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EDITION

PRECISION ARMS WORKSHOP

AND THE AMERICAN GUNSMITH ARCHIVE

A TECHNICAL JOURNAL OF CRAFT, REPAIR & RESTORATION

05

ARCHIVE ISSUE NUMBER

INSIDE THE ARCHIVE

BERETTA 81 CHEETAH

WORLD OF GUNS • WINCHESTER 1890 • KIT MUZZLELOADERS • ANATOMY OF A BLOW UP

ORIGINAL METHODS. MODERN ACCESS.

ARCHIVE EDITION 209

DIGITAL ARCHIVE EDITION

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PEOPLE & COMPANIES

World of Guns

BY AMERICAN GUNSMITH EDITORS MAY 2021

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Noble Empire Inc. was founded in 2009 and has over a dozen employees based in the United States and Europe. Since its founding, the company has been developing firearms simulators and encyclopedias, culminating in their World of Guns title. World of Guns: Gun Disassembly is an interactive firearms encyclopedia, mechanical simulator, and puzzle game. It is a free, interactive encyclopedia with simulations of firearms in full 3D.

The user can essentially climb inside any of the modeled guns and see its parts interact, turn it into a cut-away or an X-ray, observe the cycle of function as it works when firing in a slowmotion mode, and work through complete disassembly and reassembly down to the last pin. The simulators also offer a variety of game play with multiple challenges, such as disassembly and reassembly for time, various knowledge quizzes, and shooting video games.

World of Guns The World of Guns library contains 216 gun models of pistols, rifles, muzzleloaders, machine guns, grenade launchers, and artillery pieces which together add up to more than 25,000 parts. Firearms include classics from the 19th century, WWI and WWII era guns, to modern staples like Glocks, AKs, and

Miniguns. The software encompasses 200 years of firearm development into a comprehensive and educational video game.

New models are released at the rate of one or two per month with each one researched using the actual guns, manufacturer blueprints, documentation, and photographs. The game also features some interesting bonus models, such the DMC De Lorean (with a time machine option from the Back to the Future movie franchise), Vought F4U Corsair, and BMP-3 infantry fighting vehicle.

Guns Disassembly 2, the predecessor to World of Guns and also developed by Noble Empire, has been installed more than two million times and has been praised by the popular online publication The Firearm Blog (TheFirearmBlog.com) for its realism: "Each time I play it I learn a lot. I have even used it to figure out how to fit some old military surplus guns I own," wrote Steve Johnson, the site's founder. World of Guns has also been featured in the Rock, Paper, Shotgun gaming blog.

World of Guns has been released for Steam (Windows, Mac, Linux), i OS (Apple App Store), Android (Google Play) and Facebook. Download and install options are available at Noble-Empire.com.

MAINTENANCE & REPAIR

Winchester 1890

The case of the poorly-lined Winchester 1890 barrel. Here's how I refurbished this classic 22 Short takedown rifle.

BY MARK R. HOLLENSEN MAY 2021

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When I took this rifle in for the requested repairs, it seemed straight forward. The customer told me that he had purchased it on Gunbroker.com “awhile back” and that it was jamming. The Winchester Model 1890 Takedown pump action 22 Short has long been known as a “gallery gun” and many of these particular rifles were placed into service at local fairs and amusement parks many years ago. I decided to forgo historical information on this particular rifle so that I could cover some important aspects about it.

To start off, you all are aware of the convenience of Internet firearm purchases now in the mainstream. And, as great as this new type of vehicle for buying and selling firearms is, it also has some unforeseen issues attached to it. We all would like to believe that the seller is on the up and up, or at a minimum, inadvertently listed something that was not as good as their write up.

I tell my customers that when buying firearms used online they should first check to see how many firearms the seller has sold and what their rating is. More important than that, they should never buy a used firearm online if that seller doesn't offer a return option. That way when they

make the purchase, they will have time to run to the range, or better yet, have a local gunsmith inspect it to make sure it is in the condition specified by the seller.

The Winchester in my shop should have been returned as it did not match the seller's write up. So be on alert, follow those instructions, and you can lessen your chance of being burned. Commonly used as a “gallery gun”, these rifles were often seen at local fairs and amusement parks back in the day. Immediately after taking possession of this rifle, I decided to contact the customer so I could better understand what he meant by “the gun jams” on him.

As we all know, jamming could be feeding, extracting, ejecting, trouble chambering, or some other issue. It was then that my customer relayed to me that the rifle barrel had previously had a barrel liner installed and the gun had been recently reblued. All of this was purportedly done before he “won” the gun on Gunbroker. He didn't offer up what he had paid for it and I didn't ask. He told me that when he fires the rifle it jams up when ejecting the empty round.

He further stated that the magazine feed tube assembly was super tight when inserting it into the magazine tube, but that the previous gunsmith he had taken it to had

already fixed that. Finally, he told me that the same previous gunsmith let him know that the jamming was due to excess solder from the barrel liner job and that he would not work on it. I had previously worked with this customer on a repair job, so I knew him and agreed to look the rifle over.

I began by initiating the basic operating and functioning tests (without any ammo or dummy rounds employed) and the rifle functioned as it should with nothing out of the ordinary noticed other than the magazine feed tube assembly was still really tight; so much so that you almost needed pliers to turn it the one-eighth revolution to remove it. It was also difficult to pull it from the magazine tube. The inside of the receiver was found to have some rusting, most likely due to the recent blue job.

The bolt assembly and screws all had a red coat of rust on them, as did the inside of the receiver. The good news was that the stock appeared to be original, although it had been refinished, and had a small hair-line crack in the grip area but was of no concern. The bad news was yet to come. Knowing that the rifle had a barrel liner installed in the bore, I inspected it closely. I saw a jagged line around the liner and barrel at the muzzle end, with some specks of

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what appeared to be an Brownells Acraglas product in that area. I also saw what appeared to be solder in the area where the liner joined the bore. That seemed strange to me as you typically do one or the other. I then ran a patch down the bore and the bore liner was bright and shiny. However, the patch kept getting caught at the very end of the muzzle area inside of the bore.

I looked in the muzzle end closely and found what appeared to be excess solder that had run down into the muzzle area, coating the circumference of the lands and grooves. It appeared that when the liner was installed, sol- Once that pin is removed, pull the magazine tube free from both dovetail mounts. This enables removing the action bar assembly next. der oozed down into the muzzle's bore and then the muzzle was faced and then crowned over and into the solder.

The crown was in good shape but there was still approximately 1/8" of solder around the inside of the bore just before the crown. This would without a doubt cause higher

pressures and diminished accuracy when shooting. Basically, this was a slop job. Typically, a good barrel liner job will not (or will barely) reveal that a liner was even inserted into the barrel bore when done correctly. And there will not be any solder in the bore at all.

My opinion is that the barrel liner installer had initially Acraglased the liner into the bore and then soldered the liner in flush with the muzzle end of the barrel, trying to skip a step on the lathe. There was no doubt that the installer either used a bad drill bit to do the job or ran the bit all the way down the barrel until it exited the muzzle end. That is a no-no when doing a liner job. With those findings, I then turned my attention to the breech end of the barrel.

