DEC 2014

DIGITAL ARCHIVE EDITION

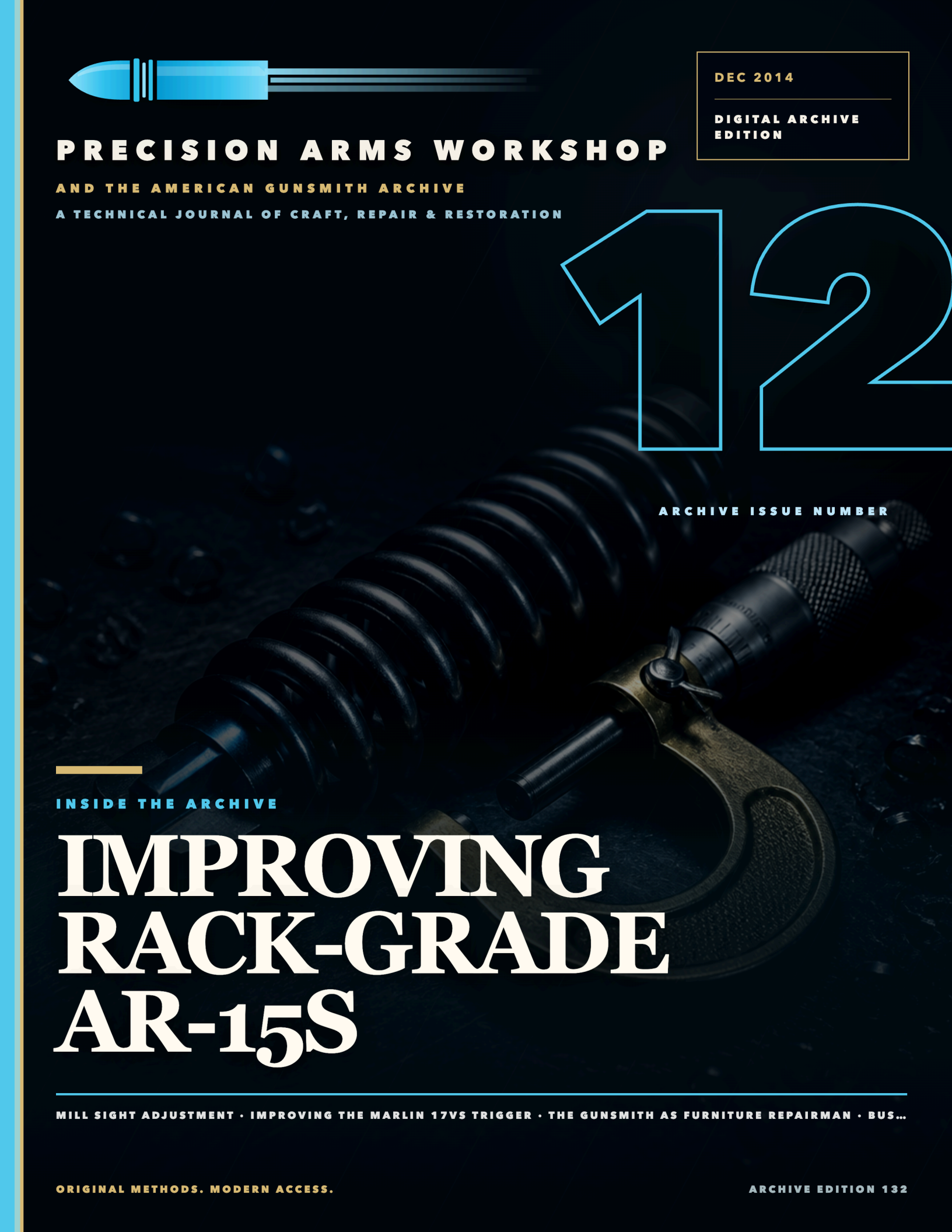
# PRECISION ARMS WORKSHOP

AND THE AMERICAN GUNSMITH ARCHIVE

A TECHNICAL JOURNAL OF CRAFT, REPAIR & RESTORATION

12

ARCHIVE ISSUE NUMBER



INSIDE THE ARCHIVE

# IMPROVING RACK-GRADE AR-15S

MILL SIGHT ADJUSTMENT · IMPROVING THE MARLIN 17VS TRIGGER · THE GUNSMITH AS FURNITURE REPAIRMAN · BUS…

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 · DECEMBER 2014


## ISSUE RECORD

| | |
|---|---|
| ORIGINAL DATE | December 2014 |
| VOLUME | Archive volume not stated |
| ISSUE NUMBER | 12 |
| SOURCE ID | ag-6d4761993d653e3cf9d985dd |

## 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 December 2014.

MILLING

# Mill Sight Adjustment

BY AMERICAN GUNSMITH EDITORS DECEMBER 2014 ORIGINAL PP. 2

A tip from gunsmith Patrick Sweeney. A neat trick you can perform with a mill is to adjust front and non-adjustable rear sights. Say your pistol is hitting low and you want to adjust it. The calculation involves four figures: The amount you need the bullet moved on the target, the distance to the target, the sight radius of your handgun, and the amount of correction of the sight blade. The ratio of the bullet correction to the distance to the target is equal to the ratio of the sight correction to the sight radius.

For example, let's say a pistol with a sight radius of six inches is hitting two inches low at 25 yards. Convert the yards to inches and we have 2/900 = C/6, where "C" is the correction to the front sight. Multiply both sides by six and we get 6 X 2/900 = C. Thus we find that our correction will be to mill 0.013 inches off of the top of the front sight. Another way to do the same thing is what a gunsmith friend of mine does. He checks all handguns with a sight-in distance of 28 yards. Why 28 yards?

Because it is close enough to 1,000 inches (1008 to be precise) to make the math easy. Simply, any error on the target, in inches, times the sight radius, is his correction on the sights. A one-inch error at 28 yards with a six-inch sight radius means 0.006 inch of correction. How to make the correction: Clamp the slide in your mill vise, level it, and then dust off the top of the front sight by the calculated amount. Deburr, cold blue and you are done.

If you are hitting too high, and your fixed rear sight has enough metal, you can do the same thing to the rear sight with one extra step. After you have dusted off the top of the rear sight with your end mill, switch to another end mill the same size as the rear sight notch (usually .125 inch) and deepen the notch by the same amount you had just lowered the top of the rear blade. If you didn't do this, the notch in your rear sight would be shallower than it was before you started.

When you de-burr the edges of the rear sight, be sure to slightly round the corners on the outside, so you won't cut your hands handling the pistol. Cold blue the exposed steel, and you are done. You can do the same job with a file, but you must be very careful. Even the slightest tip in your angle of filing will leave the front sight top angled. A visible angle on the top of the sight makes aiming difficult. If you plan to file, file to a depth short of the required depth.

Then carefully, and with the finest file you have, file down to the required depth. Check your work regularly, to make sure you are filing evenly. For more detailed advice on adjusting pistols and revolvers, check out Gunsmithing Pistols and Revolvers, 3rd edition from Gun Tests in the Books section. Gunsmithing Made Easy: Projects for the Home Gunsmith is also available and has additional useful information. Both can be found online at Gun-Tests.com/subscribe.

FROM THE ARCHIVE

# Improving Rack-Grade AR-15s

*Achieving high performance from low-bid uppers.*

BY JOE CARLOS DECEMBER 2014 ORIGINAL PP. 3-9



I mostly write about National Match Course guns but also have valuable information on making battlefield guns perform better. This article will show how to shrink group sizes with AR-15s built with skinny A2 contour, chrome-lined issue barrels down to around two minutes of angle with M193 55 grain ball ammunition. This will also work M855 62 grain (green tip) but groups will usually be fatter because that ammo isn't as precise.

The quality of the barrel will have a huge vote in the outcome and, unfortunately, there are many substandard chrome lined ones out there. The specific lot of ammo will also be important. A Strong Foundation The first article I wrote for American Gunsmith was "The Relationship Of Accuracy To Barrel Extension Diameter In The AR15" in March and April 2013.

I wanted that published first because barrels are held in the upper receiver of Stoner platform rifles by a barrel nut, which does an adequate job of reducing front to back movement of the barrel in the receiver but not as good removing sideways or up and down movement. In fact, there is so much movement you might be able to detect it with the naked eye. I first noticed this flaw while com- Bottom 001" shim stock about ¾" wide and 2 ¼" long. Bottom peting in Australia with the Army Reserve Marksmanship Program.

In fairness, Stoner's design was never intended to be a match gun. We can fix this problem by fitting an extension to the receiver, ensuring we have a strong foundation on which to make additional improvements. I suggest studying that article for particulars but I'll review high points here. This can shrink average group sizes by about 35%! Start by disassembling the upper down far enough to get the barrel off. Degrease both the barrel extension and the inside of the upper receiver.

After allowing sufficient drying time (I recommend overnight) cut apiece of 0.001" thick shim stock about ¾" wide and 2 ½" long. Wrap that around the back of the extension insuring the gap between the ends of the shim stock occur in the up position, evenly spaced on either side of the extension pin. Try to slide everything back together. If things go together too easy you'll need to cut a slightly longer piece of shim.

