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EDITION

PRECISION ARMS WORKSHOP

AND THE AMERICAN GUNSMITH ARCHIVE

A TECHNICAL JOURNAL OF CRAFT, REPAIR & RESTORATION

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INSIDE THE ARCHIVE

PRECISION AR- 15 AMMUNITION

BREAKTHROUGH CLEAN • COBRA PISTOLS • EASY HI-POWER MODIFICATIONS • PREPPING THE REMINGTON 7600

ORIGINAL METHODS. MODERN ACCESS.

ARCHIVE EDITION 152

DIGITAL ARCHIVE EDITION

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MAINTENANCE & REPAIR

Breakthrough Clean

BY AMERICAN GUNSMITH EDITORS AUGUST 2016

ORIGINAL PP. 2

Breakthrough Clean Technologies (BreakThroughClean.com) offers a line of firearm cleaning products made from a distillation process that are environmentally friendly, non-toxic, and virtually odorless. Unlike many harshsmelling cleaners, solvents, and lubricants, Breakthrough's line are clear, easier on the skin, and don't smell bad.

The company is a subsidiary of the Avio Trade Group and specializes in the distribution of chemicals within the aerospace industry, servicing major airlines, MROs (Maintenance, Repair & Overhaul) providers, and repair stations worldwide. The owners of Avio Trade are also gun enthusiasts and realized having more effective, user-safe, and eco-friendly solvents and lubricants would be beneficial for firearms and their owners. The development team has a combined five decades of aerospace chemical experience.

Breakthrough Military-Grade Solvent is a nonwater based distilled petroleum solvent with no carcinogenic or hazardous waste materials. There is no odor and it is non-staining, yet is strong enough to remove all fouling while completely evaporating, leaving no residue behind. This solvent is pH neutral making it safe on wood, plastic, polymer, Cerakote, and hydroprinted parts and surfaces. It cleans efficiently and has flashpoint of 150 degrees Fahrenheit, making it non-flammable.

Battle Born High Purity Oil has the viscosity you'd expect of a good, all-around lubricant. It's a blend of synthetic oils treated with pressure and corrosion inhibitors, and anti-oxidant, antifoam, and anti-wear additives. This combination creates a wide-range multi-service lubricant and protectant for temperature conditions ranging from -90°F to 417°F. It's safe for use on all metal, plastic, and polymer parts.

High Purity Oil is bio-degradable, water and steam resistant, non-flammable, non-toxic, non-staining, and has no odor. Battle Born Grease is an advanced lubricant technology made of synthetic grease fortified with sub-micron size PTFE. Useful anywhere a heavier grease or thick lubricant is called for, this is blended completely with pure synthetic base oils, additives, and shear stable thickeners. Battle Born Grease works through an operating temperature range of -75° to +510°F.

Non-melting, non-flammable, water and steam resistant, this non-toxic, no-odor, non-staining grease works well on anything.

ORIGINAL SOURCE PAGE

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PISTOLS

Cobra Pistols

auto pistols and derringers.

BY DAVID W. MANNEY AUGUST 2016

ORIGINAL PP. 3-5

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Based on the guns I often see sold at gun shows, inexpensive pistols are fairly common and you'll likely have a customer bring you one. Here's how to work on several from Cobra Firearms. Cobra CA The Cobra CA series are compact, light carry pistol models. The following instructions will work for the CA32 and CA380 chambered in .32 ACP and .380 ACP, respectively. This gun resembles the Jimenez JA32, a beefier and heavier version of this type of pistol. To field strip, don safety glasses and unload.

The safety is also a magazine safety and must be on to release the magazine. Switch the safety to "S", remove the magazine, then place on "F" and rack the slide back to confirm empty. This gun 32 ACP and .380 ACP has to be uncocked in order to remove the slide. The recoil spring is under tension and can fly out if not controlled. Point in a safe direction and pull the trigger to decock. On the back of the slide is a takedown button where the cocked gun indicator comes through.

Push on this with a punch or similar tool. It will go in about a 1/8". While keeping this pushed in, lift up on the back of the slide. On a few of these guns, I have had to use a screwdriver between the frame and slide in the back to get it to release. Slightly pull backwards and the slide will clear the frame, moving forward and off. Control the takedown button so it doesn't launch across the room.

When the slide is completely removed from the pistol, pull the takedown button, recoil spring, and firing pin out of the back of the slide. The recoil spring slides off the barrel to the front. The barrel is pinned to the frame and is not normally removed. For full disassembly, start with the slide. The only thing that can be done is drift out the extractor pin to the left. Keep a thumb on top of the extractor to control the extractor spring. For the frame, push down on the sear and unhook the cam from the frame.

Allow the sear to come up and remove the sear, sear spring, and cam. Remove the grips with a 1/16" hex wrench. The safety comes off the frame to the left. Push out the magazine catch pin; this is a loose fit. Take the magazine catch and spring out the bottom. Drift the trigger pin out to the left. There is a spring on the top of the trigger. When removing the trigger from the frame, remove the trigger spring and rotate the trigger assembly counter clockwise 90 degrees.

Remove the bumper pin to the left and pull the bumper and spring out. Reassembly is in reverse order. The buffer spring has to be rotated until the hole can be seen through before driving in the pin. The angle on the sear goes to the front. If you have problems getting the slide to drop down on the frame, check that the cam is seated properly. I put the slide on the frame before adding the firing pin, spring, and retainer in place.

COBRA PISTOLS CONTINUED

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1 Slide 2 Firing Pin 3 Firing Pin Spring 4 Retainer 5 Extractor Pin 6 Extractor 7 Extractor Spring Cobra Derringer After the 9mm conceal carry guns, this is the most popular handgun sold at our local gun shows. Cobra makes derringers in cartridges ranging from .22LR to .45 Long Colt, 38 Special.

Hard to tell the difference. 15 Magazine 16 Frame 17 Magazine Catch Spring 18 Magazine Release 19 Left Grip 20 Right Grip 21 Grip Screws 8 Bumper Pin 9 Trigger Pin 10 Sear 11 Cam 12 Sear Spring 13 Safety 14 Magazine Catch Pin though the 9mm and .38 Special are most popular, with the 9mm version outselling the .38 primarily due to most buyers already having a 9mm firearm and not needing another type of ammunition.

Cobra CA (Specifications subject to change without notice) 22 Trigger Assembly 23 Trigger Spring 24 Bumper/Bumper Spring 25 Recoil Spring I have had a few of these derringers come into my shop. Most of the complaints are of the too-hard trigger pull.

Quoting the user manual, "The trigger pull weight on our Cobra Derringers is higher than on most firearms due to the fact there is no trigger guard and a stiffer trigger pull provided an additional level of safety." Note, the trigger has a downward pull instead of the backwards that everyone is used to. If the customer still insists, I will polish the trigger and hammer engagement but do not lighten the mainspring as it can allow the gun to go off if dropped.

There isn't much to field strip beyond breaking the barrel to load or clean. Don glasses, flip the locking lever over and break the action open, removing any rounds. For detailed disassembly, the barrel is held on by a screw on the left side. This is blue thread locked in place and should be stiff to remove. The extractor is held in place with a hex head screw. Remove it with a 0.060" hex key. I have found these loose on a few guns and would recommend to thread lock it back in place.

On the right side, unscrew the screw holding the locking lever to the lock and lift up the lever off the

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9 Trigger Spring 10 Trigger 11 Trigger Pin 12 Lock Screw 13 Locking Lever 14 Firing Pin Spring 15 Extractor Screw 16 Extractor 1 Left Grip 2 Right Grip 3 Grip Screws 4 Safety Ball 5 Safety spring 6 Safety 7 Safety Pin 8 Cam Spring lock. Slowly push the lock out the right side using your thumb. Just as the lock is flush with the frame, listen for the locking ball snap up.

Put 17 Firing Pin Plate 18 Firing Pin Plate Screws 19 Firing Pins 20 Lock 21 Hinge Screw 22 Lock Spring 23 Lock Ball 24 Hammer Pivot Pin a finger inside the frame and finish pushing the lock out. This should keep the 3/32" ball from escaping. If you need a replacement, Brownells has them in the detent ball kit and this is cheaper and quicker than getting from Cobra. Remove the grips from the frame using the 0.060" hex key. Keeping the frame pointing up, remove the firing pin plate.

There are two hex screws holding it in place. The firing pin springs and firing pins can be removed with the plate out of the way. Now the fun part. Using a small

punch, Notice the cam and how the wings are on it. Cobra Derringer (Specifications subject to change without notice) 25 Cam 26 Selector 27 Selector Spring 28 Hammer 29 Guide Pin 30 Mainspring push the hammer pivot pin out. This should release most of the spring tension.