Here again, I saw a notable line between the liner and the bore, but it was clean enough to let me know that the installer started the drill bit from the breech end. Looking closer, I saw silver solder in the chamber from the 5 o'clock position all the

way up to the 10 o'clock position. That just didn't make sense. If silver solder was used to secure the liner, it would only leave a gold-colored ring around the liner where it is seated into the barrel. But this was inside the chamber area.

Seeing this, I decided to perform a function test using a dummy round to ensure that it would feed, chamber, extract, and eject from the action. Five out of five did just that. I then tried live ammo with the same results. At this point, it seemed that maybe the gun would function okay and that a light tweaking might be all that was needed. But I spoke too soon. I decided to open up the action using the takedown screw to separate the butt stock and trigger assembly from the action.

To remove the bolt, remove the small pin that holds the magazine tube to the center dovetail tube mount under the barrel. With that pin removed, the magazine tube should pull out without need to remove either of the two magazine tube dovetail mounts affixed to the barrel.

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With the magazine tube removed completely and set aside, remove the action slide cover from the left side of the receiver by backing out the sole screw securing it and lifting the cover off of the receiver. With the cover removed, lift the action slide and handle (the pump assembly) off the receiver and where it links up to the bolt. Depress the firing pin inward with your thumb to disengage the bolt assembly to lift it upwards at the front and then pull it rearward from the receiver.

The rifle has a rather simple design and disassembly firing order. Since we are focused on the barrel liner issue, I decided not to write a blow-by-blow disassembly procedure for the whole rifle. With the bolt out of the way, I was able to better see what the chamber area looked like. To me, it appeared to be oblong or elongated at about the 5 o'clock position on the chamber breech.

I could also better see the silver solder in the chamber and the definitive line it left where it stopped flowing when added into the chamber area. The back of the barrel had been relieved for the extractor but that looked pretty rough. There was no doubt

that it was not machined; it looked like it was done with a file—and rather crudely I might add.

I reinstalled the bolt assembly back into the receiver and pushed it all the way forward to lock it forward into position. Moving the bolt rearward slowly, you can determine if the extractor is in position to grab the rear of the cartridge case. Depress the firing pin at the back of the bolt with your finger to release the bolt and move it back and forth. Then I watched as I moved the bolt rearward each time to see how the extractor was interoperating with the breech area.

It was there I could see that the extractor had not been fully (properly) fitted. In other words, the recessed cut out on the back of the breech was not allowing the extractor to fully grab the rear of the cartridge case. Some stoning and light clean-up work of the recessed area and the extractor tip itself remedied this problem. Since the functional part of the process seemed to be all in order, I reassembled the rifle and test fed the dummy and live rounds again.

And again, all fed, chambered, extracted, and ejected without failure. It was now time to live fire the rifle. I still had some concerns about the excess solder still in the bore at the muzzle, so I used lead tipped ammunition for the testing. I also took along some 22 Short (CB) caps (ultra-low velocity ammunition). At the local range, I loaded her up starting with the CB caps and fired five shots. All five rounds fired and cycled from the gun perfectly.

I then tried the standard 22 Short ammo and the problems began. When the action bar (pump) was worked, the fired case stayed in the chamber and prevented another round from being loaded. The extractor could not budge the case at all, so it had to be tapped out with a cleaning rod. A total of five rounds were fired and all had the same results.

Back in the shop, I looked closely at the fired casings and quickly discovered that each of the 22 Short (standard velocity) spent cartridges had a bulge in the case just ahead of the rim. Inspecting the CB caps revealed a slight bulge was there but it was not as pronounced as on the standard ammo. Judging where

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the bulge was relative to the extractor marks, I found it to be bulged at the 5 o'clock position on the case; the same place where the chamber appeared to be elongated. Disassembly of the rifle again verified that the chamber was elongated at that position. Based on all of the above, I concluded that when the barrel liner installer was relieving the area of the breech for the extractor, too much was removed and some of that area removed was the rear of the chamber itself.

The installer then tried to silver solder the chamber up, making a patch so to speak, and built it up enough that they could again run the chambering reamer down the breech bore and "re-chamber" it using the silver solder as part of the chamber wall. When looking into the chamber, I could see where the reamer made the new chamber and where the silver solder had stopped inside of the bore. This created a ridge but the elongated edge of the chamber is still a mystery as to what caused that.

So what we have is a rifle that is pretty much a wall hanger. The best two solutions to this problem are to find a used but decent-shape barrel in 22 Short and replace the barrel completely, or re-line the barrel. However, drilling out a liner can lead to more issues, especially if the original hole drilled was not done properly. And everything I saw on this so-called repair was not done right. My guess is that this was someone's first try at barrel lining a bore.

Furthermore, trying to replicate or duplicate the extractor recessed area using one that was not done properly as your guide sets

you up for one heck of a rabbit hole to chase down. So my next question is, why would anyone deliberately sell this rifle without letting the unsuspecting consumer know?

And you would be correct... Without getting into all of the details of barrel re-lining, as that could be a stand-alone article or series of articles, I will cover some details of the process that should have been adhered to on this particular job. We'll use this rifle and caliber as our reference here. First, when planning on re-lining a barrel bore, remove the barrel and pay close attention to the extractor recess (if any) at the back of the breech.

Photograph it (assuming it is original to the barrel) and take as many measurements and drawings of the recessed area as possible. Where it starts on the breech and where it ends, how deep, what particular shape and size, and how the extractor interoperates with the cartridge during feeding, chambering, and extraction.

Next, insert a 22 Short Go Gauge (or use a 22 Long Rifle gauge and mark the chamber length on it) into the chamber and take measurements as to how deep. You might not see it here, but the rear portion of the chamber from the 5 o'clock position to the 10 o'clock position is made of a silver solder patch. All that effort and it still does not function properly. to chamber the newly lined barrel.

The bottom line is to take plenty of notes because once you drill out the bore, there is no going back for critical measurements you forgot to record. Next, determine if you "can" replicate the recessed area for the ex-

tractor. Can it be milled or machined? Do you have the proper bits or end mill to make a nice clean relieved area? Can it be done in one pass, two, or will it require many cuts? Practice on the original barrel breech before drilling out the bore.

Set the barrel up in your mill, lathe, or drill press and mock up how you will cut the relieved area. Then write down all of your steps. This is critical for replicating the original barrel relief. It takes time, so take the necessary time right up front to do it correctly when you have the barrel liner installed. Next, since this is a rimfire rifle, you have the option of using Brownells Acraglas or solder to secure the liner in place. You don't need both. And you don't need silver solder either.

So choose the one you plan to use and stick with it. In my experience, use of solder works really well to help hide the line between the barrel and liner when installed. This is personal preference. If you plan to reblue the barrel, solder is the better choice. If you are able to use brand new drill bits to drill out the bore to accept the liner, you may have a near perfect fit that won't show the Acraglas or solder when done.

The trick here is to drill from both ends of the barrel; never run the bit through stem to stern. If you do, it will leave a larger than desirable hole on one end of the barrel depending upon which end you began drilling. I like to use new piloted drill bits for the job and Brownells sells short and long piloted bits. I always begin drilling from the muzzle end first, drilling down into the bore about six to eight inches, and then slowly back



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the bit out. This gives a very nice cut that will nearly remove the visible line when the liner is finally inserted and the muzzle is faced. The reason I do not drill halfway down the barrel is to keep the bit nice and sharp for making the breech end cut, which helps hide the line between the barrel and liner. Invert the barrel and begin drilling the bore from the breech end. Go slow and use lots of oil so you don't damage or break the bit.