On the other hand, if you can't get the barrel extension back into the upper, take a little off of the shim ends. Continue by trial and error until you get a nice tight fit, then pull everything apart. This pre-fitting also develops "memory" in the shim stock that will make final assembly much easier. Coat the entire extension and inside of the receiver where the barrel extension contacts with Loctite Green 620. Wrap the fitted shim stock back around the rear of the extension and coat with more green Loctite.

Carefully slide everything back in place paying attention to movement of the shim stock. It may want to slide forward and if it goes too far it will curl up between the extension flange and the front of the receiver, resulting in a high spot that the barrel can pivot around. Pull everything apart and start over if you suspect this of happening. Loctite 620 is slippery and slow drying which facilitates getting things right.

After everything is assembled wipe excess Loctite off the male receiver threads and install a barrel nut at a temporary torque of 60 foot-pounds. Clean up any excess Loctite on the inside of the front of the receiver and the back of the barrel extension. Allow sufficient drying time before firing. I prefer at least three days. After drying, time up the barrel nut so the gas tube and bolt carrier key are in prefect alignment. Getting this right in any AR-15 can substantially improved accuracy.

I go into detail in "Gas Tube Alignment" (American Gunsmith, March 2014.) Flash Suppressor While waiting on the Loctite to set, move to the other end of the barrel and correct things around the flash suppressor. Most flash suppressors are put on by gorillas. Whether the gun you are working on has the older peel washers or the newer crush washers (the term itself scares me) they're usually put on with too much torque.

I suggest replacing a crush washer with peel washers and like having the flash suppressor back as far as I can get it to time up. Smart

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-3CF9D985DD-A1843-P04-F01. Know the rights holder? Please ask them to contact us.

AG-3CF9D985DD-A1843-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-3CF9D985DD-A1843-P04-F02. Know the rights holder? Please ask them to contact us.

AG-3CF9D985DD-A1843-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-3CF9D985DD-A1843-P04-F03. Know the rights holder? Please ask them to contact us.

AG-3CF9D985DD-A1843-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-3CF9D985DD-A1843-P04-F04. Know the rights holder? Please ask them to contact us.

AG-3CF9D985DD-A1843-P04-F04

Above center: Wrap the shim stock around the bottom of the barrel extension and coat with Green Loctite. guys claim too much torque on the flash suppressor can crush and deform the muzzle and crown, causing bullet deformity. Some gun builders over react and insisted on only hand tightening and using Loctite Red 271 but I've found this works loose. I use a torque wrench at three foot-pounds along with the Loctite.

That doesn't sound like much, but it's more than I can back out with a gloved hand and I haven't had one work loose yet. Needless to say, both the male threads on the front of the barrel and the female ones inside the flash suppressor need to be thoroughly degreased and dried before assembly the day prior in conjunction with the barrel extension and front of the receiver.

I have to admit that when I was first searching for the right amount of torque to apply to the flash suppressor my first attempts were higher, though not as high as the military-recommended 15-20 footpounds. I've had occasion to return a few NMC barrels to their manufacturers for follow up lapping. In some cases those barrels were assembled onto upper receivers and had flash suppressors attached at the slightly higher torques I was experimenting with. Lapping is a polishing process done by hand.

It obviously adds time and cost to the end product so not all barrel makers do it. Those custom barrel makers that do have a real feel for what is right and what isn't. In every instance, regardless of the fact that different barrel makers were involved, I always received unsolicited comments noting a constriction at the muzzle. That's when I backed off my torque to the three foot-pounds I use today.

I have machine rest tested with the heavy factory torque and then a lighter torque, revealing immediate improvement in group size. Having bad mouthed excess constriction at the muzzle and highlytorqued flash suppressors, you may believe this is always bad. Not so fast! There was a theory tracing back to 19th Century barrel making that a very slight taper in the bore was a good thing, though I've never seen actual numbers for the beneficial amount.

More recently, Black Star, the folks in Texas that used to electropolish rifle barrels (a process that removed slight amounts of metal) with the goal of ending up with a uniform and very subtle taper to the bore slightly tighter at the muzzle. While the company folded due to an acid in their polishing process becoming so regulated that storage and disposition became too costly, the Army Reserve Service Rifle Team had used match barrels processed by them with success.

Both the Army Reserve and the National Guard shooting teams tinkered with this theory. I call it the "Poor Man's Taper Bore." It isn't a true taper because only the muzzle is manipulated. A better description might be "Controlled Muzzle Constriction." It is pretty intuitive that if five foot-pounds of torque on a flash suppressor constricts the muzzle a little then fifteen foot-pounds constricts it more.

This led us to wonder if there was some optimal and repeatable amount of torque that would apply just the right amount of constriction to somewhat mimic the alleged accuracy enhancement of a true tapered bore. I fooled with research on the idea for a short spell and when I didn't see much coming of it I dropped it. The National Guard team was a bit more thorough.

That said, Derrick Martin, one of the Guard's smart guys and author of The Complete Guide to AR-15 Accuracy, mentions many successful techniques developed during this time period but nothing about manipulating flash suppressors. One reason for dropping the idea is likely because this can be rifle specific. One gun might want one foot-pound of torque while the next one prefers four, requiring time consuming testing and tuning of each specific rifle







in a machine rest. Most of us would expect rifles with standard 0.219" lands and 0.2240" grooves to have different torque requirements than barrels with tall 0.218" lands and slightly deeper 0.2245" grooves. As far as I am concerned, the jury is still out on "Controlled Muzzle Constriction" but it might be an interesting project for a gunsmith with time and a quality rifle machine rest to pursue. Note, the previous discussion was about controlling muzzle constriction using torque.

That is not the same as controlling the position of the flash suppressor which is an entirely different science and one that Bottom Drive the other pin out and make careful cuts with the taper pin reamer, checking the fit frequently. This pin indicates the need for increased cut with the reamer. I have nailed far better!

All of us can picture the difference in a flash suppressor which is screwed onto a barrel with just a single 0.002" section of peel washer compared to the same suppressor and barrel with a 0.145" crush washer. In the first example the suppressor sits back further. This front to rear positioning of the suppressor influences harmonics. Front Sight Taper Pins A short movement rear on the barrel finds the next accuracy robber: Taper pins holding most issue front sight assemblies in place.

Once again, these Below center: Coat front sight assembly barrel bands with Green Loctite. are hammered in by gorillas at the factory, degrading accuracy a bunch. Barrels rifled with the button method or hammer forging don't remove metal but displace it, leaving a lot of stress in the metal that has to be removed. Most issue A2 barrels are button rifled and stress relieved before the front sight assemblies are installed. According to theory, anything done to the outside of the barrel influences the inside of it.

An example is fluting. If a button rifled or hammer forged barrel is fluted after being stress relieved this can result in dimensional changes inside the bore of the barrel, impacting accuracy. Another example of changes outside the barrel resulting in internal changes involves the taper pins holding the front sight assemblies in place. These are driven in hard to insure they don't back out during rugged use.

The theory says that doing so causes a constriction inside the bottom of the bore in line with each pin, so all bullets passing the first pin are deformed and then deformed a second time (about 1/7 of a turn) again as they pass the forward pin. Thus, the bullet is boogered twice and on different points on its circumference. This can degrade accuracy a fair amount. I have performed machine rest tests and found a noticeable improvement in accuracy by correcting this issue.

Before discussing a fix, I can say you'll see the most improvement in stainless or chrome-moly barrels that aren't

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-3CF9D985DD-A1843-P06-F01. Know the rights holder? Please ask them to contact us.

AG-3CF9D985DD-A1843-P06-F01

*Original caption: Top: Insert a spare gas tube through the hole in the handguard end cap and corresponding hole in the front sight housing to maintain their alignment while Loctite dries. chrome lined as these seem to "bounce back" well. Chrome-lined barrels will also improve and need all the help we can give them but improvement may not be quite as noticeable as the chrome may not be as "elastic" as regular barrel steel so the deformities inside the bore don't iron out as readily. There are two ways to do this.*

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-3CF9D985DD-A1843-P06-F02. Know the rights holder? Please ask them to contact us.

AG-3CF9D985DD-A1843-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-3CF9D985DD-A1843-P06-F03. Know the rights holder? Please ask them to contact us.

AG-3CF9D985DD-A1843-P06-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-3CF9D985DD-A1843-P06-F04. Know the rights holder? Please ask them to contact us.

AG-3CF9D985DD-A1843-P06-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-3CF9D985DD-A1843-P06-F05. Know the rights holder? Please ask them to contact us.

AG-3CF9D985DD-A1843-P06-F05

I will cover the most intuitive first. Drive out either one of the two pins. The second pin is left in place to keep the alignment of the front sight near top dead center where the manufacturer (hopefully) located it For a secure fit, enlarge only the pin holes in the barrel but not the sight housing. This hole needs a little more cut. initially. Remember, these pins are tapered and only come out if hammered on from the left (bolt catch) side of the barrel where the pin is smaller.