This will make it easier to control the hammer, selector, and cam when removing from the frame. The mainspring and guide pin will now come out the top. Push the trigger pin out to the left. The trigger comes out to the front. The trigger spring has a tight fit into the hole in the trigger and should stay in place while removing it. To get the cam spring out, use a pair of needle nose pliers and pull it away from the frame and lift it up. Once high enough, take the spring out through the side.

The safety has a pin that is staked in the frame to keep it in the frame. I normally do not mess with this because the only way to get it out is to drill out the stake and then try to pull the pin back. Otherwise, drill the pin completely out and then push out the

safety to the right. There is a detent ball and spring to watch for when the safety comes out. Reassembly is basically reverse of disassembly. When putting the hammer back in, place the selector and cam in place before inserting into the frame.

Make sure the cam is in the correct orientation or the selector will not work. Put the hammer assembly in place and use a 1/16" punch to hold everything in position. Use a padded clamp across the frame and the back of the hammer to get it down so the hammer pivot pin can be inserted. You will have to push the cam spring out of the way to get the hammer to come all the way down. Blue thread lock the firing pin plate screws, hinge screw, locking lever screw, and the extractor screw.

When putting in the ball for the lock, use a jeweler's screwdriver to hold the ball down as the lock is pushed into place. It helps to push down on the lock from inside the frame. Test fire two rounds to make sure the selector is working. AG

FROM THE ARCHIVE

Precision AR-15 Ammunition

BY JOE CARLOS AUGUST 2016

ORIGINAL PP. 6-11

As a former military armorer, I was in a position to conduct many studies on the AR-15. Meticulous record keeping helped. I have passed along many of the results of my research in these pages and they helped cut average group sizes of the Army Reserve Shooting Team's National Match AR-15s fully in half. Among the successes, I also tried things that flat didn't work. There are folks that swear by some of these ideas and this article will likely ruffle some feathers.

Good ammunition is critical to precision shooting and we'll examine that here. Let's start with sorting, something handloaders love doing. Often, meticulous sorting is wasted time. Any sorting procedure needs to improve group size or velocity consistency and has to be accomplished in a "reasonable" amount of time with affordable tools. Sorting brass by weight is popular. Theory says heavier brass must have thicker walls and hold less powder, raising pressure and velocity.

Many of the big military teams weight sort their brass, assuming the volume theory is valid. Unfortunately, this is done with no evidence to validate it. Some folks weight sort in 0.5 grain increments but it is just as easy to sort in 0.1 grain increments and that is what I did. I have used about 30 little plastic bins laid out to sort cases by the thousands. The finished sort fit a near-perfect bell curve with most brass falling uniformly in the middle of the range.

As a test, I selected five cases incrementally from the low weight side and another five from the heavy side. Those ten cases were from the same lot but at the extreme ends in weight ranges. Then I took another ten of the most uniform mid-range weight and loaded all twenty rounds exactly the

same, weighing powder charges to within 0.02 grains. Machine rest testing and chronograph revealed zero difference.

I repeated the experiment using different guns so that both stainless and chrome moly barrels with cut and button rifling. Still no difference between the uniform weight brass compared to cases purposely selected from the heavy and light weight extremes. I did this with both Lake City and Winchester Cartridge Company military brass with crimped-in primers. Primer retention in even the heavy brass was fine. I also tried some Lapua brass, having found the weight spread from their cases to be very close.

For years, the Army Marksmanship Unit had used the same brass (new Lake City with crimped-in primers) as most other military teams, but then switched to the more expensive Lapua. I suspected they knew something that I didn't. Maybe it was just the specific lot I received, but the average case weight from Lapua was heavier and thicker in the neck area. I knew that more neck thickness with tighter neck tension might raise pressure.

I also noticed that the variation in case weights in .223 caliber was much higher than I had experienced in other calibers I had tried like .308 or 6.5-284. I refused to weight sort the cases because I figured if you are going to spend the money on imported brass it better pay back in having to perform less work. However, accuracy and chronograph testing showed no improvement over the brass we had been using. Worse, there were primer retention and pressure issues.

Lapua comes unprimed and lacks the primer crimp found in military brass, forcing us to reduce powder charges back by a

half grain to retain primers. Spending way more money and dropping about 50 FPS in muzzle velocity with no performance enhancement isn't smart. Compass Lake Engineering has a post on their website cautioning about pressure increases with Lapua brass so I am not the only one to document this.

Guns can "see" gross changes in brass weight by pressuring up more but it appears that minor changes in case weight (0.1-0.5 grains) don't show up in velocity or accuracy. All of my test uppers were sub-minute guns that would have shown differences if they existed. In fairness to those of you who shoot other disciplines, my testing was done with AR-15 Service Rifles with short 20" barrels and fat gas gun chambers, two characteristics known to produce fat groups and velocity spreads.

Using different guns from other disciplines may change your results. Thinking that my short 20" Service Rifle barrels might not be burning gunpowder uniformly enough, I repeated the tests with Match Rifle uppers having 26" barrels. No change in results. About a year later, I was building a Palma AR-15 for a customer with a 32" Bartlein gain twist 5R barrel and a tight bolt rifle chamber. This was the very first time that weight sorting of brass appeared to pay off.

Brass of a uniform weight outperformed brass with the maximum weight difference by 7 FPS. That's not much and may easily be within the testing margin of error. A 7 FPS velocity change at 1,000 yards will only move the bullet two inches vertically. I hope to repeat this test in another long-barreled AR-15 in the future to see if these results hold true.

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5-284 (left) and .308 (right) proved more consistent than .223 casings in the center. Above center: Gross changes in cartridge casing volumes can be seen by the guns. Significantly heavier and thicker Lapua brass coupled with a lack of primer crimp resulted in blown primers. Powder charges had to be reduced. Primers will blow out when pressures rise too high such as when using brass with low volume or from “cooking” ammo on the range.

Blown primers were the frequent result of hard seating and cooking ammo by leaving it in a hot chamber for too long before shooting it. I did a literature search to see what others had found on the brass sorting topic. I knew that researchers had conducted scientific studies to see if variations in cartridge case weights could be correlated to case volume.

Race car auto mechanics have spent a fair amount of similar effort to uniform the heads of engines and the heads on my '66 Charger were uniformed when I had the engine built for it. The approach the cartridge case folks used was to weigh a case with a spent primer in it to act as a plug, then fill with water and weighed a second time to determine the true capacity. None of the studies I've read to date have established a direct relationship between case weight and volume.

Most studies concluded that there was, at best, only a casual relationship. The whole theory of an alleged relationship between case weight and volume and resultant velocity relies heavily on a strong tie between weight and volume and the studies I've re-

viewed blew holes in that. I am always anxious to learn but lacking any counter evidence my own tests have shown no improvement in velocity consistency or accuracy from brass weight sorting. My advice is to not waste your time.

Perhaps one of the reasons that the weight sorting of brass fails to predict velocity changes is the percentage of the case weight in the head. About 40% of the total weight of a .223 Remington case is in the head, which doesn't hold gunpowder so variations in the weight of the case head are not reflected in the case volume. The water technique would certainly have allowed a person to identify cases with uniform volumes.

For a military shooting team trying to load close to 40,000 long range rounds a year, this can't be done in a time efficient manner. Perhaps the water method would be attractive to Bench Rest competitors using the same 10 or 20 cases over and over. Tied with the notion that one can predict case volume by weighing the cases is gauging the thickness of the brass. Brass varies a bunch in its thickness within the same lot as well as from one side of any given case neck.

The brass weighing theory is sometimes extended to say that cases with thick neck walls will extend their dimensions down to the case head but I have never seen any actual evidence presented. I performed a small test to see if the claims are accurate. Using a neck thickness gauge to locate the thickest side of the neck of a fired .223 Remington case, I marked that side of the case with a Sharpie.

Then, I clamped the case in a vise and sawed through it, deburred the stump of the case, and used a set of calipers to locate the thick side. The thick side of the stump was right in line with the thick side of the neck. A sample size of only one isn't a good test but this agrees with the urban legend I chose to cut my time and material losses and quit with what data I had.

If the theory that thick neck cases would have less volume, would pressure more, and achieve higher velocities was true, then sorting cases by average thickness would be worthwhile. If that theory has been studied, much less proven, I have not read about it. So, I gauged the thickness of some new primed military brass at the neck and selected ten that averaged on the skinny side, ten more that averaged thick, and another ten selected at random.