Drill down the center of the bore until you reach the first portion you drilled out and then clean up the entire drilled out center. Just don't allow the bit to exit the barrel on the muzzle end. A lathe with a four-jawed chuck works very well for drilling out the bore, especially on octagon barrels such as this one, but it can be done with a hand drill if you are very careful. Once the bore is drilled, spray it liberally inside with degreaser to clean out any oils in there from the drilling process.

You do not want to polish the inside of the barrel. It is better if left somewhat rough to help bond the liner to the barrel bore. Once prepped, degrease the barrel liner. Do not cut the liner length down yet, use the full length it comes in. If using Brownells Acraglas to secure it, run the liner down the barrel bore dry to make You may be able to see the jagged line where the liner meets the barrel muzzle. Being careful, a liner can be installed without a visible transition or line.

A target crown can at times be employed to obscure the line if needed. sure it will go in without binding. If it does, relieve the liner where it gets stuck in the bore and keep working it until you can push the liner down the bore without having to forcefully hammer it in. Once ready, mix up Brownells Acraglas according to the instructions (I prefer Acraglas Gel as it seems

to make a cleaner job), spread a thin coat on the outside of the barrel liner, and push it down the bore.

Turn and work it back and forth to get the Acraglas to spread out inside. Leave approximately two inches of the liner sticking out the muzzle end (if it is long enough) and the rest can stick out the breech end. Once in place, look closely at the area between the liner and the bore on both ends to make sure you have an even coat of Acraglas all the way around the liner. If not, push some down inside the groove to ensure it will clean up properly when facing off the muzzle and breech ends. Let the Acraglas cure.

About a week is best to ensure a good set. If you decide to install the liner with solder, get a solder with a melt point above the temperature of bluing tanks so it won't soften and

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Unfortunately, I'm missing the parts identification list for reference. leak out during the bluing process. Brownells carries this and everything you will need to do a nice barrel reline job. After the bore and liner is prepped and degreased, clamp the liner in a vise on only one end. Make sure you have enough liner sticking out from the vise to be fully inserted into the barrel bore. Test fit the barrel over the liner secured in the vise to make sure the liner passes all the way through the hole you drilled.

Using a source of heat (torch) begin heating the liner slowly starting at one end and just enough to get the solder to flow onto the liner. Keep heating the liner until the solder is flowing and use steel wool to spread the solder out. What you are doing is 'tinning' the liner, getting a good coat of solder all over the liner where it will bond inside of the barrel. Once you have solder all over the liner, begin heating the barrel. You won't need to heat the barrel up too hot.

Just get it warmed up and then heat the liner again with the solder on it until the solder flows again along the full length of the liner and push the barrel down over the liner. You will need to work fast so the liner does not get stuck. Work the barrel onto the liner by pushing and rotating the barrel while heating and get the barrel over and onto the liner in one motion.

Once you have the barrel on the liner with some of the liner sticking out both ends, make a final turn of the barrel and then remove the heat source. As it cools, you can see if you have enough solder between the liner and the muzzle, and the liner and the breech. If not, you can heat these areas back up and get some solder in there to fill the grooves. Then let cool. You can start working this barrel immediately after it has cooled.

To finish (by using either of the two methods above), use your lathe to face the muzzle, finishing by making one last clean fine cut across the barrel to true up the muzzle. Then, crown it to your liking. Turn the barrel around and cut off the protruding liner, then face off the breech end. Once flush and with a very fine clean facing cut (don't face off more than 0.001") of the original breech face on the barrel, ream the chamber with a 22 chambering reamer.

A good quality finish reamer should be used for this job. Use the original measurements taken before you began this process to measure how much of the Go gauge protrudes from the breech end of the chamber, and then replicate that measurement with the new chamber reamer and Go gauge. Once the chamber is cut and finished, set up the barrel to cut the extractor recess area. Use the measurements and setup steps you put together at the beginning of the process and cut the extractor recessed area.

If you recess it exactly as it was when the barrel was new (or before you drilled it out) you likely will not have any of the issues that this firearm had. This is a thumb-nail of barrel liner installation and only for this particular rifle and caliber. Had the "installer" taken some extra time and followed these steps, this old gallery gun would be back in service again.

The Brownells website has a Learn section (Brownells.com/guntech) on how to install barrel liners using Brownells Acraglas or solder if you are looking for more information. I recommend that you discuss with your customer the ramifications of re-lining a barrel to make a shooter out of it, especially if it has some collectible value. Essentially, the minute you bore out the barrel, the collectible value drops to the bottom of the charts (or lower).

Even if the original bore is pitted and worn out, keeping the rifle original also keeps the collectible value of it up. So have that conversation. Will it be a shooter or a collectible? You can't have both with a barrel liner installed—in most cases anyway. And it is far better to let the customer know this before you drill the barrel out, because you just can't assume that they know this most probably drop the value of their old classic firearm.

Finally, American Gunsmith ran an article on .22 rifle barrel liner installation back in March 1994 if you are interested in that write up. AG

FINISHING

Beretta 81 Cheetah

Now more commonly available from Italy, the 32 ACP Beretta 81 Cheetah will likely cross your bench. Here's how to work on them.

BY BRIAN R. SMITH MAY 2021

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The market has recently been flooded with the 32 ACP Beretta 81 Cheetah, a quality-made 32 ACP pocket pistol from Italian police service. They can be found in a variety of conditions, from finish worn to as-new, and there is a very good chance you'll be seeing one or more in your shop.

Until recently, the Beretta 81 Cheetah was not readily seen in the US firearm market for two reasons; one, it is a quality, well-made weapon that is relatively expensive, costing as much at retail as its larger, more prevalent 9mm sibling. Second, the 32 ACP/7.65 Browning cartridge has never been popular in the United States; it's been considered to be less effective than the 380 ACP/9mm Kurz/Corto/Short and American shooters have always been of a "more is better" mindset.

Until the last 20- 25 years, many law enforcement officers carried either revolvers in 38 Special or 357 Magnum, a 1911 in 45 ACP, or sometimes 38 Super. Since the late 1970s and early 1980s, law enforcement agencies have switched. The current crop of imported Model 81s were formerly in Italian police service. To one high capacity "wondernine" or another, like the SIG 226, the Glock family, or Beretta 92, and the plethora of newer 9mm, 40 S&W, and 45 ACP handguns that have been developed and offered since.

In Europe, however, the 32 ACP/7.65 Browning has for much of the 20th century been the favorite cartridge of the numerous police agencies of many countries. John Browning's first semi-auto pistol cartridge was the 32 ACP (7.65x25 mm Browning), introduced in 1899. It was an immediate success in Europe and quickly adopted for military, law enforcement, and civilian applications.

In Push the smaller button in to permit the disassembly latch to be rotated. many European countries, for a law enforcement officer a 32 ACP-chambered sidearm is often secondary to another more serious weapon such as a carbine-style rifle or a submachine gun. In Europe, .32 caliber cartridges don't carry the "mouse gun" stigma that is does in America. Nor should it; personally I certainly wouldn't want to be shot with a 32 ACP, let alone anything else.

