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PRECISION ARMS WORKSHOP

AND THE AMERICAN GUNSMITH ARCHIVE

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AR-15 BUILD PROBLEMS

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ORIGINAL METHODS. MODERN ACCESS.

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DIGITAL ARCHIVE EDITION

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SAFETY & COMPLIANCE

Liberty Shooting Camp and Seminar

BY AMERICAN GUNSMITH EDITORS MAY 2016

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Hillsdale College is hosting their annual Ladies for Liberty seminar and shooting camp on June 5-9 2016. The camp teaches women of all experience levels shooting sports techniques and gun safety.

Participants also attend lectures by Hillsdale College faculty members on topics related to the Constitution, including the Second Amendment. "The Ladies for Liberty Shooting Camp is a great way for women of all experience levels and backgrounds to meet other women who are interested in the shooting sports," said Sheila Hoekstra, certified National Rifle Association instructor and one of the camp's coaches. "The atmosphere helps women feel like they can ask anything, enabling them to learn more effectively and erasing the stereotype of shooting sports as a male-only hobby." Ladies for Liberty is held at the Hillsdale College John A.

Halter Shooting Sports Education Center, a 105-acre, state-of-the-art training facility five miles from main campus. An enrollment fee of \$1,200 covers lodging,

meals, lectures, and receptions at the Dow Conference Center on the Hillsdale College campus, as well as all lessons held at the Halter Shooting Sports Education Center.

Training topics include an introduction to handgun function and operation led by competitive shooter Sheila Hoekstra, seminar on the Constitution from a Hillsdale College faculty member, self-defense at home and away, comparison of semi-automatic pistols and revolvers, selecting self-defense accessories, a NRA Refuse To Be A Victim course, and introduction to clay target shooting led by Halter Shooting Center Range Master Bart Spieth. Winchester and Smith & Wesson are sponsors for this event.

Shooters ages 21 and up are welcome. Light-recoiling handguns will be available and attendees may bring their own firearms upon approval by event staff in advance. Visit Hillsdale.edu/ladies-for-liberty or contact Bart Spieth or Kim Gehrke for more information.

PEOPLE & COMPANIES

Ruger American Rimfire

Success of the first American rifle leads to Ruger expanding the brand.

BY CHICK BLOOD MAY 2016

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This can't be considered the last article to appear here about the Ruger American line up. In the future you'll be reading up on the pistol and, hopefully, another on the centerfire Ruger American Rifle which earned the 2013 Golden Bullseye Award from the National Rifle Association's American Rifleman magazine as "Rifle of the Year." Whether the latter ever becomes viable depends on a rumor I picked up at 2016 SHOT involving a major change in policy regarding the bolt assembly.

Present standard operating procedures require the rifle be returned to New Hampshire for any servicing. That would include cleaning! How come? Absolutely no information on bolt disassembly is available. No way, not from anywhere inside or outside the factory. Such a policy might be considered wisely made in a Legal Department but I insist it's plain dumb from a marketing standpoint.

The American Rifle is a reliable, lightweight, accurate, reasonably-priced hunter and I reckon those arriving at the choice picked a true winner. It is among the top sellers for Ruger. My fear is that it will be spending so much time travelling back and forth for anything beyond basic maintenance that the rifle is in danger of being hit with a bum rap for not being present when wanted in the field.

The fear cancelled out any personal hesitation regarding my mentioning that risk to a couple of senior management types who'd joined the passing parade in and out of the Ruger booth. Turns out, someone "up there" must have heard me and decided I wasn't a total kook.

The rumored whisper reaching my ears at 2016 SHOT included not just a change. Even the raw materials used in its manufacture are purchased from domestic sources. In the existing policy but the inclusion of a factory service jig to be included with each rifle shipped. This jig makes it possible for any informed, practicing gunsmith to disassemble and reassemble the firing pin assembly, the most verboten of bolt components.

Further, the presently-forbidden bolt detailed takedown information would be readily revealed to "previously qualified recipients." A very short list of those recipients includes us. Keep your eyes peeled for a future article. For now, I'll continue filling you in about the American Rifle's new rimfire cousin released just over a year ago. Ruger's success in the rimfire market has prompted the company to broaden purchasing choices to six options.

Stocks are either nicely-grained wood or black polymer, chamberings include .22 LR, .22 WMR, and .17 HMR, and the trigger is the same proven Ruger Marksman Adjustable unit that has earned much praise due to its presence in the company's

hunting rifles. Lengths of pull are 13.75 inches for full size models and 12.5 inches for compacts. All barrels are 18 inches with a 1/2 x 28 thread pattern and a factory-installed thread protector at the muzzle end.

There are comb height options to choose from and all models include the patent-pending Power Bedding blocks to positively locate the receiver, free float the barrel, and assures that wandering off center bore is nothing to be concerned about. All .22 LR models employ flush-mounting BX-1 ten round magazines like the 10/22 or BX-25 25 round magazines. Magnum models use the flush-mounting JMX-1 nine round magazine.

The receiver is machined to accept a 3/8" rimfire scope base and is also been drilled and tapped for Weaver #12 bases (not included.) The inside diameter of the receiver is 3/4 inches. You'll need to know that if your customer insists on having the OEM barrel replaced with one heavier or longer. There is no similarity between this barrel and the easily dealt with one of a 10/22. It's purely a Dr. Jekyll and Mr. Hyde thing. Pin #57 on the parts list is identified as "Assembly Pin".

While it may appear to be the part holding the barrel in the receiver, American Rimfire barrels are actually a press fit set in very tightly with a hydraulic press. Not until then is a hole drilled through the receiver and the lower portion of the barrel and the pin installed. Is

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It makes it possible to remove the bolt without pulling the trigger and is shown as it would be on a right handed gun. Removal is described in the article with details of the bolt disassembly. the pin tapered? Could be. Measure both exposed ends of it. If one is smaller than the other, it's tapered. So much for Dr. Henry Jekyll. Enter Mr. Hyde?

Whether he does pretty much depends upon how stubborn the customer is about replacing the OEM barrel, how you explain the work to be done, whether If it isn't, secure the rear of the bolt in padded vise jaws, grasp the bolt handle knob firmly, and rotate it counter clockwise. Basically, it's a spring with a dual function. Removal must be done cautiously. A your shop is equipped to do it, what the cost will be if it is, and—most important—what the cost will be if it isn't. Begin with the task itself.

Pin #57 does have an assembly function. Sort of. After the hydraulically-imposed press fit has been accomplished, the hole is drilled as described and the pin inserted to prevent any

possibility of the barrel backing out. As long as the pin remains in contact with the barrel the latter can't be pushed from the receiver. If you have a hydraulic press and a means of firmly holding on to the receiver without damaging it, the pin must be pushed inward.

Do no pushing from other than its smaller end if measurements taken indicate a taper. Do otherwise and a terrible internal, immovable jam will occur that will have to be drilled out. Once the pin is detached from both the barrel and receiver, a hydraulic press must be applied to separate the two major components. With any luck, this press could be the same machine needed to press fit in the replacement barrel while continually confirming any front sight it wears is centered after the pressing.

Drill the assembly pin hole through both components and install the pin. That's all there is to it, except you likely don't have a hydraulic press and no reliable, safe means of holding the receiver. Sending this work out will add to the costs. I guarantee this addi-

tional cost will dampen the determination for a Hyde-inclusive switch down to, "Isn't there some other way?" B There are several solutions to this but leave your operation out of further consideration if there's not a quality machine lathe on site.

