



DEC 2018

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

STRAIGHT BULLETS

MC MILLAN ADJUSTABLE A6 • NAMBU TYPE 14 • INSTALLING A CURVED STEEL BUTTPLATE • MODERN CASE HARDENING

ORIGINAL METHODS. MODERN ACCESS.

ARCHIVE EDITION 180

DIGITAL ARCHIVE EDITION

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AMERICAN GUNSMITH

DIGITAL ARCHIVE EDITION • DECEMBER 2018

ISSUE RECORD

ORIGINAL DATE	December 2018
VOLUME	Archive volume not stated
ISSUE NUMBER	12
SOURCE ID	ag-00ba3d884ee03b9e16696026

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 2018.

2 Mc Millan Adjustable A6
AMERICAN GUNSMITH EDITORS • ORIGINAL PAGES 2

3 Nambu Type 14
MARK R. HOLLENSEN • ORIGINAL PAGES 3-8

9 Straight Bullets
JOE CARLOS • ORIGINAL PAGES 9-15

16 Installing A Curved Steel Buttplate
PAUL MAZAN • ORIGINAL PAGES 16-18

19 Modern Case Hardening
AMERICAN GUNSMITH STAFF • ORIGINAL PAGES 19-21

22 The Country Doctor
BILL SMITH • ORIGINAL PAGES 22

24 Reader Forum
AMERICAN GUNSMITH EDITORS • ORIGINAL PAGES 24

PEOPLE & COMPANIES

Mc Millan Adjustable A6

BY AMERICAN GUNSMITH EDITORS DECEMBER 2018

ORIGINAL PP. 2

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Gale Mc Millan began producing stocks in 1973 for himself to compete in Benchrest events. His fellow competitors began asking him to make stocks for their rifles, which led to starting his own company. Since then, Mc Millan has branched into a number of product lines. Mc Millan Fiberglass Stocks manufactures custom rifle stocks and accessories with product areas including Tactical, Competition, Benchrest, Hunting & Sport, and Ultralight.

Customers include individual shooters, military, law enforcement, custom gunsmiths, and OEM rifle manufacturers. Recently added was the Adjustable A6 to their Tactical A-Series line based off the A5 with three exceptions: Flat sides on the forearm for shooting off barricades, a tapered butthook, and no texture on the fore end and pistol grip. Blending design elements from the Benchrest and A-series of stocks, the Adjustable A6 has a more angular forend profile for stability.

The flat bottom is optimized for shooting over barricades and preventing “stock roll” while the angled sides are suited for use with most tripod mounting systems. A swell-palmed grip provides a comfortable hold for

both large and small hand shooters. Also featured is the buttstock hook which enables users to maneuver the rifle with the non-shooting hand, a flat butt stock bottom that supports rear stability and an integral adjustable cheekpiece for the perfect cheek weld.

The Adjustable A6 comes with three inlet options: Flat top (no inlet), basic inlet (action outline and barrel channel), and full inlet (action and barrel inlet, molded-in color, cheekpiece is extra). As with all Mc Millan stocks, customers can choose from a wide selection of colors, finishes, and customizable accessories.

The stock looks similar to the Manners stocks with the flat surfaces, but Mc Millan incorporated these surfaces to help with tripod mounting systems and to help stabilize the platform which firing over a barricade. The stock is available with an adjustable cheekpiece and spacer system at the normal add-on cost. Currently listed as being available for the Remington-style actions, which also includes Savage actions. While not a revolutionary design, it represents a good evolution of the company’s stock designs.

CONTACT MC MILLAN AT MCMILLANUSA.COM OR

MAINTENANCE & REPAIR

Nambu Type 14

The Japanese Nambu Type 14 in 8x22mm is not as uncommon as you think. Here's how to handle one if it should cross your bench.

BY MARK R. HOLLENSEN DECEMBER 2018

ORIGINAL PP. 3-8

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I realize that much has been written about the Nambu, with many resource books and media currently available to the consumer and gunsmith. This particular pistol on my bench came to me for a detailed inspection, cleaning, and check to be certain that it was in firing condition. A deep cleaning was definitely in order as the internals of the gun were packed in heavy grease. Not Cosmoline; grease.

The good news for my customer was that this pistol was in great shape, had a very shiny bore, no broken parts, and all serial numbers matched. I suspect the grease helped to preserve the internals and my customer was very delighted to hear he had an all numbers matching, shooting condition Nambu. Historical Information Even before our own military adopted the praised 1911 semi-automatic pistol, the Japanese Nambu 8x22mm or “8mm Jap Nambu” was in full service with Japanese officers carrying it.

And although it is often confused with the German Luger pistols by some, it was not copied from it and therefore has no similarities other than being a semiautomatic pis-

tol. The first model produced is recognized by its offset recoil spring and front operating grip safety. This was later revised and became the Type 14 pistol. The early models had no magazine safety and sported a small, circular trigger guard. The very next version added the larger trigger guard and the magazine safety.

The magazine safety ensures that the pistol will not fire when the magazine is removed—a simple test you can take if you cannot tell if the trigger guard is large or small when one enters your shop, especially if you are not familiar with these pistols. You will also find that many of the parts for both types are not interchangeable. However, the following disassembly instructions can be used as a guide when disassembling the Type A pistols.

Here is a description of the Type 14 Japanese Nambu pistol based on research that I undertook. It was made in Japan between 1906 and 1945 having been designed in 1902. It is a semi-automatic pistol that holds eight cartridges in its boxed magazine, has a barrel length of 4.61 inches, and a weight unloaded coming in at 1.98

pounds. The overall length is listed at 9.06 inches and has a fixed rear sight and dovetailed front sight. Reportedly, there were three variants made: Type A, Type B, and the Type 14.

Approximately 400,000 Type 14s were eventually produced. These pistols were reported to have been used from World War I up through the Vietnam War era. The Type A and B models are considered to be the more collectible pistols, due to much lower numbers being manufactured, with the scaled down Type B “Baby Nambu” being the most sought after. It should be noted that Type B Nambus only had a seven round magazine and was nothing more than a scaled down version of the Type A.

The Type B pistols were also a different caliber, utilizing the 7x20mm Nambu cartridge. Rather than go into more historical depth, my goal in writing this article was to assemble information pertaining to the Japanese Nambu pistols that I found in multiple locations that is most beneficial to the

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Removal of the cocking piece from the rear of the threaded bolt exposes the firing pin extension, firing pin spring, and firing pin—all of which can now be removed. The magazine catch serves to retain the trigger guard to the frame. Note that the safety is OFF or in the fire position, necessary for removal of the barrel and extension and bolt assembly. gunsmith or gun owner and put it all into this article.

In other words, rather than seek out and read multiple different books, media, and articles related to this pistol, I decided to condense the most pertinent information into one short write up. There is much more information out there related to these guns and I encourage readers to seek that out. I only wanted to put the most relevant information related to disassembly, re-assembly and troubleshooting, along with a short history, all in one place.

There are some manuals available with detailed disassembly information and drawings, such as The Official NRA Guide to Firearms Assembly: Pistols and Revolvers (New Revised & Expanded Edition) dated 2007, The NRA Guidebook to Handguns, Firearms Assembly II, The NRA Guide to

Firearms Assembly—Rifles, Pistols, Shotguns, Revolvers, and NRA Illustrated Firearms Assembly Handbook, to name a few. These are handy resources if you have them and when this pistol crosses your bench. A short note about serial numbers.

On this pistol, I found that the serial numbers all matched. They were found on the frame (entire number), the barrel and extension (last three digits), the trigger group (last three digits), the bolt (last three digits), the grip panels (entire number), the locking block (last three digits), and the firing pin (last three digits). So when inspecting, this information can help you to determine if any parts were changed out along the way or if the pistol was “built” rather than manufactured.

Also, if you have a Type 14 you can determine when it was produced by looking at the frame to find a large stamped number with a decimal point and a number after that. On this pistol, the number was found underneath the serial number on the frame. The number will appear as a 17.3 or 19.9 or the like. What you do is add the number to the left of the decimal point to “1925” (the

model year) and then the number to the right of the decimal point will be the month produced.