The velocity spread of the random batch was no worse than those that were hand selected. If the thickness theory were true the ten cases that gauged thin should have developed a slower velocity and they didn't. The cases that had thick necks should have developed faster average velocity and that didn't happen either. And the ten randoms should have had a higher standard deviation but that also failed to happen. I don't recall how many times I repeated the test with different uppers but nothing ever became of it.

None of the results fit the theories and I concluded that not only is it a waste of time to separate brass by average thickness it is an even greater waste of time than weight sorting because it is slower to perform.

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Bullet on the right seated crooked with run out because the casing neck was thicker on the left side. Above center: Two neck thickness gauges. Author prefers the one on the right. When I tried Lapua .223 brass, I found it to be heavier and measured thicker than Lake City, and it pressured more.

It appears that large weight and thickness changes can be "seen" by short-barreled gas guns with fat chambers but subtle changes in either (such as one would have using a single lot of brass) aren't seen by the AR-15 in Service Rifle configuration. There was one other thing that I noticed from the study.

The brass that gauged thick resisted bullet seating to a greater degree and when I measured my loaded cartridge lengths those rounds averaged a few thousandths of an inch longer than ammo loaded in brass selected at random. The brass that was selected with thin necks resisted bullet seating less and came out shorter by just a few thousandths of an inch than brass selected at random and not sorted. There is light at the end of the tunnel regarding measuring neck thickness, however.

I said before that brass thickness at the case neck varies a bunch from one side of the neck to the opposite side. I'm talking 0.005" here and often more. That degrades performance in two ways and they will be additive. First, no matter how good your seating die is, when a bullet is seated in such a case neck the thick side is going to resist seating to a greater degree than the thinner side.

That is guaranteed to produce a finished round where the bullet is not aligned on the center axis of the case, that is, increased run out. The bullet will not enter the back of the barrel straight on and performance will suffer. Second, when around is fired from a case with a large difference in neck thickness the thick side will try to hold onto the bullet, causing bullet tilt upon moving forward. Such a bullet will hit the back of the barrel crooked and not shoot well.

Deal with this by gauging neck thickness of new cases. Really good brass will have uniform thickness but you'll find very few of those. Almost as good is brass that varies no more than 0.001" from the thin side to the thick side. Put all the cases that gauge 0.000-0.001" in one pile for your most important longer distance matches and all the stuff measuring to 0.002" in a second pile for your second most important matches.

If you are desperate, make a third pile for the up to 0.003" variance, though your best gains will come from the first two piles. The select brass will have less run out, shoot better groups, and have more uniform length. If you have determined a bullet seating sweet spot, this helps hit the harmonic sweet spot more consistently. Outside neck turning accomplishes the same thing as gauging but creates uniformity rather than identifying it, though turning may be a little slower.

I ran a study on the effectiveness of turning necks with a slow hand tool and found a 21% reduction in group size. However, the motorized neck turning tool I used made

groups larger! I believe I was getting some chatter because the tool was designed to trim case length and modified by the manufacturer to perform neck turning. In fairness, I may not have mine adjusted properly. I have fooled with it over the years and never gotten it to perform right.

The necks look good but their performance just isn't up to the standard of the hand turner. Guns are specific in their response to neck turned brass. Some like to have their necks turned and respond with greater accuracy while others aren't so keen on the processed brass. This may have to do with the specific dimensions of chamber necks. I advise you to follow the neck turning tool instructions and then compare neck turned and not-turned brass.

Like sorting by uniformity of neck thickness I also recommend sorting by head stamp and number of times fired. The comparison of pressure characteristics between Lapua and Lake City brass reveals why. Sort civilian brass from military stuff. Keep each brand to itself. Most of the WCC brass I have used was a little heavier and thicker than Lake City and didn't hold primers as well. Both have crimped-in primers but the WCC doesn't seem to hold them as well, possibly because the WCC is a little softer.

I have had to reduce powder charges about 0.3 grains in order to prevent blown primers. Differing brass has differing neck malleability, influencing neck tension. There are various theories on light and heavy tension for accuracy.

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I am of the light neck tension camp. Neck tension can have some influence on the burning of the powder. One thing that just about everyone believes is that uniform neck tension is best. The military anneals case necks while some civilian companies don't. So it is reasonable to have differences in neck tension. As brass is fired repeatedly its hardness will also change and that will impact neck tension. Sort brass by both head stamp and number of times fired for best results.

Meplat trimming was the flavor of the week some years back. The little hollow point tips of match bullets of some brands have uneven surfaces and some long range competitors thought such unevenness was causing the ballistic coefficient of each bullets to be unequal, resulting in vertical displacement. Hand operated devices were made up to shave a tiny bit of the bullet tip and make them even. Some guys got in a hurry and tried to hook these meplat uniformers up to electric hand drills with horrible results.

One guy submitted some he had for testing and it looked like a beaver with dull teeth had gnawed on the end of his bullets. The rounds were actually so bad that they shot worse groups compared to the same ammo lot not boogered on. I don't hear squat about meplat uniforming these days and it seems to have fallen out of favor. Not long after meplat uniforming came bullet pointing.

Where meplat trimming was supposed to uniform ballistic coefficient, pointing was more directed to improving aerodynamic properties by changing the profile of the tip. The tool looked like a conventional die and fit in a press. The bullet was run up into the

thing and reshaped via swaging. One of our Team shooters bought one of the kits and pointed some 80 grain Sierra and 90 grain Bergers, then loaded normally for a range and machine rest test with both tests revealing accuracy compromised slightly.

Promised ballistic coefficient gains should have shown up vertically on long range targets but couldn't be found. I thought I was seeing more signs of pressure and got range reports of blown primers when non-pointed bullets weren't. I suspected the swaging process might be causing swelling down in the bullet's bearing surface, so I compared them. The pointed bullets averaged 0.0003" fatter. Not much, but another team member measured the same results.

Much like delivering a dry fly to a trout, I suspect that both meplat trimming and bullet pointing require a fair amount of finesse. If you are getting good results from either and have objectively tested your work don't let me talk you out of it. If you haven't tried these applications I don't recommend it. Good match bullets have little weight variance (barely 0.1 grains) and my typical ten round batch machine rest testing found zero difference in bullets sorted by weight.

However, measuring bullet base to ogive dimensions with a bullet comparator and caliber-specific bullet insert can find quite a spread. The sorting crowd posits sorted bullets may have more similar total ogive profiles and should produce loaded rounds of more uniform lengths. For those seating to a harmonic sweet spot this should improve performance.

Rounds of more uniform length should position the base of the bullet more uniformly relative to the powder charge, resulting in

more uniform burning of powder and more uniform velocities. I tested these theories and found if my overall cartridge length was any more uniform it was, at best, very subtle. It appears that the greater determinate of cartridge length is the thickness of brass at the necks. Cases with thick necks resist bullet seating to a greater degree and tend to produce longer ammo.

If there is any improvement to be had in overall length from bullet sorting I believe that the variations in case neck thickness is masking this. Gunpowder can also influence seating depth where one is compressing the charge. Even for those of us who meticulously trickle powder charges, when they are dumped into the case there is a randomness in how they initially pack. Stick powder can show a fair amount of variance.

When the bullet base is coming down into contact with the top of the powder charge those rounds where the powder lies higher in the case will resist seating more and come out a little long. My chronograph readings with sorted bullets was no better than with bullets selected at random. Nor were my machine rest groups any tighter with sorted bullets. Even if there is any validity regarding positioning of the bullet base in the case I don't believe short-barreled, fat-chambered gas guns can reveal any difference.

From what I have seen on the chronograph, the bullet seating depth has to be moved many hundredths of an inch to make any noticeable change in velocity. Does this mean that we throw the bullet length sorting out along with

PRECISION AR-15 AMMUNITION CONTINUED

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brass weight sorting? Not necessarily, but if bullet base-to-ogive measurements can be used to accurately predict variations in ballistic coefficient this would only show up at extreme long ranges. I'm not aware of a study to prove or disprove the base-to-ogive measuring theory and inquiries to Sierra and Berger confirmed this. Both companies admitted there have to be some variations in the actual bullets in any given box but neither could say how much their products vary.

Sierra felt there might be something to be gained by sorting bullets by base-to-ogive measurements when shooting at 1,000 yards but Berger didn't address a recommendation one way or the other. It appears there is room for further research into this topic. Derrick Martin's *The Complete Guide to AR* to do this with one chronograph set at the muzzle and a second set 500 yards downrange. Not all that esoteric but definitely something requiring the right test equipment, meticulous record keeping, and a fair amount of time.