Support the barrel when doing this, such as using a Brownells AR-15 Front Sight Bench Block. This block is made of polyethylene and has some "springiness." For more rigid support turn a standard metal bench block upside down. Once that first pin is out put some cutting oil on your taper pin reamer (Brownells #080-000-674AK or Size #0 from MSC Industrial Supply.) The reamer needs to be inserted from the fat side of the hole on the right (ejection port) side. Check your progress frequently to avoid hogging too much.

Spray out the metal cuttings and make trial fittings by pushing the pin in by hand. You want to stop at a point where some modest raps with a small hammer are needed to secure the pin. Leave that fitted pin in place temporarily and drive out the second pin. After cleaning off the shavings from the reamer, apply more drill oil and use as before. When you are satisfied, completely disassemble and thoroughly degrease everything. After thorough drying time, use the green Loctite of your choice.

Green 638 dries faster, while 620 is thicker in consistency and is the one I use if I get a little heavy handed with the reamer because it is designed to fill spaces. Apply your Green Loctite to the barrel where the front sight bands will be, inside the bands themselves, on the pins, and squirt it into the pin holes. It is good practice to insert a spare gas tube through the triangular handguard end cap and into the front sight housing during the drying period, but be careful not to get any Loctite on it.

It is common for some to migrate during assembly and it will often end up "welding" the end cap in place. Temporarily inserting the gas tube ensures that the hole in the end cap is properly lined up with the corresponding gas tube hole in the front sight housing. Remove excess Loctite from the barrel, front sight housing, and pins and allow a couple of days for everything to set up.

The second method is no more work than the first and is the technique I always employ on any "Go To War" gun I am working on because I believe it gives a firmer pin hold. Drive out both pins and remove the front sight housing. The Parkerized finish was applied to the barrel after the front sight was put in place. Even after the pins have been taken out you will need to beat the front sight off the barrel with some sort of non-

marking device such as a wooden mallet. With the front sight housing removed, put a mild chamfer on the gas port. The chamfer will funnel gas into the corresponding hole in the sight housing in the event that the housing isn't exactly top dead center. If this is a previously-fired barrel that functioned flawlessly in the past you can skip this chamfering step. Do not cut out any metal on the front sight housing at all with your taper pin reamer. Just insert the reamer in the taper pin hole in the barrel.

Cut gradually and use frequent trial fittings of the pin to get the fit you want. This will give you full pin contact with the housing (on both ends of the pin) but will still relieve the bulge inside the bore that was caused by pins being hard driven into the holes in the barrel. Finish the process with a thorough degreasing of all parts, proper drying, and assembly with Loctite as described above. So far we've concentrated on making improvements on stock guns without replacing any parts.

Now we'll look at using upgraded parts. Match Bolt Carriers True match bolt carriers are usually fatter than stock carriers and have more bearing surface that is better polished than stock carriers, resulting in more consistent lock ups and potentially improving accuracy. Since the bolt carrier is locked up with the rear of the barrel when in battery it will influence harmonics and can improve or worsen group size.

There is no way to predict this, requiring testing with the stock carrier and comparing to the match carrier. Match carriers sold by Young and Les Baer have shiny, chrome-type outer finishes. Those by JP Enterprises have a black "self lubricating" finish (these require lubrication, however) that resemble an as-issued appearance. Regardless of carrier used, keep it clean, lubed, and it will function to its potential. Don't be afraid to add lube to the carrier during range sessions.

When new, don't assume a replacement carrier's key will line up properly with the gas tube. Perform the diagnostics and alignment tasks to the gas tube as outlined in my 2014 article, "Gas Tube Alignment In The AR15." Replacement Barrels If you really want to step up performance, replace the barrel. There are a number of barrel characteristics to consider when making a selection.

A lot of research on this was done by competing US military teams back in the 1980s as militaries around the globe were adopting other types of competition shooting courses in addition to traditional bullseye to better train soldiers to survive in modern combat. Innovative new courses of fire were developed in Commonwealth countries, mostly in Britain and Australia. Time limits for the new matches were short and there was a lot of physical activity like running and obstacle negotiation.

Many of the courses of fire got shooters off of their bellies and into other positions common to real combat situations. The National Guard and Army Reserve sent teams to both countries as well as Canada and South Africa to compete and learn. In addition to being an author, Derrick Martin was one of the Guard's better shooters and is an ac- From top, Les Baer, JP Enterprises, and Young Manufacturing. complished gunsmith and owner of Accuracy Speaks (accuracyspeaks. com).

Being competitors at the time, it wasn't until I read Derrick's book that I realized how parallel our research and conclusions were. Smart guys like Frank White, Albert Turner, and Bill Wylde had already made great strides with the black rifle by mostly working on bullseye guns and I freely admit to copying and adapting some of their ideas to rackgrade guns. Here is what Derrick and I found regarding combat rifle barrels. First, twist rate. Issue barrels are currently rifled one twist every 7 inches.

That is overly fast for most bullets. M855 stabilizes in 1:10 or 1:9 twist barrels. The faster 1:7 was adopted in an attempt to get better performance out of the tracer round which is longer than 62 grain ball and requires a faster twist. Another common bullet is M193 55 grain FMJ that the original M16A1 used. Stoner initially used a 1:14 in the first M16, which was increased to 1:12 because of concerns the slower twist might not stabilize bullets in extreme cold.

At the time there was fear that Russia might invade us through cold climates in Alaska or Canada. I have shot 55 grain FMJ bullets in 1:12, 1:13, and 1:14 twists with stellar results in Pennsylvania winters. The lesson here is use the proper twist rate to stabilize the bullet you plan to fire. Don't over spin bullets, espe-

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-3CF9D985DD-A1843-P08-F01. Know the rights holder? Please ask them to contact us.

AG-3CF9D985DD-A1843-P08-F01

*Original caption: Right top: National Match Course shooters use float tubes to eliminate sling pressure on the barrel. Compass Lake Engineering tube (top) is 1 ¼" diameter and adds 1 ¼ pounds. The fatter 1 3/8" from Northern Competition weighs 1 ¾ pounds. Right bottom: Carbinelength upper with popular ventilated handguard that removes sling tension from the barrel. cially military FMJ types. Doing so only exacerbates any ammo imperfections and makes guns shoot less than optimal.*

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-3CF9D985DD-A1843-P08-F02. Know the rights holder? Please ask them to contact us.

AG-3CF9D985DD-A1843-P08-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-3CF9D985DD-A1843-P08-F03. Know the rights holder? Please ask them to contact us.

AG-3CF9D985DD-A1843-P08-F03

This is good advice regarding match guns and bullets as well. I covered chambers and reamers in detail ("AR-15 Chamber Selection", August-October 2014) where I discussed the amount of free bore in NATO chambers. All the slop is warranted in dirty battlefield conditions but it certainly ruins accuracy. Both Derrick and I found that shortening the free bore resulted in better accuracy. The NATO chamber causes 62 grainers to jump at least 0.158" and 55 grainers to jump about 0.085".

Both are like football fields in length from the bullet's perspective and any bullet not perfectly seated concentric with the body of the casing is going to enter the throat of the barrel at an angle when jumped those kinds of distances. A Wylde chamber shortens jump lengths to roughly 0.056" with 62s and 0.050" with 55s, increasing accuracy a bunch. I have never experienced any pressure issues firing issue ammo in Wylde chambers.

According to Derrick's book, the Guard ordered a special reamer that shortened their jump down to only 0.015". He mentions this one change shrunk machine rest group sizes by a very substantial 50%. Whatever chamber you choose I suggest polishing it per instructions in "AR-15 Chamber Selection" (July- September 2014) resulting in significantly better function. If you elect to keep the issued chrome-lined barrel remember the chamber is also lined. Concentrate on a mild "kiss" of the chamber with the polishing hone.

You don't want to end up polishing though the chrome lining and into the underlying metal. Next, land and groove numbers. The military uses six groove barrels but this isn't optimal. They could easily change but refuse to listen to competitive shooters. I guess if a general officer didn't think of it, it ain't worth considering. Derrick Martin and I would be considered old timers by most, having grown up shooting M14s at bullseye targets and earning our Distinguished Rifleman and President's Hundred that way.

Occasionally, our range shooting was held up by cease fires called on the line to let dinosaurs pass downrange. During those days the rumor with M14 barrels was odd numbered lands and grooves (three or five groove) shot military ball ammo "more better" than even numbered. I had Boots Obermeyer (obermeyerbarrels.com) make me a 5R for one of my M1As and it was the best .30 caliber barrel I ever owned or tested, bar none!

Not only did it shoot match ammo but it also performed well with military-issue "Special Ball", a cartridge loaded with 173 grain FMJ bullets designed to improve M14 performance. Fast forward from Derrick's and my experiences shooting ball ammo in M14s to our quest to improve M16s, it should come as no surprise we tried barrels with odd numbered lands and grooves. Derrick experimented with three groove barrels at the same time I tried five grooves.

