



MAR 2023

DIGITAL ARCHIVE
EDITION

PRECISION ARMS WORKSHOP

AND THE AMERICAN GUNSMITH ARCHIVE

A TECHNICAL JOURNAL OF CRAFT, REPAIR & RESTORATION

03

ARCHIVE ISSUE NUMBER

INSIDE THE ARCHIVE

AR-15 BARREL EXTENSION FITTING

REAL SOLUTIONS • GLOCK ULTIMATE TOOL KIT • OFFICER MODEL FIXES • LIMITED SPACE SHOPS

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PRECISION ARMS WORKSHOP

THE AMERICAN GUNSMITH ARCHIVE · MARCH 2023

ISSUE RECORD

ORIGINAL DATE	March 2023
VOLUME	Archive volume not stated
ISSUE NUMBER	03
SOURCE ID	ag-35173b0e37113115d626679e

DIGITAL EDITION

PUBLICATION	Precision Arms Workshop
ARCHIVE SOURCE	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 March 2023.

2 **Real Solutions**
AMERICAN GUNSMITH EDITORS · ORIGINAL PAGES 2

3 **AR-15 Barrel Extension Fitting**
JOE CARLOS · ORIGINAL PAGES 3–9

10 **Glock Ultimate Tool Kit**
EARL ROBERTS · ORIGINAL PAGES 10–12

13 **Officer Model Fixes**
ROBERT M. LAYNG · ORIGINAL PAGES 13–17

18 **Limited Space Shops**
ROBERT K. CAMPBELL · ORIGINAL PAGES 18–20

21 **Rock Island Auction Company**
BILL SMITH · ORIGINAL PAGES 21–23

24 **Reader Forum**
AMERICAN GUNSMITH EDITORS · ORIGINAL PAGES 24

FROM THE ARCHIVE

Real Solutions

BY AMERICAN GUNSMITH EDITORS MARCH 2023

ORIGINAL PP. 2

No one wants to stop the criminal and tragic misuse of firearms more than gun owners. The firearm industry has led with initiatives to improve security at retail stores and prevent thefts, deter illegal purchases, and promote secure storage to help prevent accidents, thefts, and misuse. The National Shooting Sports Foundation has helped on this front with their Real Solutions Safer Communities (NSSFrealSolutions.org) initiatives.

This is an umbrella program with a host of efforts that work to create safer communities by promoting firearm safety, responsible firearm use, and safe firearm storage among lawful gun owners. This helps reduce firearm accidents, criminal access to and misuse of firearms. Real Solutions Of direct interest to shop owners are Operation Secure Store and Don't Lie for the Other Guy.

Operation Secure Store (Operation Secure-Store.org) supports the firearms industry's efforts in promoting public safety by proactively educating federally-licensed dealers in identifying and quantifying vulnerabilities and risks associated with the business of firearms commerce and industry-related operations as a whole. NSSF's team of loss prevention and security experts have an average of 25 years' experience and can help shops harden their business in the most economical method possible.

They also conduct webinars and have a selection of educational materials on security improvements, such as intrusion detection, physical security, IT security, display/showcase security, counterfeit detection, and

employee screening, among others. They offer a free FFL Risk and Security Self-Assessment Tool which can help any shop to identify and quantify vulnerabilities and risks associated with the business of firearms commerce and industry-related operations as a whole.

There are also a current list of burglary and robbery statistics to better understand crime trends. A campaign led by the BATFE and NSSF since 2000 and active in cities around the United States, Don't Lie for the Other Guy (DontLie.org) provides resources to educate firearm retailers on how to detect wouldbe straw purchasers and to raise public awareness that it is a serious crime to buy a firearm for a prohibited person or for someone who does not otherwise want his or her name associated with the transaction.

According to the Bureau of Justice Statistics, 40 percent of criminals obtain their firearms from friends or family and another 40 percent obtain their firearms from illegal sources on the street. According to the ATF, the average "time to recovery" (the time span between the initial purchase of a firearm to the time that it is used in a crime) is more than 11 years. Criminals typically are using older, recycled firearms, not newer firearms recently purchased from licensed retailers.

While these government-provided statistics indicate straw purchasing is not a common method for criminals to obtain guns, it's still wise to avoid illegal sales. NSSF offers free Don't Lie Retailer Kits that include training videos, booklets, and display information for your shop demonstrating to the community a commitment to lawful firearm transactions.

MACHINING

AR-15 Barrel Extension Fitting

An updated look at improvements and new products for barrel extension fitting precision AR-15 rifles.

BY JOE CARLOS MARCH 2023

ORIGINAL PP. 3-9

Most custom gun barrels likely have similar beginnings at the factory, starting out as blanks. Think of a big, fat, long piece of pipe with rifling inside. If you are dealing with a reputable custom barrel maker they'll likely put equal effort and high-quality steel in all the blanks they turn out. Those blanks are purchased by gunsmiths, machinists, and gun factories. Arriving at a shop or factory, they are then cut to length, turned down some, chambered, and threaded at the back.

Barrels screwed into the front of a steel bolt-action receiver have substantial side walls to support it. Barrels used in Stoner Platform builds, on the other hand, are also turned down (perhaps skinnier than for a bolt gun), chambered (sometimes a little on the fat side), drilled for a gas port (which hopefully lands in the center of a groove), and threaded at the back. Most are likely also threaded at the front for attachment of various devices (see my July 2022 article "Muzzle Attachments" on that).

The similarity in barrels ends at this point. AR receivers are not threaded on the inside; they are made of aluminum and are usually really skinny, lacking much support for the back of the barrel. The threaded back part of an AR barrel screws into a separate massproduced part called a barrel extension.

Then the barrel, with extension attached, simply slips into the front of the AR receiver and is kept in place by a barrel nut which, at

best, keeps most of the front-to-rear movement to a minimum while being less effective with up and down and left to right movement of the extension within the sloppy confines of the receiver. Regardless of the fact that the blanks that left the custom barrel shop were basically equal, the bolt action normally has more precision than the AR rifle.

We quickly skimmed past some of the barrel related reasons for this. The focus of this article, however, is on updating you on ways to deal with the slop in the fit of the barrel extension to the upper receiver. Combating this slop is nothing new to me. I have been working on the problem for decades. I wrote about how I first discovered this problem (March 2013, "The Relationship Of Barrel Extension Diameter To Accuracy In The AR-15") and I'll update what I've learned about this since.

The Epiphany One observation I made in the late 1980s was when the Army Reserve Marksmanship Program was at Belmont Range competing against foreign military teams in an international Service Conditions match hosted by the Australian Army Rifle Association. I remember coming back to the tent late one afternoon and everybody was cleaning their M16 rifles. One guy must have left his bore guide stateside because the back of his barrel was all slopped up with excess solvent and oil.

He discovered that if he firmly held the upper receiver with one hand and put pressures on his barrel with the other hand he could see air

bubbles and movement in the excess fluid that corresponded to the flexing pressures that he applied to the front of his barrel. Like little kids, everyone else had to try it too and a fair number saw the same tell tales that their barrel extensions also exhibited a lot of slop.

We all came to the same conclusion that any movement at the back of the barrel would cause erratic and exaggerated vibrations and a less-than-stellar return to consistent registration points at the muzzle between shots. This, in turn, would result in fat groups, fliers, and wandering zeroes. What to do about the problem remained uncertain, however. Early Improvements Most of the shooters who observed that epiphany likely gave it little or no further thought once we all returned home.

However, I couldn't let it go and spent many sleepless nights thinking about how to correct the problem. After enough Australia-induced insomnia, I decided to try using Loctite in an attempt to "weld" the outside of the barrel extension to the inside surface of the bore of the receiver. The adhesive company made a green #620 retaining compound which they said was designed for slip fits where there were "large gaps". I don't recall them defining what constitutes a "large gap" but the #620 was easy to use.

Thoroughly degrease both the extension and the receiver, then slop some of the

AR-15 BARREL EXTENSION FITTING CONTINUED

ORIGINAL PAGE 4

retaining compound on both the extension and the inside of the receiver. Assemble as normal and wipe off any excess Loctite. Spin on a barrel nut and tighten to draw the barrel tightly into the receiver, then let everything sit for at least 24 hours before firing. When this has been performed properly there is zero visible movement between the barrel and the receiver even with the barrel nut removed.

The downside is you can not pull the barrel out of the receiver and when it comes time to replace shot out barrels they have to be heated with a torch in order to remove them. The scientist in me demanded that I perform some before and after tests of the process by shooting ten-round groups on the machine rest. I took Army Reserve Marksmanship Program uppers assembled the “normal” way without Loctite and fired groups with known lots of match ammo.