The current flood of Beretta 81 Cheetah pistols comes to the USA from ex-Italian police inventories. They have been offered in a variety of grades, or condition levels, from as-new to exhibiting corrosion pitting on the steel slide, and wear to the anodized finish on the alloy frame. Even those examples which

BERETTA 81 CHEETAH CONTINUED

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appear to have been “ridden hard and put up wet” have moderate to very little wear internally, and most of the Beretta 81 Cheetah imports that I’ve inspected have remarkably clean bores.

In order to be imported, these Model 81 were required to be partially disassembled, with the slide assemblies shipped in container(s) separately from the frame assemblies, and frames and slides were mated again at the US importer’s. When removing the extractor pin, take care to control the firing pin and its spring, as the extractor pin retains the firing pin under spring force. The extractor pin is notched and is installed only one way.

Use a small-diameter punch to drive out both pins as an assembly simultaneously, then remove the right side safety lever. facility at the time of application of the required import marking on the underside of the trigger

guard. The frame is the only serialized component on these Model 81s. There is no chance that the originally mated slide was reunited with its frame. Opportunity alert: There may be some individual guns that have fit or functionality issues that may need professional attention.

Originally introduced in 1976, the Beretta Model 81 is a high-capacity 015" larger in diameter than the pin body. Drive it out from bottom of the slide upward past the staking. Upon reinstallation, reset the staking close to the head of the pin or the pin will launch upon firing. capacity, medium-sized, blowback-operated pistol weighing 23 ounces; with a 12-round double-stack magazine, a 3-7/8" barrel, and is a sibling of the high-capacity Beretta Model 84, chambered in 380 ACP.

The Model 81 is double-action/single-action with a light alloy frame, an open-topped steel slide, exposed hammer, and possesses an ambidextrous safety. The thumb safety is not a decocker and locks the fire control group. The safety can be engaged with the hammer in either the forward (double-action) or cocked (single-action) positions. The recoil assembly consists of a full-length steel guide rod with a single round-wire spring.

The Model 81 looks very much a scaled-down Beretta 92, and while there are some external similarities, there are more differences internally than not. These ex-LE Model 81 Cheetahs are inscribed with a finely engraved “Cat 4” on the right side of the frame dust cover, which is the Catalogo Nazionale delle Armi number. Upon approval of the Italian arms commission, any type of rifled firearm manufactured or imported into Italy must have Catalogo

BERETTA 81 CHEETAH CONTINUED

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go number, and the Beretta Model 81 was number "4" in the registry. All of these current Model 81 imports are marked "Cat 4". Disassembly Regarding takedown, first remove the magazine and retract the slide to ensure the chamber is empty. Not visible underneath the trigger bar shaft is the slide latch shaft passing through the multiple coil of the trigger spring.

The disassembly lever release button projects from the left side of the frame above the front end of the trigger guard and at the 7 o'clock position of the left end of the disassembly lever shaft. Press the button in, then rotate the disassembly lever on the right side of the frame clockwise 90 degrees. Withdraw the slide assembly forward off the frame. Note the location of the recoil spring guide head in its recess in the barrel lug.

Push the recoil spring guide forward, removing it and the recoil spring from the slide. Push the barrel down out of the slide and remove it. The spring-loaded extractor pivots around a staked-in vertical pin in front of the rear sight. This pin also retains the firing pin against its spring and is headed at the top end; the head is 0.015" larger in diameter than the pin body. Drift the extractor pin out from the bottom through the top of the slide, past two staking dents on either side of the pin hole.

Control the firing pin and its spring as the extractor and its spring as both are under spring force and the firing pin especially may "launch" if not restrained. Disassembly within a large plastic bag is recommended. If equipped, the magazine safety spring is a curled loop on the right side of the frame. I

have examined three of these ex-Italian police Model 81s and none of them had a magazine safety spring. Your mileage may vary.

To remove a magazine safety spring if so equipped, use pliers to unseat the lower spring leg from its notch in the frame and pull it out away from the frame. Unhook the other end of the spring from the opening in the trigger bar. The right-hand safety lever is fixed to the left hand safety lever shaft by a small sheet metal double roll pin; use a punch to remove the pin, then slide the righthand safety lever off the shaft to the right.

Ensuring the hammer is cocked, remove the left-hand safety lever to the left, taking care that the plunger and spring are restrained by a finger as you do so. Once the safety lever clears its positioning post on the outer end of the hammer axis pin, the safety lever plunger spring force

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will be released. Pull the plunger and spring out with fingers, pliers, or tweezers. Before removing the trigger bar, take note of the position of the trigger spring that resides between the two frame rail bosses and underneath the disassembly lever. Looking closely with plenty of illumination, this is the wire form spring that's straight at the front end, has a single coil and a multi-turn coil 90 degrees to each other, and is hooked at the rear end. A lot is going on with this spring.

The straight end of the trigger spring fits in a hole in the disassembly lever. Knock out the smaller pin first, which tensions the sear spring. Then drive out the larger diameter pin as shown. release button shaft, the slide catch shaft passes through the multi-turn coil

in the trigger spring, and the hook at the rear end is fastened over the trigger bar shaft between the two "eyes" at the top of the trigger through which the trigger bar shaft passes.

Taking a photo or making a sketch of this tight area prior to further disassembly will help with reassembly, and there is a detailed photo of the area in question accompanying this article. The trigger bar is removed by first withdrawing the trigger bar spring arm from a groove in the un- Far Once the pin is removed, cock the hammer to push the hammer strut guide out of the bottom of the frame. derside of the trigger bar, then sliding the bar out of the frame to the right.

Next remove the disassembly lever by rotating it 180 degrees so that the lever tab is vertical and pointing up, then work it out from the frame to the right. Now pull the slide catch slightly away from the frame. Using a small screwdriver tip or tweezers, unclip the upper (short) leg of slide catch spring from its seat in the frame. Then continue pulling the slide catch to the left and out of the multi-turn loop in the trigger spring, and ultimately out of the frame.

The slide catch shaft needs to be reinserted in the multi-turn loop when reassembled. Since the slide catch shaft serves as the trigger axis pin, removing the slide catch frees the trigger. With the trigger still loosely in place,

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Tweezers or small forceps are useful for re-installation. Not so with the Beretta 81. Note that the flange on the guide rod nests in a mating half-moon recess in the underside of the barrel lug—be sure to set the guide rod as shown before reassembling the barrel, slide, and recoil spring assembly to the frame. remove the trigger spring from the top of the frame using needle nose pliers or tweezers.

Withdraw the trigger toward the bottom through the trigger guard by rotating the bottom end of the trigger forward so that the trigger is horizontal in the trigger guard. Once the forward tip of the trigger spring is out of the disassembly button shaft, the disassembly button can be removed from the frame. If the hammer is still cocked, use a screwdriver or punch to push the sear out of engagement with the hammer to release the hammer.

With the hammer forward, use a pin punch to drive out the hammer strut guide (aka frame plug) retaining roll pin, adjacent to and to the rear of the lower grip screw bushing. After driving out the pin, cocking the hammer pushes the hammer strut guide out of the bottom of the frame, allowing for ready grip with finger and

thumb for removal of both guide and the mainspring / hammer strut assembly behind it. Next remove the hammer axis pin to the left and withdraw the hammer from the top of the frame.