If there is, you're still in the game with Other Option One. Get a quote from a metalworking member of The American Custom Gunmakers Guild (acgg.org), and add in the cost of a replacement barrel. Ship off the rifle after securing customer approval. Other Option Two, agree on the specifics of length, style, twist rate, etc., and relay that data to a reputable, reliable barrel maker such as Shilen Rifles, ER Shaw, or Mc Millan Firearms. With the specifics arranged, ship the job to them.

If you have a lathe and can arrange access to a hydraulic press, Other Option Three is to prep the barreled action for barrel removal and manage the removal as it happens. Take the new barrel to the lathe C

RUGER AMERICAN RIMFIRE CONTINUED

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Above center: The positioning spring (D) properly installed prior to returning the bolt to the receiver. 22 LR (BX-I) magazine for the American Rimfire also fits the 10/22. Never load .22 LR cartridges in a .22 WMR or .17 HMR magazine (JMX-I) as the smaller cases can split, releasing hot gases and particles out of the action at high speed. and turn 16 TPI x 34 inch threads inside the receiver with matching ones onto the new barrel.

Join the two components, assuring center bore front sight alignment when the union is complete. Use the existing assembly pin hole in the receiver as a guide. Carefully drill through the receiver and lower barrel, then install the pin. Eliminating the remote possibility that neither Mr. Hyde nor any member of his family hold a High Master classification, I'll now bet the revealed costs of a re-barreling project end all additional demands.

You may be thanked for your unpaid advisories but, considering the nature of the Hydes, probably not. Still, you can profit from this overview. Field Stripping Eye protection on? Magazine out? Safety on? Chamber empty? Check. Open the bolt. Pull it to the rear. At the same time, depress the rear of the bolt release. A unique feature among bolt action rimfires is present in the American Rimfire: There's no need to pull the trigger when removing the bolt.

Once the bolt and barreled action are out of the stock, routine cleaning is immediately possible from breech to muzzle. Removal of

the barreled action is child's play. Back out both action screws (#46) and lift the action straight upward. As you have probably noticed, many drawings are included in this article yet you're soon to be aware I'm only providing detailed disassembly information on one. When I've followed this practice in the past reader questions, some quite resentful, wanted to know why.

The response, then and now, remains the same. An increasing number of small internal parts, particularly in trigger assemblies, are being restricted to "factory only" fitting. They are not available to anyone outside the service department. A complete trigger assembly, however, is made available in guns where reinstallation presents no complex procedures.

The reasons for the part restrictions, especially in hunting rifles and personal defense handguns, is a concern unskilled hands will attempt to "improve" trigger pulls to a point that renders a rifle or shotgun unsafe to be carried afield or the pull of a defensive weapon too light to reliably ignite a chambered round. In either case, bad things happen. When bad things happen, lawyers bearing litigations are sure to follow. I hope all who have inquired are satisfied with this rationale.

Mean- Dwhile, what a gunsmith will need to know about any seemingly unnecessary drawing is mentioned in the captions. Detail Stripping The Bolt You will need a 1/8" or

3/32" punch and small flat blade screwdriver. The rear bolt retaining pin (#5) is located just aft of the bolt handle (#6). Uncock the bolt to relieve enough tension on the firing pin spring (#3).

You'll know you're set up for the next move when the square front end of the firing pin (#4) has noticeably cleared its guide block (#51) and has seated in the large groove at the upper end of the bolt handle. Several coils of the firing pin spring are should be visible in the U-shaped cut of #51. Now you have to place the back end of the bolt on your bench. Hold it steady as you'll need to press down on it firmly.

Listen for a slight click that is being made by the rear bolt retaining pin and lets you know the pin has been freed up for removal. Keep the pressure on. Push out the pin with the proper punch, then ease off. The rear bolt (#2) and firing pin spring will slide out of the back. If they don't, look for a hang up by the firing pin on part #8, identified as "Positioning Spring." Properly translated to its dual function, one end (the bent one) of #8 applies pressure on the cartridge case rim to retain it.

The opposite end has very small "ears" that retain the extractor (#9). Avoid getting ham-handed here. Insert the blade of the small driver between

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the front end of the bolt (#1) and the ears of #8. Carefully rotate #8 counter-clockwise as you lift the ears off the extractor. Remove #8 from its bolt slot. Lift away the extractor. The firing pin will slide out the back of the bolt and the bolt handle will slip off the front end of the bolt rear. Ruger American Rimfire (Specifications subject to change without notice) For reassembly, the extractor has position hooks that must fit into the bottom of the front bolt.

Make a magnified inspection of the extractor and forward bolt. Locate the hooks, their intended position in both, and assure a perfect marriage between the two. With anticipated broad acceptance and increasing sales as a result, I have a hunch Ruger will keep right on producing extensions of their American brand.

How about they add a marching band for the announcement meetings, telling all there is yet another American they can be proud of, with the combined display of all Ruger American firearms revealed to the tune of Yankee Doodle.

AG 1 Bolt/Firing Pin Assembly 2 Rear Bolt 3 Firing Pin Spring 4 Firing Pin 5 Rear Bolt Retaining Pin 6 Bolt Handle 7 Front Bolt 8 Positioning Spring 9 Extractor 10 Magazine Latch Housing 11 Magazine Latch Housing 12 Magazine Latch 13 Magazine Latch Plunger 14 Ejector 15 Pivot Pin 16 Magazine Latch Plunger Spring 17 Trigger Housing Pin (2) 18 Trigger Assembly 19 Safety Button 20 Sear Spring 21 Sear 22 Safety Link 23 Sear Stop Pin 24 Trigger Block Pin 25 Trigger Sear Pin (2) 26 Safety Shaft 27 Safety Spring 28 Trigger Housing 29 Trigger Sear Pin E-Clip (2) 30 Trigger Block Pin E-Clip 31 Safety Shaft E-Clip 32 Trigger Release 33 Trigger Release Spring 34 Trigger 35 Trigger Release Pin 36 Trigger Spring 37 Trigger Adjustment Screw 38 Stock Assembly 39 Recoil Pad, Standard 40 Recoil Pad, Standard, High 41 Recoil Pad, Compact 42 Recoil Pad, Compact, High 43 Locknut 44 Rear Sling Swivel Screw 45 Stock Body 46 Action Screw (2) 47 Front Sling Swivel 48 Recoil Lug 49 Magazine Assembly 50 Barrel Receiver Assembly 51 Guide Block 52 Receiver 53 Bolt Stop Pin 54 Bolt Stop Lever 55 Bolt Stop Spring 56 Filler Screws (4) 57 Assembly Pin 58 Rear Sight Assembly 59 Barrel 60 Front Sight 61 Front Sight Screw

FROM THE ARCHIVE

AR-15 Build Problems

BY JOE CARLOS MAY 2016

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As a military armorer for over a decade I conducted many studies on the AR-15. Meticulous record keeping helped. I have passed along the results of my research in these pages over the past couple of years. The techniques described helped me to cut the average group size of the Army Reserve Shooting Team National Match AR-15s fully in half. Because I have written solely about the ideas that worked it occurred to me that perhaps I have been misrepresenting the truth a little, though not on purpose.

