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AND THE AMERICAN GUNSMITH ARCHIVE

A TECHNICAL JOURNAL OF CRAFT, REPAIR & RESTORATION

08

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INSIDE THE ARCHIVE

BARRELS FOR CUSTOM AR- 15S, PART 2

SMART ARMOR CUBE • HI-POINT CF-380 • MAKING HOLES DISAPPEAR • RUGER SR1911R UPGRADE

ORIGINAL METHODS. MODERN ACCESS.

ARCHIVE EDITION 164

DIGITAL ARCHIVE EDITION

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FROM THE ARCHIVE

Smart Armor Cube

BY AMERICAN GUNSMITH EDITORS AUGUST 2017

ORIGINAL PP. 2

Smart Armor in partnership with Arrow Electronics has developed their Smart Cube, a Bluetooth-enabled smart lock monitored and controlled via i OS or Android app for securing and monitoring access. Easily installable, the 1.25" cube includes an app that tracks and monitors access to any number of locked locations. The Smart Armor Cube can be accessed from any smartphone, computer or tablet using the included software. The device can be accessed via Bluetooth so long as you have your access code.

The Cube's CR2 battery lasts over a year if accessed ten times daily and the app shows remaining battery life in real time so you'll know when to replace it. Once installed on a door, drawer, cabinet, tool box, or other container you want secured, the Smart Armor Cube lock is controlled by an app via Bluetooth connection. The Cube can be set to automatically unlock whenever your smart device is in range or set to require an additional access code determined by you.

Other users, such as your shop employees, family members, etc., can also be granted access to any or all of the Cube locks as you dictate. Every time a lock is accessed, the entry is logged and timestamped with that user's ID. Using Bluetooth Low Energy (BLE) communication protocol, a single app can act as a universal key for any number of locks. Other users using the same app on their i OS or Android device can be granted access to any or all of these locks as you see fit.

For simple and less secure applications, the lock can be mounted with double-sided 3M tape resistant to up to 100 pounds of force. For additional rigidity, the Cube lock can be bolted in place. Synced with the app, the Cube opens and closes the lock. Locate your valuables, share customized access with others, and track activation history. If someone tries to tamper with the device, it will send out an alert.

In the case of a lost or dead phone, the Smart Cube can be accessed from any device with the free software installed after entering your ID and unique access code. Pre-orders shipped summer 2017. MSRP is \$89 or \$225 for three. For more information, visit SmartArmorTech.com/product/smart-cube.

ORIGINAL SOURCE PAGE

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MAINTENANCE & REPAIR

Hi-Point CF-380

Detailed disassembly and maintenance of an inexpensive .380 pistol.

BY MARK R. HOLLENSEN AUGUST 2017

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I recently had a customer bring me in a small baggie containing the parts for a Hi-Point CF-380 semiautomatic pistol that had been completely disassembled. His goal had been to replace the trigger and firing pin with new ones. However, once the gun had been taken apart, he could not get it back together again.

As with any firearm brought to me disassembled and in a bag or box, I asked at least three times, "Are all of the parts accounted for?" I was quickly told, "Yes, I made sure they were all in there." For me, missing parts in these types of circumstances is more the norm rather than the exception. Before I move on, the Hi-Point CF-380 is a .380 ACP with a barrel length of 3.5" and an overall length of 6.75" and weight of 25 ounces.

The finish is a black powder coat with chrome slide, the sights area three-dot type with adjustable rear, and the magazine holds eight rounds with a last round hold open feature. Once at the bench, I immediately inventoried and placed all parts on a mat and photographed them prior to methodically reassembling the gun. I quickly found that it was missing one critical part (as is the norm) and had a broken magazine catch spring.

Once I had ordered and received the missing and broken parts directly from Hi-Point, the gun was ready for the reassembly

process. I didn't find much information about this particular gun concerning disassembly and reassembly and decided a detailed account of this process was warranted. Since the gun was already disassembled, I decided to reassemble it first and then go through the entire disassembly and reassembly operation to best describe it here.

First, remove the magazine and work the slide a few times and inspect visually to ensure no live rounds are in the chamber. Once unloaded and confirmed clear, draw the slide fully to the rear and lock it open with the safety (#13). With the slide locked back, look at the rear of the frame to find a roll pin. This pin must be removed to disassemble the gun. Using a roll pin punch, drift the pin out of the frame from left to right. Pull the slide to the rear and drop the safety down.

Slowly push the slide forward while lifting the slide at the rear so the slide retainer (#8) comes up and out of the hole it rides in. Once that is clear, move the slide forward and over the barrel to remove it. Go slow here as the recoil spring and recoil spring guide rod (#15 and #16) can fly out from the front of the frame.

Once the slide is off the frame without losing the recoil spring and/or guide, turn the slide over and pull the slide retainer (#8), the larger firing pin coil spring (not shown

in the schematic), the longer and smaller diameter firing pin spring (#6), and the firing pin (#5) rearward and out of the slide from the track they ride in. This completes disassembly for detail cleaning the gun. If taking it down further, continue on by drifting the extractor pin out of the slide.

Drift this pin out from inside the bottom of the slide and out through the top. This will release the extractor key (#2) and extractor key spring (#3) from the slide. This only needs to be performed when replacing the extractor key and/or spring or when cleaning that area is necessary. With the slide disassembled, move on to the frame. The following is not super difficult, however, when removing the grip panels parts can/will fall out.

That is because the grips serve to hold a number of parts in place in the frame. Begin by removing the left side grip panel. Remove the grip panel screw (#19) and lift the grip (#20) off the frame's side by pulling it up from the top and out in order to release the locking lugs on bottom of the grip that interlock into the bottom of the frame grip area. Once the grip panel has been removed, the safety (#13) comes right off. The grip holds it in place.

NEXT, UNHOOK THE SMALL HOLD OPEN SPRING (#34) FROM THE HOLD OPEN (#33)

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and then from the magazine release button (#21). The hold open pin (#33) is one of two pins that secure the barrel to the frame. Unless you just have to, there is no need to remove this pin. Note how the spring is attached to the hold open (#33) with the open end of the spring facing out from the frame. Turn the frame over to access the right side grip panel.

Remove the grip panel screw and grip panel, carefully lifting it up at the top and pulling it up and out from the interlocking lugs from the bottom of the grip frame area. There are three parts held in place only by the grip panel itself: The magazine catch spring (#27), the sear cam (#11), and the magazine lockout. The spring is in proper position with the hook facing out at the top. (#35). Remove these from the side of the frame.

The magazine catch spring has a small 90-degree bend on one end that gets inserted into the small hole in the magazine catch assembly (#21). Note how it just lays in the slot cut into the frame for it. The sear cam (#11) only sits over the sear assembly pin (#12) and the magazine lockout is just lying on the side of the frame. Note the magazine lockout

is only held in place by the grip and the small coil spring that holds it in place is secured to the inside bottom of the right grip panel.

If this spring is not attached to the grip panel (i.e., missing), you will need to get one to properly reassemble this gun. With the above parts removed from the right side of the frame, turn your attention to the inside top frame area. Begin by pulling the sear assembly (#12) and sear assembly spring (#10) out of the small metal insert in the top of the frame. With the sear assembly removed, lift the sear block (#24) and sear block spring (#23) from the inside left of the receiver and out the top of the frame.

Be careful not to lose the spring and take note how the assembly goes back into place when reinstalling it. Looking inside the frame from the top, you'll see a pin that has a 90-degree bend in it on one end. This is the counter weight pivot pin (#25) that hooks onto the counter weight (#26) that fits inside the magazine well along the back of the frame. Just lift the counterweight upwards into the top of the frame and unhook the pivot pin from the hole in the counterweight that retains it.