A small diameter roll pin in the arc-section milled area behind the magazine well restrains and tensions the sear spring. Driving out the small-diameter pin unloads the wire sear spring and the sear. Driving out the solid pin that serves as the sear axis enables the sear and sear spring to be removed to the inside of the magazine well. Pay attention to the positioning of the components as a reference for reassembly. The long, straight leg of the sear spring seats in a slot in the forward face of the sear.

There are two tiny roll pins that fasten the ejector to the frame. Removing those pins frees up the ejector, but removal is not recommended unless the ejector is broken or requires replacement. To remove the magazine catch, assuming it is set up for right-hand use, a small screwdriver is best to push the wider block inside the magazine catch to the right, while pushing the right side of the magazine catch to the left. The magazine catch will just about pop out of the frame.

Reassembly Some points of interest when reassembling the Model 81 concern the fire control group and the guide rod's positioning in its proper recess in the underside of the barrel. First, when installing the trigger bar, be sure that the forward tip of the trigger spring is inserted in the hole in the disassembly latch release button shaft as it provides the spring force to keep the disassembly release button in place protruding from the left of the frame.

Then reinstall the slide catch, ensuring that the slide catch shaft passes through the multi-turn loop in the trigger spring. Then, the trigger bar shaft is inserted in the frame from the right, ensuring that the trigger spring hook is hooked over the trigger bar shaft between the two "ears" in the top end of the trigger that the trigger bar shaft rides in. The trigger spring thus provides reset force for the trigger. Next, install the disassembly lever from the right, with the finger piece pointing up.

Once seated in the frame, rotate it 180 degrees so it points down. An improperly located guide rod is what brought the first 32 ACP Model 81 to me. The pistol was in three parts: frame assembly, slide assembly, and recoil spring/guide

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1 Barrel 2 Slide 3 Recoil Spring 4 Recoil Spring Guide Rod 5 Extractor 6 Extractor Pin 7 Extractor Spring 8 Rear Sight 9 Firing Pin 10 Firing Pin Spring 11 Frame 12 Disassembly Latch 13 Disassembly Release Button 14 Trigger Spring 15 Slide Catch 16 Slide Catch Spring 17 Trigger 18 Trigger Bar rod assembly. The customer could not get the pistol to reassemble; no matter how he tried, the slide would not reseat completely on the frame.

I examined the three assembly groups and activated the disassembly latch a 19 Trigger Bar Spring 20 Magazine Release Button 21 Magazine Release Button Spring Bushing, right 22 Magazine Release Button Spring Bushing, left 23 Magazine Release Button Spring Safety, left 24 Safety, left 25 Safety Spring Plunger 26 Safety Spring 27 Safety Wing, right 28 Safety Wing Pin 29 Hammer Pin 30 Hammer 31 Hammer Spring Guide 32 Hammer Spring 33 Hammer Strut Guide Beretta 81 Cheetah (Specifications subject to change without notice) 34 Hammer Strut Guide Pin 35 Ejector 36 Ejector Pin 37 Sear 38 Sear Pin 39 Sear Spring 40 Sear Spring Pin 41 Grip, right 42 Grip, left 43 Grip Bushing 44 Grip Screw 45 Magazine

Body 46 Magazine Follower 47 Magazine Spring 48 Magazine Plate 49 Magazine Floorplate 50 Magazine Safety Spring few times and couldn't see anything out of sorts.

While the customer was waiting I reassembled the pistol and it went together fine. I was able to rack the slide and dry fire the 81 in a safe direction. "Wait a second! How did you do that?", the customer exclaimed, staring wide-eyed at the little Beretta in my right hand. So I disassembled the 81 into its assembly groups and started to reassemble it, showing the customer where pistol's barrel lug has an arc-shaped recess into which the guide rod head is to seat.

That leaves a very short space between the longest section of the barrel lug and the guide rod head. If the guide rod head is not fully seated in its half-moon recess, the pistol won't reassemble. I went through reassembly again slowly, then disassembled it and had the customer put it together while I watched. That time, he had no problems. Other reassembly points to note: The left-side safety lever has a spring-loaded detent pin that engages the post protruding from the left side of the hammer axis pin.

In a controlled environment such as draped towel or a large plastic bag "tent", use a jeweler's screwdriver to depress the detent and push the safety in place against the frame. To replace the magazine catch, insert the left end of the catch into the left recess with the inner shoulder of the left spring housing against the inside of the recess in the frame. Push the right end of the catch to the left to compress the spring to the point where the right end of the housing clears the recess.

Then push the right end of the magazine catch housing forward to fully seat in the recess. Many thousands of these Beretta 81 Cheetah .32 caliber pistols have been imported and have been offered at quite attractive value pricing if one is not particular about cosmetic issues, such as finish wear and rust pitting of the steel slide.

These aesthetic issues generally do not compromise the functionality of an intrinsically reliable handgun design and provide the buyer with the opportunity to own an inexpensive high-capacity pistol for personal protection. AG

RIFLES

Kit Muzzleloaders

How to build flintlock or percussion lock muzzleloaders from a kit.

BY PAUL MAZAN MAY 2021

ORIGINAL PP. 15-17

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You can derive great pride and pleasure in building your own long rifle. You can buy all the components or build many of them yourself. Whether you prefer flint or percussion, left or right handed, you can build your lock from a kit and get great results. In the world of muzzleloading there are several kinds of additions. These range all the way from the guy that simply wants the easiest, most convenient gun to use so he can take advantage of a longer hunting season and/or to hunt one more animal.

He will buy a newly-made muzzleloader from one of the manufacturers that looks and shoots like a modern rifle with an optic. The only traditional aspect to it is that it is loaded from the muzzle and must be capped to make it legal. On the other end of the spectrum is the traditionalist. This is the guy that wants to build Hole placement is critical to correct functioning of the lock.

Hole locations are indicated on the parts with small depressions to ensure they are easy to locate correctly. his version of the traditional muzzleloader just like great

grandpa never had because he couldn't afford it. He will pick a school and craft a rifle that he hopes looks like it was made 250 years ago. I fall into that latter category.

I start such a project determined to make as many parts as I can and follow the advice given in Buchele, Shumway, and Alexander's book *Recreating the American Longrifle* and Shumway's *Thoughts on the American Longrifle* in it's Golden Age. One by one I craft as many of the parts as possible. These include the ramrod pipes, barrel lugs, lockplate, and patchbox. Other parts like the barrel, stock, forend tip, and buttplate that I cannot or choose not to make, I purchase.

This leaves a lot of leeway to pick the features you like and build either a rifle that looks like it came out of your favorite maker's shop or something with the features you like, historically accurate or not. The real traditionalists hate seeing guns like my first one because it is a hodgepodge of features from different schools and would never have existed during the time period.

I later built guns that reflect the Lancaster school but that first one was a rifle that I thought should have been and was made to my taste. One component I haven't mentioned so far is the lock. You can certainly buy most any style of flint or percussion lock you like. However, in concert with the desire to make as many parts as possible I elect to build the lock myself. Building a Pennsylvania or Kentucky rifle is the perfect project for the beginning gunsmith.