Then I performed the improvement discussed above, reassembling after the Loctite cured a few days with the original parts for a retest. I could see early on that groups had shrunk and I kept records. Eventually, I upgraded all 135 of the Team’s uppers, testing all of them both before and after. I had a very nice sample size and I am sure that professional statisticians would have patted me on the back. This whole process took a few years and was very work and time intensive.

When I finally analyzed my data the numbers showed an average improvement in group size of 18.6% just from using the Loctite. That is a substantial difference and many shooters told me they could see an improvement in their gun’s precision. Civilian shooters were learning about what we were doing and many of them jumped on the bandwagon.

Improving The Improvement Even before I was done with the green Loctite improvement I was beginning to wonder if there might be some

“give” in the Loctite that I was unable to see with the naked eye. After all, Loctite is basically a super strong glue and not actual metal which would have less potential to compress and expand. Each of the gaps between the barrel extensions and the inside of the receiver is different between rifles due to large manufacturing differences in the diameters of extensions.

What can you expect from apart that cost about \$20 at the time? There were equal variances in the inside diameters of upper receivers, creating a stack up of variances. When we used the green Loctite by itself we didn’t take these variances into account as it was just a “slap it on and assemble” procedure. I wondered if there was enough gap in most rifles to accommodate thin shim stock to be inserted along with the Loctite. I started to experiment with 0.001" shim stock which was the thinnest I could find.

Sure enough, every rifle I experimented with would accept a section of the thin shim material. I would begin by cutting the shim about 3/4" wide so there would be some clearance on both sides of it when positioned on the bottom of an extension. Then the length of each finished shim would vary quite a bit between guns depending on how much gap each rifle had between the extension and the receiver. Some shims might end up only 1/2" long while others could exceed two inches.

Regular household scissors easily cuts the shims to size. Determining this shim width and length was accomplished by trial and error and it took some time to get exactly right. If the shim was cut too long it was impossible to get the barrel extension into the receiver. A shim too short wouldn’t fill enough of the gap, still allowing movement of the extension inside the receiver. Final assembly was a little tricky.

After the parts were degreased, green Loctite was applied inside the receiver and on the extension.

Then the shim was placed around the bottom of the extension and more Loctite was spread on the outside of the shim. Things got hairy at this point because the next step of sliding the extension into the receiver felt like a person needed a third hand. The Loctite was slimy and the shims wanted to migrate toward the raised portion of the extension that would eventually come into contact with the front of the receiver, sometimes called the mouth.

If that migration stopped when the shim made solid contact with the raised section there would be no problem. Often, however, as the barrel continued further into the receiver the shim would continue to move and would turn up and become trapped between the raised part of the extension and the receiver mouth. This would obviously create a high spot and prevent the extension from fitting perfectly flush. Group sizes would be compromised.

Any time I saw this taking place I would simply pull everything apart and begin over. For me, this learning curve was taking place during the time I was the Match Armorer for the Army Reserve Team so I was getting daily or weekly practice and I learned some lessons. One such lesson was to position the shim closer to the feed ramp side of the extension at the start of the assembly. This allowed for some migration to take place before the shim would hit the raised section of the extension.

Because I was doing many of these I got pretty good. As with using just the Loctite I kept good before and after shooting records and when I analyzed my numbers I found that average group sizes shrunk by a significant 35%, nearly double the improvement of just using Loctite by itself. See the test targets pictured here. Almost all of

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001" shim stock. When centered on the bottom of the barrel extension this gives a little clearance on either side. Depending on the rifle, this shim could be a half inch or over two inches in length. my shooters were remarking on the noticeable improvement in precision.

Although I made a strong admonishment to my readers back in that 2013 article regarding the tendency of the shims to migrate, I worried that guys who only had to deal with one or two AR builds in a year might be challenged or perhaps forget the importance of this from one build to the next. Next in the history of this neverending saga came custom oversized barrel extensions from BAT Machine.

I purchased these in quantity in sizes from 0.9990" to 1.003" in 0.0005" (half thousandth) increments. I would take samples of each size with me to Camp Perry

where I operated a store on Commercial Row each summer during the CMP Service Rifle National Matches.

So, if a customer brought an upper receiver into the store I could select the proper size extension for his specific application in a matter of about three minutes right in front of him. I stock gain twist match-grade barrels with different size extensions. Within about a half hour of walking in the door of my store the customer could be walking back out with a quality barrel sporting the correct size extension.

BAT was selling their custom extensions for about a measly \$10 or so over the cost of the generic, garden variety extensions and properly-sized BAT extensions gave the same average 35% group shrinkage as the shim stock. Also, the BAT extensions were more user friendly for customers wanting to install their own barrels. However, BAT Machine wasn't just manufacturing custom

AR-15 and AR-10 extensions. Their main bread and butter is high quality custom bolt actions. These are high dollar items.

If you were BAT, would you be taking a man off the line and divert him to making a few custom extensions on which you are making chump change? Eventually, and unfortunately, BAT figured this out and they dropped their custom extension line. To my knowledge, no other machine shop has picked up the slack. So, for the past several years custom AR gunsmiths have had to go back to using shim stock. During these years a fair number of guns came into my shop for rebarreling.

Some of these shot out guns had shims installed by home hobbyist gunsmiths and many of those shims had migrated up between the front mouth of the receiver and the raised portion of the extension, creating high spots and some compromise of group sizes. Therefore, I was highly motivated to come up with a simple solution to this problem.



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Securing The Shim The lack of readily-available oversize barrel extensions motivated me to revisit using shim stock. Here is how I do it now. Begin by dry fitting your shim as normal. Thoroughly degrease both the shim and the extension. Remember that when you permanently install it the Loctite between the shim and the extension will end up adding a little thickness. With that thickness buildup in mind, I now use Loctite #638 instead of #620.

Both are green, but #638 seems to be a bit thinner and adds less build up when combined with the shim. Coat the area of the extension where the shim will be placed with the #638 green Loctite. Also coat the underside of Temporarily hold the shim in place with one hand while wrapping a rubber band around the outside of the extension nice and tight. While doing so, make sure you cover all four edges and all four corners of the shim. If need be, don't hesitate to use a second rubber band.

Wipe off any excess Loctite that you can get to and let everything set up for at least 24 hours. The next day, remove the rubber bands and scrape, sand, or steel wool any hardened excess Loctite from the extension. Following this, assembly of the barrel to the receiver remains pretty much unchanged. Coat the outside of the extension and shim with green Loctite. Also coat the inside of the receiver and then push together.

Based on all the problems in past history with shims moving during this step I can't help but watch the shim to make sure it doesn't move any. After using this technique for several years I have never had a single shim break loose or move during this step. I quickly wipe off any excess Loctite and then run on a standard barrel. Place the shim with green Loctite #638 applied on the barrel extension where you want it to be permanently fixed. Hold it in place while wrapping one or more rubber bands tightly around.

Allow 24 hours to set up and remove rubber bands. Targets on the left were from the guns before any improvements were done and targets on the right were from guns improved with shims and green Loctite. the shim itself and then place the two together. nut which I torque on gorilla tight.

I give everything at least 24 hours to set up and then remove the temporary barrel nut and replace with whatever nut I am going to permanently use, torqued to a starting setting of 47 pounds for heavy barrels or 60 pounds for skinny barrels. By varying the torque setting up and down from those starting settings and shooting groups you can identify the torque sweet spot that results in the best performance. For more information on this process, see my article "AR-15 Barrel Harmonics" in the October 2016 issue.

Double-Sided Coin For decades, we in the AR community have focused our attention on just one side of the repair coin regarding fitting the barrel to the receiver, concentrating our efforts on making the barrel extension fatter. While this has worked well, wouldn't making the bore of the receiver skinnier at the mouth work equally well? The problem has been that, to my knowledge, no receiver brand has offered a bore tight enough to be a viable cure.

Thankfully, a couple of years ago the industry finally caught up to our needs. I'm aware of two companies now offering true tight bore flat top uppers. If you want a mil spec upper, contact Bravo Company USA (BravoCompanyUSA.com, I am using their flat tops in all the uppers I am building for persons wanting to shoot Service Rifle matches overseen by either the NRA or CMP.