Both of us found the odd groove barrels shot 5.56mm ball ammo better than six grooves. Today, you can get button-rifled three groove barrel blanks from Pac Nor and Lilja, and five groove blanks with polygonal rifling from Pac Nor. Broughton button rifles a five groove barrel blank with what they calla "canted land" similar to 5R designs by other custom makers. Bartlein and Rock will provide 5R cut rifled blanks and Satern will give you a cut rifled drop-in complete AR barrel with 5R rifling and a Wylde chamber.

Any of these barrels can be left fat (about 1" diameter) to add weight under the handguards or turned to a skinny A2 contour. One advantage of three grooves over five is the wider area to locate the gas port hole. With more and narrower grooves, drilling the gas port more likely nicks or cuts a land.

Cutting a land with the gas port may not impact accuracy in the long run but it makes break in more difficult and one can significantly damage the barrel when dealing with heavy copper deposits forward of the port when a land is cut or nicked. I cover this in detail in "Gas Gun Barrel Break-In" (October 2014) and recommend reviewing the material.

With a quality three or five groove barrel from the makers listed above and a Wylde or shorter chamber you can expect ten shot groups with a decent lot of 55 grain ball approaching one MOA with slightly larger groups with green tip.

Regardless of using chrome-lined barrels or replacing with something more accurate, I recommend thorough cleaning after each range session for optimal performance. All barrels benefit from a proper break in. Removing Sling Pressure Shooters gain stability by wrapping their weak arm through a properly adjusted sling for support. A sling helps, and I have used it on the battlefield in combat with both the M14 and the M16 and continue to use it with my Anschutz rifles for squirrel hunting.

My squirrel rifles have free floated barrels so I am not applying any pressure to the barrel via sling tension. Rack grade M16s attach the forward sling swivel to the front sight housing and sling pressure is applied directly to the barrel, flexing it. In regular rack-grade M16s the barrel extension also moves inside the receiver, however, we fixed most of that by adding shim stock and Loctite during our improved assembly techniques.

Shooters using slings will notice quite an improvement with a properly assembled AR compared to one thrown together per the common military and civilian assembly manuals. Unfortunately, sling pressure still causes some temporary bend to the barrel, influencing zero, especially with optics. If the customer elected to replace the skinny stock barrel with a full one-incher under the handguards it will resist some bending.

The fatter barrel weighs about one pound more and it is a further advantage moving the sling attachment point off the barrel. National Match Course shooters do this with a float tube. This also adds weight and traps in barrel heat but the finished rifle still resembles an issue rifle externally. The added weight might not be welcome in hunting or combat and holding in barrel heat is never a good thing.

A plethora of other float tubes have entered the market and many of them are much better ventilated and lighter than NMC units. Certainly these are options that you and your customer may wish to discuss, especially if the customer uses a sling. Experience Earned Bear with me for just a moment while I climb up on my soap box. I've been associated with military shooting teams since the mid-1980s. During this entire period these teams have been under utilized, underfunded, and misunderstood.

Until our wars in the Middle East I was one of the few members of the Reserve Team that had a combat patch. Generals and bean counters tended to think that all the shooting teams did was punch holes in paper and win trophies. When 9/11 hit all that changed real fast, however. Reservists and National Guardsmen from their respective shooting teams stepped forward and volunteered.

Some were sent into combat but, fortunately, enough people in charge had the sense to assign most of the shooters as instructors and range cadre at the various Mobilization Stations or Power Projection Platforms. At these Mob Stations each soldier has to review and demonstrate proficiency in his particular job skills, be it Infantryman, Motor Transport Operator, or Human Resources Specialist. Everyone also has to qualify with his individually assigned weapon, usually an M16/M4.

I have all the respect in the world for Drill Sergeants and was one for many years, but Drill Sergeants have to cover all the tasks taught in Initial Entry (basic) Training from Drill and Ceremonies to Combatives. If your son or daughter was mobilizing, would you want any random Drill Sergeant supervising their marksmanship training or would you rather have an instructor that wore a Distinguished Badge on their chest and a President's Hundred Tab on their sleeve?

When experience in the Gulf demonstrated the need to reach out a little farther on the battlefield, the active component considered all those old Viet Nam-era M14s that had been stored away. However, few personnel knew squat about M14s or shooting at distance because many active duty soldiers put in 20 years to punch the retirement ticket and get out, leaving no institutional knowledge.

Reserve component soldiers (Guard and Reserve) tend to stick around longer because the military is supposed to be part time, with some remaining 30 or 40 years. Many on the two reserve shooting teams not only knew the M14 but had earned their Distinguished Rifleman badges with them and were able to show the active component how to do things right. The level of commitment went even further than that. With only 20 or 30 people slotted a military rifle team there wasn't enough to handle the entire workload.

Retired shooting team members stepped forward to help out, not unlike civilian competition shooters teaching marksmanship during the two world wars. As time went on Designated Marksman training grew. The concept has at least one person per squad trained in long range precision shooting, not as a sniper but as a superior marksman. This person could be equipped with an M14 or M16 with ACOG or similar optical sight.

After the fact, a number of organizations tried to lay claim to the Designated Marksman program but it was mostly reserve component shooting team members having competed internationally doing the lion's share of the development using lessons learned in those military shooting competitions. When I hear bean counters, politicians, and even other soldiers claiming shooting teams don't contribute it riles me up and should anger you as well.

A military rifle team can be completely funded for the cost of one cruise missile! Most of the knowledge and research I write in my articles was learned during my decade-plus tenure as a competitor and armorer with the Army Reserve Marksmanship Program. AG

METALWORKING

# Improving The Marlin 17VS Trigger

*Though the Marlin Model 17VS bolt action rimfire rifle does not have an adjustable trigger, it can be improved, making the rifle easier to shoot.*

BY NORMAN E. JOHNSON DECEMBER 2014 ORIGINAL PP. 10-11



Around 2002, Marlin added the Model 17VS, a stainless steel, clip-fed, bolt-action rimfire rifle chambered for the .17 Hornady Magnum Rimfire cartridge. The 17VS is well built, bedded in a laminated stock and features a 22inch heavy barrel with a 1:16 inch rifling twist pinned into a cylindrical receiver and measuring 0.800 at the muzzle. The bolt is of two-piece construction with a non-rotating front end. The squared, inner portion of the bolt handle serves as a locking lug.

The 17VS is an inherently accurate rifle but the trigger pull from From left, trigger with trigger spring and shoulder bolt with washer added; sear with spring and shoulder bolt and washers (added by author); and safety attached with same bolt used to retain sear. Any spring adjustment would require shortening or lengthening or replacement of existing springs with weaker or stronger ones. the factory is too hard at over four pounds.

The single-stage trigger and sear are attached to around, slotted post solidly anchored under the receiver. Both the trigger and sear are attached to the post with two 0.090 inch diameter threaded shoulder bolts.

A very positive safety mechanism is bolted to the right side of the receiver preventing any trigger movement as the safety lever is moved rearward. The camming action of the safety prevents accidental trigger pull even at less than full safety lock.

Some safeties function only with full sear/trigger contact requiring complete sear-totrigger engagement. Therefore, I felt a pull weight around four pounds, lacking crispness and with a fair amount of creep, was far too heavy for a rifle with this accuracy potential. I looking into how to make an adjustment. My approach was to micro polish the trigger and sear surfaces to reduce the amount of trigger/sear engagement, thereby reducing trigger pull weight.

This was accomplished by placing a 0.010 inch shim on the trigger, which reduced the trigger/ sear engagement from 0.036 to 0.026 inch. Trigger pull weight tests using a temporary shim between trigger and sear reduced pull from nearly four pounds to one pound eight ounces. In the process of working with the trigger and sear, considerable lateral side play was noted in both. As a means of taking up this side play I placed a 0.008 inch washer on each side of the offending parts.

**IMPROVING THE MARLIN 17VS TRIGGER** CONTINUED ORIGINAL PAGE 11







Made of hardened steel, it lends well to precise stoning and polishing. Above center: Close up picture showing trigger and sear engagement with spacer added before final fitting and polishing. The safety cams the lug on the trigger, giving the sear and trigger a firm engagement. Function felt much smoother as a result with much less lateral trigger movement. It is important that such added washers do not restrict trigger movement, thus preventing total sear/trigger engagement.

A permanent shim was then made from 0.010 inch thick shim stock and installed on the trigger. The shim was shaped to a right angle with one side interfaced between the trigger and sear and the other surface at the side of the trigger. The piece was then bonded to the trigger with J-B Cold Weld material. The essentially removable shim on the trigger makes it possible to return to factory settings should this ever be desired, however, it is highly unlikely this would ever be the case.

The trigger spring tension was left unchanged as was the sear spring. Limited adjustment of trigger pull force could also be made by changing the coil spring tension located at the back of the trigger. A small tube retains the coil spring that applies tension directly to the trigger. As measured, spring tension was just a few ounces, which would have negligible effect on trigger pull in this way. Final pull weight with the adjusted trigger is very uniform at one pound, eight ounces and safety function is positive.