Pull the pivot pin out from the top and drop the counterweight out the bottom of the frame. Note that the counterweight rides in a groove inside the back of the magazine well and the flat side goes to the back of the magazine well area. If needed, remove the magazine catch assembly (#21) by pushing it out of the frame from the left side of the frame to the right. It is held in place by the hold open spring removed on the left side of the frame previously.

Just push the pin out after taking the magazine catch release button cap off of the pin from the left side of the frame. The magazine catch cap or button is just pressed on. Reinstall in reverse. Remember that the last round hold open spring (#34) hooks onto the magazine catch just below the cap and the spring must be installed to the hold open (#33) with the hook of the spring facing up. Finally, to remove the trigger, drift the trigger pin (#17) out of the frame from left to right.

Remove the trigger assembly (#18) by pulling it rearwards and working it out of the frame. Reinstall in reverse. Go cautiously here as you can

HI-POINT CF-380 CONTINUED

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damage the plastic trigger by forcing the trigger pin into the frame during reassembly. I suggest using a slave pin to line up the trigger pin holes in the trigger and frame first, then drift the pin into the frame. That completes the disassembly of the pistol. Reassembly Tips A couple of reassembly tips as you put the gun back together in the reverse sequence. Begin by installing the trigger assembly, magazine catch assembly, then hold open and hold open spring.

This will secure the magazine release catch to the frame. Next, install the sear block (#24) and sear block spring (#23) in the slot in the top left side of the frame. Install the counterweight inside the magazine well opening (inside back of magazine well) of the frame and then hook the counterweight pivot pin into the small retaining hole at the top of the counterweight. Lay the counterweight pivot pin down inside the slot at the top right inside of the frame.

With those in place, install the sear assembly (#12) and sear coil spring (#10) into the metal sleeve in the top of the frame. The arms or pins of the sear assembly sit on and over the top of the sear block (#24) and counterweight pivot pin (#25). Also make sure the

sear assembly is installed properly. Place the frame down on your bench with the right side up and lay the sear cam (#11) in place, making sure the sear assembly pin or arm fits into the hole in the sear cam. It will press into place.

Next, hook the bent end of the magazine catch spring (#27) into the magazine catch hole and lay the spring down in the slot provided for it in the frame. Finally, lay the magazine lockout (#35) on the side of the frame. With all right side parts in place, insert the bottom lugs of the right side grip panel into the bottom frame lug holes and press the grip panel on the frame, making sure it secures all parts. You should feel spring pressure when covering the magazine catch spring.

The grip panel must lay flat against the frame. Install the grip panel screw. Turn the frame over and make sure the magazine release catch button cap is in place, as well as the hold open (#33) and hold open spring (#34). Lay the safety (#13) in place on the left side of the frame and install the left side grip panel over it. You will again hook the

grip panel lugs into the holes located at the bottom of the grip frame first, and then press the grip panel in place over the safety.

To clear the safety, move it fully upwards so that the grip panel clears and then allows the safety tab to fit into the slot for the safety on the top of the grip panel before finally attaching the grip panel with the grip panel screw. This completes the assembly of the frame. Turning our attention back to the slide, turn it over and insert the firing pin (#5) and then the firing pin coil spring (#6).

Place the shorter, larger-diameter firing pin spring (not shown in the schematic) over #6, and install the slide retainer (#8) into the track. Note how the slide retainer gets placed in the slide track. The small hole in the retainer must be situated so that the frame takedown roll pin can pass through it during reassembly of that pin. Note, the schematic shows a firing pin spring cup (#7).

Contact with Hi-Point revealed the cup is no longer utilized and has been replaced by adding the second, shorter, larger diameter firing pin spring and that spring is not pictured or identified in the schematic. Install the recoil spring (#15) and recoil spring guide rod (#16) into the

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front of the frame under the barrel. The coil spring fits into a hole that retains it in place in the front of the frame under the barrel. The recoil rod guide attaches to the spring on the end facing the front. To install the slide, begin by aligning the barrel with the barrel hole in the slide and place the flat portion of the front of the slide over the recoil guide rod, keeping them in place as you work the slide back over the barrel and onto the frame. As you move the slide to the rear, lift up on it.

When the slide is nearly to the rear, watch to make sure the slide retainer (#8) fits into the hole of the frame made for it at the rear of the frame. Once it seats into this hole, drop the slide down fully onto the frame. Once the slide is down and seated, pull the slide all the way to the rear and lock it open with the safety (#13). This allows insertion of the slide retainer roll pin (#9) back into the pin hole in the frame.

Note, the roll pin goes through the frame and through the hole provided in the slide retainer (#8), so make sure the slide retainer is installed properly. Use a slave pin if needed here. Drift and seat the slide retainer roll pin into the frame so that it is not sticking out past the sides of the frame on either side.

Pull the slide back, drop the safety catch, and the slide can be worked back and forth 1 Ejection Pin 2 Ejection Key 3 Ejection Spring 4 Slide 5 Firing Pin 6 Firing Pin Spring 7 Firing Pin Spring Cup 8 Slide Retainer 9 Slide Retainer Pin 10 Sear Spring 11 Sear Cam 12 Sear Assembly to ensure proper operation. You will need to install the magazine to ensure the gun functions properly due to the magazine lockout system in this gun.

This job is not too difficult to perform and my hopes here are to 13 Safety 14 Frame 15 Recoil Spring 16 Recoil Spring Guide Rod 17 Trigger Pin 18 Trigger Assembly 19 Grip Screw (2) 20 Grip (2) 21 Magazine Catch Assembly 22 8 Shot Magazine Assembly 23 Sear Block Spring 24 Sear Block provide readers with a detailed reassembly "firing order" just in case you encounter one in a baggie as I did. This should quickly help you determine if all of the parts are accounted for and improve your reassembly time at the bench.

AG Hi-Point CF-380 (Specifications subject to change without notice) 25 Counter Weight Pivot Pin 26 Counter Weight 27 Magazine Catch Spring 28 Adjustable Rear Sight Assembly 29 Elevation Screw 30 Sight Pivot Screw 31 Adjustable Sight Spring 32 Hold Open Pin 33 Hold Open 34 Hold Open Spring 35 Magazine Lockout 36 Magazine Lockout Spring

PEOPLE & COMPANIES

Barrels For Custom AR-15s, Part 2

How barrel characteristics influence pressure, shooting military ball ammo, and determining optimal twist rates.

BY JOE CARLOS AUGUST 2017

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Coupling proper assembly techniques and a scientific, unbiased analysis leveled the field in my barrel accuracy study. My analysis found almost every custom barrel manufacturer makes a really good barrel, some of the time and at widely varying rates. Some barrel companies only produce about one really good barrel in ten while others go as high as eight for nine.

That is a huge quality control spread and it behooves custom builders to hedge their bets by purchasing from those two makers on the high end while avoiding those on the lower end, if accuracy is a prime consideration. Know Your Customer That last qualifier was deliberate. My guns are built for those tiny few AR Accurate information on barrel quality? Probably not so much... shooters trying to win High Power competitions, a tiny niche market.

I have to constantly remind myself that for the much larger AR market, match-winning accuracy may not be the prime consideration for barrel choice. Cost is a primary consideration. Those wearing a shop apron have to live within some budget constraints. When my sales are down and I go to the supermarket with only a few dollars, I have to choose between buying ice cream for Joe or cat food. Sucks to be Kitty on those days! Just kidding.

More seriously, when a potential customer approaches me at my Camp Perry store or elsewhere, eyeballing the expensive Bartlein gain twist barrels and quipping he can buy two barrels elsewhere for the same price, he is revealing that cost is more important to him than accuracy. For customers on a budget, all four of the big AR factories so frequently demonized by the popular media offer such products. Some of these barrels come with grandiose accuracy claims that I never seen met.