Hard seating is a perfect example of something that does not work. What I am about to describe is just plain wrong. I am a great believer in observing shooters in other disciplines and applying lessons learned but this doesn't always work. In certain shooting disciplines riflemen with bolt actions sometimes soft seat their ammo, loading bullets a little long with modest neck tension and chamber each round singly while carefully closing the bolt.

The front of the bullet stops in the throat while the case moves up around the back of the bullet. Since the bullet is driven into the back of the throat, pressures rise and loads are set accordingly. Some shooters

have tried the equivalent in a gas gun. With our 600 yard ammo loaded long so each shooter could seat to the depth ideal for their chamber, a few tried to emulate the bolt gun procedure.

The shortcut version of soft seating was to lay the round on the top of a magazine and trip the bolt catch, allowing the bolt to fly forward. This hard seating jammed the long-loaded bullet into the back of the throat. If a cease fire was called, extracting ammo dislodged the bullet and spilled powder. The bullets often had to be beaten out with a cleaning rod inserted from the muzzle. When hard seated rounds were fired it caused more problems. Most military shooting teams load their long range ammo hot.

We used brand new L. C. brass with crimped-in primers fired only once. Guys tried to use that hot ammo in their hard seat effort and blew primers, lodging them under the trigger or up in the barrel extension, rendering the rifle inoperable. I had to get in there with picks and tweezers, sometimes removing the trigger. Testing showed groups got fatter and that the incidence of fliers was worse.

I set up a mini study using across section of Team uppers, machine rest testing ammo seated to the sweet spot and hard seated ammo finding that hard seated rounds always shot worse. On to factory ammunition. Even if we found that weight sorting brass, bullets, or base-to-ogive worked, it doesn't help when using factory ammo. I thought that maybe sorting loaded rounds by weight might help. I already knew that weight sorting bullets was a waste of time and that the bullets only varied by about 0.1 grain anyway.

I knew that the greater variances in the loaded rounds would come from weight differences of the brass and the factory dispensed powder charges. So I took a known lot of factory match ammunition loaded with 77 grain bullets and weight sorted them in 0.1 grain increments.

Selecting ten round samples from the top of the bell curve and comparing to randomly-selected ammo from the same lot revealed no accuracy difference but the weight-sorted rounds did improve maximum extreme velocity readings by about nine FPS on average. While most long range shooters would kill to improve the consistency of their 1,000 yard ammo velocity, the USAR only used 77 grain magazine length ammo out to 300 yards where this difference has no benefit.

What about manipulating overall cartridge length in factory ammo? Knowledgeable handloaders have known for decades that each gun will perform best with ammo is seated to the harmonic sweet spot. This normally occurs when the bullet is seated out far enough to be in close proximity to the throat of the chamber. I usually find the best sweet spot to occur between 0.000-0.010" of jump in the AR-15. Unfortunately, seating bullets out further is not an option with factory ammo because it would not function.

The standard for seating ammo length to feed well in AR magazines calls for an overall cartridge length of 2.25". A Wylde chamber, when new, jumps such ammo about 0.090". Even if we could pull the bullet forward to eliminate that awful jump and get it



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Magazine-length ammo can have bullets bumped just a few thousandths of an inch deeper to hit the harmonic sweet spot of the firearm, resulting in tighter groups. closer to optimum range it won't fit the magazine. However, we can seat magazine length ammo deeper. Magazine-length ammunition can be nudged a few thousandths below 2.250" and still function. Every gun has its own specific bullet seating sweet spot and the process for identifying these sweet spots is the same.

With 77 grain magazine-length ammo, take ten rounds at random and shoot a group. Seat the next ten rounds 0.002" shorter and test. If it gets better, seat 0.002" deeper still. Continue until groups start opening up. Normally, you'll find that sweet spot before seating 0.012" deeper than factory length. Rifles will feed as reliably with ammo set to 2.238" as it will with the original factory specification of 2.250" but finding the precise bullet seating sweet spot can shrink your groups noticeably.

Note, this technique is very lot specific. Retest if changing lots or brands. Also, make any changes in seating depth before straightening rounds for concentricity. If you straighten first and then reseat, you might induce

runout. Managing concentricity, experimenting with bullet seating sweet spot, and rigorously applying shooting fundamentals are your best solutions when employing factory ammo.

Of course, finding the sweet spot has to be done on a range and such testing may be taking away from practice time that could be spent honing your skills. Now, cooking ammunition. One of the most dramatic examples of cartridge heating I've seen occurred when the Army Reserve Team competed in Australia. The Ausies had a much more cavalier attitude about their on-range ammo storage and just dumped off a pallet of ammo on the range with no shade, no range shack, or cover tarp.

On a particularly warm afternoon foreign teams were blowing primers. A National Guard shooter blew an extractor and a South African competitor had his rifle just plain blow up! Fortunately, like most of the rest of the firearms that I have seen blow up, the shooters escaped unscathed. The Army Reserve Team complained about the ammo and its storage and the Ausies just laughed, claiming our chambers were too tight despite being as-issue 5.56mm NATO spec.

Other countries also shooting M16 variants had the same problem but the ADF Steyr AUGs seemed immune. Turns out, the AUG have a 1:9 twist barrel while all the rifles having pressure problems were 1:7 and that was the difference. I was able to take a small quantity of the Ausie ammo home and contacted the Army Ammunition Plant at Lake City for testing. They determined the Ausie ammo exceeded safe U. S. chamber pressure specs even when not baked for hours by the sun.

Because of the different burning characteristics of their powder, however, that high pressure was very temporary and by the time the gas was metering through our gas ports the pressure there had dropped to below U. S. specifications for the M16. This accounts for why our guns experienced high chamber pressure problems and operated sluggishly. The Steyr AUGs are piston-operated bullpup and the ammo worked fine for them. So much for armchair theories about ammo interchangeability on the battlefield.

Sure, their ammo would chamber and fire in our guns but not with ideal reliability and safety. Because of this, the National Guard Team started to carry their own ammo to foreign matches thanks to the resources of the Air National Guard and their planes. The Reserve Team lacks this luxury and continue to shoot the host nation's ammo. I built two M4 flat tops with 14.5" gain twist barrels for the Team.

One barrel had a gentle rate of gain that went from 1:11 twist just forward of the chamber and terminated at 1:9 at the muzzle and the other had a much more aggressive rate of gain starting at 1:20 and finishing at 1:10. Both were hammers and fired U. S. 62 grain ball ammo as accurately as any barrels I ever used. This positive experience with gain twist roughly two decades ago carried forward and all the ARs I build today have gain twist barrels on them.

Overheating cartridges in Australia would not be the Army Reserve's only incident. If anything delays your normal cadence of fire during single fed slow fire events, extract the round from the chamber. Leaving that cartridge in a hot chamber while holding up will "cook" it and run the risk of changing the burning characteristics of the powder. As a general rule, don't shove rounds into the chamber and close the bolt until you are ready to fire.



Shade your ammo when shooting and use a little restraint in your powder charges when reloading. Don't be on the ragged edge of blowing primers to get peak performance from these guns. Sitting on the Assembly Line with a spotting scope I'd watch guys that I knew were "cooking" ammo in hot chambers and could predict their fliers before they shot them just by how long they left rounds in hot chambers before firing!

Ammo loaded with ball powder (like the Ausie stuff) has a greater reputation for being susceptible to cooking but ammo with stick powder will do it too if you are not careful.
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FROM THE ARCHIVE

Easy Hi-Power Modifications

A few simple modifications any gun owner can perform will make a better gun out of the Hi-Power.

BY RAY ORDORICA AUGUST 2016

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Some time back I did a report for Gun Tests magazine on two Hi-Power clones by FÉG and Kareen. They had a few characteristics I didn't like, such as not being able to drop their magazines freely and too-heavy trigger pulls. After I filed the report I looked at my own Hi-Power clone from Charles Daly.

It has some great features, such as a neat set of express sights consisting of a wide-angle "V" rear and a big round bead in front, a really good two-tone shiny-and-dull blued finish, and a set of Ahrends fancy wood grips that dress up the gun nicely. This is an excellent, quality gun which sold for much less than the Browning version. It needed a bit of work. Those fabulous grips are vintage Kim Ahrends. With this much disassembly you can explore the workings of the disconnect plunger inside the trigger.

However, like the two test pistols, my gun didn't let its magazine fall freely and it had a too-stout trigger. It also had a few sharp corners here and there that annoyed me. I wanted to take care of those things but had never been inside a Hi-Power before. However, in the course of my report on those two old guns I had to completely disassemble the FÉG Hi-Power to clean out some nasty grit with which it was infused.