Resultant accuracy of this The tab seen at the top of the trigger is part of the thin spacer used to reduce sear/trigger engagement. Such work is to be performed only by a skilled technician. Below center: Trigger pull weight was reduced from around four pounds to a very safe and crisp 1 1/2 pounds while still passing all tests for safety. While Remington, Hornady and Winchester are loaded with Hornady's V-Max bullets, the CCI loading use full metal jacket bullets, an ideal projectile for edible game.

The rifle is equipped with an older 2.5-7x Redfield scope. The magazine has been shortened by a couple rounds for ease of carrying. The balance point was right at the magazine which dug into the hand. rifle at 25 and 50 yards is most excellent with the four brands of ammunition tested, as shown on the target pictures provided. 100-yard targets are also included, which are excellent. The Marlin 17VS rifle now proves to be an ideal hunting and target rifle with a much improved trigger.

Conclusions Through careful analysis of trigger function, trigger pull weight can often be improved on the commonly non-adjustable style trigger. Each rifle will require a careful study of its function to be sure it can be accomplished safely. This includes rifles like the Marlin 17VS bolt action with largely stamped-out parts. AG

MAINTENANCE & REPAIR

# The Gunsmith As Furniture Repairman

*Gunsmiths are machinists and metalworkers also working with firearms, sort of like furniture composed of metal and wood.*

BY ROBERT K. CAMPBELL DECEMBER 2014 ORIGINAL PP. 12-14

When addressing issues with stocks and gun furniture we are dealing with wood that has been stabilized and convinced not to rot. The artisans of an earlier age did a fine job with good wood. It is handling and the elements that have caused the problem. When a rifle is brought in for stock repair, cracks are one thing. We know how to replace a stock if it is beyond repair but it is the gouges and scratches that present a problem.

When a rifle has been mishandled there is little point in restoring it as the duffer will do it again but a fine rifle with the occasional nick and gouge is a firearm to be respected and restored. Among my personal rifles I regard the scratches and wear from hunts and decades of readiness as signs of hard work, much like a scar earned in service. When you repair a rifle or shotgun stock you do not necessarily have to refinish the entire stock. Patching and repairing is possible.

Taking care of such dings and scratches is the spot bluing of stock work. Even if the stock has a synthetic covering material, it is possible to repair the stock without a complete refinish. We have to understand the how and why of how dings occur and also why they look the way they do. Among the best examples of a well cared for rifles with numerous dings in my safe is a Beretta-produced M1 Garand rifle and a Winchester Model 94 .30-30 WCF, circa 1911.

Each has even wear in the wooden furniture with a number of gouges from honest wear, all consistent with the carry modes. The Garand was carried by the forend and pistol grip balance points. It appears not to have been carried by the sling as often as simply handled by the wood. The Winchester was carried at the forend, the perfect balance point of the rifle, and the nicks are not created equal.

Looking at the comb where the cheek welds during shooting, the dents are darker having soaked up oil from the shooter's face. Wood is alive with a system that distributes moisture through the tree but when the tree is felled and the wood cut up for blanks, the moisture leaves the wood. Wood shrinks a bit when it dries but not as much as one may think.

When you understand this construction you will realize there is only one means of effectively and cheaply raising dents and that is to introduce moisture into the dent. Most stocks are not so dead and dry that they will not react to the introduction of moisture, as a stock swollen from moisture indicates. Raising dents with moisture requires care, however, after a time and with practice such work becomes second nature, but care is always needed.

First, you must understand that the finish, light or well worn, will prevent moisture form entering the wood and must be removed. Start at the bottom of the dent and work up. Remove the finish in the dent to perhaps 1/8" around it. When scraping with a razor knife, don't remove any wood, only finish. When you are satisfied the dent is well scraped, irrigate with water. Leave the water to soak in for twenty to thirty minutes. Examine the wood.

If the water is still standing without having soaked into the pores, the finish wasn't adequately removed. The stock must be leveled, in a rack or placing it on boxes or books, to allow the dent to be horizontal and allow the water to soak in. I have used modeling clay to properly level a stock. It works well and also helps properly align parts and firearms for photos. After a few tries there should be a difference in the dents. Some effort and time will pay off.

Dents differ in how they respond to the effect of moisture because of the endless possibility of different types of damage and the differences in how pores are closed shut by the damage. Some dents come up much easier than others. Repeat the process in several ways over a period of days until the dent is noticeably changed. When the dent finally shows a difference, supercharge the process by taking a damp cloth and placing it over the dent.

Work a household iron up to maximum heat and iron a wet compress over the dent for two to four seconds. This should raise the dent noticeably. In common with bluing a steel firearm and painting a vehicle, the preparation is what counts the most. When addressing the finish, the dent that has been raised is now lighter than the rest of the wood. If properly treated with light finish, the dent will soak up oil with age and match



This old M1 isn't as bad as most. the rest of the finish. Tru Oil applied with a soaked cloth works great for this type of work. Scratches A scratch may be defined as a dent that went through the finish and penetrated into the wood. The wood may have absorbed oil, solvent or other material and appear darker than other areas A little restorative work will go along way. within the confines of the scratch. A scratch is different than a dent.

You can raise a scratch just the same as raising a dent, no problem, but then you have a dark raised area. So we use a bit of wood bleach first. Wood bleach is offered under a number of trade names and may be obtained at your local hardware store. Bleach the dark spot, raise the wood and use oil

Above center: While the barrel band has been compressing this stock for 50 years or more, the stock is in good shape. The owner has kept it oiled. It has been repaired and the rifle is good to go. to refinish. The same procedure is followed as is used with the raising of a dent, except that the darkness of the scratch must be addressed. There are instances in which the stock has suffered a little worse than simply a dent or a scratch. Apiece of wood is actually excised from the wood.

My old reliable and treasured Smith Corona bolt gun and M1 Garand has several of these apparent. I would like to think the Smith Corona suffered this gouge from contact with a rock in a trench at Guadalcanal, but I have no way of knowing. A minute or two is all that is needed. This particular Garand wasn't a war time gun so the gouges are probably from rack use. Attempting to sand the stock flush after losing apiece of the wood ends up being along, difficult job resulting in a stock with eddies in it.

It simply doesn't look right. Carefully fill the hole or nick with Brownells Acraglas. This is a good compound that works wonders for many things. I tape off the area to be repaired to avoid staining areas that are not affected by the repair. Acraglas is often used to repair a splitting or even a completely split stock and works great for this chore as well. Acraglas provides a great wood weld provided you force the compound into the nick, split or crack.

While I have used a ladle and other tools, if you really need to force the Acraglas into a crack or crevice, try using compressed air, such as the canned air used to clean computer keyboards. This fills in missing wood very well. Wax and finish with Tru Oil and the rifle will look much better than with a heavy gouge out of the wood. Working the stock and general wood repair is an important part of the gunsmith's work load and a steady source of income. Attention to detail and a steady hand will carry the day. AG

MAINTENANCE & REPAIR

# Business Issues

BY WENDELL DEANER DECEMBER 2014 ORIGINAL PP. 15-18

'm I being a little facetious with the The Perils of Pauline reference in the deck but sometimes a small business owner seems to be tied to the railroad tracks while a laughing bureaucrat looks on and twirls his mustache. In the early 1900s, when Pauline was fighting her battles, regulations for opening and maintaining a business were relatively mild compared to today. After all, in those days the business of America was business.

The Occupational Health and Safety Administration (OSHA) didn't exist; neither did any significant Labor Relations Board. You were free to discriminate in hiring practices, stand your child workers on boxes for ten hours a day and pay your female workers less than their male counterparts. All that is gone today, and that's a good thing, but what are we left with as far as regulations go?

This article can't address all those subjects but if you have any employees, or even if you don't but have customers in your shop, you do need to be concerned with safety. The federal government and all states have regulations that can sometimes be taxing (pun intended) for the small business owner. There is no way to cover each individual state's regulations but I advise you to do your homework well when contemplating opening a business such as a gunsmith or shop.

The Internet is full of information on this subject. Many states have official websites for those interested in starting a business. Local, state and federal regulatory sites have enough information available that is actually specific for gun-related businesses to get you started. The County Clerk of the Court where you plan to operate should also be consulted. I am going to touch on some of the safety measures any shop should observe and, in a general way, some of the regulations you may encounter.

First this disclaimer: I am not a lawyer. I am not a physician. I don't even play one on TV. This article is not the regular how-to that I usually submit or even a guide, rather, it should serve as a suggestion for you to think about what you may encounter when starting your business and hopefully keeping it in operation. Do you have employees? Do you have machines in your shop? What about chemicals? If you have afire does everyone know what to do?

There are some accidents that can happen in an operation like ours that are perhaps not unique but something all of us have to deal with. I want to touch on a few and remember this information is for your benefit only, not a legal guide. Take a walk and check where your shop may have a problem.

Eliminate it before it turns into a real problem, either physical or legal disaster (both are about the same, I guess.) The current political climate has driven us all into overtime but let's not lose awareness of good safety practices. I always wanted to work for myself at a job I loved. Probably that's what motivated most of you. So I forged ahead and ran into the brick wall of bureaucracy. No surprise there.