Others talk about triple lapping, cryo treatments, and other "features" that are not accurate by my standards. And they often shoot fliers. Despite claims of in-house manufacture by the Big Four, most barrels are originate in Connecticut with a button rifled barrel maker specializing in quantity at reasonable prices. This maker doesn't have a reputation for accurate barrels and so their origin is deliberately left out.

Maybe some AR-15s are assembled with in-house barrels, but they're more likely using outsourced blanks. You can often order such barrels in either steel type, preor post-ban, in a variety of lengths and contours, and a narrow choice of twist rates. These are usually six-groove barrels and the lands are cut or nicked by the gas port. A number

of my customers have reported these uppers or barrels shoot big groups and they're interested in improving them.

Unfortunately, I can't make a silk purse out of a sow's ear but I can improve matters. If I can schedule the work and conditions agreeable to the customer, I can do a better job with their ammo so I ask for about 100 rounds. After cleaning, I shoot machine rest groups with their ammo and from a known lot to compare. Both groups are normally well over Mo A and I save them. Most Big Four ARs use fatter 1 3/8" float tubes and contact the gas tube hard, throwing the alignment out of wack and causing big groups.

I fix that as described in "Gas Tube Alignment" (March 2014.) Then I stabilize the barrel extension in the upper receiver and remove the hightorque, accuracy-robbing flash suppressor and replace the crush washer with normal peel washers timed at about 3 ft-lbs. of torque and lots of red Loctite. Next step is tuning the barrel harmonics ("AR-15 Barrel Harmonics", October 2016) and working out along range load.

I include the final targets along with a sample box of the tuned load so the customer can see for himself how much improvement has been made. I have never had a customer refuse

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to pay the bill or say that he can't notice an improvement. Most of these guns end up around Mo A after treatment and occasionally better. I have never gotten true 1/2 to 5/8 Mo A performance from low-bid barrels and don't expect to. Added up, customers may still see some savings with low-bid barrels, even after paying me for improvements, but not as much as they thought. Now, low-bid barrels have their place.

Anew shooter in most disciplines will take several years to build skills needed to shoot top scores with any barrel. Saving some money on the first barrel hopefully leaves enough to buy ammo to train with. Perhaps by the time that first barrel needs replacing he'll be able to benefit from a higher priced alternative. Also, not all shooting disciplines require the tack-driving accuracy of National Match Course guns so lower priced barrels may be good enough. Most NMC competitors hedge their bets with better barrels.

Occasionally, one will try to scrimp and get lucky. Remember, almost every custom barrel manufacturer in the U. S. makes a really good barrel, sometimes, and occasionally one of those lucky low-bid barrels ends up with atop shooter. Another factor is longevity. Consider a low-bid barrel costing half as much but wearing out with a third of the round count. While barrel wear is extremely variable and can't be accurately predicted, it's more than just a function of round count.

Bore cleaning habits can equal or trump round count. I've replaced as many barrels due to neglect as from firing. Cleaning is so important and people vary so widely in cleaning practices that it's difficult to set up

a proper study to quantify wear out. As a Team armorer, I had the opportunity to make many observations on this. Understand such observations are somewhat subjective, so take this for it's worth.

Concerning stainless or chromemoly, famed barrel maker Boots Obermeyer has said that with .223 Remington shooting the kinds of bullets and powders available at the time, he felt stainless would erode less rough than chrome-moly. Note, he did not say they would wear differently regarding throat erosion, just commenting on the difference in roughness. More importantly, he also did not say chrome-moly roughness would impact performance.

I believe Boots also had this "roughness of erosion" conversation with other shooters and some of them grew up to be gun journalists as I've seen this repeated in print a number of times. Of course, these accounts connect dots Boots didn't intend and others have drawn conclusions without adequate testing. I've been watching this for a quarter of a century and what I've seen in the borescope backs up what Boots told me. Chrome-moly barrels do erode a little rougher than stainless.

However, outside of the cosmetic, there is no performance difference I've measured. Suppose I fielded two Brand K barrels, one stainless and the other chromemoly, and let's say the C. M. shot tighter groups when new. If the barrels cycled back through my shop later, given equal treatments I'd normally find the C. M. barrel still out shooting the SS. Groups sizes may have increased but the C. M. barrel would still be tighter by about the same margin.

After witnessing this so many times, longevity isn't better with stainless. While stainless does clean up easier, it has proven more susceptible to cleaning damage. Concerning cut and button rifling, makers of each insist theirs are better. Cut rifling barrel makers say their steel is better and button rifling process necessitates softer, lower-grade steel. The button rifler disagrees. My observations are cut rifling usually lasts longer with higher round counts.

In testing electropolishing and fire lapping, Stoney Point throat readings revealed button rifled throats consistently advance two to four times as far from the lapping process as cut rifled bores. I am not claiming forward erosion at the throat is the same from fire lapping as normal shooting due to the abrasive coating, but the increased wear happens. Draw your own conclusions. Propellant selection affects longevity as powders burn at different temperatures.

In testing 90 grain bullets in button-rifled chrome-moly barrels I received a copy of a private study listing most of the common powders and their burn temperatures. I was trying some so called "high energy" imports and the manufacturer claimed these yielded higher velocities at lower pressures. Lacking expensive chamber pressure measuring equipment, I just use primer condition and retention characteristics. I didn't notice pressure differences or higher velocities with these powders.

What I did notice was fatter groups in the machine rest and higher velocity spreads on the chronograph between the slowest and fastest rounds. I fielded some guns with buttonrifled barrels using the imported

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powder with about 500 total round counts and they were coming back in as being shot out. Throats measured excessively long for such modest use and bore scoping revealed extreme fire cracking running as much as six inches down the bore. The barrels were toast. I switched to cut-rifled barrels and the erosion and fire cracking backed way down to almost normal. Since the high energy powders were not performing all that well, I dropped them in favor of domestic powders.

Looking up the burning temperatures of these imports, they were hotter than other powders in the same general loading and velocity range. It appears using hot burning powder can damage bores and some button-rifled barrels are more susceptible to this damage than cut rifled barrels. It's been found that ball powder burns cooler than some stick powders and that using them should improve barrel life. I have never seen any actual tests to verify this, however.

Looking up the burning temperatures of several common ball powders reveals they do burn cooler. Given what I observed with the effects of hot burning powder, I'll let you decide if this will help. Barrels with slow twists seem to last longer than fast twist barrels. I have had AR barrels in 1:12, 1:13, and 1:14 twist rates and some of them went to five figures of estimated round counts before giving up.

Slow twist barrels are cooler to the touch with an equal number of shots fired as the bullet encounters less resistance to rotation and is out of the throat sooner, giving the hot, erosive gases less time to attack the back of the barrel. Gain twist barrels beginning with a slow twist and incrementally increasing toward the muzzle should last longer than barrels with uniform fast twists. In .223 Remington, barrels with taller 0.218" lands last longer than barrels with normal 0.219" lands.

Krieger makes all their barrels with 0.218 lands and Bartlein will give you which ever option you choose. I strongly recommend 0.218 for both longevity and accuracy. Norm Brux normally uses the tall option on his narrow-land barrels but reverts to the 0.219 on normal barrels. Barrels with long leade chambers and throat combinations shoot bigger groups with magazine length ammo at birth and wear out significantly earlier than barrels with shorter chambers.

I recommend no chamber longer than a Wylde (measuring 2.475" overall) with an 80 grain Sierra Match King bullet. Barrels with 5R rifling or narrow land options shoot fine and seem to last as long as any other barrel. Both are very susceptible to damage by improper cleaning because they are narrow up on the top surface where the cleaning rod can rub against them.

The 5R land is just as wide as any other land down at the bottom but the land is roughly shaped like a trapezoid and is more

narrow at the top where the rod will be rubbing against it. Just keep this in the back of your mind in case you are selecting a barrel for a customer who is known for rough cleaning practices.