To install a barrel on a Bravo receiver, start by using a torch and focus the tip of the flame at the junction of the front threads and the receiver. While doing so, rotate the receiver to heat uniformly around it. The heat will serve to expand the mouth of the bore enough for the extension to enter. After roughly 30 seconds of heating, see if the extension will enter the mouth. It may go part way and then stop or it may not

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enter at all. If so, apply more heat and try again. I often hold the barrel in one hand while tapping the back of the receiver with a wooden mallet to drive it into place. Just make sure that the front of the receiver makes hard contact with the raised portion of the extension with no gaps. As soon as the heat is removed the metal will attempt to “spring back” to its original, tight dimension.

So, once I have made that contact between the receiver front and the raised section of the extension Author recommends that you NOT use one of the “Receiver Lapping Tools” pictured on the bottom as they can actually add run out as opposed to correcting it. I quickly run a standard barrel nut into place and then tighten it gorilla tight using a cheater bar over my wrench. I usually allow about an hour for the parts to completely cool before removing the temporary barrel nut and then proceed with normal assembly.

Months or years down the road when that barrel shoots out and you are removing it to install a replacement you will have to heat the receiver back up to get it to release the extension. And when you are ready to install that new replacement barrel you will have to apply heat again in order to get the receiver to expand enough to accept it. The process I have just described is often called “thermo fitting”.

While it is the flavor of the week it appears to me that it is equal but not better with regard to precision as compared to fat extensions or extensions with shims and Loctite. The other company offering tight bore flat top receivers is JP Enterprises (JP Rifles.com, although I don’t believe their receiver would pass NRA or CMP muster for shooting Service Rifle as there are some cosmetic differences between it and regular mil spec.

Therefore, because I concentrate on Service Rifles I have not had occasion to try one. That said, I have used a wide cross section of other JP

parts over the years and found them to be well designed and of quality manufacture. I am hoping that shooter demand will cause additional receiver makers to offer tight bore options in the future.

Receiver Run Out Even those of us who don’t work on or shoot bolt actions are probably aware that gunsmiths who custom build these rifles for use in precision events pay attention to the machining of the front ends where the barrel comes to rest. Top-end custom receivers like those made by BAT Machine come from their shop perfectly squared. Cheaper actions often come from the factory with run out having one side being taller than the opposite side. Custom gunsmiths correct this by machining on a lathe.

I thought it might be worthwhile to look at this with regard to our AR platform. I measured the amount of run out in receivers from a variety of AR manufacturers. With one excep-

AR-15 BARREL EXTENSION FITTING CONTINUED

ORIGINAL PAGE 8

tion (Sun Devil), none of them were square at the mouth. There was some variance in the severity of run out, however, the average run out was similar to mass produced bolt actions. If custom bolt gun builders were seeing benefits to squaring the front ends might gas guns benefit also? I set up a study. First, I built up temporary guns with receivers just as they came from the factory. Then I dismantled the guns and squared the front mouths on a lathe just the same as bolt gunners.

I reassembled the temporary test guns and using the same ammo lots I machine rest tested them a second time. I did this about 30 times starting with a different receiver selected from a variety of brands each time and then averaged the group reduction that squaring produced. I came up with a significant average group size improvement of 14% after the receivers had been squared. As noted, Sun Devil was one brand of upper receiver whose mouths came properly squared right from the factory.

Their receivers were machined from solid blocks of aluminum as opposed to being cast. The bores on Sun Devils were also tighter than most but not as tight enough. The walls of Sun Devil receivers are also thicker than regular mil spec so they aren't legal for either CMP or NRA Service Rifle shooting. Their lowers had the first Accu Screws, a device that I have mentioned in previous articles used to tighten the fit of the upper to the lower.

Unfortunately, even though Sun Devil was good, they went out of the receiver business a few years ago. Customers have told me that they are sometimes successful in still finding them on e Bay or Gun Broker. Most home hobbyists don't have lathes so I recognized how attractive a simpler method would be for them. Chances are that most of you have seen those mandrels that fit in a 3/8" hand drill. They are sometimes called touted as "AR Receiver Lapping Tools". They claim to square receiver mouths.

Like many of you, I have one and I had previously tried it on some receivers that I still had in stock. I dug those receivers out and took readings of their run out. None of them had less run out than new untouched receivers from the same manufacturers! Worse, many of them had even more run out. I took a few new receivers and measured their run out. Then, using the instructions provided by the maker of the lapping tool, I attempted to square the mouths of these receivers.

Not one of them ended up with less run out and most of them had more run out using the mandrel, meaning this tool not only failed to properly lap the receiver, it made the problem worse. Those of you scientists in the audience are probably positing that perhaps Joe's mandrel was just a one of a kind that was manufactured with some error at the factory. Or maybe Joe just wasn't operating it correctly. These are fair reservations and I was asking myself the same questions.

I rebarrel a fair number of uppers each year. When the existing shot out barrel is removed it is fairly easy to visually identify receivers that the owners have tried the lapping tool on. So, I started gauging such receivers and found that none were square and that most had more run out than factory new receivers of the same manufacturer. This is exactly the same as I found when I using my receiver lapping tool.

My conclusion is that this mandrel method fails to remove run out and often makes matters worse for a significant number of home operators. I don't know of any custom bolt gun craftsmen using a mandrel to square their receivers; they use a lathe. If you don't have a lathe perhaps you know a machinist that will help you out. D. Wilson Manufacturing (DWilsonMfg.com) is one custom gunshop that offers lathe squaring. I have had them lathe-square receivers for me and their work is good.

They also offer mandrel squaring so when contacting them you will need to strongly clarify that you want only the lathe method. If you happen to have a receiver that has been subjected to a mandrel most are salvageable by doing it over the right way in a lathe. Proper squaring is a once-and-done procedure and does not need to be repeated each time you rebarrel. I believe it is a good investment.

Conclusions To my knowledge, Army Reserve Team shooters made the first discovery regarding the looseness of fit in the front ends of Stoner Platform rifles in the late 1980s, somewhere roughly in the midpoint of the life of that rifle. I would like to say that the epiphany was made using sound scientific testing methods. In reality, however, it was just plain dumb luck. Correcting the problem in subsequent years involved correct science.

It's possible that someone elsewhere had noticed this prior but since this was before the Internet was available to most of us so such information would have likely not have traveled. In that regard, the Internet has been a good thing. These days, unfortunately, I see more misinformation on the Internet regarding the Stoner Platform.

For example, I watched a video on front end receiver squaring where the presenter was holding a flat top upper receiver in his bare hand (no glove) while he drove one of those mandrels attached to a hand drill down the bore with his other hand. Is it any wonder that we gunsmiths are encountering receivers in our shops with more runout than when they originally left the factory? Before leaving the topic of on-line videos and chat I will leave you with a caution.

It seems that most anybody sitting in an air conditioned man cave with their feet propped up can get a video published. The Scientific Method of testing is seldom adhered to and it is obvious that even actual range testing is often abandoned in

AR-15 BARREL EXTENSION FITTING CONTINUED

ORIGINAL PAGE 9

favor of just speculation and theory. I personally stay off those sites and I recommend that you do likewise and rely more on reputable publications like American Gunsmith for information. From time to time I get decadesold original manufacture 1960s uppers sent to me. When I disassemble them I nearly always find the fitment of the extension to the receiver to be noticeably tighter than recently manufactured uppers. So, in the ensuing decades fit has gotten more slop, not less.

Back in the '60s about the only factory making ARs was Colt. Apparently, their factory specs for the associated parts resulted in tighter fits. Today it seems that almost everybody and their brother is turning out AR parts. So, when you combine them, the fit can be very sloppy. Therefore, the general trend has been toward more slop which has been going in the dead wrong direction.

To my thinking, this calls for more attention to the problem for us gunsmiths if we are building a rifle for a customer wanting a high degree of precision. I believe this article has provided the tools to accomplish this work easily and relatively quickly. By the way, when I machine rest test those old 1960s uppers using 55 grain ball ammo I also get much better groups than with most recently manufactured uppers.

Part of that is likely due to the tighter fit at the barrel extension and also probably the correct 1:12" twist barrels that adequately stabilize the short 55 grain bullets. There has been an industry-wide trend in recent years toward faster twist barrels needed to stabilize longer and heavier bullets. Some of those barrels, such as the 1:7" twists, spin 55 grain bullets at double the RPMs required to properly stabilize them. Overspinning bullets results in fat groups and fliers.

I have admonished readers many times regarding the importance of using the correct twist rate so I will (temporarily) climb down from my soap box now. Using the techniques

described in this article you can make a \$300 or \$400 properly-bedded barrel shoot as precisely as a \$600 barrel just slapped into the receiver the old way. If you install that \$600 barrel correctly the resultant precision can be downright stellar! Barrel selection is very important when trying to build the highest quality rifles.

