browning is due to the granular surface's ability to absorb and hold the oil or Cosmoline. By the late 1900s, gun finishes, especially on military weapons, started to include sprayed or dipped coatings such as epoxies and baked-on polymer coatings. In addition to offering corrosion protection, the application of these coatings was relatively fast and inexpensive.

These finishes generally don't have the visual appeal of a well-blued firearm, and earlier varieties were also not very chip-resistant. Modern polymer coatings are so widely used and offered in such a variety of colors (pink for the ladies and even camouflage patterns for hunters) that they now

receive a much greater acceptance for their corrosion resistance, durability, and even esthetic appeal.

Autocatalytic (electroless) methods that employ chemical reactions to plate metal were invented during World War II, but only recently have grown in popularity over electrolytic plating (by electrical energy). The absence of an external electrical source during the autocatalytic plating process produces a uniform coating thickness that can be precisely predetermined and controlled.

For applications where extremely tight tolerances are required such as on sniper weapons and custom target rifles and pistols, this property can be critical. For standard-issue military firearms, close clearances are avoided in areas exposed to dirt, yet close tolerances are still required in certain areas such as bolt heads. Today, even polymer coatings have gone high-tech with the introduction of coatings containing molybdenum disulfide and/or Teflon® (PTFE) particles.

They offer both lubrication properties and corrosion resistance that far exceeds anything offered by other polymers. Available in both satin and matte finishes, these coatings approach the beauty of the best traditional deep-blue finishes. Blackening of stainless and alloy steels to eliminate reflective glare has also reached new heights with a chemical treatment that oxidizes the chrome at the surface to produce chrome sulphide.

Methods to passivate stainless steel or anodize aluminum and other nonferrous metals that already have corrosion-resistant properties have also improved over the past decade. Electrolytic plating processes continue to be used to coat firearms with gold, silver, chromium, and bright nickel.

As the commercial says, "some things just get better with age." That might be true of metal-plating processes, but I would hasten to point out that metal plating also gets better with proper technique, careful surface preparation, and good quality control.

The "hard-chrome" plating process discussed above is not the same as the decorative chrome plating used on bumpers and other auto parts that peels like tinfoil with age and abuse. "Black chrome" is another variation which is not quite as durable as hard chrome, but has a more tactically desirable non-reflective finish and greater esthetic appeal to some. Offering Something Special Clearly, there's a broad spectrum of options available today from which manufacturers, gunsmiths, and customers can select.

All of the aforementioned metal finishes are readily available, often locally, to gunsmiths throughout the U. S. Unless they're in the business themselves, most gunsmiths farm out their finishing and refinishing work. First, it is not practical to properly maintain a wide range of treatment baths to deliver uniform results with relatively few firearms per month. And second, even painted-on and baked-on coatings, such as camouflage patterns, require a fair

FIREARM FINISHING METHODS: A TO Z CONTINUED

ORIGINAL PAGE 16

Figure 1. Comparison of Metal-Finishing Methods
ORIGINAL ARCHIVE IMAGE - PERMISSION CONFIRMED