I have tried things that flat didn't work. There are folks out there that swear by some of these 22 Magnum, also use fixed ejectors. Bottom ideas. This will likely ruffle some feathers but I have been a tax assessor, state game warden, and drill sergeant in the past so I am used to making people angry. Ejector Tension Weapons designers have incorporated various methods of ejecting spent car-

tridge casings. For example, 1911 pistols have an extractor on the right side of the slide's breech face but nothing else.

The spent casing is pulled from the chamber by the extractor as the slide is propelled to the rear upon firing. A fixed ejector is mounted on the left side of the frame. When the fired cases left rim hits the forward face of the ejector it is diverted to the right and out. Fixed ejectors are not exclusive to just pistols. Both of my Anschutz squirrel rifles have fixed ejectors. Spring-loaded ejectors have a plunger in the bolt face. When such a firearm chambers around that plunger is depressed flush.

The coil spring is compressed and applies forward pressure to the ejector. With the bolt moving rearward, pressure to the right by the ejector wants to push the casing but the casing can't move until it clears the chamber and is flung out of the rifle. Many folks are under the impression that the hard pressure on the left side of the cartridge rim by the

ejector causes the whole cartridge to cock at an angle away (to the right) from the centerline of the bore, negatively impacting accuracy.

The fact that gas guns generally tend to have fatter chambers certainly lends credence to this theory. Folks subscribing to this theory often make modifications to the bolt that result in less ejector pressure. Doing so can run the risk of malfunctions, but is there any measurable accuracy gain? I tested a number of 20" sub-minute Service Rifle uppers in a machine rest using known lots of ammo. Then I removed the upper and took the ejectors out, testing with the same ammo.

There wasn't a lick of difference between the groups. As a second attempt, I repeated the test using 26" Match Rifle uppers. Both the 20" and the 26" barrels were chambered with my normal gas gun Wylde reamer. I followed the same basic procedure as with the first attempt and the second

AR-15 BUILD PROBLEMS CONTINUED

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Above center: Bolt carrier weights influence barrel harmonics. test largely confirmed the result as the groups fired with no ejectors were a measly 3% smaller. Even High Masters can't benefit from a mere 3% accuracy gain when shooting from the shoulder. If one test showed zero accuracy gain and a second showed only a 3% gain when ejectors are completely removed from the firearm, it's logical to conclude that leaving the ejector in the bolt and using reduced ejector spring tension is a poor idea.

There is likely to be a zero accuracy gain at a potential sacrifice to reliability. Don't mess with the ejector and just leave it as Stoner designed it. Buffer Springs Manufacturers of chrome silicon flat wire buffer springs claim that they ensure "consistent forward thrust" on every shot.

Just as consistency in the application of shooting fundamentals results in top scores, I have determined that consistent bolt carrier velocity helps ensure uniform positioning of the case rim on the bolt face with equal pressures by the extractor and ejector for every shot and uniform positioning of the cartridges in the chamber for all shots. The result is improved accuracy and the use of match bolt carriers and bolt carrier anti-tilt pads enhances grouping capability by 8.8 and 14%, respectively.

I wondered if the advertised consistency in forward thrust of the more expensive springs might also buy some added accuracy so I tested my theory with 12 AR-15s. Each gun was first machine rest tested using known lots of ammo, magazine fed. Then the flat wire spring was substituted for the stock spring and the test was repeated. Seven guns responded favorably and their average group sizes tightened up by 13.8%. The other five guns failed to improve.

While I had no malfunctions during testing the various manufacturers of these springs nearly all use words like "extra power" in their advertising. I have known shooters who tried these springs to find their function compromised and they had to go back to stock springs. Any time you make any changes to the bolt carrier, the buffer, or buffer spring you can expect point of impact changes. Confirming zero is a good chance to confirm reliability.

Given that only a little over half of the tested dozen guns showed any improvement with the springs, I would advise using these springs only if your gun is similarly benefited. For you grown ups, Glen Zediker noted in *The New Competitive AR15: The Ultimate Technical Guide* that accuracy enhancement in the AR-10 with the chrome silicon flat wire springs showed much more favorable

improvement. I have not personally tested these springs in the bigger rifle and will take Glen at his word.

It is very seldom that his research differs in conclusions from mine. Recoil Reducers Recoil reducers or cyclic rate reducers resemble automotive shock absorbers. They soften the secondary recoil pulse felt recoil, which occurs when the back of the buffer slams into the rear of the buffer tube. That abrupt stop has a jarring effect to the shooter that combines with the recoil caused by the forward acceleration of the bullet.

One of the claims these reducers is to "Improve Accuracy." Although I have shoulder fired a few of these devices I have never tested them in the machine rest for accuracy, though I'd expect to see much the same as with the flat wire buffer springs. I would think that accuracy would be very gun specific.

What I have experienced with guns having reducers when shoulder firing them was that felt recoil was noticeably less, zeros changed quite a bit from the same gun without the devices, in tens of thousands of shots I never had any function issues (though testing is always necessary), and my scores went up on courses of fire where time limits were fast. That doesn't necessarily indicate accu-

AR-15 BUILD PROBLEMS CONTINUED

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The idea for the tungsten unit came from M9 KKM barrels with tungsten bushings. racy improvement, just that faster recovery between shots was spent getting better sight alignment for the next round. Bolt Carrier Weights Bolt carrier weights are supposed to increase the dwell time, keeping the bolt locked up a little longer, aiding in primer retention, possibly allowing increased powder charges.

When the Army Reserve was experimenting with 90 grain .223 bullets we were trying to keep bullet velocity above 1,100 fps at 1,000 yards. I did my load development work with these weights and felt they were worth about 0.3 grains of extra propellant, gaining about 30 fps in velocity. Some folks are of the impression that a secondary value of the weights it to increase accuracy. In some firearms this will be true but in about as many others they don't help or can degrade accuracy.

These devices can add up to four ounces to the carrier assembly. The carrier is apart of the barrel during firing because the bolt is locked up with the barrel extension so a radical change in the weight of the carrier assembly is going to influence barrel harmonics and that can hurt or help accuracy. If you are going to use these, have them in place during load work ups. Expect to have zero changes and a performance drop off if you forget to reinstall them.

I don't recommend leaving these weights in during magazine-fed rapid fire strings as they can induce malfunctions. If you wish to use them during rapid fire, there is a simple modification to the end cap of the buffer which the manufacturer thoroughly describes in the instructions. Tungsten Various non-sensical laws have restricted flash suppressors and shooters affected have contacted me for something to cover up the threads at the muzzle. I made up simple thread protectors.

While making these I remembered that accuracy work with the M9/Beretta 92 pistol found that a prime reason it shoots fat groups is lack of forward support to the barrel. There is no bushing in the slide such as in the 1911 and the muzzle is unsupported. Early gunsmiths cured this by threading the front of the barrel and screwing on a bushing locking up with the slide. Early designs used regular steel until some smart hombre decided to try tungsten. Tungsten is much heavier and stiffer than regular steel.

It is also very hard to machine. It is available in several grades and only the "softest" grade works in the pistol applications. Pistolsmiths using the tungsten bushings claim enhanced accuracy by improved harmonics. There is no doubt that stiffening the front inch of the barrel in addition to hanging that much more weight out there does influence barrel harmonics. When I was the Armorer for the Army Reserve Shooting Team I outsourced some of the work to various

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specialty shops. Most of my earlier work was in gunsmithing revolvers for police. As they migrated away from wheel guns, I worked on 1911s and Berettas. When I had so much AR-15 work for the Team, I outsourced M9 accurizing to Mountain Competition (MountainCompetitionPistols.com). Tungsten M9 barrel bushings were an offered option. When I decided to try tungsten thread protectors I contacted them for advice.