In other words, if the pistol you have has a 17.4 then it would be considered to have been produced in April of 1942 (4 being the month and $17 + 1925 = 1942$). This method works for the Type 14 and 94 Japanese pistols, purportedly. Disassembly/Reassembly Let's go ahead and begin the disassembly process.

Check to be sure that the pistol is unloaded by removing the magazine (26) to be certain no live rounds are in it and by pulling back on the cocking piece (6) to open the bolt so that you can visually inspect the chamber to ensure it is empty. Once this has been done and you are positive that the magazine and chamber are empty, reinsert the magazine and pull the trigger to disengage the firing pin (9) from the trigger bar (27). You must insert the magazine to fire this pistol as it has a magazine safety.

If, after you insert the magazine back into the pistol, you want to be sure it is empty, pull back on the cocking piece (knob) (6) just enough to expose the chamber so that you are

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Shown here is the locking block attached to the bottom of the barrel, threaded rear of the bolt, the recoil spring, and, if you look closely, the rear lug of the firing pin itself. certain it is empty, and then release. Again, pull the trigger to ensure it is in the fired state of condition. Now remove the magazine (26) and set aside. Next, depress the firing pin extension (7) down with one finger so that you can begin unscrewing the cocking piece (6) with your other hand to remove it.

The firing pin extension (7), firing pin spring (8), and firing pin (9) can now be removed from the bolt body rearward. Shake them out or use a screwdriver to pull them free if needed. Remove the grip panels (29) by removing the single grip panel screws (30) from each side of the frame. Go slow here as you do not want to force the grips out as they have grooves in them that engage with the frame when installed properly. Remove the grips by pulling up from the bottom of each panel and lifting out.

When reinstalling the grip panels, do not over tighten the grip panel screw or you will crack or break the bottom of the grip panel. Just snug these screws up. With the

grip panels removed, grasp the pistol by the grip frame (21) and press the barrel and extension (2) downward on your bench.

With the other hand, depress the magazine catch (24) fully down and while still pushing down on the barrel against the bench while holding it by the grips, you can now remove the trigger guard (19) by simply pulling it downward to slide it out of the grooves that retain it in the frame. You will find that the magazine catch (24) serves to lock the trigger guard (19) in place when properly installed on the frame.

With the trigger guard (group) now removed, remove the magazine catch (24) and magazine catch spring (25) from the frame by first pulling the magazine catch out from the left side of the frame. Shake or pull out the magazine catch (coil) spring (25) and set aside. To remove the barrel and extension (2), bolt (4), locking block (11), and the two recoil springs (5) as a unit, grasp the barrel assembly and position it where it would normally sit on the frame when closed.

Turn the safety catch (22) forward or in the fire position and lift the barrel extension and assembly up and out of the frame keeping an eye on the two recoil springs and locking block so that they do not fall out.

With that unit out, remove both recoil springs and bolt by pulling it out from the rear of the barrel extension, then the locking block by pulling downward on it, and rotating it forward and out from its position underneath of the barrel.

The ejector (not shown in the accompanying schematic or parts list) is secured into the barrel and extension and can be drifted forward and out with a punch if necessary but typically it does not need to be. Inside at the back of the frame you will see a coil spring, the locking block spring (10) that can be removed by pulling it out of the rear of the frame from the hole that holds it in place.

To remove the safety catch (22), position the leg of it so that it is in line with the grip frame downward, then lift it out. Typically, you will need to wiggle it back and forth some to free it but never force it out of the frame. Still working with the frame, remove the trigger bar (27) and trigger bar spring (28) by drifting out the large headed trigger bar hinge pin (12). Note, the large head is on the inside of the frame, so drift out from the left outside of the frame and inward.

It is best to depress the trigger bar some while drifting this pin out to help free it up during removal. Then just pull

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I have seen a couple of these come in missing this spring. It should only be removed when required and typically, it is not necessary. Down on the trigger bar to remove it and the spring. Keep a watchful eye out for the small trigger bar spring (28) so you don't lose it. Next, remove the magazine safety (13) and magazine safety spring and plunger (14) by drifting out the magazine safety hinge pin (23) from the right side of the frame to left. Only remove the magazine safety when actually necessary.

Note that the magazine safety spring and plunger (14) has a plunger affixed to the spring, therefore, you need to be aware of this as it is not listed or shown as a separate part in the parts list nor is it specifically noted in the schematic. Also, take note before you remove these parts so that they can be replaced in the same way. That completes the frame disassembly.

Moving back to the bolt (4), to remove the extractor (3), use a screwdriver blade tip or other similar tool to gently pry up on the front of the extractor where it is turned down and over the bolt face. You must go slow here and only pry the extractor face upward until it clears a small detent that holds it in place so that you can pull it forward and off of the bolt. Too much upward

force can break the fragile part, so only remove when necessary (when broken, worn, adjusting, or bluing the bolt).

Finally, remove the trigger guard group (19). Disassembly of this unit should not be done unless absolutely necessary. To disassemble for repair or bluing, drift the trigger hinge pin (20) out from right to left. This will release the trigger assembly (15, 16, 17, and 18). Once the trigger assembly is removed, you can further disassemble it by drifting the trigger sear pin (18) out from right to left and that will release the trigger sear (15) and sear spring (16) from the trigger.

The front sight (1) can be readily removed by drifting it out from left to right as it is dovetailed in place on the barrel. This completes disassembly of the pistol. Reassembly of the pistol can be accomplished in the reverse order of the above instructions. Here are a few reassembly tips. Use a slave pin to reinstall the trigger sear and sear spring to the trigger and drift the slave pin out when installing the trigger sear pin.

Then use a pin punch to line up the trigger assembly with the trigger guard and drift that punch out while installing the trigger

assembly hinge pin. When installing or replacing the extractor, go slow and tap the extractor in place with a soft nylon hammer or other non-metal drift so as not to break or deform the bent end of the extractor during reassembly to the bolt. The magazine safety, spring, and plunger can also benefit from the use of a slave pin to speed up reassembly of that unit.

During reassembly of the barrel and extension assembly unit (consisting of the barrel and extension, the locking block, bolt body, and two recoil springs) onto the frame, make sure that the recoil springs seat properly back into the frame when installing. Position the assembly at a downward angle towards the rear of the frame and seat all into place, then pull the assembly rearward to make sure it is properly seated onto the frame. You should have already replaced the safety catch (22) in the frame.

When reinstalling the trigger guard (group), make sure that the magazine catch and magazine catch spring has already been inserted into the frame. Then, grasp the pistol grip area of the frame (21) and point the barrel downward onto

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1 Front sight 2 Barrel and Barrel Extension 3 Extractor 4 Bolt 5 Recoil Springs (2) 6 Cocking Piece 7 Firing Pin Extension 8 Firing Pin Spring 9 Firing Pin 10 Locking Block Spring 11 Locking Block 12 Trigger Bar Hinge Pin 13 Magazine Safety 14 Magazine Safety Spring and Plunger 15 Trigger Sear your bench or other non-marring surface while fully depressing the magazine catch downward. Slide the trigger group upward into the frame rails where it seats in the frame.

Once fully inserted, release the magazine catch as it retains the trigger guard (group) in place on the frame. If you had not already replaced the firing pin back into the bolt body, do so now, sliding it all the way forward.

If it does not go all the Japanese Type 14 8x22mm Nambu (Specifications subject to change without notice) 16 Sear Spring 17 Trigger 18 Trigger Sear Pin 19

Trigger Guard 20 Trigger Hinge Pin 21 Receiver (Frame) 22 Safety Catch 23 Magazine Safety Hinge Pin 24 Magazine Catch 25 Magazine Catch Spring 26 Magazine 27 Trigger Bar 28 Trigger Bar Spring 29 Left Grip (panels – 2) 30 Grip Screws (2) way forward, pull the trigger so that it will.