Finishing Method	Cost	Time	Appearance	Durability	Corrosion Resistance	Wear Resistance	Scratch Resistance	Impact Resistance	Temperature Resistance	Chemical Resistance	Environmental Resistance
Acetone/Trisolv	1	1	1	1	1	1	1	1	1	1	1
Blackening/Bluing of SS	1	1	1	1	1	1	1	1	1	1	1
Bluing/Bronzing	1	1	1	1	1	1	1	1	1	1	1
Blue/Bronze/Bluing	1	1	1	1	1	1	1	1	1	1	1
Parkerizing	1	1	1	1	1	1	1	1	1	1	1
Bright Nickel	1	1	1	1	1	1	1	1	1	1	1
Electroless Nickel	1	1	1	1	1	1	1	1	1	1	1
NP3	1	1	1	1	1	1	1	1	1	1	1
Color Case Hardening	1	1	1	1	1	1	1	1	1	1	1
Gold Silver Plating	1	1	1	1	1	1	1	1	1	1	1
Hard Chrome	1	1	1	1	1	1	1	1	1	1	1
Black (Cermet)	1	1	1	1	1	1	1	1	1	1	1
Polymer Coatings (Cermet)	1	1	1	1	1	1	1	1	1	1	1
DuraCoat™	1	1	1	1	1	1	1	1	1	1	1
Proguard™	1	1	1	1	1	1	1	1	1	1	1
Regard™ (Molybdenum-based)	1	1	1	1	1	1	1	1	1	1	1
Teflon® Based	1	1	1	1	1	1	1	1	1	1	1
Tuff-Kote™	1	1	1	1	1	1	1	1	1	1	1
Table Key: Poor to Excellent	1	1	1	1	1	1	1	1	1	1	1



degree of skill to achieve superior results. Such proficiency comes with a sustained effort and not occasional use. Problems with firearm finishes are almost always related to surface preparation and/or plating solutions or coatings that are not at the proper strength or consistency. Inexperienced finishers may think that their parts are clean, but coating experts know that they must be cleaned beyond a shadow of a doubt. These experts also have the equipment to accurately monitor the potency of their solutions.

The bottom line is, if you're going Figure 1. Comparison of Metal-Finishing Methods to ship a firearm off for anew finish, you might as well offer the customer the full range of available finishes and you'll probably want to use a professional finishing service with a proven track record (see the "Sources" table on page 18). The first step in this process is to educate the customer on the advantages and disadvantages of each finish.

Most will probably already have strong preferences based on past experience, articles they've read, or from their examination of other owners' firearms that looked inter-

esting. The issue here is that they may not be aware of the full spectrum of options and the relative advantages and disadvantages of each. The table in this article (Figure 1) is a good qualitative starting point to explain the range of possibilities.

The chart illustrates the relative performance among these options based on my personal experience and preferences, as well as input from plating experts. A few words of caution are needed, however, regarding the chart in Figure 1. Individual gunsmiths may have their own relative ranking, especially in the case of esthetics. Moreover, all of these options come in a variety of finishes, hues, patterns, colors or patinas.

Even something as basic as Parkerizing can vary tremendously depending on the type and strength of the solution and the oil applied after treatment. And again, much also depends on the skill of the company doing the finishing. Even within specific categories, the cost can vary nearly twofold because of the final finish (from matte to bright). In addition, the precise performance measurements can vary between platings and coatings.

For example, abrasion is measured on the Taber abrasion index for plating and on the tensile-hardness scale for coatings. Thus it can be difficult to make apples-to-apples comparisons. The cost of a finishing job is also significantly affected by whether the finisher is responsible for disassembly and reassembly or if only component parts are being coated. The chart is mainly meant to illustrate one approach to begin the discussion of possible alternatives, as well as their strengths and weaknesses.

Having actual examples on hand to show to customers is especially helpful. Most gunsmiths are familiar with most of these finishes, with the possible exception of emerging proprietary coatings, which brings us to the subject of this article: firearm finishing has entered the Space Age. For example, manufacturers such as Glock are touting their proprietary sub-coating treatment for hardness, Tenifer™, a form of carbonitriding. Other trade names such as Melonite™, Sursulf™, Arcor™, Tufftride™, and Koline™

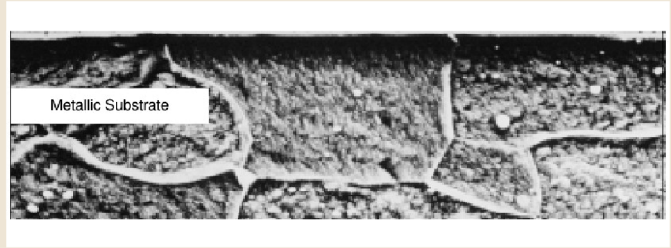
FIREARM FINISHING METHODS: A TO Z CONTINUED

ORIGINAL PAGE 17



Right: After autocatalytic plating, parts are rinsed in deionized water and then given a stress-release heat treatment in an oven at 220 degrees F.