Pistols use a different thread than the AR-15 but it was close enough to allow a judicious “re-tap” to get it to fit. Mike Harpster, a local gunsmith I outsource some of my work to (DeadCenterSports.com), performed the machine shop modification. They feel noticeably heavier. I pretest all the AR barrels I sell on a machine rest for accuracy and make the groups available to my customers so they can select a barrel that is the best compromise of price and accuracy to meet their needs.

I had just received a shipment of Bartlein gain twist barrels and was finishing up their break in when the thread protector project was coming to fruition. Using the pre-ban configuration barrels I ran three tests with known lots of ammo using a normal A2 flash suppressor, a regular steel thread protector, and the tungsten unit. 1/3 of the barrels tested liked the normal A2 flash suppressor, 1/3 shot best with regular steel thread protectors, and the final 1/3 favored the heavy tungsten unit.

As with other tests, my study of the tungsten thread protectors found firearms to be individuals with particular preferences and I chose not to sell tungsten protectors. Without machine rest testing a customer would have no idea if his barrel would be one favoring them. Why didn’t the tungsten thread protectors have the desired outcome of improved accuracy? An M9 barrel is five inches and the tungsten bushing occupies the front inch, or 20% of the total length.

Contrast that to a 20" barrel and a thread protector between 1/2-5/8" long. The tungsten part is about 2.5% of the total length. So perhaps part of the answer is we are just not using along enough section of tungsten to have a positive dampening effect on barrel harmonics. Long Chambers Long chambers are those in which the combination of free bore and throat causes magazine-length rounds to jump enormous distances before encountering any rifling.

There are a few folks out there that try to convince us that magazine-length ammo is jump proof and that these long jumps don’t hurt performance. I’m not aware of any studies that support the veracity of such claims and believe these assertions are examples of “encyclopedic error” where claims have been repeated so often that they have become accepted in spite of any empirical evidence.

I have set up and conducted studies into this bullet jump theory with details covered in my July-September 2014 articles “AR-15 Chamber Selection.” Summarizing that, my studies revealed that some bullets are jump resistant but none I tested are jump proof. All bullets degrade in accuracy the further they are jumped, all other things being equal.

If you are building a gun shooting some or all of the time with 2 1/4" magazine-length ammo and you want both accuracy and longevity, I would back away very smartly from any barrel with a chamber longer than a Wyld. Recoil Compensators While I haven’t tested all the recoil compensators on the market, most true compensators are closed in at the front with the hole in the front just large enough to allow the bullet to pass through without rubbing the sides.

This design causes the gas following the bullet to be directed upward, dampening muzzle jump. The GI A2 units are open in the front, similar to the A1 flash suppressor but closed at the bottom to reduce dust signature when firing in dry conditions from prone. Recoil compensation, if any, is minimal. True compensators do make a noticeable difference in felt recoil. If I were burst or full auto firing at modest distances I would sure want one of these devices.

That said, there are a few downsides from the ones I tested. Point of impact changes when installing these. I have had a gun firmly clamped in the ma-

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chine rest with bullets going nearly through the center of a 4' x 4' target backer at 100 yards and switching to a compensator would put rounds clear off the backer! I have also tested a few of these for accuracy and wasn't impressed. Some groups nearly doubled with the compensators in place. Perhaps I just haven't tested the right compensators. Certain match rules disallow their use, including NRA events. I have mentioned some of the things to look for regarding compensators.

I suggest that if you are interested in the potential use of them you conduct your own tests to see if they provide an advantage in the style of shooting you are involved in. Gas Ports And Velocity Another encyclopedic error I'll debunk is the notion that gas ports in our AR-15s drain off gas that could be used to raise bullet velocity. It seems to make sense. Gas ports in 20" barrels are nearly 1/10" in diameter and about 7" to the rear of the muzzle. The bullet is still accelerating in that last 7" of barrel.

One would suspect that a gas port of that size could drain off gas that would be valuable in speeding up the bullet before it exits at the muzzle. What happens in real life? I use adjustable gas blocks from JP Enterprises in my rifles which have set screws that can be adjusted to meter gas or shut it off entirely. For this test I fired a ten-round group with the port in the full open mode through my Oehler chronograph, then set the screw to completely shut off the gas for a second group.

There was zero loss of velocity. In Derrick Martin's *The Complete Guide To AR-15 Accuracy*, he recounts the same results performing a similar test. There is a handy estimate used even by big ammo makers and applied across many cartridges, not just the .223, stating that for every inch of barrel increase or decrease one can expect about a 25 fps change in velocity. I have only sometimes found this to be an accurate estimate.

Comparing the velocity of an M4 barrel to a full-length 20" AR-15 barrel the formula holds pretty well with a predicted 150 fps

velocity difference. When one attempts to apply the formula to longer barreled guns the formula seems to overstate expectations. Chronograph readings on the difference between 20" Service Rifle tubes and 26" Match Rifle ones yields about 100 fps difference, quite a bit below what the formula predicts.

Derrick Martin mentions similar testing in his book and he came up with a difference of just a little less than the 100 fps I found. I took it one step further and compared 24" barrels to 26" ones and the difference was only 27 fps. Not 27 fps per inch but 27 fps total. The conclusion that I draw is that the 25 fps per inch is fairly accurate when comparing barrels in the carbine to "normal" 20" length but overstates things with regard to longer barrels.

It also appears that one is getting most velocity out of 24" or 26" barrels and going longer in barrel length probably can't be expected to give more. AG

MAINTENANCE & REPAIR

Working The Winchester Model 61

BY DICK MAHEU MAY 2016

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A good friend recently brought me his Winchester Model 61 .22 rimfire rifle with feeding issues. In addition to the mechanical problem, the stock was severely cracked at the junction of the guard assembly and had been repaired by securing a hose clamp around the wrist, then painted blaze orange! I have seen a lot of unusual repairs on gunstocks in my years of gunsmithing but this was a first for me. This particular Model 61 was chambered for the .22 Short, Long, and Long Rifle.

According to Winchester records, its low serial number of 151xx indicates manufacture was in 1935. The rifle was originally purchased by the owner's grandfather new, and then handed down to his father and then him. The Model 61 was introduced in 1932 due to demand of loyal Winchester customers, although there were other slide action hammerless rifles already on the market. It was made until 1963 and over 342,000 were built in several configurations.

Throughout its manufacture, the basic model was chambered in .22 Short, Long, and Long Rifle interchangeably, as well as being offered with a smoothbore barrel for

.22 shot cartridges in 1939. After WWII, the M61 was offered in .22 Winchester Rimfire and in .22 Winchester Magnum Rimfire after 1960. Due to arise in collector interest, many of these great little shooters have been relegated to "safe queen" status.

I have seen these rifles in the basic configuration go for \$500 to \$1,200 at gun auctions with the other configurations much higher if in very good to excellent condition. Recently, I saw a Model 61 in .22 WMR go for \$3,000! There were several different barrel lengths offered in both round and octagon contours and the upper tang was drilled and tapped for an optional peep sight. This well-engineered rimfire has about 70 parts but rarely gives trouble.