Once fully forward, replace the firing pin spring and then the firing pin extension into the back of the bolt body. The firing pin extension should be under spring tension when reinstalling the cocking piece (knob). Just place the cocking piece (knob) over the protruding end of the firing pin extension and begin rotating it. You will need to make sure that the firing pin extension “leg” gets placed in the bottom bolt body

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Use care when removing the extractor as it can bend or, worse, break. track or slot to correctly assemble. You will know when it is correctly in place as the cocking piece (knob) will be threaded nearly all the way down to the back of the frame. Troubleshooting Typically, these guns will come into your shop for reassembly (parts in a baggie) or for broken firing pins, weak springs, chipped or broken extractors, and jamming.

I have found that jamming is typically due to shooters that use war-era ammunition and that should be avoided at all times. It is always best to purchase and shoot modern-made ammunition or reload your own. But take caution in reloading as you should not load to or near maximum velocities and pressures. Just load the ammunition at standard velocities and pressures for this cartridge or as published for these original pistols.

Other jamming issues are due to bent, cracked, or deformed magazine lips and followers, along with bent or chipped extrac-

tors themselves. A good cleaning can also reduce jamming as the old corrosive gunpowder used back in the day tends to gum up the chamber area and bore. This powder residue will lead to corrosion and damage if left for prolonged periods of time. Weak recoil springs are common, as are weak firing pin springs.

This can be directly attributed to pistols that were cocked and stored in the cocked and ready to fire condition or with the action locked to the rear for safe inspection of the pistol and left that way in the safe. This places full compression tension on the springs and over many years the springs take a "set." When problems are found during shooting, it is best to replace the recoil springs and the firing pin spring. Firing pins are prone to breakage but not at such arate to be a very common occurrence.

Many of the pistols that I have worked on had a replacement or spare firing pin inserted into the slot in the original leather holster under the flap. Fitting a replacement firing pin is straight forward, just remem-

ber to perform the shock tests to be sure that the firing pin cannot be jolted to the point that it fires when bumping the pistol while cocked. Finally, magazines get weak, especially when the owner has loaded the magazine(s) full of ammunition and left it that way for many years.

This weakens the magazine spring significantly. That, along with dropped magazines on hard surfaces deforms the lips or breaks them, and is the leading cause of jams—other than the 75 year old ammunition found at gun shows or in grandpa's safe. Hopefully this short article will aid you in working the next "8mm Jap Nambu" that comes across your bench. I suspect you will see one or more as many were produced and are floating around out there. This is a fun pistol to shoot.

Just know that parts continue to dry up and if you are lucky enough to have one with all matching serial numbers, maybe it is best left holstered as a keepsake or collectible rather than chancing a breakage at the local range. AG

FROM THE ARCHIVE

Straight Bullets

Having cartridges straight and inline is critical for accuracy. Gunsmith work and customer education to ensure this happens is vital.

BY JOE CARLOS DECEMBER 2018

ORIGINAL PP. 9-15

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We're going to be talking about sending bullets straight into the back of the barrel in this article and how doing so contributes to tight groups. Good bolt-gun builders seem to have understood the importance of this before we gas gunners. If gunsmiths and shooters whose passion is the Stoner platform hope to rival bolt-gun performance, we need to take a few pages from their book. In doing so, both the gunsmith and the shooter share responsibilities. What happens when a bullet hits the back of a barrel off center?

It's easy to envision the front end of the bullet being deformed and how that will degrade accuracy, however, some might ignore the also-important bullet base. If the front of the bullet is at an angle, the base will be tilted proportionally. That tilt will remain with the bullet as it spins down the bore. Where that tilt becomes critical is in the split second the bullet is seated in the cartridge on the bottom is crooked and will be damaged when it impacts with the back of the barrel off center.

Pay attention to how the base of the bullet is also tilted. The bullet exits the muzzle when one side of the bullet is outside of the bore while the opposite side is still in.

This will allow gas pressure to escape, causing the bullet to be pushed to the side. This is similar to a damaged crown allowing gas on one side of the bore to escape prematurely and push the bullet off course. In another lifetime, nearly a half century ago, I was a competition pistol shooter and hand cast some of my lead bullets.

I remember other bullet casters who greatly valued a nice flat and straight base. I didn't fully understand the emphasis on this at the time. Now I do. Gunsmith Preventatives AR gunsmiths can buy barrels with the same quality used by gunsmiths building bolt guns. So if two "identical" barrels come out of a given factory on the same day and one ends up on a gas gun and the other on a bolt action rifle, why does the latter usually shoot tighter groups? We'll consider receiver squaring first.

Gunsmiths building custom bolt guns sometimes buy quality custom actions that arrive squared. When using lower cost receivers, the diligent gunsmith will perform squaring operations to the receiver face (front). For decades, AR gunsmiths have turned a blind eye to this process. With the exception of some very high-end receivers, like those made by Sun Devil, most AR re-

ceivers come from the factory with run out with one side of the receiver face taller than the opposite side.

When the AR gunsmith pushes the barrel extension into the receiver, the raised flange on the extension will contact that high side of the receiver face and stop. As the barrel nut is drawn up and exerting pressure, the barrel will be set at an angle inside the receiver. Since there is so much slop in the fit between the barrel extension and the corresponding inside surfaces of the receiver, there is no resistance to the barrel seating at an angle.

If the bolt carrier assembly is perfectly aligned with the receiver when it delivers a cartridge to a barrel that is set crooked, there is no way that a cartridge attached to the bolt face is going to line up as well as we want with the center of the barrel's bore. I believe that runout in the receiver face likely influences barrel harmonics as well. As the barrel whips, those high spots constitute a pivot point making shot-to-shot harmonics less uniform.

Those uneven harmonics likely cause the barrel extension to relocate to different angles inside the receiver. The barrel extension becomes a moving target for the bolt to try to align with for

STRAIGHT BULLETS CONTINUED

ORIGINAL PAGE 10

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each shot. Most gunsmiths assemble the AR rifle and leave all that slop between the barrel extension and the upper receiver, permitting the extension to move around which causes the muzzle to return to a different position after each shot, resulting in fat groups. The solution is twofold. Start by properly squaring the faces of your receivers. I performed a study on this. I built temporary guns on a bunch of receivers and machine rest tested them with known lots of match ammo.

Then I disassembled each gun, properly squared the receivers, and reassembled each temporary gun using the same parts, torque settings, etc. Using the same Properly done, this will shrink groups by an average of 14%. ammo lots, the squared receivers improved by a significant 14%. Let's be clear on the squaring procedure. This needs to be done on a lathe. I tried a squaring tool that fits in a hand drill.

Using lapping compound, the long section fits into the receiver and it's supposed to result in proper alignment of the squaring surface as even, forward pressure is applied to the drill. However, used as recommended, I measured the run out of a receiver was about

half again greater than the undoctored first reading. I chucked that tool in the trash. Comparing once again to bolt gunners, they do their receiver face squaring on a lathe and not by running something in the receiver attached to a hand drill.

With the receiver face properly squared we are part way to a solution. Next is to stabilize the extension in the upper receiver. This is best done by matching a BAT Machine custom barrel extension to the upper receiver to achieve a tight fit. You can also use a thin (0.001") sec- Author found using this tool to attempt to square receivers actually makes them worse. tion of shim stock wrapped around the stock extension and held with green Loctite 620.

Properly done, this keeps the barrel extension in one consistent position at the front of the receiver and the muzzle of the barrel will return to the same spot for each shot, cutting group size by about 1/3. This is so important that I wrote about it in, "The Relationship Of Barrel Extension Diameter To Accuracy In The AR-15" (March and April 2013.)

Chamber Selection It is generally thought bolt-gun chambers can be tighter than those in gas guns. This is a function issue.