ORIGINAL ARCHIVE IMAGE • PERMISSION CONFIRMED



Below: A scanning electron microscope at 3,000 magnification reveals the structure of NP3. The particles of Teflon (PTFE) appear as black dots in the top layer.

ORIGINAL ARCHIVE IMAGE • PERMISSION CONFIRMED

employ similar chemical-bath nitriding processes that embed nitrogen into an iron-containing alloy. While these manufacturing-based coatings and treatments are not generally available to gunsmiths, there is a growing list of processes that are within easy reach. For instance, powder and bake-don coatings that incorporate nanoparticles of ceramics and Teflon ® are now available.

So-called “diamondlike coatings” (DLC) are now starting to emerge with materials such as carbides or nitrides of titanium, boron, and tungsten. DLC finishes hold tremendous promise, but they are currently very expensive and the plating processes are evolving and are not yet as reliable as alternatives that offer similar results. For this reason, these coatings are not listed in the comparison table.

For the purposes of this article, I’ll limit the discussion to NP3, an electroless plated nickel/Teflon matrix used by the aerospace industry that has been thoroughly developed and tested in firearms applications. The Evolution of NP3 In the 1980s, drilling

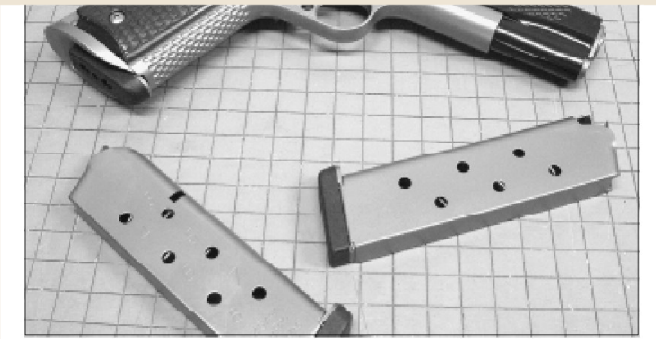
platforms in the North Atlantic were having problems with galling of the stainless-steel unloading couplings.

To solve the problem, the Dutch firm, Akso Nobel, invented an electroless-nickel/Teflon coating, but they needed help getting it out of the laboratory and into production. The UK company, Fothergill Engineered Surfaces, joined them in a partnership to commercialize and market the product. A local supplier of plating chemicals stopped by Robar Companies, a Phoenix-based custom-gunsmithing and metal-finishing firm, and provided the owner, Robbie Barrkman, with some information on nickel-Teflon coatings.

Barrkman immediately understood its potential in gun finishing, and obtained the exclusive licensing rights for weapons coating. The “NP” in NP3 stands for “nick-el-polytetrafluoride” and the “3” is part of the formula. He was joined by Dr. Paul Ebdon, the individual originally responsible for commercializing electroless nickel-Teflon in the UK with Fothergill Engineered Surfaces.

Robar’s coating business began to grow, helped along by a cover story on NP3 that appeared in 1987 in SWAT magazine, and a separate coatings business, Coatings Technology, was spun off that same year. What made Coatings Technology’s business really take off was its entry into the aerospace field. But in order to enter this specialized market segment, Robar first had to seek NAD- CAP certification. NADCAP stands for National Aerospace and Defense Contractors Accreditation Program.

The NADCAP program is similar to ISO 9000 certification, only much Submicron Particles of PTFE in a Matrix of Nickel/Phosphorus Metallic Substrate more rigorous. “Mil Spec” is a term that gunsmiths are familiar with, but it is a minimum standard, and a plating business is not even audited unless it is doing military contract work. The particles of Teflon (PTFE) appear as black dots in the top layer.