Pressure Unfortunately, a few shooters feel loading ammo too hot somehow buys additional "wind proofing" but the ballistic reality is an extra 30 to 50 feet per second provides minuscule wind bucking capability. Smarter shooters choose a higher ballistic coefficient bullet instead. However, at 1,000 yards enough velocity is needed to remain supersonic (above 1,100 fps) to the target as dropping below the sound barrier causes bullet instability.

We can deal with this pressure by choosing the right barrel options and/or by increasing dwell time (how long the bolt remains locked up.) Bolt carrier weights help a little. Superior Shooting Systems has a shot-shell-sized weight worth about 0.3 grains of additional powder and 30 fps. Note, carrier weights in rapid fire events can cause malfunctions. If you choose to leave them in for all shooting, follow the included instructions on this.

This includes slightly shortening the back of the buffer, appropriate load work ups with the weight in place, and rezeroing. Another way to increase dwell time is drilling the gas port two inches forward of normal and using a longer gas tube, such as from White Oak. This is not an option for Service Rifles but is for Match

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Rifles. Very Low Drag bullets have higher ballistic coefficients and can be started at slightly lower velocities to retain more speed at 600 and 1,000 yards. VLD bullets are a little “pointier” and their bearing surface is frequently shorter they often pressure up less.

VLD bullets are normally loaded longer than the chamber so the bullet jams into the throat a little (about 0.000 to 0.010”). Each gun has its own preferred amount of bullet jam and this has to be worked out by the shooter and maintained with a process called “chasing the throat.” Note, jamming bullets into the throat can raise pressures so perform load work ups gradually. Certain barrel characteristics lower pressures.

Chambers with a combination of long leade and throat permit long range bullets to be seated out further, tending to lower chamber pressure and allowing more propellant and higher velocity. If such a gun is to be used with magazine length ammo, long chamber is a poor compromise as jumping bullets yields accuracy degradation. I only recommend a chamber longer than a Wylde for use in dedicated 1,000 yard guns, typically a Holliger chamber for 90s with a reamer having a tighter neck.

Tall 0.218” lands make for more pressure. They also make for more accuracy with every bullet I have tested in the AR-15. The tall land may require a 1/2 grain reduction in powder charge. I recommend exploring every other low-pressure option before giving up the tall land! The standard groove in .223 Remington is 0.2240”, about the same as the diameter of the bullets by design.

When I first began experimenting with first generation 90 grain Sierra Match King bullets in 2006 my Krieger barrels caused the then-thin jackets to separate from the cores. I sat down with Krieger’s Plant Manager and we discussed bore options to remedy this. His idea was cutting grooves an additional half-thousandth to 0.2245” as such a subtle change wouldn’t impact accuracy. These deeper grooves did improve jacket retention but didn’t completely cure the problem.

Group size tests with magazine length and long range ammunition proved no accuracy degradation and the incidence of fliers reduced. As an added bonus, pressures went down as the deeper grooves to lower pressure to compensate for tall lands. The 0.218 x 0.2245” Kriegers pretty much mirror the industry standard of 0.219 x 0.2240” the Krieger configuration was noticeably more accurate. Bartlein also provides this bore configuration and I use it with all my AR barrels. The land-to-groove ratio influences pressure.

As a general rule, grooves are wider than lands. Each barrel maker is free to make his lands and grooves as wide as personal preferences and tooling allow. Some barrel makers allocate 40% of the area to the lands and the remaining 60% to grooves. Another common configuration is 1/3 to 2/3, making the land half as wide as the groove. Another maker uses a 30% to 70% ratio and “narrow land” configurations go all the way to 20%:80% with a groove four times as wide as the land.

Given a normal 0.219” land and 0.2240” groove, the narrow land option pressures significantly less, allowing more powder and higher velocities with moderate pressures. The type of rifling also influences pressures.

Polygonal rifling is offered by some button rifling manufacturers in the U. S. and has a less pronounced transition between lands and grooves than conventional rifling.

Barrel makers using the polygonal rifling claim it stresses bullets less and in tests to overcome bullet blow ups I saw evidence of this claim when Pac-Nor expanded their 5P line to include the 6.5 twist. Polygonal rifling has a reputation for causing more pressure and I’ve seen evidence of that with 80 grain bullets in 1:8 twist barrels. The Reserve Team had to cut loads between 0.3-0.5 grains to hold primers with these. I generally discourage polygonal rifling in .223 Remington for dedicated 1,000 yard guns.

The 5R rifling pattern (five lands, five grooves) made famous by Boots Obermeyer is more pressure friendly. The lands have a trapezoidal shape more narrow on the top. Bartlein offers their barrels with a 30% land to 70% groove ratio in both four groove and 5R. On paper, loads should pressure equally but I’ve found they don’t. 5R barrels are good for about 0.3- 0.5 grains more powder than four groove barrels. There are two possible explanations.

Since 5R lands are more narrow on top, the total surface area of the land is slightly less than with more rectangular shapes. Less surface area and less drag lowers pressure. All barrels with even lands line up directly opposite each other and uneven numbered lands (like 5R) staggers them and reduces constriction. Regardless of cause, 5R pressures less and is an optimal choice for 1,000 yards. I’m also getting stellar accuracy from the 5Rs, which is key to long range.

FIVE BARREL MAKERS I KNOW OF OFFER THE 5R PATTERN, THOUGH KRIEGER

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doesn't have it in .22 centerfire. Four companies that do are Rock Creek, Satern, and Bartlein in single-point cut rifling and Broughton in button rifling (they call it 5C.) Another pressure-friendly configuration is gain twist, which starts spinning the bullet slow in front of the chamber and incrementally increases the twist rate toward the muzzle. This reduces overall pressure and the twist rate at the muzzle is what counts for stability.

Uniform twists are more convenient for barrel makers but a disadvantage to pressure and possibly accuracy. Smith & Wesson uses gain twist in certain heavy-caliber hunting revolvers and believes a bullet launched into a fast twist barrel skids a short distance over the rifling before the lands engrave enough to start rotation. This skidding deforms bullets and negatively impacts accuracy.

Even if you don't subscribe to S&W's theory, Harry Pope and his contemporaries realized over a century ago that slow initial

twist rate contributes to longer barrel life, easier cleaning, less rotational torque, and cooler operation. The downside is increased barrel cost due to the greater machining difficulty. Shooting Military Ammo Military full metal jacket ball ammunition doesn't have a good reputation for accuracy in six groove barrels and some of this reputation is deserved.

Even though the M16A2 and later were intended for 62 grain M855/SS-109 ammunition, team shooters found older bullets shot better with less fliers. Derrick Martin with the National Guard Team and I both experimented with barrels to optimize the FMJ military rounds. It was known with the M14 that .30 caliber barrels with odd numbers of lands shot FMJ bullets better so I tried five-groove barrels in 5.56mm caliber while Derrick was trying three grooves.

Derrick was an accomplished M14 shooter and may also have been employing lessons learned with the Brown Gun. Both of us documented better accuracy with odd-num-

bered lands. For three groove barrels, look at Lilja and Pac-Nor. For five groove barrels in .22 centerfire look at Bartlein, Rock Creek, Satern, and Broughton. We also independently found the NATO chamber was way too long in the throat for accuracy. I recommend using nothing longer than a Wylde chamber for shooting military ball ammo for top accuracy.

Twist Rate Football players learned long ago imparting spin to the ball makes it travel more true. Bullets do also and that is why ages ago makers began to rifle bores. Bullets require different rates of spin, mostly set by their length, with longer bullets needing more. We annotate this spin rate is by how many inches a bullet travels in the barrel while making one complete 360 degree rotation. .22 LR normally spins their short bullets one full rotation for every 16 inches, written 1:16.