It's easy to visualize a cartridge in a tight-fitting chamber where the bullet lines up more directly with the center of the bore than the same cartridge in a sloppy chamber. Most AR gunsmiths elect to not use tootight chamber reamers for fear of function issues during feeding. The body of the cartridge case (side walls) offers a lot of surface area which can contribute to friction and drag during both feeding and extraction. Case necks, however, offer much less surface area.

Necks in the .223 Remington are shorter than some other .22 centerfire rounds and can be tightened just a little. The feasibility of this will be dependent on several variables. The first is use. If I know my customer will be only single feeding rounds you can be sure I'm going to use a reamer that produces a tighter neck. Type of brass and how it is processed are important variables.

Lake City and Winchester brass tend to be thinner than WCC and Lapua brass which are needlessly thicker with no positive pay back that I have ever been able to deter-

STRAIGHT BULLETS CONTINUED

ORIGINAL PAGE 11

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mine. In addition to thicker brass taking up more space in the chamber neck, it pressures up more, causing handloaders to have to reduce powder charges. Outside neck turning is an option that thins brass at the neck and also has a vote in how you should order your reamer. Work with your reamer maker on dimensions and the specific variables of your project. I get my reamers made by Pacific Tool and Dave Kiff there asks me about these variables when I am working with him on a reamer order.

If your reamer maker isn't asking you these questions you need to consider switching to a maker that does. However, if you are a general gunsmith that only builds a few ARs a year, you will likely elect to just own one reamer. Freebore is another important chamber dimension for straight feeding. This section of the chamber immediately in front of the case mouth is smooth without rifling and about the same diameter as the bullet.

Longer freebore causes more bullet jump needed to make it to the lands when they're seated to magazine length. Visualize a water hose. The further the water spray is from the hose, the further it is from the center of the nozzle. Accuracy is enhanced by avoiding excessive bullet jump. For those shooting a combination of magazine-length ammo and longer single-fed rounds, I recommend the

Wylde chamber. For magazine-length ammo only, I recommend the Compass Lake Engineering chamber.

Guns with excessive freebore, such as 5.56 NATO, "shoot out" earlier. In fairness, freebore length can be used to help control pressure or make room for longer bullets. Work closely with your reamer manufacturer on this dimension. For more information on chambers refer to my three part article, "AR-15 Chamber Selection" (July-September 2014). Leade angle will be our final chamber topic. You need to specify your choice on this when ordering a reamer.

Wylde reamers should come with a leade angle of one degree and 15 minutes but double check with your reamer maker to be sure this is what you are getting. Regardless of reamer and chamber dimensions, you can always specify this gradual leade angle which seems to ease the bullet into the back of the barrel and may result in less bullet damage even when bullets are off center.

In that 2014 series on chamber selection, I lay out specific reasons for concluding that this leade angle treats bullets more gently than more abrupt angles. Match Bolt Carriers Two primary match bolt carriers are from JP Enterprises and Young Manufacturing. Both fit the upper receivers better than regular car-

riers and have greater polished bearing surfaces resulting in more uniform bolt carrier velocities and lock ups.

I performed an exhaustive study on group sizes of ARs with regular carriers and then substituted match carriers. The groups fired with the match carriers averaged 8.8% tighter than groups with standard carriers. I attribute the improvement in precision to better positioning bullets on the center of the bore. See "AR-15 Upper Quick Fixes: Match Bolt Carriers" (May 2014). When positioned all the way forward, bolt carriers tend to tilt downward at the back causing the bolt face to be set at an angle.

Since the cartridge is attached to the bolt face, it is also thrown out of alignment and causes the bullet to enter the back of the barrel at an angle, deforming it. Gunsmiths have known of this accuracy shortfall since nearly the invention of the AR-15. Early attempts to correct the problem failed and gunsmiths were discouraged and largely ignored the problem for decades.

I picked up the gauntlet and described my efforts to fix this in "Combating AR-15 Bolt Carrier Tilt" (May 2017) and characterized the "baby steps" taken and implored gunsmiths to improve on my work. In that article I described the adjustable anti-tilt pads that I

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equip all of my carriers with. This causes carriers to be level inside the receiver and better positions ammo in line with the bore. This results in tightened groups about 14% better than a match carrier without pads. Gas Tube Alignment Very closely related to the previous topic of carrier positioning is the subject of gas tube alignment.

The gas tube should leave the back of the front sight assembly or gas block and touch absolutely nothing until it goes straight through the "cloverleaf" hole in the front of the upper receiver and straight into the carrier key. If the back of the gas tube enters the key at an angle, the whole carrier will be forced out of alignment and, most important, the bolt face will be at an angle.

There is abundant slop in all AR chambers and the fit of the bolt inside the barrel extension results in rounds positioning their bullets off center. This is such an important and often overlooked topic that I have written two articles on it in the March 2014 and May 2018 issues. Twist Rate Don't over spin bullets. The twist rate of the barrel needs to

match the longest bullet that the firearm will be shooting. Longer bullets require faster twist rates.

Once a bullet is stabilized, spinning it even faster doesn't help at all. Over spinning a less-than-stellar bullet, such as one damaged by entering the bore at an angle, will only make groups fatter. Eric Stecker from Berger Bullets used to have a post on their company website about this topic. Paraphrasing, he said that overspinning exacerbates imperfections in the ammo. If a 1:8 twist will stabilize your 80 grain bullets, don't use 1:7.

If you don't know what twist rate to use for a given bullet, many barrel makers and bullet companies make this information readily available. Case Issues We have all picked up brass from firing ranges that exhibited deformed rims. These deformations often take the form of "ripping" the rim to the rear of the casing. Those tears in the rims are often the result of the bolt trying to open but meeting resistance during extraction.

Sometimes those rips in the rims deform the case so bad that you can't even get it to fit in a shell holder for reloading. Even if you are

able to resize around that is cocked in the shell holder, what are the chances the case will come out concentric? Sometimes these boogered casings can be salvaged by simply placing the heads on a flat file and working down the high spots. Maybe some of you will find that too low tech?

The flip side is, what happens when you chamber a deformed round and the bolt face closes on a high spot in the case rim. Obviously that round will end up being cocked in the chamber and will not orient the bullet properly with the bore. What is the best way to deal with torn cartridge rims throwing bullets out of alignment with the bore of the rifle? Don't bend the rim in the first place! There are any number of possible culprits at work here. The gun owner can address some of them.

A good start may begin at the loading bench by reducing powder charges by a few tenths of a grain, although I must point out that heavy 80 and 90 grain bullets shot out of the .223 Remington perform best when pushed hard. Gun owners are encouraged to use a chamber brush during their

STRAIGHT BULLETS CONTINUED

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cleaning following each range session. Tumbling cartridge casings during the reloading process will also enhance extraction. Gunsmiths can further this by polishing chambers. I wrote about how to do this in the article I cited previously on chambers. Dwell Time Semiautomatic firearms often extract fired casings easier when timing of the bolt or slide opening happens after most of the chamber pressure has gone down. One way gunsmiths can control dwell time is by the location of the gas port.

All other things being equal, the closer the gas port is located to the chamber, the sooner gas bled from that port will reach the carrier key and begin unlocking the bolt. AR gas tubes are available in various lengths. Depending on the specific project and customer preferences, gunsmiths can use longer tubes to increase dwell time. Gas port sizes vary in relation to where the port is located. Generally speaking, the closer to the chamber, the smaller the port needs to be.

On Match Rifles, I use a two-inch longer gas tube than typical from White Oak Armament. Shooters participating in Long Range competitions tend to use heavy 90

grain bullets pushed fast. The extended gas tube coupled with a gas port about one drill size fatter than normal results in a longer dwell time. With the exception of .22 Nosler, I can't remember the last time I picked up a case with a torn rim from my test shed floor. Watch for a dedicated article on the pros and cons of the .22 Nosler soon.

Another method of increasing dwell time is to insert a bolt carrier weight in the back of the carrier. These weights look like a shotgun shell and the kit comes with different weights to tailor to specific needs. Dress down the buffer with a file as per the included instructions if the weights are left in place for rapid fire events and leave them in during load development. Reliability, group size, and location can be negatively impacted if this is ignored.