Other than a weak carrier spring needing replacement, the one area of trouble I have encountered over the years is the cartridge cut-off assembly. Although well made and heat treated, the cutoff arm succumbs to wear over along period of extensive use. This particular rifle had a worn cut-off arm extension on the side facing the action slide bar. The wear on the slide bar was very minimal for such an old arm.

The old cut-off arm head measured 0.213 in width while anew one I acquired from Jack First Gunshop (jackfirstgun.com), measured 0.224. This small part would be relatively easy to make and harden, however, I didn't know off hand the correct width needed and it would have been a file-and-dry proposition that I didn't want to take the time with on this job. The original cut-off was releasing several cartridges at a time instead of just one and holding the others back. Let's look at how this feed system works.

With the slide handle in battery (fully forward), the inner magazine tube is pulled out far enough to allow cartridges to be loaded into the slot in the outer magazine tube. The inner magazine tube is then pushed all the way in and locked. The entire feeding and chambering cycle is controlled by the movement of the slide assembly. As the slide arm is moved to the rear briskly and smoothly without pause, several events take place.

There is a half-circle slot machined into the action slide bar, approximately 5 / 16 " in length, 1/8"

WORKING THE WINCHESTER MODEL 61 CONTINUED

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Original caption: Top: Model 61 field stripped showing bolt, guard assembly, barreled action, and inner magazine tube. in height, and 3/32" deep. As the slide bar starts its movement rearward, it allows the cartridge cut-off arm, powered by the inner magazine spring follower pushing on the next cartridge, to be pushed into this slot and allow a cartridge to feed out of the magazine.

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As soon as the slide bar moves past the stationary cut-off arm, it is once again a solid piece and forces the cut-off arm back in to stop the next cartridge in the magazine from releasing. The cartridge is then picked up by the lower extractor of the bolt and lifted by the carrier up to the top of the bolt and fed into the chamber. As this is all taking place, the movement of the bolt from battery has extracted the fired case and ejected it out of the ejection port.

When this rifle functions properly, it is one of the very best rimfire systems ever invented, at least in this gunsmith's opinion. It was so good that Winchester used a modification of it in their Model 9422. Replacing the cartridge cut-off in this rifle cured its feeding issues. Field Stripping This rifle is easily field stripped into several units. Remove the inner magazine tube and make sure the outer tube is free of cartridges. Cock the action to remove any chambered cartridge and return the slide to battery.

There is a large slotted screw on the left side of the receiver. Loosen this screw and pull it out as far as it will go. Pull the buttstock and guard assembly to the rear and out of the receiver. If you're only going to clean the guard assembly you might want to leave the buttstock attached. With this rifle, it was damaged and needed to come off. I personally like to remove it routinely to get a better look at all the parts in the guard assembly.

Taking off the two buttplate screws and buttplate gives access to the stock bolt which has a large straight slot. I like to use a 3/8 ratchet and extension with a proper fitting drag link bit to do this. Some of these bolts have been installed since the factory assembly and can be very tight to get out. To remove the breechbolt, invert the receiver and slide the bolt all the way to the rear. There is a breechbolt retaining spring staked into the right wall of the receiver.

While lifting up on the bottom front of the bolt with a non-marring tool, use a small screwdriver bit to push the breechbolt re-

taining spring in to release the bolt upward. A little judicious wiggling will free the bolt cam from its slot in the action slide bar. This is as far as disassembly needs to go for routine maintenance and cleaning. Here is the drill in order to remove the cartridge cut-off assembly if repair is needed. The rear magazine ring (holding the outer magazine tube) has a pin going through it.

Tap this pin out either way and remove the outer tube. These are often stuck in pretty tight so caution must be utilized in removal. I put plenty of penetrating fluid on both rings, let soak for a few minutes, then use a tool I made out of 1/4" brass rod ground down at the end similar to a flat tip screwdriver and mounted in a piece of dowel rod. By lightly tapping on the flanged end of the outer magazine tube, it will usually start to move.

Take your time on this maneuver as you don't want to deform the outer tube in any way. Refrain from tapping on the end that goes into the receiver as even slight deformation will cause feeding problems. The forend assembly can then be

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easily removed and the cartridge cut-off assembly will simply slide out easily from its recess in the bottom left front of the receiver. To replace the cutoff arm, make a special tool to support the edges of the retainer that hold the arm pinned to the assembly. Any two pieces of narrow 1/16" thick brass or aluminum will suffice in place of this tool. The cut-off arm is made of spring tempered steel and can be easily deformed or broken if not supported on both sides of the pin when the pin is driven out.

Some of these pins are in tight and have never been moved since factory assembly. I made my tool out of a piece of scrap aluminum and it is 1/2" wide, 3" long, and 1/16" thick. Small round and flat files were used to cut the slot to provide clearance for the arm. The pin holding the arm in the assembly is 0.059 in diameter and can be easily made from the appropriate size of drill rod. The shank of a #53 drill is the exact size.

Further disassembly of the bolt or guard assembly is not required unless a specific part is giving trouble. There are two very good resources for complete disassembly of the Model 61: J. B. Wood's Gun Digest Book of Firearms Assembly-Disassembly: Rimfire Rifles, Part 3 and Official NRA Guide to Firearms Assembly: Rifles and Shotguns. I highly recommend these publications as they have many firearms assembly/ disas-

sembly instructions in them. No gunsmith, either professional or layman, should be without them.

Buttstock Replacement As noted previously, the buttstock needed replacement and I obtained anew one from Boyds Gunstock Industries, Inc. (boydsgunstocks.com). This stock was made of walnut with a decent grain pattern to it, similar to the time period for this rifle's manufacture. Note, these stocks are usually not a drop-in fit and rightly so because of differences in machining tolerances and wear. Some minor fitting needed to be undertaken to fit the stock to the guard assembly.

Let me add that the folks at Boyds are pleasant to work with and the item was delivered quickly and in great condition. With most of the normal parts sources, these buttstocks are in very short supply and it's hit or miss to obtain a factory original stock, new or used. On this stock, I had to widen both tang slots slightly on the sides and reduce the lip at the front of the inletting approximately 1/16" so it would fit flush in its recess in the guard assembly.

This is necessary to prevent any wobble when it is secured by the stock bolt. I also cleaned up the inletting burrs that are ever present on new wood. The entire fitting process took me about an hour or so. Boyds stocks are very good quality. Final Check A critical point where slide-action rifles and shotguns are spoken about is worth dis-

cussing. Slide-action arms rely just as much on perfect timing and interaction of parts to function properly as do semi-auto arms.

The slide must be operated briskly, smoothly, and uniformly without pause or hesitation in order for all parts to mesh together and function properly as engineered. Just as in semi-auto arms, any glitch in sequence will render a malfunction of some type. It's been my experience that many owners of these slide actions either do not know how to operate them properly or are careless with them.

When I ran a gunsmithing operation full time I often had customers bring in a slide-action rifle or shotgun with a claim of not feeding or extracting properly. I would first check the arm for any live rounds, load with dummy rounds, and proceed to run them all through the action without malfunction. I would then let the customer do the same thing with the dummy rounds, finding quite often the owners failed to do likewise because of a lack of knowledge of how these firearms worked.