CENTERFIRE

BARRELS FOR CUSTOM AR-15S, PART 2 CONTINUED

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rifles usually have twist rates from 1:14 to 1:6. Each bullet has a twist rate that optimally stabilizes it. If your customer is going to only shoot one bullet all the time, it's easy to determine optimum twist rate. Most bullet manufacturers publish recommended twist rates. National Match Course competitors shoot 69-77 grain bullets at 200 and 300 yards and longer 80-90 grain bullets at 600 and 1,000 yards. In such cases, twist rate needs to be set for the longest (heaviest) bullet.

A few gunwriters who likely have failed to perform adequate due diligence claim it's OK to over spin bullets. In fact, they've coined the deceptive "over stabilizing" which almost sounds like "too much ice cream." Unfortunately, over spinning bullets is not a good thing and doing so likely compromises accuracy. No bullet is perfect and over spinning exacerbate any problems, creating fat groups and fliers. Faster twist barrels also heat up, pressure, and foul more. Don't over spin your bullets!

Stoner designed the AR-15 with a 1:14 20" barrel for 55 grain bullets. This works fine and I have a 1:14 twist barrel that shoots 55 grain bullets at near Mo A. The military changed to 1:12 and I've owned 1:12 and 1:13 barrels that shot 55s fine. With the A2 the military went to a 1:7 six-groove barrel for the longer 62s. Green tip M855 also has a steel penetrator and some say keeping that centered is difficult, creating inaccuracy. Regardless, 62s usually shoot horribly! They'd stabilize just fine in 1:9.

The faster 1:7 was chosen to stabilize longer tracer rounds that are inherently inaccurate anyway. The combination of over spinning 62s coupled with six-groove barrels and the inherent inaccuracy of the ammo results in difficulty hitting targets at 300 meters, sometimes even closer. If you are building a rifle for someone with a pile of 62 grain green tip I recommend 1:10 or 1:9 with three or five grooves. A rifle

shooting 55 grain FMJs does best with 1:14-1:12 with three or five grooves. Wylde chambers in both.

A NMC gun shooting 77s and 80s needs 1:8-1:7.7. Unless building a dedicated 1,000 yard gun, I see no reason to go all the way to 1:7 twist. The Reserves shot 1:8 barrels with 80 grain boat tails and VLD just fine even out to 1,000 yards. The difference in RPM between an 1:8 and 1:7 is 35,357. Over spinning bullets by that much will result in degraded performance. To optimize 90 grain bullets, use 1:6.5, ideally with again twist. Don't Overlook Chrome-Moly!

As with the errors of jumping bullets in a too-long throat and over spinning bullets, another piece of misinformation regards barrel steel and the misbelief that stainless steel is always best. Stainless was hyped endlessly during the my decade-long barrel study. I grant that stainless is more corrosion resistant but I couldn't find any real studies concerning accuracy potential.

I kept records on hundreds of barrels made with stainless and chromemoly and in every brand of barrel offering both types, chrome-moly shot tighter groups with less fliers. 50% of all C. M. barrels I tested came out shooting better than average while only 41% of stainless could make the same claim. 28% of stainless barrels shot fatter than average groups while only 15% of C. M. barrels did so. And when all the groups were compared C. M. shot 9.6% tighter than stainless.

I went into the test figuring that stainless would top chrome-moly and was surprised early on to actually be able to see C. M. performing better. I don't know why this is, but considering the volume of data I amassed and records I kept I am certain of the final results. Two Best Barrels In my study, two barrel companies consistently made the most accurate barrels. Some

companies dropped from consideration, such as those only making stainless options and low-bid makers offering cheap blanks of questionable steel.

I was lucky to get one or two barrels for every ten from such manufacturers that shot to my standards! All the companies using button rifling eventually dropped off. Lilja hung on the hardest and I like their threegroove design and their .22 LR barrel is second only to Krieger. The last two barrel companies left standing were Krieger and Bartlein. When I arrived at my final conclusions I asked what these two outfits had in common. Both use the single-point cut rifling method, good steel, and tall 0.218" lands.

I am getting good wear from both. Quality of tooling and a commitment to excellence are also prime factors. I wish I could have included Obermeyer barrels in my study because I've had great success with them in M14s and AR-15s, but during the time of my testing Boots was tied up in a DOD contract making barrels for rotary cannons and wasn't doing much on the civilian side and I was unable to get barrels from him.

I build guns for National Match Course competition shooting 90 grain bullets and have achieved 3/8" ten-shot groups. That is the kind of accuracy performance you can obtain with a quality barrel, a 90 grain Berger boat tail bullet set to the sweet spot, and proper gun building techniques. I used a chromemoly Bartlein gain twist barrel with 0.218" lands, 0.2245" grooves in a 5R rifling pattern. The 20" barrel had a Wylde chamber with 1:13 twist at the throat and 1:6.5 at the muzzle.

These are the best barrels I have ever shot and my acceptance rate with them is eight out of every nine, the highest in my study. I hope the tips passed along in this article help you to build guns as accurate by making wise barrel choices! AG

FROM THE ARCHIVE

Making Holes Disappear

A restoration approach to handling unsightly holes in a firearm.

BY ROBERT E. FRIED AUGUST 2017

ORIGINAL PP. 13-15

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The title of this probably should read “Making Ugly Holes Disappear” because that’s what we’re actually covering in this article. Ugly holes can be on any firearm, such as long guns where they were drilled and tapped for either scope mounts or a sight of some sort. Over time of installing bases, sights, and later removing them, sometimes these holes can become unsightly and require repair. For files, eight-inch second cut and smooth cut, six-inch smooth cut, and four-inch #2 Swiss pillar file.

Also needed, a file cleaner and chalk. Gunsmithing often requires things like drilling and tapping a hole or milling a slot, but here we are going to partially do the opposite. If you have an older firearm that is in

the need of refinishing, this is the perfect time for this restoration work. This isn’t limited to older firearms as newer firearms may require this as well.

Recently, I had a customer bring in a fairly new Henry Repeating Arms Golden Boy that “someone” had messed up the scope base holes appearance and threads. Some gunsmiths might prefer to weld up the holes but such a fix is drastic on a barrel or receiver with good bluing. This repair procedure can be done on blind holes, through holes, blued areas, or—best of all—a firearm needing to be refinished. Top Bottom To begin, determine the size of the hole (#6, #8, #10, etc.) and thread pitch.

If the hole isn’t threaded, it needs to be for optimal results. Chase the threads with the appropriate tap as needed, especially if they are “buggered up.” Having a hole with good, clean threads, use General Tools 196 Hand Reamer/ Countersink or the equivalent to cut a countersink into each hole. Cut the countersink deep enough to allow an oval head scope base screw to nicely engage it when screwed down completely. With the hole now prepped, plug it.

I use a Weaver-style oval head scope base screw cut to size as necessary so that the oval head completely bottoms out in the countersink. An-

MAKING HOLES DISAPPEAR CONTINUED

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neal the screw prior to installation. I do this on a scrap piece of metal drilled with a series of different size holes to put the screws in for heating to prevent them from rolling off, though you may secure them in any suitable manner. Heat each screw until red hot before moving to the next one. By doing them one at a time, heat applied to the screws in sequence allows them to cool more slowly, an approach that works great for me. After all the screws have been heated, allow them to cool to room temperature.

Once cooled, install the screws with red Loctite, making sure the oval head bottoms out in the countersink. Clean away the excess

Loctite and set aside for a day to allow the Loctite to set. Failing to allow the Loctite to fully cure will let the screw heads turn when filing them down (don't ask me Top Bottom We're ready for bluing. how I know this.) Failing to wait a day and having the screw turn can ruin this process and leave a tell tale outline once finished, which is something we're trying to avoid here.