If you can't find suitable weights, contact me and I can help. Gain Twist Gain twist starts bullet rotation slowly and speeds it up toward the muzzle, lowering pressure and enhancing extraction. With the exception of the .22 Nosler, I never have bent rims on cases fired in gain twist barrels.

Other potential advantages include improved accuracy, longer barrel life, cooler operation, and less rotational torque. "Revisiting Gain Twist" (November-December 2013) and "Gain Twist Barrels For Palma" (December 2016) discusses this further. Ejector Pressure Armchair experts posited for years that a left-mounted ejector and its spring pushes the cartridge into the chamber to the right of center, degrading groups. In a world where thousandths of an inch can have a huge impact, this theory sounds plausible.

Chambers do have several thousandths of an inch of clearance around the loaded round so I understand how guys came up with this theory. I took a little step forward from others, however, and abandoned the easy chair and air conditioning for a hot, dusty test range. I fired groups from a number of uppers and labeled them. Then I completely removed the ejectors from the bolts of each upper and tested a second time with the same lot of ammo. There was no improvement in group size! Lesson learned: Don't

STRAIGHT BULLETS CONTINUED

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The Hornady on the far right will actually straighten the round, mess with ejectors. Your groups will not improve and you may compromise function. Shooter Preventatives Let's move from the gunsmith's chores to the shooter's tasks in feeding straight bullets. I mentioned previously to clean the chamber using a chamber brush after each range session. Add to that a thorough cleaning of the bolt carrier assembly and finished with fresh lube. Don't be afraid to add lube during extended range sessions.

If you shoot events like High Power, Palma, F Class, and other long-range matches where you feed rounds one at a time, I recommend using a Bob Sled magazine. These don't have a spring-loaded follower, just a trough the cartridge lays in, and eliminates upward pressures on the bottom of the carrier which can vary and push the carrier out of alignment. After you have placed the cartridge in the trough, use the tip of your index finger to push it forward into the chamber.

When your index finger contacts the front of the ejection port, stop and pull your finger out, trip the bolt catch, and fire the round applying the appropriate fundamentals of marksmanship. My tests show that this simple, cost free, and fast technique will result in an average reduction in group size of 13.8%

compared to just dropping the round on the top of the magazine and tripping the bolt catch.

I believe this results in more uniform positioning of the cartridge on the bolt face and in the chamber and helps keep straight bullets. Most of the rest of this article will deal with ammunition, both factory and handloaded. I strongly recommend reading "Better Ammunition" (April 2016) before proceeding. If you don't have a copy, email me. The first topic is cartridge concentricity which has to do with how well the bullet is lined up in the cartridge neck with the centerline of the whole case.

This is measured in thousandths of an inch as run out. Simply stated, bullets in cases with run out are seated crooked and we need to avoid this. There are a couple of ways of dealing with this and both require a tool often referred to as a spinner. Spinners hold rounds in place while the operator rotates (spins) them while a dial indicator pressing against the bullet measures how much run out, if any, there is to a thousandth of an inch. This finds any "high spots" of the cartridge.

Back in the day, we culled out rounds with the most runout for close range practice. Straighter rounds were saved for long range

and important matches. This worked fine but a few years back the good folks at Hornady invented a better spinner. Their cartridge straightening tool can also push the bullet into better alignment, is quick and effective once you get the hang of it, and reasonably priced. Culling or straightening works with both factory and handloaded ammo.

As a related point of interest, high-end rim-fire shooters use a .22 spinner made by Nielson Brothers Arms. Spinners are also useful to measure runout in some pistol ammo and pistols shoot straight ammo better just as rifles do. I stress to my customers that no gunsmith or barrel maker can produce a firearm that will shoot optimally with crooked ammo. No matter what you do, some ammo will come out of the loading press or arrive from the factory with run out.

However, handloaders can take steps to minimize both the severity and frequency of run out. This begins with die selection, how dies are mounted in the press, and how bullets are seated. I recommend match dies from Redding or Forster. There is a process to mount the dies in the press for better alignment. That process is described in my article, Glen Zediker's

STRAIGHT BULLETS CONTINUED

ORIGINAL PAGE 15

Handloading For Competition, and on the Sierra Bullets website. During the bullet seating process, I recommend a “half seat and spin.” Approximately half seat the bullet, remove the pressure on the ram of the press, spin the round about 180 degrees, then finish seating. Rounds will come out about 0.001" straighter than if you seat in one stroke. Regardless, please don't slam the ram. This results in poorer concentricity. The thickness of the walls of cartridge casings is far from uniform.

Where this lack of uniformity is most important is the neck. If the thickness of one side of the brass is greater, the thick side will resist bullet seating to a greater degree and cause the bullet to cock in the neck. Likewise, when bullets are fired from such a casing the thick side of the neck will hold on to the bullet harder, sending the bullet into the back of the barrel at an angle. There are a couple of ways to deal with neck thickness problems.

There are gauges that measure neck wall thickness so those with the most uniformity can be reserved for long range and important matches. Outside neck turning aims to make all brass usable by shaving the neck where it is thicker. This is gun specific. Some guns respond very well while others are more neutral. Chamber dimensions have a vote here as tight neck chambers respond better to outside neck turning.

I recommend every gun owner experiment with this to determine if their gun responds favorably or if it doesn't make a measurable difference. I doubt that there are many handloaders who have access to a lathe but those that do need to read Norman E. Johnson's very intriguing article, “Precision Case Neck Turning In A Lathe” (May 2018.) We have talked about better centering bullets by using tight neck chambers when plausible, such as single-fed slow fire and techniques to better align bullets in the neck.

But the neck is a small part of the whole case. What about the case body? There is a solution there as well. When around is fired, the case walls swell under tens of thousands of pounds of pressure. The swelling stops when the case walls come in contact with the chamber walls. When that heavy gas pressure subsides, “spring back” occurs. Brass has a sort of memory and spring back causes the walls to return toward their original, non-fired shape by about 0.001".

By no means do the walls shrink all the way back to their pre-fired shape. This small spring back allows the case to be easily pulled out of the chamber during the cycle of function. Such brass is about as close to a perfect hand and glove fit as we can get. We call it fire forming. I recommend picking up those perfectly fire-formed cases, ensuring they aren't mixed with brass fired in a different gun. For single-fed shooting, neck size only and bump the shoulder back using a special die.

Ammo which is going to be used for magazine-fed events needs to be full-length sized, however. My studies show that fire formed brass that has been neck sized shoots groups 16% tighter than full length sized or new brass. Well worth the effort. Each gun will have a bullet seating sweet spot, which is also the title of an article I published in June 2016. Let's say that using tips in that article you find your rifle's bullet seating sweet spot is 0.004" of jump when the barrel is new.

That means that the round is 0.004" shorter than the chamber length as measured by an overall length gauge. Set your match bullet seating die to that length and that sweet spot will remain sweet till the barrel wears. However, we all know that barrel throats erode forward due to the hot cutting gasses developed at the back of the barrel.

That 0.004" of bullet jump may need to be 0.040" after enough shooting and that will depend on how much the firearm is shot, the twist rate, quality of the steel used in the barrel, land height and width, and the burning characteristics of the powder. We can still keep seating bullets at that sweet spot length that we found back when we did our initial load work ups when the barrel was new but that will jump the bullet a longer length before coming into contact with the throat of the barrel.

Like a water hose, however, if bullets are not centered on the bore they will hit the throat a greater distance from center as we jump them further. Smart guys often establish anew bullet seating sweet spot at about the middle of the barrel life, say, around 1,500 rounds. The bullet will be seated further out to compensate for erosion. The longer seated bullet won't jump as far so the water hose effect will be significantly less. In our example, the initial sweet spot was 0.004".

While we can't just set the new seating depth to 0.004" of jump and assume it will be sweet but that will be a good starting point to establish the new seating length. Just follow the instructions in my article the same way you did when the barrel was new and you will be fine. Obviously, if you are one of those folks that shoots only magazine-length ammo this technique won't work. We only use this lengthening method with ammo that is loaded longer than magazine length for hand feeding into the chamber.