In so doing I learned all I needed to know about Hi-Powers, specifically how to disable the magazine disconnect safety "feature", which I badly wanted to do to my Daly HP. I knew this modification would permit the magazine to drop free just like 1911 type pistols. It would also allow the gun to be fired with the magazine removed, which I believe is mandatory for any self-defense gun.

Before I go any farther I'll let myself out of arguments by stating that I will not tolerate any handgun that does not let me shoot it with the magazine removed. You might like that feature, but not I. Doing this sort of modification will surely void any warranty on your gun and may not endear you to some future owner because the gun will no longer be original. That's just tough, I say. The future owner will end up with a better gun, whether or not he realizes it.

Just be sure to let anyone who handles your modified gun know it'll fire without the magazine. The Charles Daly HP, I found out, has parts made by FÉG, though the

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These are mighty fast to use, though not as precise as Patridge sights. The front bead can't hold elevation with back light because the white circle disappears. Above center: The top arrow points to what the author calls the sear arm. Driven by the trigger, it links to the sear via a transfer bar in the slide. The bottom arrow points to the spring arm that needs to stay within that notch. Under that the plunger face is visible, still within the trigger. Daly HPs were assembled in the U. S., not Hungary.

So as luck had it, my digging into the old FÉG military beater had told me all I needed to know in precise detail about how my own gun comes apart. The first step was to get my thinking pipe loaded with suitable fodder and get it nicely cooking. This turned out to be a three-pipe problem, with apologies to Sir Arthur Conan Doyle, but it was a necessary thought process. I was about to alter a gun that is no longer made.

While the Daly is not yet a collector's piece, it could become one some day and all-original guns are always the most sought after. Further, I was going to disconnect one of the safeties on the gun. In a court of law following a justified shooting

involving that gun, the removal of a safety device could play against the user of the modified gun. It is also possible that the fact the gun could fire with the magazine removed might be the reason you're in court instead of the other guy.

After due consideration I came to the conclusion that it would be a good idea to do nothing irreversible. I'd be sure to store all the parts that I was about to remove in the Daly's hard case along with the gun, so a future shooter could put all the nonsense—er, safety parts—back in, if desired. The first step was to unload the gun and then entirely disassemble it. But wait right there a minute, pilgrim.

If all you want to do is remove the magazine disconnecter there's no need to take the sear and hammer out of the gun. I wanted to deburr my gun inside and do some work on the trigger pull, so I took everything apart. As it turned out, having those parts out of the gun made it easier to see problem areas and then to deal with all the burrs and rough spots here and there, especially in the magazine chute. The way the magazine disconnecter works is easily seen after field stripping the gun.

The back of the trigger holds a plunger. A spring within the plunger forces it outward against the front of the magazine. This acts as a brake and prevents the magazine from falling freely out. Some magazines made for the Belgian Hi-Powers had a spring mechanism in their base that would zing the mag out of the gun when the magazine release button was pressed. I think that's a dubious design at best.

It could prevent the proper latching of a fresh magazine, which would have to be inserted with extra force to overcome that spring. If you don't get it right the first time, zip, there's your magazine on the ground. Once the magazine is removed from the gun the disconnect plunger extends fully and a portion of the plunger forces or cams the sear arm (that's what I call the thing that connects the trigger with the transfer bar in the slide) forward so it's out of contact with the transfer bar.

In that position the trigger cannot release the sear and the gun can't be fired. Watch what happens as you press in on the magazine-discon-

EASY HI-POWER MODIFICATIONS CONTINUED

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The end near the black arrow is where the sear arm presses upward when pressure is put on the trigger. The white arrow is where the transfer bar presses downward on the sear. There's a hinge or axle, about where the Vis, through the slide. Next plunger with your finger. The sear arm moves rearward to a position from which it can make contact with the transfer bar in the slide. If you remove the disconnect plunger from the gun, the magazine will drop freely by the force of gravity.

And with the plunger gone, the gun can be fired with the magazine out. So getting rid of that plunger is what. While you're looking at the guts of your gun before beginning work you'll see a small wire spring in a notch of what I've called the sear arm. That little wire spring is what presses the sear arm rearward and back into play so it can contact the transfer bar in the slide and fire the gun. That wire spring rides in a notch.

Be sure that little wire spring gets back into that notch when you put the trigger back into the frame. Field stripping one of these guns

is easy and I don't need to explain how. Be sure the gun is completely unloaded before you begin. That can't be said often enough. The next step beyond field stripping is to remove the grip panels. That's not absolutely necessary if you're only going after the plunger inside the trigger but removal will keep them safe.

Also, if all you want to we're going to do here, do is remove the plunger there's no need to even take the barrel out of the slide. On my gun the slide was mighty slick inside and I did not need to do anything to it. To continue with full disassembly, make sure the hammer is uncocked and drift out the sear pin, right to left. The sear will jump forward out of the gun.

By slightly pulling on the hammer to get the hammer spring out of the way, you can remove the long, flat sear spring from its recess in the bottom of the grip where the pressure of the uncocked hammer spring traps it. Next, tip or rotate the ejector plate forward and downward as far as it'll go and then push out the safety axle. If your gun has an ambi

safety you'll have to remove the right side first. The axle should go easily out the left side.

The little ejector plate will fall out and then you can pull the hammer and its spring out. I saw no reason to remove the spring strut from the hammer nor the spring from its strut. Next is the trigger. While it's easy to get out, it's not easy to get back in. But hey, you're clever, and if I can do it, so can you. The trigger pin has a detent in its middle. A good solid whack with a light hammer and a brass rod to direct the blow will get it started, again right to left.

Then you can shove or tap it out with a suitable punch. The trigger will move rearward slightly from spring pressure. That's a clue to getting it back into the gun, by the way. Going back in, you'll have to overcome that light spring pressure to line up the axle holes. But that comes later. Far This lets the sear arm move rearward to contact the transfer bar.

EASY HI-POWER MODIFICATIONS CONTINUED

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It has to go back in the same way. A sharp tap on this will free the pin from the detaining spring that rides in a groove in the center of the pin and then the pin can be shoved out. Above center: This is the same picture either right before taking the trigger out or right after getting it started back in. If you're taking the trigger out, just pull out the punch.

If you're putting it back in, a finger needs to be inside the gun to make sure the parts stay in place while you put the trigger pin back in from the left side. The trigger comes out more easily with the plunger removed, as shown. If you're putting the trigger back in, put it in only as far as shown. Get the sear arm positioned correctly, put a finger inside to hold it all, and move the assembly back

into position. Insert a loose punch through the frame to hold it all until you can put the axle back in.

With the trigger's hinge pin out of the gun, rotate the rear of the trigger downward until the whole mechanism is sitting within the trigger guard, just dangling there, and then it's possible to get the assembly out of the gun with some deft wiggling. The groove in the axle keeps the pin in the gun by pressure from the hairpin trigger spring. If it's not staked it could lead to grief. On the Daly the axle for the trigger's hairpin spring is staked to keep it in place.

If yours is not, it might be a good idea to do so, to make sure that axle doesn't fall out. It can't, inside the gun, but on your workbench

it just could. And it's tiny. The little odd-shaped sear-transfer pin or sear arm, as I shall call it, will probably fall out of its recess in the trigger assembly as the trigger comes out. Don't fret, just make sure you realize what the sear arm does and where and how it fits before you actually remove the trigger.

Getting the sear arm back in is the only hard part of this job. To clarify, what I'm calling the sear arm lives in the gun in a vertical position. It is driven upward by the trigger when the trigger is pressed rearward. It transfers your pressure on the trigger to pressure on the sear through a captive, pivoted arm within the slide, which I call the transfer bar.

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These are kept in the gun's case for possible later reinstallation. The lower end of the sear arm has a short stub axle which fits into a recess in the trigger so it easily falls out when the trigger comes out of the gun. Got that? A good look at the parts in your gun will make it all clear. You can also remove the magazine latch from the frame, which I did to make it easier to slick up the magazine well. The mag latch comes out just like the one on a 1911.

Press on the button and turn the tiny screw counterclockwise to lock the Move it forward, push out the safety, and out comes the hammer. thing so you can remove the assembly. On the FÉG I worked on, the parts were old and battered and did not want to turn at all. On both the FÉG and the Daly I found it did not take much pressure on the button to line up the slot with the lock, so take it easy here and don't damage the slot in the small screw.

Once you have the mag catch out of the gun and thus out of the way, you can use sandpaper on a dowel to remove all burrs from the magazine chute. The first thing I did was to

deburr the gun internally. I found lots of burrs and sharp edges inside the Daly HP. All they do is collect and hold dirt and cut your fingers when you clean the gun. In the magazine well they might also hinder the free fall of the magazine. In short, they don't belong there.