Do you have to install a handicap accessible bathroom in your new building or update the existing facilities where you plan on doing business? Maybe, depending on where you want to locate. It only costs another couple thousand dollars. Better make sure that mirror can accommodate tall people as well as those, shall we say, who are height challenged. If you're off by a couple inches a lawsuit may be headed your way and the bureaucrat will twist his mustache and have a good laugh.

Let's consider some of the potential hazards in our hypothetical gun shop. Recently, our local paper reported on a generator fire at a recycling operation that did $200,000 in damage. In another recent story, a smaller shop where a belt sander started afire cost the owner $20,000. Every machine we have in our shop runs on electricity. The days of pumping a trestle for power or having an apprentice turn a crank for us are long gone—except in Williamsburg.

Even they have a backlog, and if you want a rifle made the old-fashioned, way the wait time is years. Most of our work can't take that long. How many machines are working from the same circuit? Are radios and scanners and shop lights all plugged into the same place? Maybe it's time to upgrade your electrical system to accommodate all this stuff. Has one of your employees snuck in a radio that has frayed wires and blows a breaker every time he plugs it in? Don't let this happen.

Make sure every item in your shop is inspected for safety before use. It's always nice to be called out at three in the morning and be met by the flashing lights of fire trucks and a wet, smoldering ruin where your shop used to be. Let's hope your insurance covers faulty wiring. A wise man once told me that it was OK to do dumb things, just don't tell anyone about it. Well, sometimes a story told can be a lesson for someone else.

I was hanging a pair of shop lights and decided to run the wires across the ceiling and fasten them with a staple gun. Naturally, it was dark there (that's why I needed the lights) and I fired them up so I could see what I was doing. While standing

This one got anew switch and a going over. It runs like new. on my aluminum step ladder I was able to brace my forearms on some convenient water pipes to make it easier to place the staples exactly. The first couple went in pretty good. The next one went into the hot part of the wire instead of over it. Before I knew what happened I found myself slumped on the floor in the corner of the concrete wall behind me. I'm not that little of a fellow but that jolt threw me like a leaf in a strong wind. Oh, what fun!

My brother-in-law, who is an electrician, informed me that if instead of throwing me, had the current had held me in place I would've been dead. Common household current (110 volts) will kill you, as many dead people could attest. After regaining some of my composure I checked my body and found that I was bruised all along my arms and chest and legs. Strangely, all of these bruises were equidistant on both sides of my body. Ever see a black spot on apiece of chicken?

That's because most of these birds we buy in a supermarket have been electrocuted at slaughter. The current traveled through me, burning as it went all the way down to the ladder that grounded me perfectly. I can tell you that this little episode made me a chicken when it comes to electricity. I had an EKG done and checked out OK, but I'm still not sure that gives my wife the right to call me a moron after every one of these incidents. No, I'm not a mad scientist, honey.

Do your employees know what to do if they see their buddy on the receiving end of an electric shock? Do you? It's not a pretty sight and the first thing any of us want to do is to pull the guy off. Big mistake. Make sure everyone who works there knows that if the power can't be shut off immediately a non-conducting materiel like a wooden or plastic broom stick should be used to separate the victim from the source. If high voltage is concerned there's not much can be done without cutting the power.

The accident happened. What now? Are any in your shop certified in CPR (cardio pulmonary resuscitation)? Standing around waiting for the ambulance that someone should have called right away shouldn't be the only option available when a life is at stake. Anyone can learn CPR. Your local Red Cross is a good place to start. They have classes and certification processes for small, if any, fees. Cuts and abrasions are the bane of any shop. It's always going to happen. Hopefully, the damage will be limited.

Do you have a decent first aid kit? This is not the same thing that your wife bought for you to stick in the glove compartment. You need plenty of gauze and bandages. A clean piece of gauze used to apply pressure to an actively bleeding wound beats a dirty, oily shop rag any day. The tools we use can be razor sharp and a dull tool is more dangerous to use than one that is sharpened properly. Did you know that a cut from a sharp tool will bleed more copiously and take longer to clot than a jagged wound?

Hold the pressure on for twenty minutes or so and give the wound time to clot. If you keep checking you'll just disrupt the clotting process. Once the bleeding has stopped cleanse the area gently with soap and water. Soap in the wound itself can be irritating. Apply a thin film of antibiotic ointment and cover with gauze or a Band-Aid. After a few days remove the bandage and let air help heal the wound. Be careful that the patient is not allergic to the ointment.

If the cut is more serious applying pressure is about all that can be done until the paramedics get there. Staunch heavy bleeding with

This is their basic model and retails for $24.99. These common stock inletting tools can leave a nasty wound if they slip. clean towels. A tourniquet should not be applied except as a last resort. Serious tissue damage can occur if it is not used properly and sometimes even if it is. Of course, tourniquets can only be applied to limbs, not the torso. Once in place it should be left alone for the trained medical personnel to handle. Most times lay people should avoid this practice.

If untoward consequences are the result you can expect a lawsuit to follow. Burns are another common shop injury. They can be a lot of fun. Want to hear another dumb story? When I was a younger man I drove a hot Buick with a three fifty something V-8 engine. It was an older car that I could afford at the time but it had been sort of a luxury model in its day. As it happened, the lifters started ticking so I decided to replace them.

I accumulated all the new parts and, since I didn't have a garage, I waited for good weather and started the job at the end of my driveway. How long could it take, anyway? Popping the hood, I went to work and soon had the fuel line, carburetor linkage and what ever else unhooked, and then removed the manifold so I could get to the offending lifters. Most of them were easy to remove but I had one problem; a few were buried in their seats and I couldn't grab them with anything to pull them out.

I tried turning the engine slightly by moving the radiator fan. No go. Enlisting the aid of my wife, the plan was for her to tap the ignition key just enough to make the lifters stand up while I stood out front to tell her when to stop.

It worked, but not having remembered the gas line feeding the carburetor was open, and my fuel pump fabulously doing its job, a little gas squirted out (actually, it was a pretty good dose of gas.) Oh, bother, I said (or maybe I said something else.) I'll just put my finger over the line. It was just going to take one more tap, anyway. OK, baby, try again. You guessed it. On that last tap I suddenly held a ball of fire where my hand used to be.

If the neighbors would have seen me I suspect they would have thought I was performing a rain dance as I jumped around in my back yard trying to get that fire out. Thank goodness I was able to snuff it out but not before I was badly burned with real nice blisters all over my charred paw. I got a basin full of ice water and kept my hand in it all the way to the emergency room. It hurt like hell.

The doctors used about a pound of Silvadene (an antibiotic/anesthetic cream for treating skin infections in patients with severe burns) to cover my hand an inch thick, then bandaged me up. They wanted to know how I had done it. I still think I heard some snickers behind that curtain they pull around the hospital bed. My wife, again, said I was moron. Hey, I'm a victim here! Well, after a few weeks I did get the car fixed and back on the road. It sounded a lot better. I think I learned my lesson about gasoline.

It deserves respect. As with any high flash point material, don't ever use it as a cleaning agent and keep it off your body. I have another good gasoline story about the water heater, the granny and the dirty dog, but I'm saving that one for some other time. All joking aside, burns can be very serious. The first thing to for first aid is put the fire out. Sometimes clothing should be left alone, especially if it is adhered to the skin. Let the professionals take care of that.

For minor burns on the hands or feet, place the area in cool water to help take heat away from the skin. Ice is not recommended by most experts, although I have seen it used in water in the emergency room. Cooling the area really helps with the initial healing process as well as the intense pain a burn can cause. For severe burns that go deep into the skin, stay away from them until the paramedics get there. Do not put any kind of grease, ointment or butter on any burn.

It will only hold heat in and will be very painful when they have to take it off at the hospital. We used to go to the "Shoot 'Em Ups" (Westerns) at the drive-in movies when I was a boy. I might have

ARCHIVE IMAGE WITHHELD



ARCHIVE IMAGE WITHHELD



are available at almost any pharmacy. been about ten years old when I was sent to the snack bar to fetch. One of the drinks ordered was hot coffee, and in those days that meant hot. No suing Mickey Ds for this one. Lids must've been in short supply also. Of course, I spilled a large cup of the steaming stuff on my ankle and was wearing socks so it stayed around a little longer than I wanted. Man, it hurt! My mother went to the snack bar and got about a pound of butter to rub all over my blistered ankle.

Thanks, mom! They even let me suffer through the rest of the double feature. Visiting the hospital wasn't even an option. One thing I did learn from the experience was that if somebody wanted coffee they could get it themselves. A good first aid kit should be in every shop. You can get one from many sources including the Red Cross. Lo and behold, our friends at Brownells stock several different kits. A basic one is #100-011-359WB, going as I write this for $24.99. It contains a lot of bandages and other essentials.