I can remember when bolt gunners just turned their heads and snickered when other shooters pulled gas guns out of their cases to participate in precision events. Using the many tips in this article, gas gunners can get their bullets centered on their bores and turn the tables, resulting in the last laugh on bolt gunners. Be one of those gas gunners! Feel free to send me an email to if you have any questions about these topics. Thanks for reading! AG

HISTORY

Installing A Curved Steel Buttplate

Classic spurred steel buttplates look nice and provide a slip-free anchor between your shoulder and the gun.

BY PAUL MAZAN DECEMBER 2018

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A discussion at our local range about what a pain it was to install a curved buttplate made me decide to install one on the Savage 219 rifle I was shooting that day. I like the look of the curved buttplate and I have installed them on several guns. As far as I am concerned, it is well worth the time to give a rifle a much more classic look than a flat plastic buttplate ever can.

There really isn't any way of installing the curved buttplate without shortening the stock so that eliminates it from consideration for a rifle you have already brought the

length of pull to the dimensions you want. However, on a new stock or even an old one that is too long, it can be just the ticket.

Naturally, you will want to avoid installing one on a truly hard kicking rifle but I find them useful for rifles chambered in .308 on down as cartridges in this range are about the limit of my recoil tolerance without a pad on the buttstock. At 70 years old I no longer feel the need to prove that I can take it.

I've taken it when I In this case we want to shorten the stock by 3/4" so we measure at the middle of the butt, hold the buttplate against the stock, and mark the curve using the buttplate as a guide. was younger and

dumber and today I like to shoot without pain. If that makes me a wimp, OK, I'm a wimp. The first step is to determine what length of pull you want and measure from the center of the trigger to the middle of the butt and mark the wood.

I then hold the buttplate over the stock and determine how I want it to look. There is some flexibility Once done, cut each segment off. on how much of a sweep you want from the heel of the stock to the toe. Once you have determined how you want it to look, scribe a line on the stock using the buttplate as a guide. When I'm happy with what I have, I mark it in permanent marker as a guide to cutting the wood.

INSTALLING A CURVED STEEL BUTTPLATE CONTINUED

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Far Now we use the rasp to smooth out the wood of the butt. Lay the buttplate on the wood often to see your progress and determine where more wood needs to be removed. The buttplate is nearly in full contact with the stock. Now it is time to fit it to the stock. If you have a band saw you can simply cut the stock using the line as a guide. Leave the stock a little long to allow for fitting of the buttplate.

If you don't own a bandsaw, the easiest way I have found is to simply make a series of cuts from the butt forward to the line you drew on the stock. I then take a thin bladed saw

like a hacksaw and cut each of the segments off using the marked line and the bottom of the cuts as a guide. I then like to bevel the edges from the line in the stock toward the center of the butt so that as I use the rasp to work the wood down, I don't have as much trouble with the edges chipping.

At first, the end of the stock is going to look like it was attacked by a mad beaver but don't worry because that is exactly why you left the stock long. With the wood rasp, work the wood down closer to the line until it is smooth enough to start seriously fitting the buttplate. Place the buttplate on the stock

and work down the high areas of the wood until you get the steel plate nearly in contact with the wood along its whole length. Now is the time to inlet the spur if your example has one.

I hold the spur down to the heel of the stock and draw the point on the Far Using a smoky candle or inletting fluid on the back of the plate where it will contact the wood is blackens any high spots. Placing the buttplate in the stock, gently tap with a nylon hammer to transfer the black material to the wood where it is in contact.

INSTALLING A CURVED STEEL BUTTPLATE CONTINUED

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With the inletting done, scribe a line on the steel using the edge of the stock as your guide. Grind off the excess metal and cold blue the edges. Comb using the buttplate as a guide. Blacken the inside of the buttplate that fits up against the wood with Dykem or other inletting black, or hold it over a candle to cover it with soot. The buttplate is then placed down on the stock held in place and tapped lightly with a plastic hammer.

Remove the plate to reveal dark spots on the wood where the plate made contact with it. Carefully remove those spots with a scraper

and repeat the process. Try to just remove the blackened area without disturbing the wood alongside it. At first you will want to work only on the top of the stock until you have the spur fully inletted.

Once that is done you can work on the rest of the butt, smoking or blackening the buttplate, pressing it in place, and removing the black spots it leaves. Stain the edges of the stock and cold blue the edge of the steel buttplate for a finished look. behind. Continue this process until you have full contact with the wood.

The new buttplate is going to be oversized so I like to attach it to the stock with wood screws and then use a metal scribe to scribe a line around the buttplate everywhere it extends past the stock. I then remove the buttplate and grind it down to the scribed line. You might want to deburr and cold blue the edges before you install the plate. Now you can stand back and admire your work. AG

METALWORKING

Modern Case Hardening

Finishes have advanced greatly since basic bluing. Ferritic nitrocarburizing is incredibly durable but was never aesthetically pleasing. Blacknitride+™ and Armor Ti changes that notion.

BY AMERICAN GUNSMITH STAFF DECEMBER 2018

ORIGINAL PP. 19-21

Ferritic nitrocarburizing (sometimes abbreviated FNC) is a case hardening processes that diffuses nitrogen and carbon into ferrous metals at sub-critical temperatures during a salt bath. Processing at a temperature of over 1,000°F where ferrous alloys and steel are in a ferritic phase provides advantages over other case hardening processes that occur in the hotter austenitic phase.

FNC improves surface integrity aspects by increasing corrosion and scuffing resistance as well as fatigue properties while inducing little shape distortion during the hardening process. By staying in the cooler ferritic phase and using a lower processing temperature, thermal shock is reduced and phase transitions in the steel are avoided. The process dates back to experiments in the 1950s. Early attempts were difficult to clean and not very environmentally friendly.

Degussa in Germany released their Tufftride/Tenifer process. This was commonly used for engine components in locomotives and known for its harsh wear and corrosive resistant properties. FNC is known by a number of proprietary names, such as Tufftride, Tenifer, Melonite, Nu-Tride, and QPQ (Quench Polish Quench). These processes are commonly used on low-carbon, low-alloy steels, however they can also be used on medium and high-carbon steels.

Common applications include spindles, cams, gears, dies, hydraulic piston rods, and powdered metal components. This process is not new and always held poten-

tial for firearm parts. One problem is that ferritic nitrocarburizing has often been used for components that aren't normally visible to the user. Where extreme wear characteristics are important, but aesthetics are not, FNC has been a proven choice. Thanks to further advances, it can now be done in a more aesthetic manner.

Blacknitride+™ H&M Metal Processing (Blacknitride.com, was originally founded in 1946 as a fullservice heat treat factory. In 1948, the family grandfather bought an interest in the company and in the late 1980s, the factory expanded its capabilities to provide salt bath nitriding. Today, H&M is a fourth generation, family-owned company in Akron, Ohio and exclusively specializes in providing its proprietary metal surface treatment, Blacknitride+™.

Blacknitride+ is a QPQ steel hardening process tested for superior corrosion resistance, lower coefficient of friction, and increase lubricity.

With a 50,000 square foot facility staffed with 50 employees in Akron, Ohio and an additional 20,000 square foot Glendale, Arizona facility staffed with five employees, H&M maintains its own in-house metallurgical research and development testing laboratory and FFL license. "Blacknitride+ uses our own propriety blend of chemistry to provide better uniformity and corrosion resistance," said Ben Mc Millen, H&M's Vice President. "FNC was never intended for aesthetics and the process makes it difficult to achieve uniformity.

It often leaves a hard black finish meant to be in the middle of a motor and just perform. Our process results in a more uniform look. We took the known benefits of FNC and made it pretty. It replaces bluing and other less durable finishes." As H&M developed their process, the company introduced the technology to golf clubs and later expanded to firearms, finding it produces an excellent finish.