I removed these with a file, scraper, and with a small grinding wheel in a Dremel tool. As I carved out the burrs with my Dremel set to a low speed, I recalled the words of my friend Robbie Barrkman, headman of the Robar Companies and inventor of the marvelous NP3 coating. Robbie was my hunting partner in Tanzania in 1995. We were standing on the beach at Dar Es Salaam, waiting for a bush plane to take us to our hunting camp and discussing life in general.

Robbie told me he had been trying to hire some new workmen for his busy company. He was lamenting the lack of skills of the applicants. Of the many unqualified fellows who wanted to work for him, Robbie said if they had a Dremel, they thought they were a gunsmith. But if they had a variable-speed

Dremel, ah, then they were master gunsmiths! Now, there is no great need to remove all the burrs, despite what I said, nor is there any need to wash or wax your car.

I thought deburring the gun was a good thing to do while I had all the guts out of the way. I also broke the edges of the magazine well to ease insertion of a magazine. You can't go very far there because there's not a lot of metal around the magazine opening and you don't want to make it a knife edge. Be sure to check the top edges of your magazines to make sure they don't have sharp edges that can catch on the mag opening.

I bought two Mec-Gar magazines (Brownells has 10-, 13-, and 15-round versions of these) and they were OK on top but the original Daly magazine needed some slicking up. When I was all done grinding, sanding, filing, and scraping I anointed the bare steel with my favorite cold blue from Brownells, Formula 44/40. With the trigger assembly out of the gun, removal of the magazine disconnect is

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One can't go too far here or a knife edge will result. Be sure to slick up the magazine tops as well. "—Robbie Barkmann. easy. The plunger is held in the trigger by a small pin. I drilled a small hole in a block of wood to catch that pin and then put the trigger on the wood block with the retaining pin directly over the hole. A tap with an appropriate punch drove the small pin out of the trigger and into the hole. I left the punch stuck through the trigger to control things.

I then depressed the plunger against its spring force, carefully withdrew the punch, the plunger, and its tiny coil spring, all under good control. I keep the three removed parts in a small plastic bag in the gun's case so that if anyone ever wants to restore the gun to original specs the parts are right there. My Charles Daly HP had a creepy 6.5-pound trigger and I didn't like that. The contact point of the sear was not quite square with the hammer and it didn't make full contact. The fix was simple.

I put the hammer in a small, hardened, square vise (Brown and Sharpe Model 752). With the offending portion of the sear surface just barely exposed I used a diamond hone to true up the contact area and then put

a mirror polish on it with appropriate stones. I also did the sear. I ended up with a clean five-pound trigger. Reassembling the trigger required learning a trick. After what seemed like several hours struggling with the trigger assembly I hit upon the method.

I put the trigger almost into place, resting inside the trigger guard and up somewhat into the gun, but without the sear arm in place. I positioned the trigger so the rounded cutout for the sear arm was just visible and made sure the curved front end of the trigger's little wire spring was inside the frame at the front of the trigger. This was easily corrected, resulting in a much better trigger.

I then came from the inside and fitted the sear arm into its little socket on the trigger and put the wire spring into its proper notch. With a finger inside the gun, I held the sear arm in place while I moved the trigger assembly the last little bit upward into the gun. Then I gently pressed the assembly forward until the axle hole in the trigger lined up with the hole in the frame. Then I inserted a punch through the frame and trigger.

The punch was a loose fit but it held everything in place so I could insert the trigger's correct axle pin from the left side to displace

the punch, then seat the axle pin properly home. The trigger axle has a tapered end that points to the right. When the axle is fully home the left side is just about flush with the frame and the pointed end protrudes slightly. The finger of my left hand was key to the process. It held the sear arm in place all during the final positioning of the trigger assembly.

It's easier than it sounds and the more you do it the easier it gets. Be sure to double check the position of the little sear arm's wire spring before you try to move the trigger. Well, we're done. The rest of the reassembly was pretty simple, generally a reversal of the steps needed to get it all apart. If you've come this far I don't really need to explain it all to you. What I ended up with was a Hi-Power that has an acceptable trigger pull and has all its sharp edges and burrs removed.

The best improvements are that the magazines fly out of the gun for fast reloading and the gun can now be fired with the magazine out. These simple things make me like my Hi-Power a whole lot more. I'd like better accuracy but that's a subject for another day. AG

PEOPLE & COMPANIES

Prepping The Remington 7600

How to prepare the Remington pump-action rifle for the hunt.

BY BRIAN E. CAPPS AUGUST 2016

ORIGINAL PP. 18-19

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The early November morning stillness was shattered by a ferocious blast. The walkie-talkies lit up, "What the hell was that?" "That" was a 7mm Winchester Short Magnum and I was deaf in my left ear for half an hour. It all started two days earlier as we planned for opening day of deer season. I had brought a woods rifle but had a chance to hunt a large, open field that was practically guaranteed to produce a fine buck or doe.

My good friend Gene offered me his Winchester Model 70, commenting that it was sighted in and ready to go. Good thing it was as he only had three rounds left. That 21st century cannon worked very well as I got a Gently press out both pins to remove the trigger group. young buck, although I did end up having to wade into a pond to retrieve him. I decided right then I'd get my own longer range rifle, but something a bit milder.

A trip to the next gun show had me walking away with a smile on my face and a Remington Model 7600 chambered in .30-06 in my hands. What is a trigger job? This is one of the most common requests asked of a gunsmith but doesn't have a really good definition. To get to the heart of the matter, the customer needs to say what he wants done and it is then up to the 'smith to proceed or explain that his idea isn't a good one.

For example, a light trigger (less than four pounds) on a selfdefense handgun may cause a very nervous finger to set it off accidentally, while three or four pounds is about right for a hunting rifle. Pull weight isn't the only thing involved. How the trigger "breaks" can be just as important. A proper trigger the hammer or sear is released, the sensation should be one of breaking glass, nice and crisp. So, trigger jobs are part science (the weight, which can be measured) and part art (the way it feels).

Although the Remington's action cycled smoothly, the trigger was certainly in need of help. It was heavy at almost eight pounds and gritty feeling. Having long been a fan of Timney triggers, I dug out my Brownells catalog to see if they had what I needed. I was pleasantly surprised to find their trigger kit fit not only my 7600, the earlier 760, the semi-automatic 740 and 7400, as well as 870, 1100, and 11-87 shotguns!

One part number will take care of deer hunters using rifles or slugs and anyone wanting a nice trigger to break clays or drop a pheasant. Begin the process by clearing and cocking the rifle with the safety on. Gently tap out the two pins holding the trigger mechanism into the receiver (either left or right is fine as these aren't tapered pins) and pull the trigger assembly down and away. Locate the trigger plate bushing and remove it by pushing it should have a minimal amount of travel (creep) and, when

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left to right, then lift away the sear spring. Using thumb pressure, push down on the hammer and pivot the sear rearward, then slowly release the hammer. While not necessary, I went ahead and removed the hammer pin and hammer to allow polishing on various surfaces. This also gives easier access to the sear pin. It is simple to see metal-to-metal contact spots that could use a gentle polishing. Very little material needs to be removed so a 400 grit stone or very fine grade file will do the job nicely.

Use a buffing wheel on the hammer to add a nice finishing touch. In addition to springs, the kit contains anew adjustable sear which needs to be installed. The sear pin is partially covered and requires a bit of dexterity to remove. Utilize a small diameter punch to drive the pin from right to left and remove the old, non-adjustable sear. Install the new sear and tap the pin back into its location. Choose a replacement spring for the factory piece. I went with the middle weight (white) one.

The difference in springs is readily apparent as the factory unit is a bit longer and uses considerably thicker (0.022 versus 0.031) wire than the white spring. The new spring goes into the mechanism and the trigger

plate bushing is reinstalled. Before installing the trigger group back into the receiver, take the time to lubricate all the moving parts and put a bit of molybdenum grease where the sear and hammer connect. Insure the hammer is cocked, otherwise it is impossible to reassemble.

While it is great to be able to weigh the trigger pull, in reality whatever feels right is best. I tried the trigger several times and appreciated how much lighter it was. Just to make sure I was getting what I wanted, I tried the other two kit springs but went back to the white one. A bit of adjustment on the sear yielded an even four pounds and a trigger than should make it easier to take my next deer. With the trigger situation handled, it was time to address the lack of a method to carry.

There was no sling and because this is a pump action, there is a two piece stock and forend with no traditional spot to put a front sling mount. The sling swivel kit contains a front swivel that clamps to the barrel, so there is no need to drill a hole. That being said, a hole does need to be made in the stock and that's where a drilling fixture (I got mine from MidwayUSA.com, comes

in very handy. This item allows for quick and easy centering of the drill and makes for a professional looking installation.