Having waited our day, it's time to upset the screw heads. Put the part being finished (barrel, receiver, etc.) in a sturdy vise positioned so the screw heads will absorb the maximum impact. Using an eight ounce ball-peen hammer, begin upsetting the screw heads by con-

tinuously tapping on them, starting top dead center and then around the circumference to insure the head is driven into the countersink. It doesn't take much and there is no need to slam the hammer down. A controlled tapping will suffice.

Once the heads have been flattened to your satisfaction (experience will teach you how much) the real work begins. The files I use are eight-inch second cut and smooth cut, a six-inch smooth cut, and a four-inch #2 Swiss pillar file along with a piece of chalk and a file card to keep the files from loading up. If the work isn't being done as part of a refin-

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The two unsightly holes have disappeared. Inishing project, tape up around the screw heads to prevent or lessen any file damage. I start with two layers of masking tape, work down to one layer, and eventually have to remove the tape. Very careful, slow, and deliberate strokes go along way with this project. Shape of the project determines how to file the heads down. For this article I used a discarded round muzzle-loader barrel. This required filing the heads following the round contour.

The Henry I mentioned earlier had an octagon barrel and was a little more difficult to file perfectly flat so as not to round off the edges of the barrel. Since you are going to do a substantial amount of filing on this project it's wise to have good files with handles on them, one for control and another for safety so as to prevent the tang from piercing your hand. Start and end with the files in the order I listed them. As you get to the first of the two layers of tape, switch to the eight-inch smooth cut.

Upon reaching the top of the of the second layer, move to the six-inch smooth cut. As you go down through the last layer of tape, proceed with care. As you move down in size, go slower and more deliberate in your strokes. When the screw head starts to "flake" at the edges, move to the Swiss cut file and on to the home stretch. As the job finishes, you'll see the screw head melting into the base metal. Rub the area with your fingers to check for high spots. Carefully remove them, holding the contour.

Just prior to where you should stop, use a fine grit emery cloth starting with 360 up to 600 with a six-inch pillar file as a backing to finish up to where it is totally melted into the base metal. I suggest practicing on some old barrels to get the feel of using each file and to learn the stopping point. The key is to cut the countersink deep enough to swage the annealed screw head into it to form a seamless joint.

Using Oxpho-Blue Once satisfied with the results, refinish the work area if this isn't part of a complete refinishing job. I use Brownells Oxpho-Blue (082-024- 004) with very good results. While attending a Gunsmith Career Fair, I brought some of my shop-made tools blued with Oxpho-Blue and the Gun Techs there were impressed with the good and durable finish.

When asked how I did it, the gist of my response was, "I don't follow the manufacturer directions." I've used Oxpho-Blue on rifle barrels, jigs, and fixtures in this manner with exemplary success. Here's how. If it is a repair such as making holes disappear or doing a touchup, I polish the affected area without disturbing the finish around it. For barrels and fixtures, I bead blast. After the metal surface is prepared, apply a degreaser and let it totally evaporate.

Saturate a cotton 12 gauge cleaning patch with the solution and wipe it on. The metal may turn several shades of blue or some spots will not blue at all. To make the area or part blend and turn a dark blue-black,

take apiece of 0000 steel wool and saturate it with the bluing solution. With a heat source (propane or a good heat gun) heat the area to be blued until it is very warm. Apply the steel wool with bluing solution with a swirling, blending motion.

The metal should be hot enough that applying solution causes it to steam a little. Do this several times depending on the color wanted. With the last application, let it dry. Take another clean cotton patch saturated with the solution and wipe it again, letting it partially dry, then wipe with a clean cotton patch to completely dry it off. Use only clean patches or swabs each time. Never reuse the applicator patch as you don't want to contaminate the bottle of bluing.

My experience with cold bluing indicates bead blasting and heating makes the bluing solution take very well, especially with barrels. There are barrels I have done this way being used on hunting rifles I built that look as good today as they did when I blued them. The bead blasting exposes the metal, while the heat opens it's pores so to speak. This allows the bluing solution to penetrate well for a very nice and durable finish.

A great unexpected result with wiping the barrel with 0000 steel wool provides a nice matte finish for the bead blasted parts, one that matches many of the new rifle receivers being produced today. Now you can tell your customers, "I can make those ugly holes disappear!" This will be a service I'm sure they'll appreciate. AG

METALWORKING

Ruger SR1911R Upgrade

Working Ruger's take on a Browning classic.

BY ROBERT K. CAMPBELL AUGUST 2017

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I recently had the call to work on an upgrade of the 1911 handgun that's a newcomer compared to those from Colt and Springfield. The Ruger SR1911R is a governmentlength .45 ACP appearing similar to other 1911s. Like many modern 1911 pistols, it comes from with factory enhancements like good sights (Novaks), an extended safety, beavertail grip safety, and accessory rail. As with many solid Ruger pistols, the frame is cast while the slide is forged steel.

Another improvement over the original military specification is a permanently-attached plunger tube. Other than the lowerquality Llama (which suffers poor metal and no

spare parts; I've seen two broken examples within the past year) Ruger offers a well-made improvement. The first question my customer and I had was part interchangeability.

While it was hoped quality aftermarket parts such as from Ed Brown and Wilson Combat would present little obstacle to upgrading, the only guarantee I could initially offer was to exchange the recoil spring! I'd like to assume the same for magazines, but an Auto Ordnance 1911 with a propriety magazine and a finicky Top Bottom polymer-f ramed "rail gun" have given me pause on that blanket recommendation.

Despite certain brands releasing in recoil and the possibility of base pads interfering with a magazine chute unless checked and fitted, I've enjoyed excellent parts adaptability with Colt, Springfield, and Rock Island handguns. I didn't have such experience with the Ruger SR1911R. 1911 handguns have been built for many decades at many different companies with many grades and degrees of tolerance.

The poorly-fitted Llama pistols are the baseline for those to be avoided while the exquisite Ed Brown handguns need no help from me. While 1911A1 Government Model handguns manufactured during World War Two have Far These grips are off spec!

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a high degree of interchangeability, this is no longer true in modern production. High end handguns with tighter tolerances need the most fitting with aftermarket parts. GI guns were reliable and accurate enough. The Ruger pistol is much higher quality. There is more to the equation than most understand. Quality manufacture was demanded and these handguns were good, despite the cheap plastic grips and Parkerized finish.

When it came time for detail strips and parts replacement, military armorers had a large parts bin to choose from. If a certain part didn't fit well, the next Top Bottom for combat, with the standard of a fiveinch, five-shot group at 25 yards with GI ammunition. Most were more accurate than that and very few

less so. one probably would. As long as the trigger functioned within GI specifications the pistol was deemed acceptable.

In contrast, modern makers do not consider aftermarket part fit a major plus for their firearms and only consider their own replacement parts. They manufacture their handguns to their standard. Parts not made by them aren't considered so fitting will usually be needed. I have found magazine releases are among the few parts that seem to fit all 1911 handguns well. I have used quite a few Brownells magazine guides that also work well.

That's about it, Parts that need fitting include the slide lock safety, extractor, grip safety, barrel, barrel bushing, ejector, trigger, disconnect and sear, and grip panels. Given the fit-

ting required, changing parts should be an upgrade geared toward improving the pistol. The more skilled the gunsmith, the more improvement may be pursued. The old, heavy trigger of GI guns isn't acceptable to modern shooters. A lighter trigger with less take up is desired. Match grade accuracy is a respectable accomplishment.

The standard 1911 pistol sometimes feels clunky in its operation with a stock barrel and fit. An accomplished shooter will demand more and we can provide. Examining the Ruger SR1911 revealed a credible 1911. It's almost as tight as a Kimber and tighter than those from Rock Island. I fired the pistol from a solid bench rest at 25 yards with Hornady 200 grain XT P for a fiveshot 2.5-inch group. Good enough for most needs. The barrel is good and tight and the

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Fit and function are excellent. barrel bushing tighter than GI guns but not so that a bushing wrench is needed. The slide lock safety is positive in operation with a good detent. Unless you have a left handed shooter, the safety is fine as issued. The black nitride finish seems durable and is non-reflective, so no thought was given to refinishing. The grips offer excellent adhesion so changing them would be but a vanity.