Right: The 100-year-old M1911 design enters the "Space Age" with an NP3-plated receiver and magazines combined with a molybdenum-disulphide (Roguard) coated slide.

ORIGINAL ARCHIVE IMAGE • PERMISSION CONFIRMED

The trend today is to have NADCAP certification, which helps to increase the chances of successfully bidding on a military contract. The NADCAP process creates a quality mindset in the NP3 business that otherwise probably would not exist. From the gun coating side of the business, it means that customers get the exact same treatment on their parts as components destined for some exotic aerospace application, since the identical process is used for both. The parts literally share the same plating racks.

Another benefit of this rigorous systems approach is that Robar has gotten excellent comments (and has received no citations) from the ATF when the agency has done their routine audits. Robar has an 07 gun manufacturer's license, and keeping track of all essential paperwork is crucial for maintaining this license, of course, Metal-Finishing Sources as any gunsmith can appreciate. The NP3 process is similar to autocatalytic nickel plating, with a few notable exceptions.

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1393-P18-F01. Know the rights holder? Please ask them to contact us.
AG-77551C06AF-A1393-P18-F01

Parts are first logged in and given unique identification codes, then the surfaces are prepped by blasting with aluminum oxide or glass beads. Once the parts are racked for plating, the next steps are degreasing, rinsing, a proprietary "actuator" step, and plating in an emulsion of nickel, phosphate, and PTFE. From there, the parts are rinsed and soaked in deionized water and stress-relieved in the oven. Finally, the parts are removed from the rack, sorted, checked for quality assurance, assembled, and shipped.

Robar's aerospace business has enabled the company to acquire the equipment and trained personnel that would probably be impossible to justify based solely on gunsmithing applications. This is simply a fact of today's competitive business environment—you need to have some niche or advantage if you are to survive. Which brings me to my final point: Offering your customers a choice of the latest Space-Age coating technology is another means you can use to improve your business and increase your profits. I

FROM THE ARCHIVE

Making and Installing Decorative Metal Overlays

Overlays on a gun or its stock can enhance its appearance as well as its value, and you don't have to be a metalsmith to get the job done.

BY NORMAN E. JOHNSON AUGUST 2009

ORIGINAL PP. 20-21

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1394-P20-F01. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1394-P20-F01

Original caption: Right top: Possible overlay designs come in the form of tableware, pins, buttons, cabinet hardware, and other decorative metal objects. Right bottom: This shotgun triggerguard overlay was made by the author from a silver spoon handle. you would have to devote to an engraving job.

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1394-P20-F02. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1394-P20-F02

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1394-P20-F03. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1394-P20-F03

If you look around, you may have all the materials you need to do some pretty nifty surface overlays on your guns. You'll find that no extraordinary talent is required just a little imagination and the cost is likely to be very low. They say: "Beauty is in the eye of the beholder." Sometimes we can create our own beauty. Several years ago, I went over an old Stevens shotgun. The triggerguard looked very plain and I wondered what I could do to enhance its appearance.

Earlier that day, I had pulled out a junk drawer and found a decorative, old silver spoon that provided the idea and the means for beautifying that trigger guard. I carefully shaped the end of the silver spoon to the con-

figuration of the trigger guard and attached it with a "cold-weld" epoxy. It looked quite attractive and compliments were abundant. Since that time, I've done quite a few surface overlays using many different metal designs' some for myself and some for others.

These overlays were done on rifle floorplates, the sides of forends, on pistol-grip caps, and other places. All of them turned out nicely and all were done in a matter of minutes not the hours

I'm not suggesting you start slapping overlays all over your guns. But when you see a place where a surface overlay could enhance the appearance, look around for that special

design. It may appear in different forms. I've used many kinds of tableware like forks and spoons, for example. These are available in some very attractive designs and materials. They might be silver, silver plated, gold plated, polished stainless steel, or even chrome plated. There are plenty of ready-to-go designs of other kinds too.