The molten salt bath deposits nitrogen and carbon that actually penetrates into the surface of the steel and is not just a coating. Finishes such as PVD (Physical Vapor Deposition) or Cerakote are actually ceramic coatings applied on the surface's outside rather like a hard candy shell. While this is durable and provides benefits, Blacknitride+ is impregnated into the metal and is measured by case depth as to how deep inside, like ice on a pond.

This extends the life of barrels and other parts by hardening the interior and exterior surface by treating them outside and inside. This leaves a hard, lubricious surface that prevents galling. Blacknitride+ can be applied to parts after all components are fitted by a gunsmith.

H&M's metal surface treatment attracts many recognizable and familiar OEM's in the firearms industry in addition to providing services to consumers with requests to customize their firearms. "Roughly 90% of the industry uses us in one way or another, to include high-end custom guns," Mc Millen says.

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Blacknitride+ For Gunsmiths While H&M works with big gun companies, they also run a custom shop that can work on individual customers and custom pieces. The first step is to contact them directly by phone or through their website and ask to speak with their custom shop. They will provide specific instructions and details to obtain optimum results for your project and then will create an account to log in your order in their computer system.

Primary points are the gun must be completely detail stripped and disassembled down to the last screw. Not only because they can't promise to be familiar with every possible firearm but because **Blacknitride+** will surface harden everything inside and out. The process can't be used on springs and will absolutely destroy any aluminum parts. After making arrangements with their custom shop and completely detail stripping the gun, ship it to H&M.

Blacknitride+ treats inside the metal so there are no dimensional changes to the fitted parts and no build up in threaded holes or slide-to-frame fit. This is not an outer finish but a surface treatment. This covers all internal areas, even inside screw holes and the like. H&M charges a minimum fee based on the volume of each job.

Each work order is a customized process for those components shipped to the factory. "Success for this process takes real effort to obtain our internal high standards," Mc Millen explains. Because of this, the price per gun drops sharply when done in batches and volume work. H&M has customers that ship in 1-5,000 components per month

which can dramatically reduce the price for a bulk savings. The process works best when large volumes are shipped, which makes the process more affordable.

For reference, the company uses a vat for the drop-in dunk that is six-feet deep and 50 inches around. Once the arrangements are made through the custom shop and the guns shipped to H&M, the company has a two to three business day turn around for custom work. Just to send the point home, **Blacknitride+** will degrade and eat aluminum. The customer is liable for all damage should they mistakenly included parts made of aluminum.

In addition to the hardening, increased slickening, durability, and other performance gains, **Blacknitride+** is known for being an attractive finish. And you can have it in any color you want... as long as it's black, satin or matte. As Henry Ford told his management team about the company's Model T, there are no other color options, however, if color options are necessary, the surface offers exceptional adhesion for those products that have color variations.

Armor Ti Blacknitride+ is for steel parts, however, this type of surface-hardening treatment and finish is also available for titanium. Titanium is a great material for gun building as it is light and strong but the friction is bad, galling is a big problem, and there are issues with impact damage. This creates problems in applications where titanium would otherwise work well. Mc Millen started Akron Research and Technology (AkronRT.com), to address these issues.

Galling is a form of wear caused by welding between two surfaces due to friction. When this welding occurs, the parts continue to slide against each other but a section breaks out, causing galls. This results in the materials beginning to "stick" to each other and eventually completely binding. Thermal conductivity is the ability for a material to absorb and transfer heat. Steel has a thermal conductivity about four times higher than that of many titanium alloys.

The lower thermal conductivity of titanium makes it more difficult for the heat to transfer into a titanium part, keeping it cooler longer and cooling faster once it becomes hot. Due to its thermal conductivity properties and light weight, it is common for titanium to be used in applications like firearm suppressors and muzzle devices, however sparking can be an issue. Titanium has a reputation for deforming under impact.

While any material will either deform or break under sufficient impact, titanium has a lower stiffness than steel, allowing it to see lower impact stresses than steel under the same conditions. For these reasons, titanium hasn't been used as extensively in firearms as its benefits would suggest.

While light, strong, and having good thermal conductivity, the galling and impact deformation issues have limited it largely to peripheral, non-structural components such as muzzle devices, small controls, pins, and the like. The exception to this has been in suppressors as they don't have to deal with friction. Protective coatings designed for steel can't accommodate titanium's

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Using an Armor Ti-treated titanium slide, a Glock 19 weighs 16 ounces. lower stiffness. The result is a failure of the coating (typically cracking or delamination) resulting in wear on the titanium, most often leading to galling. The University of Akron is a public research university in Akron, Ohio. A STEM-focused institution, it focuses on polymers, advanced materials, and engineering. Having earned his Metallurgical Engineer degree there, Mc Millen and ART partnered with the school's Research Foundation.

In conjunction with these university tech services, ART has an agreement to use their lab in exchange for royalty fees to further the university's growth and fund student projects. ART develops metallurgical solutions for many industries, including aerospace, automotive, defense, energy, food, medical, mining, oil/gas, and steel. One of their developments is a wear-resistant coating for the defense industry, a thermochemical diffusion hardening process for titanium.

Testing revealed the coating was an excellent treatment for Navy submarine fire suppression valves and has since become a prime choice for applications requiring wear resistance in submerged environments in salty water and corrosive environments. The coating took two years to develop and patent and is now used widely with the U. S. Navy and Coast Guard. Of interest to gunsmiths, ART's research led to creating their Armor Ti process.

With their focus on titanium, Armor Ti creates a finish that overcomes the material's weaknesses. It is a proprietary, patented process that produces a black, extremely hard, abrasion-resistant finish and allows titanium to be used for applications it was not previously suited for due to titanium's tendency to gall. This surface treatment eliminates friction issues while improving impact resistance.

Armor Ti uses forced diffusion to harden titanium's surface that results in a slick, durable, black finish with a Rockwell hardness of over 70 HRC. The finish only affects the surface layer of titanium and leaves its integrity and the most desirable properties of titanium intact at its core. Titanium parts are first machined to dimension and then run through the process.

Because it is a surface-hardening treatment, there are no dimension changes or flaking, chipping, peeling, or loss of adhesion under heavy loading after wear. Unlike other options, Armor Ti changes the metallurgy of the outer layer of the titanium by diffusing interstitial hardening elements into the surface instead of applying anew material to the outer surface of the titanium. Where traditional titanium anodizing results in This makes Armor Ti for titanium the equivalent of Blacknitride+ for steel.

Like H&M, Akron Research and Technology offers a custom shop for gunsmiths. After making the same type of arrangements, gunsmith can have their titanium guns and parts finished with Armor Ti. In addition to

the custom work, Armor Ti is featured on pre-made titanium parts from Krytos Industries (KrytosIndustries.com, Krytos began by offering titanium AR-15 bolt carriers.

This solves the problem that PVD coating failed to as PVD would instantly fall off due to the substrate not being strong enough to support the coating. After Armor Ti proved its worth there, Krytos started offering titanium pistol slides which had never been successfully accomplished before. Using an Armor Ti-treated Krytos titanium slide, a Glock 19 weighs in at 16 ounces. The slide takes a lot of impact from rails and barrel but this treatment eliminates titanium's galling issues and protects the core.

Testing has demonstrated slides continue to hold up after tens of thousands of rounds fired. Even though friction isn't normally an issue, titanium use with suppressors leads to sparking issues. Armor Ti has been found to have 98% spark mitigation, making it an ideal treatment there. Traditional finishing like bluing still looks great but performance and high-wear environments demand more durability. Blacknitride+ for steel and Armor Ti for titanium are great options to consider for your firearm projects.

AG oxide finish intended to reduce galling, it fails to hold up under extreme friction and other heavy load-related conditions found in firearms and many aerospace and automotive applications.

PISTOLS

The Country Doctor

Unless you're running a big-time custom shop, run your gunsmith practice in the same way that an old fashioned doctor conducted his.