It requires woodwork, metal work, and blending the separate parts into something that flows together into a truly American art form. To my eye there is no gun more beautiful than an American Longrifle. To fulfill my goal of making as many parts as I could I found that Jim Chambers (Flintlocks.com), offers the Siler locks in kit form. After considering it for awhile I contacted the folks at Track of the Wolf Inc. (Track-OfTheWolf.com),

KIT MUZZLELOADERS CONTINUED

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The easiest way I have found is to simply replace the drill I just used to make the hole with the tap, lower, and turn the chuck by hand. This method ensures that the tap enters the hole at exactly the same angle the drill did. This method gives excellent results and ensures you break fewer taps. I use a pair of small vice grips to hold the frizzen in place so I can drill and tap it and the lock plate and have them positioned perfectly.

The kits are available in flint and percussion, left or “wrong” handed (wrong handed for me at least, might be right for you). I purchased a left hand Siler Flint Lock Kit and was delighted with the quality. The kit comes truly complete, with all the parts and screws, two fixtures, and very well written instructions that list all the drills. Simple nylon jigs

are supplied with the lock kit to insure that you get the bridle properly located. The shaft diameter of the tumbler was slightly oversized.

It can be turned most easily on a lathe but you can also use a drill press instead. Here I have chucked the tumbler in the chuck and use a hand file with a safe edge so it only cuts the shaft. and taps needed at the top of the page. The instructions are taken step by step through the process of drilling, tapping and, assembling the lock, along with how to keep things aligned. All the holes needed to be drilled are indicated with a center punch-like depression.

The parts are supplied “as cast” so be prepared to hand finish them by grinding off the casting sprues, mold lines, and polish the

surface if the finely-sandblasted surface is not what you want. This is mainly a drill and tap project but there is an exploded drawing to refer to as well as instructions on hardening and tempering of the frizzen, tumbler, sear, and fly. The assembly process went very smoothly for me but the heat treating took a couple of tries.

It seemed that after heating the frizzen and quenching it in Mobile 1, it would spark but I wasn’t particularly happy with the volume of sparks I got. I knew this could have been several things. Perhaps I didn’t get the part hot enough or perhaps Mobile 1 isn’t the ideal quenching oil. As I say, the lock worked fine, I just wanted to see if I could get a larger shower of sparks.

KIT MUZZLELOADERS CONTINUED

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Top If you have an oxyacetylene torch it will heat your parts to bright red and quenching will harden them. If you do not have oxyacetylene you will need two propane or MAPP gas torches to heat the frizzen. Heat it as hot as you can get it (in this case, bright orange) dip the part in Kasenit or Brownells Surface Hardening Compound, reheat it, and then quench in light oil. There is a separate instruction sheet on home heat treating supplied with the kit.

Immerse the heated part in the oil for about 30 seconds and move it around. Be careful as the oil will flame up. Once the part is cool,

hardening compound will be encrusted on the part. It is removed with water and a brush. Prove the lock to yourself by assembling it and check to be sure it sparks. As you can see, the lock is well designed and throws its sparks directly into the pan. This ensures positive and fast ignition and the delay between hammer fall and discharge of the main charge is almost instantaneous.

I contacted Brownells and ordered a jar of their Surface Hardening Compound (#083-000-033). I tried treating the frizzen again following the directions on the jar. The procedure is easily followed. Simply heat the

part to glowing red, dip the part in the compound, reheat it to red once again, and quench in oil. The compound is water soluble so the compound can be easily cleaned from the part after it has cooled with water and a brush. As the accompanying photos here show, I was delighted with the results.

If you're looking for a winter project and have a hankerin' to put together a traditional style Longrifle, trade gun, or Hawken style rifle that will become a family heirloom, give the folks at Track of the Wolf a call and they can fix you up with something that will please you. AG

MEASUREMENT & INSPECTION

Anatomy of a Blow Up

Preventing problems posed from prodigious pressures.

BY ROBERT K. CAMPBELL MAY 2021

ORIGINAL PP. 18-21

Gunsmiths are often asked quite a few questions concerning gun safety. One concerns the safety margin built into a modern rifle. I have a good idea, but I am not going to contribute to the delinquency of a handloader. I have inspected quite a number of damaged or blown firearms. Without exception, they were ammunition related. Just the same, some blowups are related to what I call an “accommodating chamber”, one relieved too much and which allows too-rapid and too-extensive cartridge case expansion.

These chambers may not necessarily lead to a firearm blow up, such as when a cartridge case ruptures and allows gas into the magazine but without damaging the firearm. It’s worth asking the shooter for their opinion of what caused the incident as apart of your diagnosis. A blow up can be very subjective and this is especially true if the situation may lead to a court case. To illustrate, let’s look at several of the incidents I have encountered.

Although I am confident I understand what caused these blow ups, I can not be completely certain what actually happened as I wasn’t there and only evaluated the result. In one case a customer brought in a Kimber Custom II for a trigger job; a nice pistol, well finished, and it didn’t require much work to have it in top form. I fired a single round of the customer’s supplied ammunition and the firearm kicked much more than expected. I foolishly fired another round.

It again functioned well but there was tremendous recoil. I ran a third round over the chronograph and recorded a speed of 1202 feet per second—stout even for a 45 Super! This was a good 200 fps over what I would expect from a 230 grain JHP at +P level in the 45 ACP. I used a bullet puller to break the load down. The projectile was a 230 grain Hornady XTP. Along-standing standard +P loading for this bullet weight generates 1000 fps average.

I checked with the owner and his quoted powder charge of was correct for a +P. The problem here—and we have to learn something about ammunition and handloading to really examine this problem—was that the overall loaded length was much shorter than the prescribed 1.250 inch. Definitely error by the shooter made while handloading. The spent cartridge cases were recovered and demonstrated flat- The sidewalls usually give first. Tented primers, a sure sign of excess loading.

All of the handloads were pulled and the shooter corrected the overall length problem. He was lucky. Would a lesser gun than the Kimber have blown up? Who knows, but the next Kimber may have broken into pieces. Despite modern manufacture, every pistol isn’t molecularly identical to the other. My bet is on the Kimber, however. I think that a simple answer to what blows guns up is that the pressure or burning gas is constrained, it cannot bleed off as quickly as it needs to.

When pressure begins to build, bullet pull is important. The bullet must have sufficient pressure—referred to as bullet pull—to contain pressure long enough for the pressure to build. Otherwise there will be erratic ignition. For example, this is why a 110 grain 357 Magnum bullet cannot be driven as fast and accurate as a 125 grain bullet. If there is any type of obstruction the pressure stops moving and must go somewhere.

If it burst the case that is one thing, but if the case is adhered to the chamber while remaining intact and the bullet is still in the barrel with pressure beyond specification, the barrel may burst. This generally occurs with rifles more than handguns. One problem is using a charge of fast burning powder rather than a charge of slow burning powder in a revolver. Fast pressure curves and a heavy bullet that slows movement is a recipe for a blow up. Older ammunition is always suspect.

As an example, I examined a vintage 351 Winchester rifle. All was well, and a limited amount of firing showed the rifle

ANATOMY OF A BLOW UP CONTINUED

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was in great condition, however, several cartridge cases had split on firing. The ammunition fired every time and the rifle functioned but by my estimate the ammunition was about seventy-nine years old. The correct answer was to tell the shooter to stop firing that ammunition as some of the cases had split, and there is always a chance for a worse split or head separation. There is also the chance of overpressure loads in older firearms.