Just keep an eye out for things you can use when you wander through garage sales or second-hand stores, and don't be in a hurry. Having found your special overlay, preparing it and applying it to the gun is fairly simple. Many of the surfaces that lend themselves to an overlay are flat, but you can easily form the piece to lie flat on a curved surface.

MAKING AND INSTALLING DECORATIVE METAL OVERLAYS CONTINUED

ORIGINAL PAGE 21

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1394-P21-F01. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1394-P21-F01

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1394-P21-F02. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1394-P21-F02

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1394-P21-F03. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1394-P21-F03

(Semper Fi.) Far Most silverware handles are not flat, but they are malleable to some extent. I have used a padded vise to shape and hold the part while preparing it, or padded shaping tools can be made. Here's where your creativity comes in handy. Consider the length and width of the part being installed, and then lay the overlay or a paper tracing of it on the gun to be sure it is centered and of the correct size and proportion.

If you're not sure of yourself, have a friend look at the part to get a second opinion. For bonding the overlay to the gun, I use J-B's

Cold Weld epoxy. It comes in a pair of tubes, is mixed 50-50, and cleans up with water. Working time is at least 30 minutes. You might want to roughen the underside of the overlay to give the epoxy a better grip, and be sure that all surfaces are clean and oilfree. Use tape or clamps to ensure the overlay doesn't move while cleaning up any excess epoxy or while the epoxy is curing.

You probably won't want to roughen the surface of the gun, which would require refinishing if the overlay was ever removed. Moderate heat can be used to soften the

epoxy if you later decide to remove an overlay. This should leave little need for cleanup and no unsightly marks. consider the application of a wellchosen overlay. I believe you'll like the results and you'll have some fun in the process.

So the next time you're looking for a project or away to enhance the appearance of a plain-looking gun, I

RESTORATION

Reader Forum

BY AMERICAN GUNSMITH EDITORS AUGUST 2009

ORIGINAL PP. 22-24

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1395-P22-F01. Know the rights holder? Please ask them to contact us.

AG-77551C06AF-A1395-P22-F01

Stevens Crackshot Restoration I have two Stevens Crackshot Model 26 rifles that most people would have thrown away. These were my father's and are nearly 80 years old. I'm rebuilding them for my grandson. I intend to leave one in the original 22 caliber. For the second one, I've been kicking around the idea of making it a .17 HMR, since both barrels need to be sleeved anyway. Will the actions and breech handle this cartridge? Despite the years of use, the metal is in good shape and the action is reasonably tight.

Please advise. Thanks. The action of the Crackshot is strong, but it wasn't built for Magnum pressures, since there was no such thing at the time. Both your rifles are quite old and almost to the point where their metal might suffer some degree of granulation which could weaken it. The barrel for the one you intend to modify would not only require sleeving to reduce the bore size, its chamber would have to be recut since the .17 HMR is a bottleneck cartridge and unlike the straight-neck case of the .22 LR.

We recommend securing the help of a metallurgical lab to establish the metal's true condition before proceeding with a caliber conversion. Also, be aware that what

you're considering, even if it's possible, would reduce the collector value of the rifle considerably. Regarding the rifle you plan to keep in its original caliber, why are you thinking of sleeving the barrel? Is it shot out? Is the bore rusted to the point of being pitted?

The very sleeve that restores the rifle to shooting condition can also cause a loss of value. That's all academic, of course, if you plan to keep the rifles in your family forever. Winchester M72 Reassembly I have a Winchester Model 72 brought in disassembled. I need info on the fire-control group. I have a schematic from Jack First and from Numrich, but they have no detail on this area. I have Wood's rimfire book, but it's not in there either. Can you help? Thanks.