The grip safety properly releases its hold on the trigger at the midway point in compression and meets the criteria for service use.

There is no drop safety or firing pin block. Instead, an extra power firing pin spring is used. This may not invite institutional sales but works well for the individual and is perfectly adequate in preventing discharge should the pistol be dropped muzzle first. The first upgrade was the addition of Challis grip screw bushings as I've found these to be a superior set up.

The recoil spring was changed out for a 17 pounder and the mainspring replaced with a 19 pounder. The pistol was test fired again and found to be still reliable with service

loads. There would be no full-length guide rod to complicate the pistol. The factory trigger is a standard type with fixed overtravel.

The Wilson Combat standard tar- The larger, extended units seem far more likely to tie up the pistol by allowing momentum to press them into the locking slot prematurely. get-style trigger features a pad length of 0.500 and a height of 0.905. I chose the short pad trigger because the short trigger length makes for better control in rapid fire. Fitting the trigger wasn't difficult. The

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The original is lying on the frame. first step is to strip the frame after clearing. The trigger is checked for binding in the slot and fitted as needed. This trigger bow bound in the slot just slightly so I filed the high spots and deburred it, proceeding until the trigger fit in the slot without daylight on either side. Next, I removed the trigger, smoked the trigger surfaces, and reinstalled the trigger. At contact spots on the smoke marks, I filed carefully had a perfect fit after a few tries.

The set screw for trigger adjustment is fine to achieve good fit but should be Loctited permanently in a service pistol. I adjusted the trigger set screw to the point that the hammer fell to the half cock notch, then to where it fell completely, and adjusted it out just a

little past that point. Trigger compression was 4.5 pounds after installation with up and down movement eliminated. Next was the slide stop. The slide stop functions and fit fine. No need to change this out.

The Wilson Combat slide stop I had on hand was checked and it fit well so Rugers seem agreeable to Wilson Combat there. I elected to fit a Wilson Combat Bullet Proof extractor by carefully filing the "bump" on the extractor body. A few file strokes is all it took for a tight fit and positive function. It's common to overlook cleaning the extractor tunnel. I did that before installation, as well as greasing the extractor to allow a truly tight fit. On to the mainspring housing.

I found the fit good with the factory unit but decided to go with a Wilson Combat MSH and magazine guide. Some 1911 mainspring housings actually compress on the gun and others have a poor fit and are too brittle to be fitted. When a MSH doesn't fit well, striking the ends with a hammer and then filing to shape works, except the brittle versions will break. Wilson Combat parts are high quality and their MSH and magazine well offered a good, tight fit.

These upgrades turned out to be a good combination that work well. Ruger's SR1911R is as compatible with aftermarket parts as other quality 1911 handguns. AG

MEASUREMENT & INSPECTION

Scope Leveler Device

Canting a rifle will always degrade accuracy to some extent but there are positive measures that can be taken to alleviate this on our way to reliable accuracy. Here's how to make, install, and test a scope leveler.

BY NORMAN E. JOHNSON AUGUST 2017

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As a measure in the process of eliminating—or at least reducing—the effects of accuracy-robbing scope canting, we can install a scope leveling device designed for the purpose. These levelers are for sale and range widely in price, or we can conveniently make them from readily-available materials. This will be the approach covered in this treatise. As a rifleman and gunsmith, it

behoooved me to determine precisely how rifle canting actually affected bullet impact on target.

Some years ago, and more recently, I conducted definitive tests to reveal the effects Top This high-height scope base works out perfectly for the 3/8 x 1" level used. The existing base hook was removed from the ring. Bottom of rifle sight canting. As a scoped rifle is shot, the sight reticle (crosshairs)

should be perpendicular to the aim point on target, or as uniform as possible from shot to shot.

Under normal shooting conditions a shooter can arrive fairly close to maintaining a vertical and horizontal scope reticle without canting error, but it seldom occurs. Errors here are more critical while target shooting or shooting game at long range. The insidious effects of scope rotation can creep in as the shooter aims and shoots the rifle from shot-to-shot.

SCOPE LEVELER DEVICE CONTINUED

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high-height scope ring has been prepped for use as a scope leveling device. Shown is a 30mm ring with optional reducer shims for a one-inch scope tube. Upper ring is a 30mm Redfield Jr. Other two are inexpensive rings machined and ready for use. Depending largely on the height of the scope above bore axial center and the ammunition used, as little as a few degrees of cant can cause the bullets to impact from the intended aim point. Where the rifle is canted right, the bullet will hit right and low of aim.

Alike deviation occurs where rotation is left. While not dwelling on a lot of geometric technicality, I'll elaborate on the harmful effects of canting a riflescope as we shoot and show how to make proper corrections. Canting error on target occurs when the barrel axis is rotated out of the vertical plane.

As a scope is mounted well above the bore axis, the bullet must cross the line of sight at about 25 yards and then again cross the line of sight at the point Below center: The proper procedure for attachment of a scope leveling device is quite basic, but must be performed with precision. First the rifle is carefully leveled. A common bubble level is used here across the Picatinny rail. The scope leveling device is then leveled into place.

This scope is mounted quite high above the bore line which would increase the effects of rifle canting, where the rifle is sighted in. This sets the stage for right or left impact errors depending on how much the barrel is canted out of the vertical plane. Cant rotation causes the bullet to impact in the direction of rotation with at least some drop as an effect of trajectory. In all cases, canting a rifle will

be harmful to precision and accuracy, but there are corrections that can be made to alleviate this.

Making A Scope Leveler Device The pictures will serve as a guide in making a scope leveling instrument. As apart to hold the level used in making the leveling device, I used a common Redfield Jr. high-height ring. A front or rear ring will suffice. I also used a pair of aluminum rings of another style with a sufficiently high base for the same purpose. Either one-inch or 30mm scope rings can be used. A 3/8-inch hole was drilled and reamed at center on the underside of the base to about 1/2-inch depth.

FOUR SMALL SET SCREWS WERE DRILLED AND TAPPED AROUND THE BOTTOM PE-

SCOPE LEVELER DEVICE CONTINUED

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The three shots marked zero (left) show a 2 3/4" bullet shift (right) as the scope is canted 5 degrees at 300 yards. This is no small error for the serious target shooter. rimeter of the base to hold the inchlong 3/8" diameter spirit level. With level inserted to desired depth, the four set screws are lightly tightened. The level is essentially self-aligning in the base hole.

Attaching To The Rifle When installing a leveler, always begin with the rifle held precisely perpendicular in sand bag rests or other method of holding. There must be no cant or rotation right or left. This requires some attention to detail, which can be deceptive. The rifle must be precisely aligned with a level, not just by eye. A perpendicular line on a paper attached to the butt plate will work fine after checking with a small machinist's level.

The next critical step is to align the scope reticle precisely perpen- Cant error is shown in the direction of cant. Cartridge and load used

was a 6x45mm with 88 grain bullets at 2540 fps. The bullet type and velocity as well as the height of mounted scope above bore axis has an effect on the cant error. dicular with the squared rifle. If this isn't accomplished, the scope reticle will be at an angle with the rifle.

This can be checked out by aligning the scope reticle with a known object that is level or perpendicular. The rifle must therefore be kept in a perpendicular position as the scope is leveled. With the rifle maintained in true vertical position, the leveling device is attached with the level bubble at true level. The modified rings used as the leveling device can be clamped to the scope just ahead of the rear ring on either side of the scope.