To that end I have been working with gain twist barrels for decades—about half of my life, and I ain't young. The finest of those gain twists have doubled their twist rates from the front of the chamber to the muzzle. For example, the 20" Service Rifle barrels I stock begin their twist at 1:13" at the back and end at 1:6.5" at the muzzle. I consider this gain twist topic to be of such importance that I wrote about it in my second article for this magazine.

See "Revisiting Gain Twist" in the November and December 2013 issues. For more information on barrel selection see "Barrels For Custom AR-15s" in the July and August 2017 issues as well. Please remember that the precision of any barrel can be ruined in seconds if you use the wrong attachment to the front threads. Certain screw on recoil reducers and combination flash suppressors/ quick mounts for silencers can ruin groups in a heartbeat. See "Muzzle Attachments" in the July 2022 issue for more on that.

We began this article by mentioning that barrels installed on bolt action rifles normally shoot tighter than those on gas guns. That precision gap can be closed by a bunch in AR-15 rifles as well. I think of the main methods of doing so as the three legs of a tripod. The first leg of that tripod is the barrel extension to receiver fit that was the topic of this and earlier articles. The second leg is getting the upper-to-lower fit nice and tight. I wrote about this in April 2017 ("The Accu-Wedge").

The final leg involves the bolt carrier and its tendency to tilt down at the back setting the bolt face, putting it and a cartridge attached to

the bolt face at an angle in the chamber. This results in bullets entering the rifling of the barrel off center and deforming. This issue has been known since Stoner's time and still hasn't been 100% resolved to my mind. I wrote about some cures in "Match Bolt Carriers" (May 2014) and "Combating AR-15 Bolt Carrier Tilt" (May 2017).

Getting the bolt carrier to line up properly with the bore is another of those two-sided coins. The other side is split between gas tube alignment covered first in March 2014 ("Gas Tube Alignment") and updated in May 2018 ("Gas Tube Alignment Revisited"). Cartridge concentricity is also involved, which I covered in "Straight Bullets" (December 2018) and "Better Ammunition" (April 2016).

It used to be that when gas gunners showed up at precision and long-range events the owners of expensive bolt rifles sort of turned their heads and snickered. Using the techniques described in the articles I have just cited and others, those snickers seldom occur these days because those bolt gunners have had their you-know-what handed to them often enough.

The growing popularity of 90 grain bullets which allows the wimpy Mouse Gun to compete with more ballistically-efficient calibers found in bolt rifles has also helped. Mouse Guns will shoot the hotter 22 Nosler which drives bullets faster than the 223 Remington can also help, as detailed in "22 Nosler" (March 2019). The one variable that we gunsmiths have no control over is the proper application of marksmanship fundamentals by the gun owner. This involves lots of hours on hot, dusty ranges honing skills.

I hope that if you area gun owner reading these pages you will keep that in mind. As always, any comments and questions can be addressed to me at G

MAINTENANCE & REPAIR

Glock Ultimate Tool Kit

Review of the Nc STAR/VISM Ultimate Tool Kit for Glock handguns.

BY EARL ROBERTS MARCH 2023

ORIGINAL PP. 10–12

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Do you own a Glock? Are you responsible for repairing or maintaining Glocks? Is there a chance a Glock will ever land on your workbench? If you answered “Yes” to any of these questions, then this product review is for you. For me, in addition to the tools in my workshop, I have always tried to keep some basic tools in my range bag, piecing together some punches, sight tools, sight pushers, small screwdrivers, and the like.

I have fit them, as best I can, into in some bag, pouch, or case to make it portable and handy. However, this was not ideal and I was always on

the search for the best way to store, carry, and protect these tools. Having discovered Nc STAR/VISM’s Ultimate Tool Kit for Glock pistols, I now have a solution. View online (bit.ly/3Jfd4gc) at the Nc Star (NcStar.com) website. First, a little about the company who makes this Ultimate Tool Kit (UTK).

Nc- STAR has been providing superior quality products at affordable prices since 1997. In 2010 they expanded by creating the VISM division with the mission of creating new products with higherend features. The Ultimate Tool Kit is one of the latest of those new products. The UTK for

Glock contains four tools, two of which are multitools, so you ultimately have more than ten tools nicely packaged in this kit.

The largest tool is the Universal Pistol Rear Sight Tool, designed to remove, install, and/or adjust the windage of Glocks as well as most other semi-automatic pistols

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with movable, dovetailed rear iron sights. The Glock Pro Tool is one of the multi-tools. About the size of a medium screwdriver, it has a hollow handle designed to store five interchangeable bits, including a magnetic 3/16" hex nut driver, channel liner remover, a channel liner installer, Phillips screwdriver, flathead screwdriver, and a 3/32" punch. Additionally, the handle itself acts as a striker assembly holder.

The other multi-tool is the pen-shaped Glock Pocket Tool which functions as disassembly tool and a magnetic front sight tool which can be used to remove and install front sight posts. The UTK also includes the Mag Popper, a handy magazine disassembly tool. All of this is packaged in a foam-lined plastic case about the size of a Glock pistol case. There were a few features of this kit that initially caught my eye. The first was the case itself.

As mentioned earlier, I wanted something that was easy to carry and protected the tools, specifically the sight pusher. This case is about the size of a factory-provided pistol case and fits perfectly in my large range bag right next to the Far Glock Pro Tool handle. other pistol cases. The tools were neatly and safely arranged inside the case.

I assumed the Universal Rear Sight Tool was comparable to the basic sight pusher that I already had in my kit, but I figured I could always use another, so I didn't give that tool much more thought. The next thing to grab my attention was the Glock Pro Tool. This looked very handy, I liked the idea of the channel liner bits, and loved how that the handle also served as a striker assembly holder, which could potentially serve as a third hand when there is no access to a vise.

I cross checked prices direct from the maker and on other websites to see if I could find a better deal. Prices may have changed from when I bought mine and there are several retailers who carry this kit, but the price seems to range from around \$80 to just under \$100. It seemed to be a good fit and a good purchase for me, so I bought one. I have been happy and impressed with the Ultimate Tool Kit since it was delivered to my door. The size of the case was perfect and it fit in my range bag as I expected.

As soon as I opened the kit, I was blown away; what I thought would be a basic, economy sight pusher was in fact a beefy, well-built, Universal Pistol Rear Sight Tool complete with an elevation wheel, witness windows, and worthy of mounting to a gunsmith's workbench. Stepped inserts and plastic spacers are included to ensure proper slide fit and to help protect the finish on the slide. I was also surprised to find

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Original caption: Bottom: Glock Pocket Tool, open. Bottom plates before, but when I picked up the Mag Popper, which is made of heavy-duty steel, I couldn't believe how simple and fast it was to use; no more using a punch, this is my go-to way of disassembling magazines now.

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that the Glock Pro Tool uses a quick release locking system to securely hold the bits into place when in use and the handle fits nicely in my hand. I have never really had an issue removing magazine floor

Oh, and the Mag Popper is technically a multi-tool also; not only does it have a built-in hex recess designed to act as a kind of T-handle for driver

bits, like those included in the Pro Tool, but it also functions as a bottle opener as well. As for the Pocket Tool, this is my second one; I have another one that I have been using for a few years now and it is still in great shape. One last thing about this Ultimate Tool Kit: hang on to the included instruction sheet.

The sheet includes QR Code links that, if you take a picture of them with your phone, will lead you to Nc STAR's webpage where you'll see videos on how to use the tools, which is helpful for those using the Universal Rear Sight Tool for the first time. For me, this tool kit was worth the price, it came nicely packaged, is well built, and is supported by a company with great customer service. I'll be using it for years to come. AG

MACHINING

Officer Model Fixes

Officer Model Fixes “What seems to be the problem, officer?” Addressing some issues on an Officer Model 1911 and my fixes for them.

BY ROBERT M. LAYNG MARCH 2023

ORIGINAL PP. 13–17



Left: The new extended slide stop from Fusion Firearms. These are a great addition that don't add any bulk to the pistol, especially for those of us that don't like changing our grip to send a slide back into battery after a magazine change.

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Gunsmiths, whether they are true professionals with a shop and a storefront, a kitchen table tinkerer, or a machinist with spare time and materiel on their hands, are more often than not put in a position wherein they are solving a problem with a firearm, sometimes even more so than building new firearms, fitting barrels, and the like. There are two distinct paths that are taken to get to the bottom of an issue.