After looking at the drawings in the Jack First catalog, we think you'd be safe in following the instructions for the Winchester Model 60 given in Wood's Gun Digest book for rimfire rifles. Reader Requests Input Has anyone ever converted a 94 Winchester to the .357 Maximum? I imagine the cartridge guides and the carrier would have to be customized. I would be pleased to hear from any reader with info on this subject.

Ruger P94 Takedown Has American Gunsmith ever covered the assembly/disassembly of the Ruger P94/P944 in a past issue? The P345 (covered in January 09) is similar, and the P84 in Gun Digest's assembly/disassembly book is also similar, but the differences are not trivial. I'm not sure I'm going about the disassembly of the frame correctly, and I'm really concerned about my ability to reassemble it when the time comes.

This gun had been disassembled by the owner and he couldn't get it to function after he put it back together. I have to assume he put the springs in wrong, reassembled parts in the wrong order, or even lost some of the parts. I've worked on P89s before, but the P944 is quite different, especially the trigger/hammer group in the frame. Any help you can give or resource you can point me toward would certainly be appreciated. The second edition of Gun Digest's book on pistols shows the P85 on page 447.

The book says the P94 is similar or identical to the P85, but the P95 is not. This is one reason why we haven't covered the P94. If you want a schematic, call Ruger's customer service in Arizona and request an owner's manual. J. C. Higgins Conversion I have a J. C. Higgins Model 103-18, which I understand is a Marlin Model 100. Since this little rifle is a singleshoot, I had hopes of converting it to a .17 HMR or other .17-caliber variant as a project gun for my shop.

That is, until I removed the barrel-retaining pin and found that the receiver slips off the barrel with only hand pressure, essentially a slip fit. I was under the impression that the barrel should at least need to be pressed out of the receiver. There appears to have been no alteration to the barrel or receiver, although given the condition of the pin I am sure someone has removed it. The pin is .114 inch in diameter at the small end. What remains of the larger end is too mangled to measure.

My questions are as follows: 1. What is the proper receiver to barrel "fit" for these rifles, and any other .22 LR, for that matter? (I amused to seeing threads or at least a press fit with taper pin.) 2. If the current configuration of slip fit is normal for this model, is there a .17-caliber round this rifle can safely be chambered for without shearing the barrel-retaining pin and shooting the barrel off the gun? 3.

ORIGINAL SOURCE PAGE

22

If the barrel/receiver fit is not correct, is there an acceptable way to improve the fit, after which I will chamber it in .22 LR and call it a day. (If not, I have a tomato stake I will sell real cheap.) Your help with these questions is greatly appreciated. Thank you. The Model 100 was last produced in 1959. It did have a barrel-retaining pin which is shown in the Jack First catalog, Vol. 2. Due to the rifle's age, we'd probably shy away from a Magnum conversion, unless the present metallurgical condition

ORIGINAL SOURCE PAGE

22

READER FORUM CONTINUED

ORIGINAL PAGE 23

of the receiver could be checked out by a lab. The conversion to .17 Mach II would give us somewhat less concern. Rely on your chosen barrel maker to advise you further on caliber choice. The proper union between barrel and receiver is not determined by tightness alone. Rather, the final correct fit is established by whether the bolt closes on a "go" gauge, but fails to close on a "no-go" gauge.

As a practical matter, our suggestion is to leave the rifle at .22 caliber, thoroughly clean and polish the bore, rub down the wood with boiled linseed oil, install anew barrel-retaining pin, and use a wooden stake to support your tomatoes. Frozen Model 88 Winchester A customer brought in a Winchester Model 88. He had fired it, ejected the empty, tried to reload, and found the lever to be frozen. I have disassembled the action according to the NRA's Shoulder Arms Assembly book.

I found the hammer-spring pin lodged in the bolt. In the disassembly process, the pin fell out. I'm amazed it didn't do more damage than locking up the lever. Now I have run into a problem with reassembly. How do I compress the hammer spring and insert the slave pin? There is a hammer-catch spring and a hammer spring in the Model 88. The latter part has a hammer-spring guide and guide pin associated with it, so we're assuming that's the pin you found.