Even if they were fine to begin with, temperature changes may change how the powder develops pressure. Obviously, black powder firearms should be used only with black powder cartridges or those rated as equivalent. Even modern ammunition isn't as reliable when it comes to steel case loads. One common problem is misinformation from the Internet. Folks with older 8mm Lebel and 7.62 Nagant revolvers are told that they may fire various revolver cartridges of .32 caliber in these chambers.

Sure they split, but the cartridges aren't very powerful and it is safe—so they are told. Nothing could be further from the truth! Any time a case cracks it is bad news. Another problem actually instigated by advertising is the “accommodating chamber” of the 9mm Largo. Only 9mm Largo should be fired in the chamber. The 9mm Luger may move too far into the Largo chamber and might burst. The 38 Super is far too powerful for the 9mm Largo.

A second example, This blow up occurred with along time shooter I would characterize as a careful hand-loader. He was firing a High Standard 1911 45 ACP

manufactured by Armscor. He fired several Far They are suspect at the least. shots and then it happened: the cartridge case head shredded, blowing into the magazine well. Thankfully, the shooter had glasses on, but he received brass to the face.

The shooter was not badly hurt but his face was pocked (his wife picked the brass out with tweezers) and his hand was burnt with powder. The magazine was wrecked and the baseplate, spring, and follower were never found. The pistol was brought to me along with a few rounds of ammunition both from the magazine and the remaining box of ammo used. The High Standard 1911 wasn't damaged, only the slide stop was pushed out and it clicked back into place.

I thought the ejector was loose but the owner said it had always been that way. The frame was blackened. I examined the ammunition that was found laying on the ground. One had the bullet jammed back into the case. It was also blackened by powder and I felt the force of the explosion could have forced the rounds back into the case. The others appeared normal. I pulled the bullets and the powder charge was fine.

While gun powders are difficult to identify by eye, but these loads appeared to match the shooter's powder samples. However, when I went to examine the box of handloads I discovered I could push the bullets into the cartridge case by finger pressure. There was insufficient case mouth resistance. It appeared the shooter failed to Far Pressure was at a dangerous level.

ANATOMY OF A BLOW UP CONTINUED

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A shooter purchased an older Colt 1911, fired a 38 Super, and the case exploded, more or less. The pistol was marked 38 Super but the barrel was chambered in 38 AMU, a rimless 38 Special intended for lower pressures. apply a proper crimp. Taper and roll crimps for automatics and revolvers differ. In this instance the culprit was handloading procedure. During the feed cycle the insufficient crimp let the bullets be pushed into the case, resulting in a tremendous rise in pressure and a blown cartridge case.

I put the pistol back together. Anew magazine was needed but the magazine catch was not damaged. The barrel, chamber, and feed ramp were all were undamaged. The pistol was cleaned thoroughly. Under magnification there were no cracks, not even any deep

scratches. I placed the piece in a fixture I have used for years and stood behind a barrier and fired by remote attachment with along pull rope. The pistol fired and locked back normally. In this instance all of the force blew downward and the handgun was not damaged.

A clean bill of health! I have also examined two blown 10mm pistols with polymer frames, both with handloads. The owners had been loading for the 10mm Delta Elite with seems to have had issues with longevity, largely due to the earliest recoil rod and spring designs. The Glock will run forever perhaps, but it can not stand the same loads as the Colt and were wrecked by loads used in the Delta Elite with no problem.

The same situation occurred with a shooter using a heavy 260 grain 45 ACP bullet in a Springfield without issue, but the same loads cracked the locking block of his 45 ACP Glock. A different case involved 10mm loads that had been used without issue in a different gun but cracked the frame of a XD Series 10mm. Luckily, Springfield was able to refurbish that pistol with anew frame. The SIG P220 has a rather unsupported chamber.

In the days when the Speer 200 grain JHP with its stubby nose and huge cavity would not feed in any unmodified 1911, the SIG ran it well as well as many thousands of rounds with factory ammunition. However, the SIG, some Glock pistols, and

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others feature chambers that don't offer optimal support. A factory chamber may be said to offer full cartridge case support if it supports the case 0.05 inch into the case above the beginning of the extractor groove. I prefer a chamber supporting the cartridge case well down to the extractor groove. Some pistols feature a relieved area that makes for reliability with any type of bullet nose—what was once referred to as “exotic shapes”.

While there are very few instances with factory ammunition, using old load data with heavy SWC bullets or light bullets at high velocity into the unsupported chamber era has resulted in several spectacular blows. One SIG was an unusual example. When the shooter brought the piece to me for examination it was long after the fact. The spent cartridge case had not been retrieved and the blow up resulted in the right grip panel being damaged with the top of the grip panel blown completely away.

A trigger return spring was damaged and the magazine blown out the bottom and not retrieved. The shooter had been shook up and didn't pick up the ruined magazine or the spent cartridge. The case had been cleared on the spot and the shooter stated—with imperfect memory—it was easily cleared from the chamber. The magazine release was not damaged, surprising when you consider that the magazine was torn from the lock. The frame was cracked. I thought the location was odd.

The SIG features a steel insert of a frame block that isolates steel from aluminum as the pistol operates. I would have thought it would crack near the chamber or crack around the magazine catch as the magazine was bolted from the latch but the crack is higher than the magazine latch. The shooter brought the pistol in for an evaluation even though someone had told him to put the pistol back together with anew set of grips and springs and shoot it. I replied very much in the negative.

A pistol is a machine of irreducible complexity. With one part broken the rest will not work. There is a certain amount of flex in a frame (steel, polymer, or aluminum) and this flex cannot cycle correctly with a crack in the frame. There was some discussion of perhaps putting a 22 Long Rifle conversion on the frame but I advised to scrap the frame and mark it off to a lesson learned.

If welded the frame he could not ethically ever sell or trade the piece and probably would not be comfortable firing the pistol after his earlier experience. Handgun blowups are not terribly common but neither are they rare. We usually don't have a chance to caution shooters before they make a mistake. When working with a blown gun let caution be your guide. Most should be scrapped and mined for the parts. AG

FROM THE ARCHIVE

Where Are You Going?

An overview of getting into the gunsmithing profession.

BY BILL SMITH MAY 2021

ORIGINAL PP. 22-23

To understand where we gunsmiths are going, we should best try to understand who we are for the word “gunsmith” is bantered about quite easily. Almost anyone can get an FFL or take an online course classifying him as such. One can take a correspondence course and be a “Gun Expert” in six months—so it is claimed. Unfortunately, these courses cannot put brains or experience in the ends of your fingers.

You might be able to read the lessons but if you have no experience—and that gained hopefully as an apprentice—you are ill-equipped, even though you have a diploma to work as a gunsmith. Most of these correspondence schools also have law courses. Interestingly, none of them admit you to the Bar and I certainly wouldn’t hire a six months “Law Expert” to defend me, if need be, against the IRS or BATFE. No clear thinking person would.

The same is true of the “yesterday I couldn’t spell the word, today I am one” gunsmith. If any of us owe anything to ourselves and to the public we owe competence and experience, or in other words, credibility. A file, hammer, vice, and bench does not a gunsmith make. A background of tool and die experience plus knowledge of actions, stocks, ballistics, and the hand making of parts is a must for basic gunsmith education.