I would supplement this with some antibiotic ointment and more gauze and medical tape available from any pharmacy. Depending on the scope and size of your operation chemical burns, inhalation injuries and eye contamination can be potential problems. Bluing chemicals, cleaning supplies and a lot of the everyday, runof-the-mill stuff we take for granted sometimes can be hazardous if it finds its way to the wrong places. In a shop with employees it makes sense to have an eye wash installed on a convenient sink.

These are inexpensive and are simple enough to allow even the victim to rinse their eyes with tap water, which is usually the first thing to do in this case. It could well save someone's sight. Rinsing a chemical off the skin as soon as possible is usually a good idea in most cases. In a shop with a lot of dangerous chemicals in stock, government regulations require proper storage, sometimes including fireproof safes. Also, MSDS (material safety data sheets) are mandatory.

MSDS provides information about the dangers of each chemical and how to treat exposure. They need to be readily available and each employee should be familiar with their use and location. This brings us to regular safety inspections. All these things can be taken for granted after implementation and no follow up ever performed. It is a good idea (ethical and legal) to have someone (mix it up among your staff) responsible for written inspections, perhaps monthly, and to keep a record of these inspections.

If you are ever in court and the legal eagle that has you on the witness stand is trying to rip away a pound of your flesh, you will thank yourself for having such records available. It goes without saying, but I'll say it, anyway, eye, hearing, and inhalation protection should be not only available to your employees but also required if the situation warrants it. Here, also, is a case where you are not only protecting those who work for you but yourself, too.

This treatise was not meant to scare would-be entrepreneurs into abandoning their plans for anew business. If you pay attention to detail and jump through all the government's hoops you can succeed. The trick is to be aware of what you are diving into before you spend a lot of money. Of course you've thought long and hard about what kind of equipment and merchandise you may need according to the size and scope of your plans, but do your homework and don't let that bureaucrat laugh at you as he twirls his mustache.

**AG**

PEOPLE & COMPANIES

# Custom Wildcat Cartridges With Standard Reamers

*Making a custom wildcat chamber while avoiding the cost of a custom reamer is both possible and practical using a pair of standard SAAMI reamers you likely have in your shop, or can readily rent or borrow.*

BY NORMAN E. JOHNSON DECEMBER 2014 ORIGINAL PP. 19-21



As a sort of unconventional project, I set out to develop a special wildcat cartridge based on a commonly available parent case. I knew precisely what I wanted but didn't want to go through blueprinting a special custom reamer in getting the job done. The cartridge I had in mind was based on the .243 Winchester Super Short Magnum case, necked up to a caliber .308 bore. I had a Broughton stainless target barrel with a 1:16 twist chambered for the much smaller .30BR which I would rechamber.

I also had a Weatherby .300 WM barrel with a 1:10 twist for the other chambering which I would cut down and rethread. The project has had a most favorable result and I named my new creation the .30BR Magnum. The smaller .30BR version is one of today's most successful benchrest cartridges. The barrels normally have a slow twist around 1:15 to 1:18 for use with lighter bullets ranging from 110 through 135 grains. The Weatherby barrel would have a standard 1:10 twist for use with a wider range of bullets.

The Winchester Super Short Magnum series of cartridges was 30BR using existing standard reamers to form the new chamber from the .243 WSSM case. From left, .30BR and .30BR Magnum. developed by Winchester in 2003 to fit their Super Short rifle actions. It was introduced in .223, .243, and .257 calibers. The case is nonbelted with a rim diameter of 0.535 inch, the same as standard Magnum cartridges.

The short-fat cases have little body taper, resulting in a 28 degree shoulder with a diameter at the shoulder of 0.5444 inch. I vied this short-fat case as ideal in the accuracy arena and was not disappointed. I had worked extensively with all three WSSM cartridges and previously had a special reamer made, building a 6.5mm wildcat on the .243 WSSM case a few years ago named the 6.5x42 NEJ Super Grouper. It performed amazingly well but I wanted to see what a larger caliber would do in this short, fat case.

The Winchester Super Short series failed in popularity and is no longer available through Winchester or Browning in these three original calibers. Reaming .30 BR Magnum Forming the first stage of the new .30BR Magnum chamber began with a .243 Winchester Super Short Magnum reamer, in cutting the new .30BR Magnum chamber only, with no alteration to the case neck at this stage of development.

Here I had carefully made up a .30 caliber brass pilot to fit over a .243 Winchester Super Short Magnum pilot to fit precisely inside the .30 caliber lands. The new chamber was then headspaced exactly for the .243 WSSM cartridge body. The neck and throat (leade) part of the chamber was later formed with a different reamer. Reamer selection here was very critical.

The neck of the slave reamer must be longer than the existing .243 WSSM case neck and the throat/leade section must conform to the bullets being used in the new .30BR Magnum case. The shoulder of the neck reamer must also have a more shallow angle than the .243 super-short WSSM reamer

**CUSTOM WILDCAT CARTRIDGES WITH STANDARD REAMERS** CONTINUED ORIGINAL PAGE 20

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-3CF9D985DD-A1847-P20-F01. Know the rights holder? Please ask them to contact us.

AG-3CF9D985DD-A1847-P20-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-3CF9D985DD-A1847-P20-F02. Know the rights holder? Please ask them to contact us.

AG-3CF9D985DD-A1847-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-3CF9D985DD-A1847-P20-F03. Know the rights holder? Please ask them to contact us.

AG-3CF9D985DD-A1847-P20-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-3CF9D985DD-A1847-P20-F04. Know the rights holder? Please ask them to contact us.

AG-3CF9D985DD-A1847-P20-F04

30BR cartridge to the new .30BR Magnum wildcat. From top, .243 WSSM case, Clymer .243 WSSM reamer with special pilot sleeve from .243 to .308, .243 WSSM headspace gauge, Manson .308 Winchester reamer used to form neck and leade, Broughton caliber .308 barrel chambered for the .30BR used in the conversion threaded for a Remington Model 40X rifle. 300 Weatherby Magnum barrel to the new .30BR Magnum wildcat. Note the cut off portion of the Weatherby barrel.

This barrel is fitted to Savage M112 rifle. to avoid any contact with the existing shoulder as the new neck and leade are cut. This reamer pilot must also fit the lands of the barrel. Here I used a special neck diameter and throat built into a 308 Winchester reamer by Manson Precision Reamers (mansonreamers.com, This .308 Winchester special reamer has a tighter 0.342 inch neck and 0.3085"x0x1-1/2 degree throat which would fit my needs for the new .30BR Magnum perfectly.

The neck was then formed on the new barrel with neck length a few thousandths longer than the .243 WSSM neck. I used a special stop on the lathe to precisely control neck length conforming to the new .30 BR Magnum cartridge. Things went very well in completing the Br oug hton barrel. The Weatherby barrel was shortened and rethreaded for a Savage Model 112 single-shot action and rechambered in the same fashion.

Testing The New Chamberings The .243 Winchester Short Magnum cartridge is a very sturdy case with 243 WSSM reamer was fitted with a special sleeve to convert it from .243 to .308 used in reaming only the chamber on the new .30BR Magnum wildcat. The chamber neck and leade were cut with a special .308 Winchester reamer. The more shallow shoulder slope prevents contact at the .243 WSSM shoulder while neck reaming. 243 WSSM reamer used to form new .30 BR Magnum chamber headspaced up to the chamber shoulder only.

The neck on this reamer is a smaller .243 requiring a special reamer to form the neck and leade. neck walls approximately 0.020 inch. I had to anneal and turn the necks to 0.015 inch wall thickness for the 0.342 inch diameter chamber neck. Redding Reloading made up a perfect set of bushing dies for me based on worked-over .243 WSSM dies necked-up to .30 caliber. I also had a body die made up. The dies worked flawlessly on these super strong, short Magnum cases.

Both barrels were completed together and ready for testing. The heavier Broughton barrel was fitted and headspaced to a 40X Remington rifle of known, fine accuracy. The Weatherby barrel was chambered for a Savage Model 112 single-shot rifle. Both were switch-barrel rifles





308 caliber barrel clearly shows the chamber was formed for the new .30BR Magnum cartridge, designed and made by the author, using two different standard reamers. Cartridge shown is the new wildcat necked up from a .243 WSSM case. 30BR Magnum. Accuracy average was around 0.250 MOA using Berger 135 grain bullets in the Broughton 1-16 barrel. The new cartridge has excellent potential. with other chamberings. Both had extra bolts as well just beckoning for anew cartridge.

Cartridge case capacity for the new necked-up Winchester Super Short case to .308 bore was very close to the same as the standard .308 Winchester cartridge using similar brand cases. Starting reloading data was essentially the same for both cartridges. Standard primers work out well as I had learned from my work with my 6.5x42mm cartridge made from the .243 WSSM. This case was capable of withstanding greater pressures than the .308 Winchester family of cartridges.

Accuracy performance delivered by the newly created .30BR MAG was little short of amazing with some bullets grouping as small as quarter MOA with the Broughton barrel. The modified Weatherby barrel as shot exceptionally well, with some groups well under half MOA. Following is an example of such accuracy from this standard weight 24 inch, fluted barrel. Berger 30BR Magnum average 0.311 MOA. A Remington Model 40X rifle was used along with a Broughton 1-16 twist and Berger 135 grain match bullets. 420 MOA.