The first is “tribal knowledge” that is either passed from person to person or researching the issue and the second is by doing a lot of trial and error. This article pertains to a little bit of both. I recently had an issue when my Officer Model 1911 began causing nosedive failures to feed. It was a sudden and constant issue. I'd load a magazine, click it into place, draw the slide back, and let it slingshot forward.

Instead of the “clack!” one normally hears when a 1911 slide goes home, all I got was a dull “thunk” and the slide barely inched forward. Digging through my notes on the platform (after safely clearing the firearm, of course), I started going down the troubleshooting list of what could go wrong and what a possible fix might be. I started with the magazine. It was factory original with the pistol. I cycled it out of rotation, even though it didn't seem like the spring was weakened from age and use.

I put it aside and supplied a fresh new magazine loaded with snap caps, however, I was met with the same issue of a “thunk” and minimal slide movement. So I cleared the firearm safely and disassembled it in the typical way. After triple checking to make sure it was empty of all ammunition, I retracted the slide until the witness hole in the guide rod was visible and slid a tiny hex key in there to capture the spring and plug.

I then retracted the slide a bit more until the takedown cutout was aligned with the pin and removed it. This allows the slide to come forward off of the frame. I immediately put the thumb safety on as I didn't want to inadvertently trip the trigger and have the hammer slam into the frame and cause damage. At this point I had two evident tasks, checking the frame and the controls on it to see if something was binding and then checking the slide for anything that would cause a failure to feed.

I also immediately dug back into my notes and these are a great addition that don't add any bulk to the pistol, especially for those of us that don't like changing our grip to send a slide back into battery after a magazine change. I consulted some fellow 1911 owners to see if they had experienced the same problem. The frame only had the typical wear on the feed ramp integral to

the frame and where the magazine had rubbed against the internal surfaces, nothing impeding the slide from going forward.

The overwhelming response from fellow 1911 shooters, which concurred with my notes, was that the recoil spring assembly was the culprit. When they sit under compression for extended periods of time as they do, they begin to take a set and weaken. I decided to give the pistol a slight overhaul to better suit it to carrying concealed, and this was the perfect opportunity to perform these upgrades along with replacing the worn recoil spring.

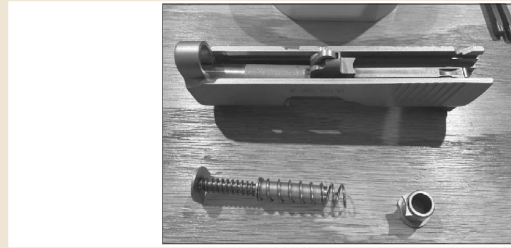
I purchased a bobbed hammer, solid stainless steel mainspring housing, and an extended slide stop from Fusion Firearms (FusionFirearms.com, of Venice, Florida. I also needed a new recoil spring assembly, so I went back to Fusion for a replacement assembly in the standard weight for a 45 ACP-chambered Officer Model. I had a spare new firing pin spring on hand and figured if I was going to have the slide out and apart, I might as well tackle replacing that spring as well.

Springs are cheap and you don't want to be stuck in a sticky situation when they go bad. Now I needed to pull the slide apart. Kimber has embraced the



Above left: Slide assembly with the new firing pin and spring installed and the barrel reinstalled. Below it are the new recoil assembly, also from Fusion Firearms, and factory reverse spring plug. Above right: Pin punch pointing out the firing pin, captured by the firing pin block plate. To remove that plate, simultaneously depress the firing pin itself and the firing pin stop in the underside of the slide. Removing this plate allows you to remove the extractor for inspection and allows you to remove the firing pin and spring.

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Far left: Series 80 firing pin stop. This must be depressed to allow the firing pin to travel either forward to detonate a cartridge or to the rear for removal. Left: What the firing pin and spring will look like when it is free of the slide. Shown are the pin with the new spring around it, ready to be seated back in its place in the slide.

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Far left: Series 80 firing pin stop. This must be depressed to allow the firing pin to travel either forward to detonate a cartridge or to the rear for removal. Left: What the firing pin and spring will look like when it is free of the slide. Shown are the pin with the new spring around it, ready to be seated back in its place in the slide.

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Below it are the new recoil assembly, also from Fusion Firearms, and factory reverse spring plug. To remove that plate, simultaneously depress the firing pin itself and the firing pin stop in the underside of the slide. Removing this plate allows you to remove the extractor for inspection and allows you to remove the firing pin and spring. Series 80 setup in their pistols (at least on both of mine) and the takedown for the slide for service is a little more intricate than some others.

To do this I first depressed the firing pin stop in the underside and keep it depressed with a small punch to push in the firing pin and simultaneously

slide the firing pin block down slightly while relieving pressure on the firing pin stop. I then worked the block out of its recess while keeping the slide pointed into a cardboard box so the pin and spring couldn't take off across the room! There is a good chance the firing pin stop will keep the pin in its channel but one should never assume.

I also kept that pin recess pointed away from my eyes (over which I always have protection) and into something to catch it, should it take off. I cannot stress this enough. I have chased after my fair share of springs and components that have

flown across the room and floor of my work area. I have even left a few small dents in the ceiling and walls, too. But I digress.

The firing pin and spring have remained captured, so I covered Far This must be depressed to allow the firing pin to travel either forward to detonate a cartridge or to the rear for removal. Shown are the pin with the new spring around it, ready to be seated back in its place in the slide.



Far left: The new hammer installed, ready to start putting the frame back together. My pin punch is pointing out the thumb safety plunger that must be kept in the frame for proper function of the safety. This will be pushed back into place with a small screwdriver covered in tape. Left: After replacing the hammer, seating the grip safety, fitting the two thumb safeties, and getting the mainspring housing started, I wiggled the frame to make sure the hammer strut fell into place atop the mainspring plunger.

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Far left: The new hammer installed, ready to start putting the frame back together. My pin punch is pointing out the thumb safety plunger that must be kept in the frame for proper function of the safety. This will be pushed back into place with a small screwdriver covered in tape. Left: After replacing the hammer, seating the grip safety, fitting the two thumb safeties, and getting the mainspring housing started, I wiggled the frame to make sure the hammer strut fell into place atop the mainspring plunger.

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them with my hand and depressed the firing pin stop once again. With both parts freed up, I removed them and set them aside. Many 1911 shooters also like to take this opportunity to check their extractors for tension, tuning, and cleanliness of the channel. 1911 extractors are mostly held place by the firing pin block but they actuate by putting pressure on the wall of its channel to firmly grip the rim of the round being fed and extracted.

Should this channel get too dirty, it could impede operation by locking up any movement the extractor would need to properly function. Once I'd taken the firing pin block out, the extractor slid out with ease. I have now taken the slide apart far enough to inspect and clean as necessary. Reassembly is in the opposite order. I am of the school of thought that springs are cheap and easily replaced wear parts on firearms so I took this opportunity to change out the firing pin spring for a new one.

After inspecting the firing pin for any damage or deformities, I placed the new spring on and set it aside. I took the time to scrub the firing pin and extractor channels to make sure there were no foreign materials in them.

Once cleaned, I dabbed a cotton swab in quality gun oil and applied a thin coat to the two channels, being careful not to over-lubricate these areas as excess oil is known to retain powder residue and foreign materials like lint and dirt which would send me back to square one with any slide issues. I re-inserted the extractor after checking it for proper tuning, then the firing pin and spring keeping the firing pin stop depressed to allow the pin and spring to fully reach "home" in their channel.

The firing pin block was started back into its recess, making sure to align the extractor's cutout with the block as I started it in. I then depressed both the firing pin stop and the firing pin itself to allow the block to slide back into place. Once I was satisfied everything was back together properly, I went back to the recoil assembly that started this whole adventure.

I removed the existing recoil assembly and replaced it with the new set of parts from Fusion, then topped it off with the factory reverse recoil spring plug. Next, I fed it back into its place in the slide. I then set the entire slide assembly aside for now. Far My pin punch is pointing out the thumb safety plunger that

must be kept in the frame for proper function of the safety. This will be pushed back into place with a small screwdriver covered in tape.

The new bobbed hammer gets rid of the protruding spur on the hammer while still retaining the necessary mass to get the firing pin to reliably detonate primers. It also looks great when you are done shooting and the hammer is down on an empty chamber as its geometry follows the existing lines of the rear of the slide with no spur sticking out. Best part is it allows use of the factory grip safety as there is an abundance of clearance and no need to fit another grip safety's pawl.