When you receive these complaints, use this exercise with dummy rounds to determine if it is operator error or a true malfunction. I was able to put this great little shooter back into good operating condition and my friend will put it to good use. Many owners of these fine rifles are still not ready to relegate them to safe queen status, regardless of their collectible value! AG

PEOPLE & COMPANIES

M70 Winchester Extractor Retrofit

Extractors are crucial parts and a retrofit is warranted if its potential failure will put a halt to your shooting.

BY NORMAN E. JOHNSON MAY 2016

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There are many reasons for replacing parts on a firearm. Chief among these area lost or worn part, or where modification of an existing part is necessary. When a crucial part can put a halt to your shooting, it's high time to do something. While in the process of chambering a 6mm PPC cartridge for a post- 1964 Model 70 Winchester pushfeed style rifle, I discovered a major problem with cartridge extraction.

In this particular rifle I would be using 6mm PPC and 6mm Remington cartridges as a switch-barrel system despite the differing case rim diameters. The difference in rim diameter of these two cartridges is 0.031" by most cartridge manufacturers. The 6mm PPC Sako case rim diameter is smaller than the 6mm Remington by 0.031", requiring a different extractor. Below center: The older style Model 70 extractor using a spring and plunger which was not only too short, but very sluggish in operation.

The normal SAAMI specifications are 0.472" for the 6mm Remington and 0.441" for the 6mm PPC and .22 PPC cartridges derived from the .220 Russian case. While most Remington Model 700 series extractors fitted for the .308 family of cartridges will extract PPC cartridges, the M70 I was working with will not. While exploring my options, which were very limited, I decided to make a totally new extractor for the Model 70 bolt.

In changing and making the new extractor I studied the existing push-feed style extractor used on the post-1964 Model 70s. There appeared a flat hook-style extractor fitted directly into the right side of the slotted bolt lug. This part has two laterally opposing rails that fit directly into the slots milled into each side level with the flat plane of the bolt face. These flat rails fit into and slide along the bolt lug grooves and are on the same plane as the bolt face.

The integral extraction hook is part of the extraction body and is pushed laterally by the case rim against the top bevel, snapping and locking into the case extractor groove. The extractor is activated and held in place by a spring-loaded plunger beneath it. The plunger, with its 82-degree angle, engages a coned hole in the extractor from below. This brings the extractor back to center after it engages the case rim, all ready for extraction.

In the retrofitting process, I substituted the spring-loaded, coneshaped plunger with a ball bearing and spring that fit the same bolt hole. The ball bearing worked more smoothly as it moved up and down in an 82-degree angled hole as the extractor functioned. Now to make the new extractor. There would be some difference in the new extractor which would be 0.035" longer with a longer, some-

M70 WINCHESTER EXTRACTOR RETROIT CONTINUED

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As few as 0.010" hole position will make a crucial difference here. An extractor claw that fails to extend far enough into the bolt face can spell trouble. What more shallow bevel at the top of the extractor claw. It would require more lateral movement to engage both the 6mm Remington and 6mm PPC cartridge rims. I milled the extractor body to pretty much the same dimensions as the existing part from a piece of semi-hard steel.

I then shaped the extractor hook to proper case rim radius and length and made sure it worked smoothly into the bolt slots. Though a small part, the extractor performs an extremely important function. The transition requires close attention to detail, particularly when the extractor serves different size cartridges. It was a "must work" situation or the secondary cartridge would not have been adaptable.

Sometimes the precision in making an intricate, little part can consume an inordinate amount of a gunsmith's time. The key is getting started and to just do it. AG Where the extractor is a little over length between the detent and claw, this is easily remedied by using an end mill to cut it back and shorten it. If it's too short it becomes a problem. Measure twice and cut once is the old carpenter's warning.

PEOPLE & COMPANIES

Correct Handgun Sight Adjustment

The variety of sights used on handguns can warrant gunsmith attention for this seemingly-simple task.

BY ROBERT K. CAMPBELL MAY 2016

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One of the greatest advancement in handguns over the past hundred years has been in the area of their sights. For many years, front sights were little more than a simple bump on the barrel. Even the infamous Colt Single Action Army came with sights leaving much to be desired and Colt's Flat Top target revolver was a great step forward. This was improved when Tom Threepersons had a special flat top and tall custom sight installed on his revolver in the 1920s.

Shooters on the line realized the untapped accuracy potential of a revolver would never be realized without proper sighting equipment. Then came the National Match upgrades applied to the Colt 1911A1 pistol. Good sight design was at a premium for precision competition. Factories began to offer good adjustable sights in the form of the Smith and Wesson Micrometer sight and the Colt/Stevens sights.

Today, it is common for service-grade handguns to offers some type of adjustment in their fixed sights and adjustable sighted handguns are also common. But all sights are not as good. Some, particularly on the compact handguns and inexpensive handguns, continue to challenge the shooter. Many handguns have sights that are difficult to adjust and we gunsmiths are often called upon to change or adjust them.

Fixed sights remain common because they are rugged and relatively inexpensive but even these aren't completely unadjustable. Even the grooves in a revolver top strap may be modified if we wish to badly enough. Three types of sights that come into the shop most often are fixed, adjustable, and laser sights. Each has its own system of adjustment. Before we begin to sight the pistol properly we need to fire the pistol to check zero.

A known-good shooter may be Below center: Adjusting sights at the firing range is often the best choice. With experience you'll be able to predict the nudge needed to sight in. This Springfield came from the factory firing two inches to the left. The hobbyist doesn't always get it right. trusted and we can use his notes or fired targets as a reference but we'll usually need to take a trip to the range. I test fire from a solid bench and sandbag rest.

For revolvers in .38 Special, .357 Magnum, and .45 Colt I use my own carefully-constructed handloads with Oregon Trail hard cast lead bullets, 160 grains in the .38 and .357 and 250 grains in the .45 Colt. When testing self-loading pistols I use quality factory ball ammunition, usually from Fiocchi, with 124 grain 9mm and 230 grain .45 ACP. I test at 15 yards as this is an adequate distance when firing an unfamiliar handgun to determine if the problem is the shooter, the sights, or sight adjustment. I

CORRECT HANDGUN SIGHT ADJUSTMENT CONTINUED

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Adjusting these sights is straight forward. Above center: A revolver sight is more difficult to adjust if off center from the factory and can't be done with a padded vise and pliers! You must turn the barrel. usually determine pretty quickly if a simple adjustment will work or if sight replacement is needed. Simple adjustment may be accomplished at the firing range. Before beginning to adjust the sights, check if the sights are centered by removing the slide and placing it on a flat, even surface.

Using a dial caliper, measure the height of the sight from the surface from the New Novak sights were successfully fitted after soaking in Kroil. Below center: The front sight on this old Inglis High Power was

locked in with a punch. It's cleaner to remove the sight and roughening the dovetail. forward edge and then the rear edge of the front sight. The same may be done with the rear sight. Each measurement must be the same.

Sometimes, the sights are off center, especially with aftermarket sights that shooters install themselves, particularly for the Glock. While hobbyists sometimes get it right, they should shell out the modest cost for gunsmith installation. If the sights are not centered, the point of impact cannot coincide with the point of aim. This simple check will save a lot of problems. Adjusting Sights Most self loaders have some type of adjustment in the sights, at least to an extent by moving the rear sight.