After drilling, the swivel is screwed into the wood. I always use a bit of epoxy to insure that the swivel stays in place. For a relatively expensive rifle, this one comes with poor quality open sights. I decided to use a scope as my eyes don't do well with metallic sights. Luckily, the receiver is drilled and tapped so adding mounts was a simple task. It is a good idea to use thread locking compound (like Loctite) on the screws and a drop on the bottom side of both mounts to further insure it doesn't come loose.

As I planned to do a lot of practice, I also added a recoil pad. After letting the Loctite cure overnight, I attached a scope, bore-sighted it, and headed for the range. I brought along some target ammo that I use for my M1 Garand and proceeded to shoot a three round group. Were these lucky shots? Probably, but I'd rather be lucky than good. Brownells parts used include a Sling Swivel Kit (593-144-100), Trigger Kit (883-000-022), Recoil Pad (440-000-053), and Scope Mounts (955-010-093).

I ALSO USED MIDWAY- USA'S DRILL FIXTURE (783-373). AG

FROM THE ARCHIVE

Herbal Root, London Guns, And Hue

Restoration of a long-neglected English classic. Here's the details of how classic gun makers achieve their much sought after stock finishes.

BY SHAWN MCWILLIAMS AUGUST 2016

ORIGINAL PP. 20-22

It all started with a 1882 W. C. Scott that my Dad literally found in a trash bag at an estate sale. It appeared to have been stored for generations in an old lambskin case. Over time and humidity, the wool bonded with those old Damascus barrels and corrosion was so extensive I thought for sure all was lost. There was a nice piece of walnut under the reddish stain but the grain was a mystery due to the dirt. W. C.

Scott may not be a Sons of London "Best" grade, but this was most certainly the finest gun I ever worked on. It was a true side plate hammer gun with carefully executed scroll engraving and it was by far the lightest 12 bore I have held. It was a gentleman's gun and it was my desire to bring it back to life. I needed to figure out what gave the stock that reddish color, better described as its hue. Gun makers in the 1800s used what was available to them.

In many cases it was the same materials used for hundreds of years, something to keep in mind when searching the past. I sought answers in the ShotgunWorld.com gunsmith area and a gentleman was kind enough to tell me it was certainly alkanet root but had no idea where to obtain some. I had read about something called slackum and also found that Purdy's was selling alkanet, albeit at a high price and with mixed reviews.

Some gun stores simply sell stain labeled as "Red Oil" or "Red Stain" but I needed this gun to be correct. More searching about alkanet led down the herbal highway. It's a place of candle makers, soap makers, traditional dye makers, and holistic medicine. Alkanet comes from a num-

ber of places and Europe, the Middle East, and France are large producers of it. With the exception of the finest of guns, it is almost extinct in its usage in stock finishing.

In an age when any gun manufacturer can acquire rapid application, rapid dry times, and minimal cycle times, Alkanet was destined to follow rust bluing into the great unknown. Alkanet has along history, having first arrived on the scene in Egypt in the latter half of that ancient civilization's 3,000-year period as a world power. As I stated earlier, if you want to learn what the old craftsman used it's important to look at what others were using during the same period.

Among its other uses, alkanet was used as a pigment in paint. It would be natural for a stock maker yearning for a color in the 1800s to turn to oil paints for a solution. By the 1800s alkanet had already been in use as such for hundreds of years and lies within all the great paintings of our time. Alkanet played its role along with many other ingredients. The old masters didn't have Home Depot to turn to, and neither did the cabinet makers, luthiers, painters, or blacksmiths.

In many ways, they all had the same tool box to turn to, learn from, and refine for their specific needs. I learned where I could get alkanet and found it's readily available from a variety of sources, but that is only one component. In looking at any gun finish there are multiple facets that must be considered for the entire recipe. Alkanet gives the medium the color and is the focus, but carrier oil is used. How long

does it take to dry? How will it flow? How will it settle? How easily will it possibly run?

How long can the user work with it before the very hands using it become the enemy of its beauty by it tacking up too fast? What can be added to improve its flow, its gloss? Most importantly, what did the old masters most likely use? Linseed oil is used in oil paints and has been around for centuries. In its natural state it takes forever to dry. Boiled linseed oil isn't boiled at all, but simply has chemical additives added to aid in accelerated drying. It is readily available, easy to apply, and easy to repair.

Like alkanet, it too had been used in the oil painting trade forever and it's these facets and common history that keep us on the trail of what guns were carrying around on their surface and what components can make up "alkanet oil." Turpentine is a true solvent of linseed oil. When I say true I mean once blended they shall never again part from each other. Many people confuse dry time with what I call tack time, or dryness to the touch.

My objective with any finish is to assure one coat per day can be applied because I have read that the old makers would put a coat per day for 30 days. Based on my experience, "happyland" for linseed lies between 12 and 30 coats. The quality of the finish is subjective but I find that in my use that band is pretty common. Customers of any product like to complete that effort in some rational level of time and making fine guns was a process that took time and, quite frankly, was expected to. Many

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Mineral spirits evaporates 14 times slower than VM&P Naphtha and 56 times slower than acetone. activities were taking place in parallel to that 30 day application process in the fabrication of a firearm. Although in many ways, spirit of turpentine may be a great choice but it has a nasty smell that bothers some people and also has some health issues that can be significant with prolonged use. After extensive trials, my decision was to use mineral spirits which is much safer.

OSHA notes, “turpentine is a skin, eye, mucous membrane, and upper respiratory tract irritant in humans. It may also cause skin sensitization and central nervous system, gastrointestinal, and urinary tract effects.” In many experiments with both I could see no difference in results that would drive me to a different decision. Mineral spirits, contrary to what some reading may believe, didn’t accelerate drying.

Mineral spirits is a great thinner of linseed oil but not something that improves dry time significantly or the tack time so that another coat can be applied. To think

of it another way, my desire was to get the surface of the material dry enough to be handled, knowing that through the process of oxidation the many layers would be “curing” over time while another coat could be applied.

To give you a clear understanding of the evaporation rate of mineral spirits verses other solvents, mineral spirits evaporates 14 times slower than VM&P Naphtha and 56 times slower than acetone. Mineral spirits is an excellent choice as a thinner but it really isn’t the best choice to aid in the dry time. Water evaporates quicker. The trick is finding that balance of dry time.

If you incorporate an excessive amount of one ingredient over another, the working time could be cut down dramatically while the flow and the dry time could be negatively affected. I only reference acetone because most of us are familiar with the blinding speed at which acetone evaporates. I am not suggesting it be used in any linseed oil-based finish. I wish there

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com) specializes in reprinting long out-of-date gun catalogs and manuals containing guns featuring wood finishes as described here. Among their many titles area series of W. & C. Scott & Son reprints, digitally restored and enhanced. was a profoundly simple solution but there never is as it takes experimentation if you desire to find that blend of chemicals. I use mineral spirits and VM&P Naphtha.

There is one last ingredient mentioned in many texts regarding the definition of slackum oil as used by the London gun trade and that is the use of Venetian turpentine or Venice of Turpentine. Venetian turpentine is made from the resin of larch trees and larch tree resin, especially those found in the areas of the Alps and Carpathian mountains, though it can also be made from trees in the western United States. If it comes from anything else, such as a standard pine, it is not Venetian.

Venetian turpentine has a natural golden-yellow color and it looks and feels like honey. Venetian turpentine is soluble in acetone, ether, and water, and partially soluble in petroleum hydrocarbons. The most common use of Venetian turpentine, particularly in pure form and not blended with anything else, is in application to horse hooves. The turpentine is applied after

shoeing or other foot treatments as a therapeutic measure to help the bottom of the hoof heal.

Venetian turpentine is mixed with certain oil paints to increase the paint's flexibility, transparency, and gloss. After reading of this one mysterious ingredient listed for a traditional recipe for slackum it made perfect sense! It isn't that the old master craftsmen invented something new, they just looked to painting and fine furniture making for the answers to their questions. What does it look like?

Alkanet stain looks like Cabernet Sauvignon and doesn't affect wood and wood grain quite the same as a traditional stain. Depending on the specific piece of wood it may respond differently to it. It is a very "safe" stain to use, especially on deeply-figured walnut that may have varying levels of porosity. Fine walnut is not just brown, it has touches of purple, red, and orange. It may be hard to pick up these colors unless the light is right but it is there, especially in crotch feather.