We're still trying to visualize how it became lodged in the bolt, unless it had been knocking around in the action unattached for awhile. We've located a Winchester fieldservice manual that describes spring compression and reinstallation of the hammer assembly, and we'll send you copies of the two pertinent pages. Due to the volume of requests received, please remind us it's the Model 88 you're after when you

send us your mailing address. Please also tell us where the pin was stuck in the bolt. We're curious.

Rifle Questions I recently purchased a Sears Model 6C (the same as the Winchester Model 490) that has "Made In Canada" stamped on the barrel. I got it cheap (no magazine and I think it's got a homemade stock on it), but the metal looks good. My question is: How do you take the darn thing down? I can't find a takedown guide anywhere on the web or in any of my books. It almost looks like the barrel has to come off before the bolt comes out. Any help in that area will be appreciated.

My second question involves a Stevens 87D. The problem is, when it's fired, the bolt will feed another round into the chamber but won't always cock the striker. It's almost like the striker is only half-cocked. When I pull the trigger, the firing pin hits, but not hard enough to fire. It barely leaves an indentation on the base of the case. When you pull the bolt back to clear it, another shell tries to feed in before the first live shell is extracted from the chamber.

Also, when it does fire, and I hold the trigger back, sometimes the bolt stays back, and sometimes it goes forward into battery. Any suggestions on that? I appreciate any help you can give me on both of these matters. If the Sears rifle is a copy of the 490, that Winchester went out of production in 1977. We doubt that the present entity, Browning Winchester, would have an owner's manual, but someone in the Winchester Collectors Association might.

You can find their address in the rear pages of a current issue of Gun Digest. You'll also find a parts drawing in Volume II of the Jack First Catalog. Among the components shown is a barrel bracket and barrel-

bracket stud, which are apparently the means by which the barrel is attached to the receiver. This doesn't mean the barrel isn't also press-fitted. And it would come as no surprise to us if the barrel has to be removed prior to removal of the bolt just as it does with semi-auto and pump shotguns.

By the way, you might want to check with Buckingham's for a magazine. The Stevens is probably just as old, or older, than the Sears rifle. Discuss the problems with Steve at The Small Arms Shop but don't call him until after 5:30 p.m. Eastern time. Steve may have the parts you'll need to get the rifle back into good operating condition. S&W Cylinder Replacement I have an old Smith & Wesson M&P that was made in 1947. The cylinder has a chamber that has an oversized portion in the front of the chamber.

The case has to be punched out with a hammer and punch. My question is: What do you have to do to replace a cylinder? I've read Jerry Kuhnhausen's S&W book, and it doesn't say anything about cylinder replacement. Thanks. There's nothing in the Kuhnhausen book for a very good reason: S&W will not sell a replacement cylinder to anyone other than an authorized factory service center. Your old M&P revolver will have to be returned to Smith & Wesson, but call them first to make certain they can install a replacement.

Unplating an M-1 I've inherited an M-1 carbine that has been electroplated in nickel. I would like to know the best way to remove the plating so I can refinish it more like the original condition. Any help you can give is greatly appreciated. Brownells shows a product in their catalog that strips off plating. Once the stripping is done, you'll probably be facing another problem. Originally, the carbine was Parkerized, and

ARCHIVE IMAGE WITHHELD

The original image is not displayed while permission is being confirmed. If you are the author, photographer, or rights holder, contact editor@gunsmithmag.com and reference AG-77551C06AF-A1395-P24-F01. Know the rights holder? Please ask them to contact us.
AG-77551C06AF-A1395-P24-F01

(continued from previous page) that's nothing like hot bluing. There are some bluing services that offer Parkerizing as well. Brownells would have a list of them, and one is listed in the article in this issue that begins on page 14. Saddlegun Disassembly? Can you advise me where I can get the disassembly instructions for an Ithaca Model 49 Saddlegun? It's a singleshot, lever-action .22-caliber rifle. Thank you. The Saddlegun was last made by Ithaca in 1979.