A Model 112 long action, single-shot rifle was used, along with a shortened and rechambered .300 Weatherby barrel with a 1-10 twist. Berger's 168 grain VLD bullets at around 2400 fps fared the best thus far with several others very close. 168 grain VLD bullet ahead of 42 grains of Norma 203B powder and CCI primer averaged 0.410 MOA five shot groups. The two 300 yard groups fired with this load were 0.358 MOA and 0.503 MOA. The cartridge would be pure poison on varmints with 110-125 grain bullets.

I loaded the case to near 3200 fps with Hornady's 110 grain V-Max bullets and accuracy was excellent. There are other unique wildcat chambering possibilities that can be made from smaller cases to larger bores using a standard cartridge reamer and headspace gauge, along with different slave reamers of correct caliber to form the new neck and leade. It just could add a whole new dimension to your shooting. AG

FINISHING

# Reader Forum

BY AMERICAN GUNSMITH EDITORS DECEMBER 2014 ORIGINAL PP. 23-24

Ruger Mark II Pistol I just finished reading Wendell Deaner's article on the Ruger Mark II Pistol and other models in the October 2014 issue. I would like to add a few notes based on my experience with these great little pistols. The 22/45 Mark II has the magazine catch on the left side of the frame, not on the bottom like the standard Mark I and II pistols. The same spring that holds the trigger pivot pin in place also holds the magazine catch in place as noted in your article.

You caution against dry-firing this pistol, but the firing pin stop prevents the firing pin from going too far and peening the chamber. I've dry-fired my personal 22/45 hundreds of times with no adverse affect. I have discovered over the years that the U-shaped piece at the end of the recoil spring assembly seems to have a right side up. In the center of the Uis a bulge that is actually two halves of the slot that are peened together to hold the U-shaped piece in place.

This peened bulge has been polished to facilitate installing the mainspring housing assembly, specifically allowing the bolt pin stop to go through the bolt. If this piece becomes oriented upside-down I have found it very difficult to get the bolt pin stop to install properly. Apparently the bottom half is polished more than the top half. Part of my cleaning routine is to compress the recoil spring and clean the rod, then release the spring and give it a good spray with an aerosol spray cleaner.

In the process of compressing the spring the Upiece can become oriented upside down. I mark it first with a black marker to ensure I get it oriented properly. Author Wendell Dwight Deaner responds. You are correct that a Ruger MK pistol is safe to dryfire. I accepted some advice that I thought was sound when writing the article. However, let's chalk this one up to an old guy who is used to handling old .22s; most of them are not to be dry fired excessively.

I think it speaks well of the manufacturers of new pistols that they have corrected this problem for the most part. I called Ruger about this. They confirmed that the pistols are safe to dryfire, but when I asked how many times (as in hundreds and thousands for practice) they sort of back pedaled with a "we're not sure" answer. I have heard of the firing pin stop itself being peened and damaged by this practice, but that has only been hearsay as I have not seen this phenomena myself.

Be that as it may, I have no desire to dryfire one of these guns until it breaks, which may be never, so I think it's safe to practice on an empty chamber, but maybe not excessively. Thanks for bringing this to my attention. As for the U-shape piece you mention, which I believe Ruger calls a "recoil spring guide pin" I have not noticed it having an up or down side, so I really can't comment. Now that you have alerted us to this possibility we will all be on the lookout in the future.

That is one of the things I enjoy about this magazine. 504 Remington Extractor Just read "Fitting Remington Model 504 Extractors" in the October 2014 issue. In it author Norman Johnson mistakenly refers to the left extractor of the 504 Remington as the "ejector". The ejector is part #19 on the assembly drawing. Jim Corolewski Ramsey Gunsmithing From author Norman Johnson. Thanks to gunsmith Jim Corolewski for being wide awake to notice the assembly definition lists the Model 504 Remington as having two extractors.

So, if these parts look even remotely alike, they must both be extractors, right? Well, not really. Roy Seifert My article on the Remington 504 extractor functionality was to point out the true function of these two near-identical parts and how to improve extractor function. This is easily accomplished if the reader merely follows the text instruction. By definition, the word "extract" means to pull out or draw out. Conversely, eject means to throw out or discharge.

In a close study of actual function, the Remington 504 extractor, positioned on the right side of the bolt, pulls out the cartridge case. The very similar looking part, positioned on the left, merely holds the case rim into the true extractor until such time the case rim is drawn against the ejector, completing the process.

So, the primary function of this so-named left extractor has little to do with extraction per se, as it holds the case in place following withdrawal from the chamber, providing a spring-loaded, lateral thrust as the case is thrown out. The true extractor continues to pull on the case rim until final case expulsion takes place.

Sometimes the true function of a gun part isn't fully understood and is one reason gunsmiths can have a difficult time repairing a gun. 1916 Spanish Mauser I recently purchased a surplus 1916 Spanish Mauser. I disassembled it and cleaned it thoroughly before firing it. The action worked very well until I shot it, then I had to give the bolt handle a very hard rap to get it to open.

I assume the heat from firing it caused it to expand because after letting it sit for 15-20 minutes the action worked fine until I shot it again. What would you suggest that I do to solve this problem? I did put some gun oil on the bolt but that did not help. Also, as advice to anyone else who has certain models of Mausers, paint the little muzzle cover a bright color. I almost forgot it was on before I shot, which could have been a big mistake.

Bill Steinborn Once upon a time one of our guys purchased a .308 Spanish Mauser

carbine. The trouble was it was chambered for .308 Spanish, somewhat different than our .308 NATO. You didn't mention the caliber of your Mauser but whatever it is make a chamber cast with Brownells Cerrosafe Chamber Casting Alloy and check it out against SAAMI specifications. If the chamber is tighter than those specifications the heat generated by rapid fire might be squeezing the rounds, making extraction difficult.

A tight chamber has to be reamed to match SAAMI specs but bore diameter can also fail to meet these specifications. If larger, the projectile may be too small to contact rifling properly and accuracy will suffer. If too tight, excessive pressure can result along with all its associated problems. As it turned out, anew barrel was necessary with the .308 Spanish carbine. Barrel replacement is recommended with an oversize bore and required with an under size one.

Your advice on muzzle covers is a good reminder for all owners of rifles equipped with them. Loosening Screws I am working on an old antique gun which has two bolts/screws that seem to be rusted to a point where I can not move them. I used PB Blaster Penetrating Catalyst on them and let them set for a few hours but still can not make them move. I have not yet tried heat or an impact tool. If these area possibility, what do I use and how do I use them?

Two other bolts/screws were removed with a screwdriver on the same gun without incident but these two are much more stubborn. Try penetrating oil for a couple of days first. If this doesn't work, I recommend a screw extractor from B- Square called the Frozen Screw Jack. If that doesn't work or is unavailable, an impact tool is worth a try after that. Select a screwdriver with a tip fitting the screw slots perfectly. Insert the driver blade and tap on the upper end of the driver.

If heat remains an option after trying the impact tool, do not apply it to anything but the screws. This can be accomplished with a 2 1/2" length of brass or aluminum rod and applying the torch to the upper end of the rod for a minute or two. The resulting heat will be transmitted to the screws and nothing else. Of course, always remember that anything you replace on an antique firearm reduces its collector value. S&W Front Sight How can I replace the front sight on a S&W Model 57?

Mark Morrison You can only replace or change the blade on the front sight. It is secured by a pin mounted in the ramp integral with the barrel. Contact S&Won the availability of a blade replacement prior to drifting out the pin. .404 Je ery I would like to convert a .375 H&H Whitworth Mauser to .404 Jeffery. Although the Jeffery's case rim is 0.543 and the .375 H&His 0.532, the .404 seems to fit the bolt face without resistance, appears to be centered, and is held in place by the extractor.

Is it safe to proceed with the unmodified bolt or must it be opened up another 0.11 inch? Don Lesovsky Doug Heritage Occoquan Custom Guns, LLC A potential and possibly dangerous problem exists several inches beyond the bolt face in our opinion. Your Mauser was barreled, bored and rifled to accommodate a .375 H&H which as a bullet diameter is 0.375 inches. You wish to convert to a .404 with a bullet diameter of 0.422 inches.

We are concerned about pressure problems arising as a result of pushing a bullet down a barrel that is 0.29 inches too small to swallow it. Please check this out with SAAMI saami. org) before working further on the project. You may have to invest in another barrel to accomplish your conversion. As for reworking the bolt, get hold of some brass in both calibers, resize if necessary, and run several bolt cycles to test for extraction problems with the .404.

**IF NONE OCCUR IT'S LIKELY YOUR BOLT WILL REQUIRE NO ALTERATION. AG**

SEARCHABLE ISSUE RECORD

# Archive index

# American Gunsmith

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

GUNSMITHMAG.COM · EDITOR@GUNSMITHMAG.COM