Move the rear sight in the direction you want to change the point of impact. A brass mallet and brass punch are the preferred tools. Sight pushers are even better. If you wish to move the bullet impact down a taller front sight is needed and that means sight replacement. Moving the point of impact down can be done by filing the front sight. Be careful as a little goes along way and you cannot return the metal to the sight once removed. I always make windage adjustments before elevation adjustment.

REVOLVER SIGHTS ARE MORE DIFFICULT. HORIZONTAL ADJUSTMENT ON

CORRECT HANDGUN SIGHT ADJUSTMENT CONTINUED

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Original caption: Top: After fitting a Bar-Sto barrel to this Caspian slide, the author was glad he also used a Caspian sight. Changing the barrel will also change the point of impact, fixed sight revolvers requires moving the barrel and that may not be an option the shooter wishes to pay for. Fortunately, the adjustment is usually modest. The barrel should be marked first to track the starting point before adjusting. Single action revolvers need the barrel turned far more often than solidframed double action revolvers.

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Field strip the revolver, remove the cylinder, and place the revolver in a padded vise. Use a frame wrench to turn the frame. Carefully record each adjustment. For example, if moving the barrel by loosening it 0.001" changes point of impact by two inches then you have a guide for further adjustment. Adjustable handgun sights can cause problems. For example, a Philippine-produced 1911 on my bench had a fully-adjustable rear sight that appeared to be a Bomar clone.

As delivered from the factory the rear sight was at its highest setting and the owner's shots were going hopelessly high, however, the sight wouldn't turn down. To the customer's credit, he didn't force the issue. Upon examination, I found that applying pressure on the rear sight leaf body allowed

easy sight adjustment. Half the sights of this particular make I've seen so far exhibit this quirk.

Occasionally, dovetails are exceptionally loose, usually the result of improper sight installation or ham-handed handling. Or the sight may have been moved often over the years. The best means of repairing this is removing the sight to clean the dovetail thoroughly.

Take a punch and lightly tap the dovetail, stippling the surface and tightening the dovetail.

Apply a good lubricant on the dovetail and tap the sight back in place. I have seen the wrong size sight forced into dovetails and other problems that boggle the mind. Machine work and extensive hand work may be required. I have also seen front dovetailed

sights that were struck with a punch to keep them in place. This is unsightly on a personal handgun but on a service pistol it may be a useful field expedient, though it makes further adjustment difficult.

Sometimes, the dovetail sight will not move under normal pressure. The best course is soaking the sights overnight in Kroil. Be certain any set screws are completely removed. A neat trick is to order a brass rod from McMaster-Carr (mcmaster.com), and cut it into about a four-inch length. This gives excellent leverage and control. Give this rod a hard hit and the sight should budge. A final piece of hard-won advice. Fitting a match-grade barrel usually causes the point of impact to change.

I have never seen an exception with a 1911, though drop-in Glock barrels are sometimes consistent and the same as before fitting. 1911 handguns will have to be resighted. AG

MAINTENANCE & REPAIR

Scope Reticle Replacement

Innovative gunsmiths can meet their customer's needs. A request to replace a scope reticle proved to be a new, fulfilling challenge.

BY NORMAN E. JOHNSON MAY 2016

ORIGINAL PP. 20-22

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A customer brought in an old Weaver Marksman 3-9x variable power scope originally made around 1959 for reticle replacement. After asking elsewhere and being told the scope was too old, he asked me if I could make repairs or just replace the reticle. I assured him I would give the scope a good inspection and let him know what I could do. This wouldn't be my first job of this sort.

I installed a crosshair The flare present here is caused by light passing through a non-focused lenses. 003" in diameter is used as across wire for the new reticle installation. in an old brass telescope onto a .22 rifle with an

external mount I made when I was 16 years old. Since then, I've installed reticles and posts in a number of broken scopes. To inspect the scope, I removed the ocular (rear) lens to provide access to the back of the erector lens systems where the reticle cross wires had broken off.

The erector lens system is a sort of scope within a scope. In the case of a variable scope it is movable by rotation of a power selector. I could see dangling pieces of the cross wires, indicating where a replacement reticle had to be installed for it to be in focus. As the scopes power ring is turned, a cam moves the

erector lens forward and back. The lens moves forward to increase power and rearward to decrease it.

Two focal planes are present inside a scope, one at the back of the ocular and erector lens, and another up toward the front between the collector and the objective (front) lens. In this case, the reticle was positioned rearward where I would have access to it and be able install anew reticle ring at the very end of the sleeve where the erector lens moved forth and back from inside. The new ring that would retain the cross wires would need to be short enough to not strike the erector lens as it was moved fully

SCOPE RETICLE REPLACEMENT CONTINUED

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Failure to set the reticle ring properly into the focal plane would result in an unclear reticle. rearward. All this could be accomplished just as a surgeon would use forceps and special tweezers. side diameter of the outer erector tube housing and turned a brass collar to fit inside it without binding. This piece was kept to 1 1/4" length. I then tried the collar for fit, which was fine. A search for suitable cross-hair material was the next step.

I found some multiple strand electrical wire that measured 0.003" which was a good size as the customer wanted a The next step is to make the new reticle. I carefully measured the in- Each task we gunsmiths take on will require some ingenuity and inventiveness—some just a bit more than others. This places the collar free of the moving erector lens system on the precise focal plane.

All scope users should know that the scope reticle (crosshairs) can be focused clear and crisp by loosening the ocular (rear) lens lock ring and turning the lens housing in or out until the reticle is crisp and clear. The lock ring is then tightened. This need be done only once and will serve anyone with normal vision. Some of today's scopes have a calibrated ocular lens without a locking ring for easy focusing.

SCOPE RETICLE REPLACEMENT CONTINUED

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The outer edge of the bonding droplets prevent the reticle collar from falling into the tube. At this point the reticle can be bonded permanently into position. coarse reticle. The wire subtended about 3/4" at 50 yards (1.5 MOA) which would make it appear well in low light and easy to see while hunting. I stretched a few strands of the wire and put them aside. The next step was cutting notches at 90 degree intervals around the perimeter of the ring.

This was accomplished by laying it on an angle rule and making the notches with a machinist's knife file. The notches were cut at a depth of about 0.10" and wide enough to hold a very small amount of J-B Weld used as across wire bonding material. The reticle ring was laid on a flat piece of smooth pine board. The over-length cross wires were stretched

across the reticle ring notches and twisted at each end around laterally-opposing, slanted brads driven into the wood.

Bonding the cross wires in place was a simple matter of placing a very small amount of J-B Weld into each cross wire slot, being careful none spilled into the inner surface of the reticle retaining ring. A very small amount of bonding material was allowed to go beyond the outer perimeter of the reticle retaining ring to serve as a four-way stop as the ring was later lowered into the tube that guides the erector lens housing. The part was then set aside for the bonding material to set.

The next step was bonding the new reticle assembly in place. With the reticle assembly carefully removed from the board, each cross wire end was carefully cut at the outer edge of each droplet of J-B Weld. The reticle assembly was then tried for fit as it was lowered into the erector system housing. The

cross wires were carefully squared up with the scope turrets and the reticle assembly was bonded firmly in place with drops of J-B Weld at the cross wire terminals where they ride on the erector lens housing tube.