There may be just a sliver of color. A normal stain can act to give the overall color hue desired, while at the same time masking the very details, like those subtle colors, that were already hard to see. Alkanet doesn't do that at all as it creates a subtle mahogany hue. Instead of masking colors it

seems to accentuate them, sometimes dramatically. In addition, walnut will have mixed levels of porosity, perhaps slivers of it, and what the wine color will do is fill those areas with color.

It is in these overall yet small changes that an already nice piece of wood becomes an even greater piece of wood because of it. Alkanet was a pigment for thousands of years as was linseed oil. Mineral spirits and turpentine have been around since the Crusades and actively used by painters of the day. Venetian turpentine has been documented in use since the 15th century. Naphtha in its various forms has been around for over 2,000 years.

In creating my SB Mc Williams Alkanet Oil, I had no desire to create something new. My interest was simply finding the solution that would have been available when my Dad's 1882 W. C. Scott was made with such great care. The key to the solution, in the end, was not really the ingredients; they were just the beginning of along journey. It is important to understand the detail that the quantity of one ingredient versus another can have an extremely negative or positive impact on the outcome.

In any fine restoration, details matter because it is the details that make a "Best" gun simply, profoundly, and exactly that. AG

MILLING

Reader Forum

BY AMERICAN GUNSMITH EDITORS AUGUST 2016

ORIGINAL PP. 23-24

Yes, I have sheet brass jaws that I hammered in place but they always seem to get beat up. Aluminum angle is much less expensive than heavy brass or copper. Note you'll need to mill the inside radius so the inserts fit the original vise jaws and sit flat. I made wooden vise inserts for my Versa-Vise and glued 9-10 oz. leather on them to hold wood using Barge Cement. I don't know if there is away to get the leather to stick to aluminum as I haven't tried that.

I use 1/2 x 1/8 neodymium magnets in the four-inch Kurt vise on my milling machine. They just fit over the cap screws holding the jaw inserts in place. My parallels just snap into place and stay there. I have yet to find chips adhering to the magnets to be a problem. Ever need to get chips out of a small hole, such as one that has been threaded? I got 1 1/2 x 1/16" neodymium magnets and put them in pieces of 3/8" aluminum round, making getting chips out of a small hole quite simple.

Spiral flute taps are the only way to go, at least in my opinion. They are easier to start, require less torque, and there is less chance of breaking a small tap. As with any small tap, be careful and reverse every eighth or quarter turn so chips come out of the hole, not into the hole. This makes a big difference when threading blind holes. Yes, you can get them in plug and bottoming. I was given a bunch of hand taps years ago but don't use them as they are too hard to start and tap, particularly the big ones.

I also don't use "gun taps" (spiral point taps) as most of my holes are blind. Just spend a little bit more for spiral flute taps as most of this type of work is going to be

with blind holes anyway. I tried using neodymium magnet donuts to hold thread measuring triangles on my micrometer rather than those useless rubber thingies. Don't bother, as it didn't work as I had hoped. I get neodymium magnets from K&J Magnetics (kjmagnetics.com) and highly recommend them.

There are many uses for neodymium magnets that I have yet to explore. Just be aware that these magnets are somewhat fragile, so don't crash and bang them together. Ask me how I know that. Author Norman Johnson responds. Your comments on my article demonstrates there is no end to the innovative ways in making vise jaws. A good deal of thinking and effort went into your inventions. In my case, I saw away to make a quick-change pair at very low cost while spending just over an hour on the whole project.

Additionally, I have a pair of noscratch, no-slip universal barrel jaws used in the same vise. These powerful, padded jaws enable me to remove and install difficult gun barrels with no damage to their finish. I wrote about these back in March 2003. I also have a set of jaws that enable me to hold and align a rifle scope within the vise and are used to test the internal adjustments of scopes. I use a number of soft and firm pads made of various materials for a range of applications. I like your ideas, Bill.

Thanks for taking the time to tell about it! Stevens 67F I need information on the size of the magazine plug screw for a Stevens Model 67F 20 gauge shotgun. The schematic at Numrich lists this as part #28. The only information I've found in print or online so far is that the size is a 0.217 thread diameter. My screw gauges

show it as a 6mm x 100 fine thread. I'm doing some custom work on this shotgun and need a longer screw. Cliff Salisbury Yucaipa, Go with your gauges.

Either turn/ thread to the length needed or hire a machine shop to do it. We advise you also secure a set of screw head files from Brownells. FEG P9R Thanks for Dick Maheu's "FEG P9R" in the June 2016 issue. I'm a great fan of FEG firearms as they are well made, finished, and function extremely well. I have both the P9R and the GKK-45, preferring DA/SA automatics pistols. I also have a FEG APK in .380, also a DA/SA automatic, which was part of a South African Police overrun.

Bill The only problem I've had with these was an extremely hard double action pull. Apparently, the contract called for a heavy hammer spring to prevent panicked first shots. I solved the problem by replacing it with a standard APK spring. Any interest in an article on the APK? Pete Richiuso Merritt Island, Author Dick Maheu responds. Thanks for your nice comments. I have never had my hands on a FEG APK, either to shoot or work on. Evidently, they were imported in small numbers.

Should I get my hands on one in the future, I will do an article on it. Marlin 39A I would like to add a tip about taking down a Marlin 39A, as asked by R. L. Murdak in the June 2016 issue. Although purchased new in 1963, my 39A is no doubt not much different from his. It is important to remember that when the two halves separate, the breech block remains with the front half and the hammer remains with the rear half. The action must

READER FORUM CONTINUED

ORIGINAL PAGE 24

be closed before loosening the takedown screw and before bumping the two halves apart. When the hammer is down with the action closed, the hammer enters a slot at the rear of the breech bolt. The rifle will sort of fold to the right before the two halves separate. When trying to bump the two halves apart, the hammer must be at the full cock position in order to prevent it from pulling the breech bolt out to the right as the two rifle halves come apart.

A hammer down condition also causes an ugly burr to appear on the rear corner of the breech bolt slot as the rifle folds before separating. Clearly, it goes without saying that an empty chamber condition must be triple checked before starting the take down procedure. It might be of interest to mention that I learned the above by trial and error with my rifle some years ago and now have an ugly, damaged bolt as a reminder. Thanks for the tip, John.

We always welcome constructive ones, particularly when they contribute to preventing damage. Submit a question or letter to the Reader Forum column by addressing an email or posting a letter to American Gunsmith, 14439 NW Military Hwy, STE#108 PMB#410, San Antonio, TX 78231. Send subscription questions to Walther PPK I have a Walther PPK in .32 ACP with a bulged barrel about 1 1/2" back from the muzzle. The bullet has been removed and the slide is still on the pistol.

How can I salvage this wonderful pistol and make it usable again? We see no alternative to replacing the barrel. A bulged tube is not an ideal candidate for relining. Bulges can be eliminated with a glimpse through the barrel prior to firing a bullet through it. When handloading ammunition, be certain the case contains powder, not just a primer. Author Dick Maheu adds. Obviously, this is a dilemma of grand proportion. As you know, the pistol cannot be field stripped in the usual manner.

I would recommend sending the pistol back to the Walther factory through an authorized dealer. The slide would have to be drilled at the precise position of the barrel retaining pin and the pin pressed out. These pins are in extremely tight. With the barrel completely loose, the slide and barrel could then be removed from the John frame. I would classify this as a job for the factory only. LLama Especial 9mm I have a customer's LLama Especial that usually jams on the second round when using hollow points.

The bottom of the nose stubs against the bottom of the chamber. It doesn't do this with FMJ. Should I polish the feed ramp and chamber very carefully without changing any angles or shapes? Is "jump" a factor here along with magazine issues? Or should I let it be and tell the customer only run FMJ bullets? Samuel G. Circle G Many personal defense pistols demon-

strate distinct distaste for hollow point bullets, more often with .380 and .25 calibers, less so with 9mm.

Your problem might be related to the nose of the bullet drooping upon being released from the magazine and becoming trapped against the upper chamber when the slide returns forward. This could be corrected by using smooth jaw pliers to very carefully move the magazine's upper lips closer together. Do this one lip at a time, use a light touch, and employ dummy rounds while cycling the slide after completing each adjustment.

Just remember that manual cycling is no certain substitute for test firing prior to returning the pistol to its owner. Harold L. Pierce Louisville, KY If the bullet was being jammed against the upper chamber the possible correction would be to widen the gap between magazine lips. That operation should take place with the same care and consideration as narrowing it. All this assumes the owner is using commercial ammo and not loading his own.

If the latter is true the hollow points may not be seated properly. "Properly" means they are seated neither too deeply or not deeply enough. Both these factors can be checked against the overall cartridge length of a factory loaded 9mm cartridge. AG

SEARCHABLE ISSUE RECORD

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