BY BILL SMITH DECEMBER 2018

ORIGINAL PP. 22

This is aimed at Mr. Average, the probably small-time gunsmith. It is not for large shops and the competition gun boys with factory-sponsored champions that can afford full page ads in American Handgunner magazine. It is for the “no name” gunsmith that nobody is writing up when they fixed up the gun used to shoot a “world record” jack rabbit. Specialty, big-time shops, and custom makers that regularly do business in deep in to the six-figure range and up aren’t going to understand this anyway.

Their primary interest is in selling you their add-on parts and making more profit. That’s all well and good for if we small-timers buy and sell their parts in our work we provide a service to our customers while also making a profit, something that is (or should be) the goal of everyone in business in anything.

If you have ever been in the old Pachmayr or Paul Jaeger shops or at the Griffin & Howe gunsmithy, you will at once—at least after the envy dies down—realize that there is a wide world of expensive guns and Master Gunsmiths. You will find the Parkers, L. C. Smiths, Purdeys, Fabbri, Merckles, etc. What you won’t find is the Iver Johnsons, Savages, Stevens, H&Rs, Remingtons, or Winchester, or any such pedestrian, commoner, off-the-rack guns.

I suppose no nobility is found in these expensive firearms but they and their owners have a great deal in common with you and the country doctor. Both of you treat these different patients and in each case the disease is different. You and Ol’ Doc have to be able not only to diagnose the trouble but you are expected to fix it. Not much romance in building a custom, hand-fitted part for these guns (especially for a

“patient” that can’t afford it) but there isn’t much romance in curing a social disease either.

But you both do it. All in all, taking the number of gunsmiths around the country who keep the old favorites owned by common people working—and after all, both of these are the best kind—what are you and Ol’ Doc doing? You are performing a service. What is this service? The country doctor may have been phased out by the newer, younger specialist as he eventually could not compete but that’s where we are one up on him. We don’t have to specialize as long as there are two different off-the-rack guns to buy.

We will end up fixing both sooner or later. We may not be undertakers but we can wait. The small-time, local gunsmith’s specialty lies in the fact that we are able to repair, refinish, or improve a whole range of different types and makes. Our “specialty” of not having a specialty along with our service is that we can do a job for a local customer that the custom maker or the elite house cannot (or, rather, simply won’t) at a price our customer can actually afford. We are the country (gun) doctors of today.

While we may not make house calls or trade our services for a bag of potatoes, we have that old Yankee know-how to keep things shootin’. You can’t buy this knowledge for it only comes with time and experience. You can’t get it from a correspondence course or a school without also working on customer projects. Just like a country doctor, getting through education basics and preliminaries merely starts the learning and only years spent working at it can give the experience.

Unless you have worked on a great many different guns, you really aren’t out of your internship yet. If you think so, come work for me or any other local independent gunsmith for a month and learn just how far away from your Ph. D. you really are. You need to have a service and knowledge that should be of great reward to you—monetarily as well as personal satisfaction. Nowhere can a person go to get as much service, experience, ability in working with a large array of firearms as a local gunsmith.

Just like a country doctor will see and treat a much larger array of ailments than a specialist ever will. While you may be learning with many of your customer projects, be certain you’re running your shop in a reasonably profitable manner. While not as glitzy as those big shops, you are professional and can offer something locally they can’t. Your ability and knowledge cost money and time to develop and you deserve a reasonable minimum rate and hourly rate for your work.

Gunsmithing boils down to how many hours you work for how much. You are repairing, not making a product that will sell for so much. As you continue to stay in this business you will have to one day realize that your hourly rate is what you are going to be living on. This is your profit. For example, let’s take a job involving replacing a broken pin that takes 15 minutes. What do you charge?

At least \$10-15, or a minimum charge for specific work posted on the wall of, say, \$25.00, along with the cost of the part added in. If your final bill is \$30.00 and you think this is too high, take your car into a dealer and get a fuse changed. Charge a fair but profitable rate. PS, Ol’ Doc didn’t die poor. AG

METALWORKING

Reader Forum

BY AMERICAN GUNSMITH EDITORS DECEMBER 2018

ORIGINAL PP. 24

Hopkins & Allen I have a Hopkins & Allen XL double action revolver chambered in .38 Short Colt and marked, "PAT. MAR.28.71 JAN 5.88". What is the estimated value of this revolver given the gun has matching serial numbers and is intact? There is a small coil spring in the trigger mechanism. Along with anew cylinder, I believe it will be shootable. Would there be any interest in publishing on article on this? David A.

Denhoff Hopkins & Allen Manufacturing Co. of Norwich, Connecticut, was a major manufacturer of rifles, shotguns, and inexpensive cartridge handguns between 1868 and 1915. Hopkins & Allen purchased the assets of the Bacon Manufacturing Company when that firm ceased operations in 1868.

The firm was initially prohibited from manufacturing cartridge revolvers using Rollin White's patent for bored-through cylinders that Smith & Wesson held exclusive rights to, however, after the patent expired Hopkins & Allen converted their percussion revolvers to fire cartridge ammunition. In addition, a line of spur-trigger cartridge revolvers in .22 rimfire and .32 rimfire calibers was introduced.

Many of Hopkins & Allen revolvers were sold to distributors under trade names such as Blue Jacket, Mountain Eagle, Ranger, and others. By the late 1870s, Hopkins & Allen's sales had grown to the point that the company relocated to larger facilities in Norwich. Their product line expanded to include the XL Army, XL Navy, and XL Police models. The patent dates stamped on the top strap refer to patent number 113,053 issued March 28, 1871 to Samuel S.

Hopkins for a revolver and patent number 333,725 issued January 5, 1886 to James Boland for a revolver and assigned to Hopkins and Allen Manufacturing Company. Rexville, NY Gun values for revolvers of this type range from about \$100 to \$350, depending on condition. Numrich (GunPartsCorp.com, has an entire sec-

tion on Hopkins & Allen revolvers with parts, springs, cylinders, and schematics. Higgins M101.25 I have a J. C. Higgins Model 101.25, which is a variant of the Stevens Model 39A.

Does this use the 2 1/2inch shell or the 3-inch shell? Robert B. Three-inch .410 shotshells were not common until the 1940s and J. C. Higgins made four models (39A, 59A, 59B, and 59C) between 1946-1950. If the barrel isn't marked as having a three-inch chamber, assume it is 2 1/2" until you have it measured. Three-inch .410 shotguns can safely fire 2 1/2" but not the reverse. German Hunting Guns I am looking for more information on E. Schmidt & Habermann firearms.

Specifically, the company's bolt action and single shot rifles with double triggers. What calibers were offered? What are typical values? Ken Rice Ken Arthur's Trading Post E. Schmidt & Habermann was founded by Emil Schmidt and Al Habermann as a gun factory in 1860 with headquarters at Roschstraße 1 in Suhl, Germany. The company owned a number of hunting-related patents. Around 1920, the company was bought by Franz and Paul Stadelmann who operated it until 1935.

They produced bolt actions, double shotguns, drillings, and Bockdoppelbüchsen (Bock double rifles), among others. The website German Hunting Guns (German-HuntingGuns.com/ archives/e-schmidt-habermann) has an entire section on E. Schmidt & Habermann firearms along with articles and original advertisements from the company. The German Gun Collectors Association (German-Guns.com) has information and history on all German sporting arms, including E. Schmidt & Habermann.

Finally, Michael Hammer maintains the website Jagdwaffensammler.de (Hunting Weapon Collector). While the site is written in German, Google Translate will help if you don't read the language. AG

SEARCHABLE ISSUE RECORD

Archive index

Mc Millan Adjustable A6 American Gunsmith Editors	2	Modern Case Hardening American Gunsmith Staff	19-21
Nambu Type 14 Mark R. Hollensen	3-8	The Country Doctor Bill Smith	22
Straight Bullets Joe Carlos	9-15	Reader Forum American Gunsmith Editors	24
Installing A Curved Steel Buttplate Paul Mazan	16-18		

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