As you know, the original Ithaca Gun has gone out of business, and we have nothing on that model. There are a couple of possibilities, though. Ithaca Gun USA is the new entity, and they may have information on your lever-action. A second possibility would be Sharps Guns, Ltd. in Canada. They have parts for out-of-production Ithacas. Locked-Up Ruger I purchased a used Ruger MK III auto pistol. It's in the fired position and will not cock. I have tried to disassemble it, but I can't remove the mainspring housing.

It seems to be held internally, and will not budge. I've tapped on the bolt-stop pin, but to no avail. I think the previous owner put it back together wrong when it was cleaned. And when it wouldn't fire and he couldn't get it disassembled, he sold it. Any

help would be greatly appreciated. It's too bad the original owner of the pistol previously didn't see our October 05 issue, where disassembly and reassembly of the Mark III was covered.

We think it's likely the hammer strut was positioned incorrectly, and somehow the previous owner managed to force the take-down lever at the rear of the grip frame back into its upward position. This would not only jam the pistol, it would make future takedown nearly impossible due to damage. We know of no simple solution and fear that significant damage may have been done. We suggest you contact Ruger and arrange for factory attention to the problem.

Marlin Model 44 Problems I have a Marlin Model 44 pump shotgun with an action that's very hard to work. I've had it apart many times and can't determine why it's so difficult to work the slide. Also, the sear will not release the hammer to fire. Have there been any past articles on how to work the Marlin Model 44 or is there a manual on assembly/disassembly for this particular model? This gun went out of production in 1933.

There is no schematic we're aware of, no disassembly/assembly manual, and no article has been published in American

Gunsmith. However, a difficulty in operating most pump guns is usually due to bent or burred action bars and/or similarly affected action-bar receiver ways. Since you've had the gun apart a few times, we assume the sear/hammer problem isn't due to a deposit of fouling. Unfortunately, any parts you may need will have to be found in the aftermarket.

Smith & Wesson Safety I have an S&W Model 1000 20-gauge that has a safety locked in the "on" position. How do I get this apart for inspection/repair? I have it out of the gun that was the easy part. It looks much like the Remington configuration. Thanks. We also have a new Model 1000 on hand, but we've been unable to pursue an article on it because S&W can't provide a suitable schematic. We're told there is a good possibility the Model 1000 will be discontinued.

That should not affect factory service on Model 1000s already out there not as long as the supply of factory parts holds out. In view of the uncertainty regarding the future of this shotgun, we advise you to contact S&W customer service and have their repair technicians tackle this job. I can Gunsmith, address your email to a letter to American Gunsmith Merritt Island, FL 32954.

SEARCHABLE ISSUE RECORD

Archive index

Sales Boom Has Gun and Ammo Makers at Full Capacity **2**
American Gunsmith Editors

Disassembly and Reassembly Of the Ruger LCR Revolver **3-7**
Chick Blood

Modifying the Hammer/Sear Jig For Function Testing **8-9**
Joe Grisafi

The M1 Garand: A Troubleshooting Checklist **10-13**
Robert K. Campbell

Firearm Finishing Methods: A to Z **14-18**
Richard MacLean

Making and Installing Decorative Metal Overlays **20-21**
Norman E. Johnson

Reader Forum **22-24**
American Gunsmith Editors

Rights and corrections. Images without confirmed permission remain reserved in place. Authors, photographers, and rights holders may contact editor@gunsmithmag.com. Corrections to searchable text are tracked against the source-page record.



American Gunsmith

The complete searchable archive of a technical journal devoted to craft, repair,
maintenance, machining, and restoration.

GUNSMITHMAG.COM • EDITOR@GUNSMITHMAG.COM