It was a "win-win" situation for me. To do the hammer replacement, I first must removed the mainspring housing by removing the grip panels and placing the pistol on its right side on a soft bench block. This allows use of a pin punch to push the mainspring retaining pin out. The mainspring and housing are under considerable spring pressure, so I upended the pistol and pressed the mainspring on my bench block to allow my punch to be removed. Easing



Above left: With the mainspring housing seated, my pin punch is keeping everything together as I make sure things lined up properly. Once I was satisfied, I upended the pistol and pressed on that housing to get the punch loose and started the pin back into place. Laying the pistol back on its right side, I was able to drive the pin home with my brass hammer. Above right: With the mainspring retaining pin seated, I tested the hammer by running it back over the sear. Two audible clicks, I'd say that is a success!

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Above left: With the mainspring housing seated, my pin punch is keeping everything together as I make sure things lined up properly. Once I was satisfied, I upended the pistol and pressed on that housing to get the punch loose and started the pin back into place. Laying the pistol back on its right side, I was able to drive the pin home with my brass hammer. Above right: With the mainspring retaining pin seated, I tested the hammer by running it back over the sear. Two audible clicks, I'd say that is a success!

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Once I was satisfied, I upended the pistol and pressed on that housing to get the punch loose and started the pin back into place. Laying the pistol back on its right side, I was able to drive the pin home with my brass hammer. Two audible clicks, I'd say that is a success! the pistol up to take spring pressure off, I cocked the hammer to help with the removal of the mainspring housing, then slid it right off without issue.

Fusion Firearms sold me the aforementioned parts as "drop-in ready" and they were true to their advertising. After taking the time to remove the old mainspring housing, which included the mainspring, mainspring plunger, and capture pin in the factory plastic part, I moved all of the internals into the new mainspring housing, slid it partially up into its slots, and then began work on the hammer replacement.

The sear spring had come loose, as it does with most 1911 pistols that have been stripped down for whatever reason. Pointing the frame down, I slid the sear spring back into place and started pressing the mainspring housing up slightly to capture the sear spring in place. I was sure not to fully seat the mainspring housing as this impedes the replacement of the hammer by putting spring pressure on the hammer strut and pinching the hammer pin in place. Next for removal was the thumb safety.

On models with a single lever, this is easily achieved by gently wiggling the safety between the "on" and "off" positions while gently lifting up on the part. The safety plunger may or may not try to abscond at this point and I had to make sure I didn't lose it! That's it for models like mine, with ambidextrous units first needing to have the left side removed as mentioned.

I then swung the right side lever up off of the retaining boss on the right side of the frame and then slid it out of the right side of the frame. This allows removal of the grip safety and will also expose the hammer pin, so I removed the grip safety and set it aside. The hammer pin only goes into the frame one way, so that it is captured by the existence of the thumb safety, but in this case it extends past the right side of the frame to provide the pin for the right side thumb safety's attachment.

I gently slid the pin out of the left side of the frame, allowing the hammer to be removed and carefully set the remainder of my frame aside. Using a bench block to support the hammer, I drove out the hinge pin that captures the hammer strut. Once the hammer strut pin was driven out, the strut was free and I placed it next to the bench block. I set the original hammer aside for my parts bin and placed the new hammer on the bench block and started the strut pin back into the hole.

Placing the strut back in its position and double checking to make sure the strut arced rearward (towards the shooter), I used a brass hammer to drive the pin back into place. This hammer and strut can now be checked for proper function (it should swing freely), placed back into the frame, and the pin seated to keep it in place. At this point, I started to reassemble the frame. Bringing the frame to level allowed the hammer strut to fall freely into place against the sear spring.

I gently placed the grip safety back into place and captured the grip safety by placing the thumb safety parts back into place in reverse order from when I took everything apart. Using a small flat blade screwdriver with some tape around the tip, I depressed the thumb safety plunger and seated the thumb safety back in place. Now comes the interesting part of seating the mainspring housing and starting the retaining pin.

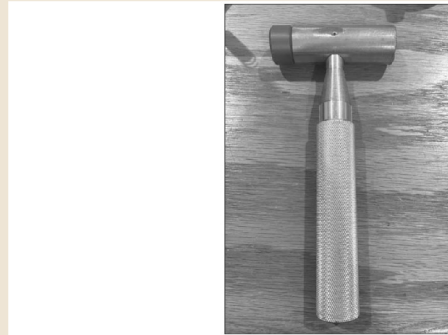
I made sure the hammer strut was lined up with the mainspring plunger and rested the new solid stainless mainspring housing on my bench block. I gently pressed the frame down onto the housing until I could get the pin started in its recess to keep everything in place. I then placed the frame on its side on the bench block and drove the mainspring pin flush with the frame. I checked the new hammer



Left: Attaching the grip panels back onto the pistol using the new grip screws from Brownells.
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for function and two “clicks” on the sear. Perfect engagement! I then checked function on the thumb safety levers and they effortlessly clicked into place in both the “on” and “off” positions. I left it in the “on” position to finish up my work. I reattached the grip panels using some new screws that I found on sale at Brownells, added the slide assembly back to the top of the frame, clicked the slide release into place (being careful NOT to “idiot scratch” the frame), and loaded a magazine with snap caps.

After three magazines full of snap caps that reliably fed, took a firing pin strike, and ejected, I was satisfied that my work was complete. Solving the problem was almost as much fun as actually shooting the pistol, and allowed me to go from the terrible pun of, “What seems to be the problem, Officer?” to having a reliably functioning carry pistol again.



Left: My brass hammer. I made this from scrap lying on my bench, even including a polymer tip for when I really want to take it easy on something. Every good machinist or gunsmith should have at least a few brass hammers in their toolboxes. This thing is worth ten times its weight in gold.
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I have recently started selling my old and spare parts to Numrich as this is away for other gunsmiths to be able to obtain parts I don’t want or need and it puts a little spare cash in the fund for my new parts. Thanks for reading, and I hope that this helps you, should you have a similar issue cross your bench. I’d like to give a special “Thank you” to Fusion Firearms of Venice, Florida and Brownells.

AG I made this from scrap lying on my bench, even including a polymer tip for when I really want to take it easy on something. Every good machinist or gunsmith should have at least a few brass hammers in their toolboxes. This thing is worth ten times its weight in gold.

FROM THE ARCHIVE

Limited Space Shops

A how-to on working in a shop with limited space.

BY ROBERT K. CAMPBELL MARCH 2023

ORIGINAL PP. 18–20

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Sometimes less is more. We downsized a few years ago and have really lived this.

The children are grown and the grandchildren are occasional visitors. A camping cot takes the place of a third bedroom. I have downsized my workspace a bit. My jobs these days are one at a time. I don't have a list of projects waiting—other than writing projects—and I am very selective what I take in for repair. When the firearm comes in the work is done as quickly as possible.

Sometimes there is await for parts and if the project is long term it is a personal project. The work area and workspace bears some discussion. Our home is 116 years old but has been adapted to a home business along with upgrades over the decades. The porch needed serious rebuilding—it should have lasted more than a hundred years, I suppose—and the wiring and plumbing is modern. The guns are secured in a safe, as they should be.

The parts are neatly stored in bins and an old food larder in the back room serves for ammunition storage. I have worked with limited space most of my career and have picked up some tips that help. It is ideal that we begin our career working as an apprentice to an The

smaller the area the more important offset is. experienced gunsmith. This isn't always possible. Many of us get our education online, in the service, in schools—and the “by God and by gosh” method is still viable.

With success, we move into gradually larger quarters. At some point we need to learn to make do with what is available and, increasingly, that isn't much. Property is at an all time high. I would hate to be a young person looking for a home or a business site at this time. There is a time honored tradition of gunsmiths working out of a building behind the home. If you have a garage with a door or a properly heated basement that would be good. For some work you don't need a lot of height.

As an example, the Garrett in my attic offers pleasant light for writing and occasionally for light gunsmith work. The attic slopes downward and you cannot stand upright near the window but that doesn't mean you cannot work there as I only need about four and one half feet to set and work. It's also possible to make more than one use of an area. As an example, the garage may hold a vehicle but can still have a roll-out work table that is used to in the floor space normally occupied by a vehicle.

Courtesy of Real Avid. Whatever type of work we do we need a designated area for it, even if it is shared by multiple uses. Work and home must be separated for safety and sanity. The space need not be elaborate. It cannot be too cramped but can be compact. You can add special tools as you go along, such as if you learn your business is best by specializing on one type of firearm rather than abroad number. When the time comes for power tools, a shed behind the home or a dedicated corner of the garage is needed.