While it is easier to see on the left side of the rifle, it is less likely to be damaged while carrying the rifle if attached to the right side. Double check the perpendicular position of the rifle and scope reticle as necessary from

time to time. So now we have the rifle, the scope reticle, and scope leveler device all calibrated, leveled, and ready to put to the test. I made up a special target using an angle rule to indicate the position of the scope reticle in degrees of perpendicular alignment.

This test target makes it possible to aim the rifle to the exact degree off level shot-to-shot. The degree of shot displacement or error on target will depend on scope height above the bore line, bullet trajectory, and distance. Bullet impact will vary. This leaves nothing to guesswork. Conclusion While adding a leveling device to a rifle may not improve its inherent accuracy, it will alert us to the effects of accuracy-robbing cant. If we can nullify this untoward problem, groups are sure to improve.

AG When shooting a rifle, it is not always easy to distinguish cant error differences. A scope leveler device takes the guesswork out of the equation.

FROM THE ARCHIVE

Gunsmith Time

It's time to think about time... and your bottom line.

BY ARTHUR J. HUNT AUGUST 2017

ORIGINAL PP. 23

Yep, I'm back on the old pet project, trying to organize my time into an amount that will result in productivity as well as leave me some freedom for getting new business gained by talking to my customers. Few of us really look at how much time we spend talking and how much time we can spend working.

Let's say you still charge \$30.00 an hour for basic gunsmith work, even though a recent Brownells Shop Price Survey (brownells.com/userdocs/miscellaneous/shoppricesurvey.pdf) currently lists this fee at \$40-\$80 per hour, \$50-\$95 per hour when it involves machine work, and a minimum fee of \$35-\$70 per gun. You insist it's affordable to waste 15 minutes on idle chit chat with each customer. In an eight hour day, 15 minutes spent with six people is 1.5 hours lost.

You could have made \$240 (\$30.00 per hour x 8) but now you have a deduction of \$45.00 so your income for the day is really \$195.00. Even if you did make the \$240.00, you still left 1.5 billable hours on the table. "But I still have to talk to customers," you point out. "If I don't talk to people, how am I going to get business?" You are right of course. You do have to talk, so what do we do about it? First off, forget that billable hourly rate that is going through your head.

Simply keep that figure in mind plus the time you have spent talking and price the job out so that you are properly paid for it either then and there or later. Hourly rates are fine if you have a helper who is also on an hourly rate (lesser, of course) and every hour he works he makes you money. If

your business is such that you can afford a counter man, take his salary and spread it out or divide the hours per week that he wants into his salary and be sure this overhead is covered in your prices.

You may have to increase the average you charge per job. Lone Gunsmiths A single gunsmith with no employees or other help is better off not opening shop to the public until noon. That gives you the first half of the day to work uninterrupted and still be open when many customers might stop in during a noon break or after work.

There are plenty of customers that will run in on their lunch hour, which may delay your eating your cheese sandwich, but this is a good time to take care of them as lunch hours are often lost time anyway. In addition to a later open time, I also prefer to be closed Mondays as it provides an entire, uninterrupted work day and even more productive time. I often do my bluing on Monday. Let's revisit the hourly rate idea and time spend talking to customers.

If you've firmly concluded that by charging your normal hourly rate and still spending 1.5 hours (or whatever it is) talking isn't all bad, I can't do anything but agree with you except to point out you're assuming that it will take only 45 minutes per job to stay in that picture. The fact is a gunsmith would have to be pretty damn good to take eight jobs in and fix them all in a 45 minute time schedule. What if two or three of those jobs took a full hour or longer?

That blows your hourly rate out the window and you end up working anywhere from two to three hours longer. What's the

solution? There is no hard and fast answer. All you can do is quote by the job, use your shop hourly rate, know the approximate time it should take, and work long enough or do what you can for the day and put the rest off until later. Only you can judge your time and the money you want to make. This all depends on what you are satisfied with.

If \$100.00 per day is all you want, you're free talk a lot and goof off more. There will be days when you won't make even that. There will also be days when you spend an hour just to get a stubborn screw or a broken tap out. Then what? You can't always charge for the unseen. Sometimes you can, not always. Gunsmithing is many things and different problems come up. Your judgment and experience is necessary and you have to know your customer. If you quote a price you may be stuck with it.

There are many unforeseen situations that are not your fault and you can do nothing but eat them. I have always found it best upon running into a significant, unforeseen problem to call the customer immediately, tell him I can't do the job for what I quoted, and give him the new price based on the previously unknown issue. If he doesn't want it done it is his election but you are being honest with yourself and him.

He should understand, at least you hope, that just because you quote a price that would've held had you not run into a different problem not of your making that your shop shouldn't have to completely take the loss. Whatever you decide to do, be up front with it and why. In the long run, most people will understand. AG

RIFLES

Reader Forum

BY AMERICAN GUNSMITH EDITORS AUGUST 2017

ORIGINAL PP. 24

Noble 33A Parts I have a Noble 33A pump action rifle chambered in .22 LR. The rifle belongs to a friend and I am trying to get it into working order. I have been trying to locate extractors for some time now with no success. Numrich Gun Parts lists the rifle, but not the parts I need. Jack First has no parts at all. Online searches have come up empty as well. If anyone can provide a source I would really appreciate it. Production on the rifle ended in 1950 so we're not amazed at the parts shortage after 66 years.

In searching the web we discovered Guns America has a "Good Working" 33A for sale. No price listed but if you browse up GunsAmerica.com, making direct contact will resolve that lack. If you decide to purchase it you can scavenge the needed parts and others. Remington 887 I have a Remington 887 12 gauge in my shop. It came in not being able to eject the fired hull, as if the slide was blocked. Sometimes I could push the slide forward and it would release, however.

I cleaned everything up and deburred some places inside I thought may be catching and causing the problem. Now when the shotgun is fired it comes out of battery all on its own. The slide comes about half way open when it is fired without holding any tension on the forend. Please let me know what you fell may be the culprit in this problem as it has me at the end of my rope. Kenneth W.

Wright Wright Enterprises of Texas James Slack Sounds like the problem might lie in the back end of the action or even in the receiver. Hopefully, not the latter but we can't be certain without the gun in hand. Suggest you contact Nu Line Guns as they area former Remington field service center and can give a definitive evaluation

and permanent fix. Taurus PT738 Have you produced an article on the complete disassembly of the Taurus PT738 TCP .380 ACP semiautomatic pistol?

A customer just dropped off a "shoe box" model after he completely disassembled the pistol frame and had it Hydro-Dipped in a camouflage pattern. He now wants me to reassemble it. Before I send it back to Taurus, I wanted to see if you have an issue covering this model. I can send it back to Taurus but I'm sure they won't be as careful with his new finish as I would be! Shawn Shupp Sorry, we have not yet done anything specific on the Taurus PT738. The only Taurus P-series pistol we covered had truly demonic pins.

By deliberate design, they collapsed if drifted by anyone other than factory service techs. Our suspicion is the PT738 may have similar tendencies. Contact Taurus and try for some reassurance or advice concerning damaging the dipped finish. Frankly, it seems quite odd that a concealed carry pistol should be in need of camouflage. Mosin-Nagant Does a receiver thread tap exist for the Mosin-Nagant? What about taps for the action/stock screws?

Robert Eubanks If you can measure the threads, and they're probably metric, try MSC Industrial Supply (mscdirect.com, Brownells might also have what you need in taps specific for the Mosin-Nagant, so check there. Either way, measure the threads first. Stevens Model 58 How does one remove and replace the barrel on a Stevens Model 58 bolt action shotgun manufactured about 1955?

Jack Roche The schematic we spotted in the Numrich Gun Parts catalog fails to make it clear whether the barrel is double pinned, screwed, or pressed in. You'll have to begin the job by calling them to see if they have a barrel in stock. AG

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