Again, the scope was set aside for the bonding material to set. The next day I replaced the ocular lens and focused the cross wires by turning the ocular lens housing until the reticle was black and crisp against the sky. Scope fogging doesn't seem to present a problem if such repairs are performed in a room with very low humidity. Ordinarily, scopes are filled with nitrogen at the factory for this reason. However, this is the least of one's worries taking on a job like this.

Making up a scope reticle assembly and installing it is across between machining and a medical endoscopic procedure. I'm not saying it's easy, but it can be successfully accomplished. It sure made my customer happy. AG

READER FORUM

Reader Forum

BY AMERICAN GUNSMITH EDITORS MAY 2016

ORIGINAL PP. 23-24

Moly-Coated Bullets I read Paul Jewett's letter in the February 2016 Reader Forum about moly-coated bullets and suspect he may have already ruined his barrel. Given the rapid up and down heat and pressure of firing, peaking at 50,000 PSI or so in some cartridges, molybdenum disulfide releases sulfur and will etch the barrel over time. Once embedded this way, it can not be removed. Before I found this out, it led to me ruining four barrels. What has your experience with moly-coated bullets been?

In reloading, this respondent has never tried moly-coated bullet since there are several non-suspect bullet lubricants readily available. Moly (molybdenum disulfide) was the slicker-upper used in the auto racing oil additive STP.

Small amounts of it in combination with hydraulic fluid makes an excellent lubricant for the slide-to-frame interfaces on target pistols, specifically, a Hamden, Connecticut-made High Standard Victor, an accurized M1911A1, S&W Model 41, and Ruger MK II plus the boltways in a bull-barreled pre-64 Winchester Model 70 .30-06 target rifle used to win several local bench rest competitions. Remington Model 41 I have a Remington Model 41 in my shop and am unfamiliar with it.

The barrel and receiver appear to be a single unit. How can I adjust the boltway? The Remington Model 41 Targetmaster was only produced for three years in 1936

to 1939. Despite not putting a serial number on most of their firearms until the 1960s, Remington did serialize these. We have been unable to turn up a schematic or a parts list for it even after including a Remington Field Service Manual dated 1942. Perhaps a phone call to Remington requesting a contact with the company museum would be more productive.

We do have questions regarding your assumption the barrel and receiver area single unit. To our knowledge, Remington never designed or produced a bolt action rifle with its barrel and receiver inseparably united. We also have some advice: If you add material to the forward edge of the boltway where it contacts the bolt you may increase the 0.010 gap. Instead, reduce the contact area of the bolt by 0.010. Better Ammunition "Better Ammunition" by Joe Carlos in the April 2016 issue has inspired me S. D.

Shearman Artesia, NM to reexamine my approach to reloading and to try further steps to ensure my brass is as close to perfect as I can make them. Thank you for the great report. Your research emphasizes the importance of launching the bullets exactly in line with the center bore axis, which launched me on a concentricity binge. My goal is to use highly perfected ammunition to evaluate the accuracy of rifles.

I decided to "square up" some resized .308 brass using a Wilson trimmer case holder in my precision toolroom lathe. The

Wilson trimmer case holder interior is machined to simulate the chamber of a firearm. With resized brass inserted, I put the case holder in a one-inch collet in the lathe. First, I cut the end of the case neck square, then turned the neck outside diameter using your criteria of cutting only about half the circumference.

I turned the Wilson case holder around so that the case head faces the tail stock instead of the neck and turned the case head square in the same manner. Both ends of the case are square to the bore axis, resulting in the loaded round being as concentric as I can make it. Dean Lake Because potentially increasing headspace is a concern when messing around with rim thickness, I removed only enough material to show a bright area on about half of the circumference, same as with the neck.

I am curious if you have tried squaring the cartridge head to the bore axis, and if you have, what accuracy changes did you note? For my own info, I did a comparison of case head "squareness" on a variety of brass from different manufacturers using a Gem Instrument precision dial indicator in my lathe. I found a variance from 0.0005" to 0.0015" on new brass and a little less on fired brass. I do not know if this is significant and would like your opinion.

Interestingly, I measured some old National Match brass on hand and found them almost perfect. I am not sure if that is from firing or from higher quality brass.

READER FORUM CONTINUED

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For those not lucky enough to have a lathe on hand, a Wilson case trimmer can be used to square up both ends of brass quite easily by modifying the cutter so the center is no longer “proud” of the cutter blades. This will allow the cutter blades to contact the case head and not be stopped by the center of the cutter. With care, the cutter blades can be modified to clear the primer on loaded rounds if you are brave, but this can be dangerous.

I do not recommend doing that or turning the case neck on alive round either. Ed Renaud Partridge Meadow Firearms, LLC Author Joe Carlos responds. Thanks for reading my article on cartridge concentricity. I always appreciate feedback on my articles and especially so for this one. When I queried the magazine about an ammunition article, I stressed the notion that inferior ammo will any rifle under perform no matter how diligent the gunsmith.

Regarding squaring case heads, I haven't tried it because I primarily build Stoner rifles and there are several design flaws in the AR-15 regarding accuracy. One of the big ones is the way the upper fits to the lower with only two captive pins, resulting in accuracy robbing movement. Another problem is the way the barrel extension slides into the front of the thin-walled receiver and is held with just a barrel nut.

My March and April 2013 articles (“The Relationship Of Barrel Extension Diameter To Accuracy In The AR-15”) discussed ways of correcting this. A third accuracy problem is poor alignment of the bolt face to the center axis of the bore of the barrel. Because we are dealing with a semi-auto gas gun there is a lot of slop in the fit of the bolt carrier. Bolt gunners look at ARs and just shake their heads. The back of the carrier tends to tilt down at an angle and that carries the bolt face at an angle.

It is amazing that the rifle shoots as well as it does. I certainly wasn't the first person to discover this as Stoner's contemporaries back in the 1960s recognized the problem. They tried some techniques to correct it that weren't entirely successful and for nearly a half century since gunsmiths have buried their collective heads in the sand trying to pretend it wasn't an issue.

I had been devising ways to correct this for a couple of decades before finally coming up with some “baby steps” that resulted in an average group size reduction of about 23%. Thus, I never pursued truing case heads because I feared that any improvements would be masked by the enormous variation in the position of the bolt from shot to shot. Now that I have taken steps to get the bolt face better aligned, I might be interested in testing some casings whose heads have been squared.

Your email reminded me of this topic being addressed in Glen Zediker's Handloading For Competition. Zediker makes a couple of good points about head squaring. First, he says it will slightly influence the headspace of the cartridge in question. Second, if too much brass is removed from the head, the primer can end up extending above the head. For us gas gunners that could be a problem and might require cutting the primer pocket a little deeper to compensate.

He wasn't too keen on squaring for cartridges used in gas guns and was more receptive for use in bench rest rifles. You didn't mention what type of gun you were performing the squaring for. Adjustable Choke I'm looking for an adjustable choke for a single-barrel .410 shotgun. I'd prefer a unit similar to the old Poly-Choke. S. D. Shearman Artesia, NM The “old” Poly-Choke and Poly-Choke II is still available from Nitram, LLC (Poly-Choke.com, but they don't list units for .410 shotguns.

Mossberg used to have their C-Lect Choke as an option for the 183 bolt action, which was a collet-type choke similar to the Poly-Choke. Technical advisers at Brownells will have more current information. Note, this query doesn't provide the make or model of the firearm in question. Lacking this makes it less likely we can accurately and safely respond. Please include make and model information in all future Reader Forum questions. AG

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