I have seen shops take over the garage to the point a car cannot be parked in there. Well, car covers are cheap but don't let clutter take over. It isn't difficult to have a storage shed wired for electricity. More elaborate gear will follow. Then there are some like myself that have downsized and need less space. However, the bathroom laundry room and the kitchen table are not viable for most of us as we need a designated area to avoid interference with concentration and for safety.

The one thing you must have is good lighting. Most home lighting is soft, being easy on the eyes and comforting. To examine a firearm for damage and finish flaws, stronger light that would be too harsh for a home environment

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is needed. Fluorescent overhead lights are good with desk-type lights for maneuverability to add additional lighting as needed. You need a work bench. A handgun doesn't require as much work. Plan ahead and try to predict the likely chores your space will demand. It hangs neatly in an old food larder. space; a chassis rifle is another matter. For handguns, a sturdy rolling table is good. Don't neglect estate sales garage sales and yard sales.

I found a beautifully made, heavy combination bench and tool storage table that a home craftsman had custom made. It was good to find this piece and keep it in business as the original owner intended, kind of like reaching back in time and shaking hands with the man. The legs are strong and the surface about 24 x 48 inches, ideal for most uses. Mounting scopes, changing stocks, and other action work are easily accomplished. I use various hard plastic rests from Caldwell and MTM to stabilize rifles during work.

Handguns are done on the rolling laundry table with a hard top. For some These screwdrivers cover much of the author's needs. I suppose it is easier to take in the whole picture when standing. Of all the things I miss as middle age comes upon me, my knees are at the top of the list. Just the same, standing at the bench works with a sturdy chair to sit for close work. A swivel chair is good and the more adjustment the better.

When you mount a work board or tool holder on the wall be certain the wall will actually hold the weight. As an example, our old house has an attic that has little reinforcement on a walled off section. Even a few books on a book rack are too much. On the other hand, the heavy boards and treated lumber of the rest of the home are sturdy, stout in fact. But you have to know what they will take and support.

My main work area for handguns requires I slide the chair to butt against a closet door and pull the table to me. The tools are laid out on tables at each

elbow. A set of files and other tools hangs on the wall. In the attic is a walled off section with along clothes rod that was in the home complete with hangers when we purchased the dwelling. In each corner a section was cut out to accept a standard furnace and air conditioning filter. This was intended to fight dampness and mildew.

It is similar to storage space some use for expensive furs, although I doubt my humble abode ever housed a mink stole! Just the same, this is a useful spot for storing items subject to rust. It is good to have a mat on the floor of the work place. You will be surprised how much pacing and walking wears the floor and a mat is easily replaced. The work area must be kept well swept and cleaned. The gunsmith doesn't breathe who has not dropped small parts on the floor.

If the floor is dusty or covered in wood chips and metal shards it is very difficult to find small parts that have fell. And these days there is difficulty in finding parts that

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were once plentiful. Keep the floor clean and swept. Keep the tools that are most commonly used most handy. A storage unit that I have found among the best types for my use is a well-finished wooden jewelry box. This is a free standing box that is easily moved to a corner. The drawers hold a good many tools and parts. The lower drawer is an open space and the upper drawers are segmented. The lid lifts up for padded storage. While I could easily remove the jewelry pads I like the look and function.

The side doors open and have hooks originally designed to hold necklaces. These hooks easily hold parts, pistol magazines, and tools in their original packaging. Often called a jewelry armoire, the nicer types of such cabinets sell for less than two hundred dollars new but there's no point in paying that as they are common at thrift shops and garage sales for less than fifty dollars. Other storage cabinets are similar and as useful.

A partner's desk is another addition if you are able to find one, which is simply a desk that may be used from either side. It was originally designed in the Bob Cratchit times for those in small firms working together and sharing a desk. Be certain to keep the work place separated as much as possible for different chores. As an example, writing may take abstract thought

while mechanical work is concrete and logical. This limited workspace includes a couple of vises of different sizes.

They are simple enough to bolt down and are quite secure on a sturdy table. Let geometry be your guide. The vise should not be mounted on a light table that will tip over. I also have a retractable laundry line I use to keep paperwork tied up so I don't forget the project and instructions. It is simple enough to mount a few lines of instructions to complete the chore, then file the papers and close the retractable line. This was another yard sale find.

While my example is vintage, such retractable The MTM K-Zone shooting rest is adjustable for both rifles and handguns. It is also useful to hold firearms you are working on. laundry lines are available for less than \$13 new online or at chain stores. A few more tips. Metal filing cabinets show up often at yard sales. They are inexpensive and hold a lot of tools parts and paperwork. The heavy types are best as some of the smaller types with thin metal don't last long.

When you are working with limited space you usually have plenty of wall storage and even overhead storage may be put to good use. The problem is floor space. Rolling tables work well and so do folding chairs. A huge concern is the environmental factor. If you create dust and

wood shavings, keep them policed up. There are small and affordable dust removal systems that would be profitable. I travel to the outdoor range often so this means dirt and mud may be on my shoes.

Metal, dust, and wood are by products of our work. A good vacuum is a minimum. Don't neglect to purchase fans suitable for clearing solvents from the air. A box fan is good. We need to open a door and air the work area out from time to time. This is much more important when the space we work is small. I think when we hear the term "cottage industry" most folks don't really understand it.

Before the Industrial Revolution most things of value were made in individual cottages scattered across the countryside and delivered to a central location where they were assembled. Today my cottage is an old mill house and the quarters, while close, are not cramped due to careful husbanding of resources. They are cozy. Since I work a bit in the "shop" every day my movements are habitual. It is good to keep things arranged properly. Good luck to all expanding businesses with more employees and machinery.

As for those beginning, watch the pennies and carefully organize your gear. For those downsizing, it is good to make it this far. AG

PEOPLE & COMPANIES

Rock Island Auction Company

Rock Island Auction Company is a renowned auction house known for extraordinary antique collectibles, unprecedented results, and an overarching dedication to quality.

BY BILL SMITH MARCH 2023

ORIGINAL PP. 21–23

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Rock Island Auction Company (Rock Island Auction. com), is a premiere action house known for handling extraordinary antique collectibles and numerous famous firearms over the years. Established in 1993 by founder Pat Hogan, RIAC offers clients a great selection of collectible firearms and antiques and innovative sales approaches that have earned dedicated clientele from dozens of countries and driven a string of world sales records. There are a number of reasons why RIAC finds auction sales doing well.

As gun people, I don't have to explain the appeal to anyone reading this. Who doesn't enjoy adding anew, choice firearm to their collection? On a practical note, there is real investment value in collectible firearms. Consumers are turning to hard-value assets, such as antique RIAC hosts over twenty auctions each year. firearms, in spite of inflation because they tend to retain value.

Due to the popularity of their auctions, RIAC announced plans to expand to Bedford, Texas, with the second auction house slated to open in 2023, which will feature a firearms showroom, auction hall, vault, room for offices and shipping,

and more, making it unequaled in the auction industry. Specializing in the auctioning of antique and collector firearms and militaria, RIAC hosts over twenty auctions annually in three formats, catering to many levels of collecting expertise.

Premier Auctions are hosted three times annually and feature rare, unusual, historical, and high-condition world-class collectibles. Many world sales records have been set in this format. Sporting & Collector Firearms Auctions are made up of more affordable antiques, beginning collector's items, usable sporting arms, and many non-firearms lots. The origins of this auction format began in the demand for "everyday collector" guns. Finally, are the Arms & Accessories Day Auctions.

Different from typical timed online auctions, these events utilize live stream of licensed auctioneers to conduct the auction. While this online format does not have live audience or physical catalog, it is exactly like their other auctions. RIAC auctions can be in-person or conducted online, and interested

ROCK ISLAND AUCTION COMPANY CONTINUED

ORIGINAL PAGE 22

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buyers can utilize a number of ways to bid both live and in advance of the auction. Live bidding during the auction can be done in person, via telephone, or by using RIAC Live, which shows a livestream of the auction. Absentee bids can also be submitted to RIAC via their website, authorized thirdparty websites, email, fax, phone, or by mailing in an Absentee Bid Form. With all forms of bidding, participants must be registered to bid prior to the auction.

RIAC also actively seeks consignments catering to every level, from single items to collections. When people agree to consign, RIAC takes care of the photography, item descriptions, advertising, storage, insurance, as well as legal transfer and shipping to the buyer done for a simple percentage of the item's sale price. Recognized as an international firearms auction house, RIAC has a reputation for holding the most Examples include Ulysses S.

Grant's revolvers (left), Wild Bill Hickok's Smith & Wesson Model No. 2 Old Army Revolver (center), and a Napoleon six-piece garniture (right), prestigious events in the industry. One example was during their 2021 December Premier Auction, where they sold a six-piece collection from Napoleon Bonaparte, which auctioned at more than \$2.8 million.

In the past several years, RIAC hosted some of the largest firearm auctions ever, including December 2020 (\$22 million), May 2021 (\$30 million), September 2021 (\$24 million), and December 2021 (\$25.2 million). In 2022, RIAC hosted their May Premier Auction with \$28.2 million in total sales, with a pair of Ulysses S. Grant Remington revolvers selling for \$5.17 million on the opening day of the three-day auction that took place May 13-15; watch the video footage of the Ulysses S.

Grant Remington revolvers online (youtu.be/qZlb6MPyJ-c). Their August Premier Auction achieved \$23 million in total sales with the Star Wars Han Solo blaster headlining the three-day

event that took place August 26-28. The only surviving blaster originally used by Harrison Ford in Star Wars: A New Hope sold for \$1,057,500.

While the sales of items and collections making record-setting six and seven-figure auction prices certainly attract the most attention, this has led some to believe they could never afford to buy anything at RIAC. High-end sales are just one aspect and RIAC prides itself on catering to enthusiasts at every price point.

For example, with the different auction formats, RIAC caters to everyday pieces to the finest world-class collectibles, the sheer variety available keeps the auction house approachable for the average gun buyer while still offering the very pinnacles of the hobby. By regularly offering military firearms, antique firearms, and sporting arms, RIAC gun auctions appeal to collectors, investors, general gun enthusiasts, historians, target shooters, and hunters.

Firearm Sales Trends Rock Island Auction Company sales data indicates trends in gun collec-

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Examples include John Wayne's revolver from True Grit (right), Angelina Jolie's Heckler & Koch pistols from Lara Croft: Tomb Raider (center), and the Star Wars Blas Tech DL-44 Blaster used by Harrison Ford as Han Solo (right). tion pricing and demand. First, antique muzzleloaders often make for some of the most impressive display pieces in gun collections. From the Civil War era, perhaps the most famous Civil War repeating rifle, the New Haven Arms Co.

Henry rifle, is also one of the most recognizable collector guns today. Revolvers of the Old West offer both historical value and Hollywood appeal, having been the sidearm of choice for countless lawmen, desperados, homesteaders, and cowboys who braved the frontier, both in real life and on the big screen. Early percussion Colts like the Colt Dragoon area gun collecting cornerstone, as is the Smith & Wesson First Model Schofield single-action revolver.

Winchester lever actions of the era are another collection must-have, remaining popular as a collectible and Cowboy Action Shooting

mainstay. The "Improved Henry," better known as the Winchester Model 1866, is often hailed as "the first cowboy rifle" and is also the first rifle to bear the fabled Winchester name. In World War I era firearms, the distinctive Luger is often called the most famous pistol in modern warfare.

Manufactured in numerous variants, Georg Luger's creation was one of the most widely carried sidearms of WWI and beyond. "Old Slabside" 1911 handguns being the longest-serving sidearm in U. S. military history, remaining very popular and a staple in collections.

Moving to the World War II era, the M1 Garand is popular due to Georg Patton's admonishment of it being "the greatest battle implement ever devised", its use in the millions by American GIs from 1936 to 1959, and its popularity by the Civilian Marksmanship Program in their CMP Games and the Garand Collector Association. As more individuals build their portfolio of

alternative investments, other pieces of history garner interest and a subsequent increase in sales.

The Russian M1891 Mosin- Nagant rifle, invented in 1891, has seen increased popularity since 2015. When RIAC conducted an audit of more than seven years of their auction history, they found that in only a six-year span the average Mosin Nagant price at Rock Island Auction Company more than tripled, a dramatic surge in value that equals or surpasses some of the hottest collectible guns on the market right now by growth percentage.

In 2015, a Mosin Nagant averaged \$211.83 in price, inching up another \$32.33 in 2016 before rocketing up more than \$200 in 2017 and holding that average for the next three years before continuing its impressive ascent to its current \$692.69 mark. If investing in firearm collectibles appeals to you or if there's that one gun that would be the perfect fit in your gun safe, Rock Island Auction Company is an ideal place to begin your search. AG

FINISHING

Reader Forum

BY AMERICAN GUNSMITH EDITORS MARCH 2023

ORIGINAL PP. 24

Flitz on Nickel Plate I started working on a nickel-plated S&W Model 10 made in 1977 that had been exposed to something that dulled the finish. Not terrible, but it needs some areas touched up. Is Flitz good for polishing a nickel-plated firearm? Is there anything better? Robert Joseph Ward From Paul Mazan. Flitz would be a good product to try first. Failure or success is dependent on many issues. The age and condition of the plating as well as the type of plating it is will all affect the outcome.

Commercial plating is much heavier (thicker) than an electroless nickel. On many old guns, the plate will already be separating from the base metal and any abrasion is likely to simply cause it to flake off. In addition to all that, many older guns and war souvenirs were chrome plated in the '50s. Normally on a gun where the plating is just dull, a superfine abrasive product and a rag to apply and polish it is all that is needed. I have successfully used polishing wheels and fine abrasives as well.

Your best bet is probably to start out with a polish like Flitz and see if that gives you the result you are looking for. If that is not successful, evaluate if you have any plating flaking off. If you do, your only option is to leave it as is or strip it and replating. If the finish is intact you can always move up to an automotive or gunstock polishing compound like Brownells FFFF stock polishing compound for example and hand polish.

I wish I could be more definitive but without seeing the gun that is the best advice I can offer. Good luck with your project. From RK Campbell. I studied this awhile. Stainless is okay to polish. Parkerizing absorbs oil and actually looks better the more oil there is. Nickel should simply be cleaned. Factory nickel is good. It is the general after market types that are seen chipped and peeled in the pawn shop. I would be very hesitant to use any type of abrasive.

Nickel is resistant to corrosion more than it is to wear. I think I would clean nickel with denatured alcohol. As for a desire to polish, it is possible but I would remove the grips and apply the compound briskly over a surface that is normally hidden and see what happens. Next, the underside of the barrel. Remember many nickel handguns have a different appearing finish due to the factory polish—the area of the sights, as an example, might be frosted and the sides be highly polished.

I think a very good cleaning and a jeweler's rouge would be the best thing to proceed with. From Ray Ordorica. I'm not sure why anyone would need to polish a nickel-plated gun. I've owned, carried, and shot my nickeled S&W Model 29 since about 1975 and have never polished it. The plating is still in perfect condition. I've never used Flitz but have had excellent success on most metals with MAAS metal polish.

Still, I'd recommend against excessive polishing as this could eventually wear through or scratch the plating. Muzzleloading Cleaning That portion of your audience that is new to muzzleloaders, and presumably black powder, may wonder the best cleaning techniques. As a youth, I shot those guns, muskets and rifles, for several years. Some of my guns dated to the early 1800s, so they were precious and warranted good care. My chosen cleaning regimen: soap and water.

I'd separate the barrel from the stock, remove the breech plug, put the barrel in a pot of soapy water, and run a patch up and down, scrubbing the crud out. Then rinse with hot water, dry, and oil. For the lock, the same basic procedure, but scrubbed with a tooth brush. In the field, a lot of shooting will also coat the bore with crud. A small load of powder and a dry patch followed with an oiled patch will allow a wet patch on a worm (maybe with a bit of water as well) to loosen and partially clean the barrel.

I'm sure more modern methods with commercial products are popular now. Various "Moose Milk" recipes can also work: one version calls for about one part Ballistol to three parts water, another uses equal parts Murphy's Oil soap, rubbing alcohol, and water. However, for me, soap and water worked well and saved money for spending elsewhere. J. C. Tate, CDR USN (Ret.) AG

SEARCHABLE ISSUE RECORD

Archive index

Real Solutions American Gunsmith Editors	2	Limited Space Shops Robert K. Campbell	18–20
AR-15 Barrel Extension Fitting Joe Carlos	3–9	Rock Island Auction Company Bill Smith	21–23
Glock Ultimate Tool Kit Earl Roberts	10–12	Reader Forum American Gunsmith Editors	24
Officer Model Fixes Robert M. Layng	13–17		

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