This knowledge and experience is what brings you from the \$30 botched job to the \$80 excellent job. You can’t give it unless you’ve got it. Today, with the huge number of how to books in the gun field (to say nothing of the “Whirled Wild Web”) one can build a library of information. Diligent reading and study will gain a smattering of

gun knowledge. While books, courses, and online resources are certainly helpful, they can never establish qualifications.

Beside my personal learning, I am also thankful these sources of information exist because they constantly bring me work. It’s the difference between adding additional knowledge to an already-established base and “instant expert”. Someone becomes an instant expert, takes a gun apart, and maybe sticks in an aftermarket part. That’s easy enough, but repair and re-assembly is a different story, never mind good custom work.

Lacking solid expertise and deep understanding, many end up taking that project into an actually qualified gunsmith. It is regrettable that each fulltime gunsmith cannot afford to hire an apprentice because it would mean a constant resupply of qualified people. This is probably the case if your local market is not large enough to support more than a one-man operation. To pay an apprentice a living wage today and start to train him is an impossible situation.

Any potential apprentice willing to put in the work at minimal salary will likely end up leaving and opening up his own shop. The qualified gunsmith has to compete with the gunsmith schools turning out gunsmiths, gun books and courses, and many of them ending up working cheaper than you do. Few would-be gunsmiths realize the out-of-pocket, up-front money required.

I estimate that to start a one-man shop in a home-based workshop would require a layout of at least \$5,000, assuming he steals (or, preferably, already owns) a lathe, drill press and/or mill, and a few

other items. Depending on the ability and sophistication of the shop, this start price could easily be higher. If one is thinking about opening a shop in a retail store area, the overhead costs rapidly increase.

A low rent area will easily cost \$1,000-\$2,500 per month when one adds up rent, lights, phone, water, insurance, advertising, and this doesn’t take tools, fixtures, and shop maintenance into account. Annual lease rates of \$10-\$25 per square foot is common in retail areas. A 2,000 square foot gunsmith shop on the low end of this range might lease at over \$1,500 per month. Without getting into working days per month, consider what these amounts require just for overhead costs.

If one uses four weeks in a month you have a \$375 per week nut to crack. Break that down into a five day week and you have to be assured of at least \$75 per day just to keep the lights on and not pay yourself or eat. Gunsmith businesses should not be started unless the prospective operator knows his market. This is impossible to determine exactly for no one knows how many broken guns there are in any area and how many will actually come in.

Oh yes, the first few months will likely see pretty good activity and the phone will ring off the hook but what will really count is the actual number (and price) of the jobs that walk in the door. If you are not qualified and turn out poor work it will soon catch up with you. However, if you are good and can do the work right with efficiency, your next problem is turn around time. You don’t get paid until the job is done and 100 jobs ahead do you little good if you can’t turn out the goods on a daily basis.

WHERE ARE YOU GOING? CONTINUED

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Imperfect markets favor the person with the most knowledge and experience. Used guns are an imperfect market and good gunsmiths are in the best position for a good deal. In addition, gunsmiths can clean, refinish, and/or repair that low-cost used gun and turn it around for a profit. Besides shop work, this is where gunsmiths should focus business.

What you should realize by now is that just because you are a good workman, know and love guns, and enjoy working on them, that if you do not know your market, understand costs, profits, and other business issues, you are doomed. Michael Gerber, author of *The E-Myth Revisited*, would identify such a person deciding to open and run a business as “a technician suffering an entrepreneurial seizure”. Running a good business requires being good at business, regardless of what that business does.

Gunsmithing is an art and a business. Your product is your craftsmanship which demands being an artist. For your shop to flourish, you must also be a businessman. And those of you who are doing it part time are not an exception. Many (too many) would-be gunsmiths and even those who are good gunsmiths think they can stack retail space in their shop with accessories and guns and make a killing. Baloney. Know of what you speak and let me lead you out of this temptation.

You can't compete with the chain stores for prices on guns, scopes, and ammunition. That is the first rule. The second rule is to never forget that first rule. If you stock guns or other retail items and have, say, an inventory of \$50,000.00 worth and if you sold each one at full retail, you might gross 24%. Let's call it 25% and look at your gross profit of \$12,500. If it took you a year to sell all that you grossed \$1,000 per month—big deal, especially after you factor in the cost of your retail space.

And this assumes you always stock items that always sell and always at full retail. The reality is you'll have to mark slow-selling items down to move them to get some of your cash back for other retail items that do. Now, consider the buying power large shops and chain stores have and the fact they can move slow-selling inventory to a different outlet where it will sell. Never mind the online buying options.

At the end of the day, your new retail item is no better than the same thing in a different store, so competing on price is the primary distinguishing buying factor. Oh, you say, your customers prefer to buy from a gunsmith shop? Where is that one written in stone? What really happens is that a prospective gun buyer will look at a gun or other item in your shop. You will spend time away from the bench trying to sell it and he can ultimately decide to go buy it for less at Walmart.

It is not rare I'll end up seeing him later when he needs some work done because it's not as if their cashier that rung up the purchase can do it. If you insist on selling new guns, I'd recommend working in a package deal for a discount on any future repair work to offset your necessary higher retail price. But I'd rather you didn't insist. If I were to make one rule for gunsmiths regarding new guns it would be to just say NO. Used guns are different. Many people will sell you a gun outright.

This is where the negotiator (or bandit) in you comes out. Unlike new guns and retail items, used guns are an imperfect market because pricing varies depending on a host of conditions, such as the gun's current condition, state of the local market, among others. Take a few minutes to explain this can create good deals for you, allowing purchases that can lead to 50-100% profit. As with any imperfect market, the person with the most knowledge and experience is in the best position for a good deal.

In addition to your knowledge, you can fix a clunker and resell it for much more. This is where the money in gun sales is best found for a small, independent gunsmith. Advertise that you want old, broken guns and buy them based on that criteria (i.e., cheap!) and then clean, fix, and resell them. It's possible a person will come in for an estimate for gunsmith work which may be more than the owner wants to pay and will instead offer the gun to you for a price. Negotiate and get the used gun.

One good way I use to compete with the chains and discount houses is to offer to my customers the ability for them to buy any new gun from a wholesaler or Internet retailer at my cost (listed purchase, and actual shipping and sales taxes) with only \$30.00 added for my ordering and FFL transfer fee. All cash up front. This requires no up-front investment for me and minimal paper work. For my time invested, it's more than my standard hourly rate, pure gravy and no stock waiting on my shelves.

I stay away from cleaning kits, gun cases, gun oil, and other small retail items. I sell gunsmithing, used guns, and FFL transfers—that's it. When the day comes I can't sell these then I will get a job as a stock clerk with Brownells. So where are we going? The competent, experienced, independent gunsmith is probably dying off. The exotic pistolsmiths will get larger. The discount stores will sell the majority of common retail items as well as guns and ammo. However, we still have a few things in our favor.

We can recount those scopes, sell some used guns, do repair work, refurbish, and reblue. We simply have to do it all well, quickly, and at a price comparable to the plumber, electrician, doctor, and lawyer. AG

MACHINING

Reader Forum

BY AMERICAN GUNSMITH EDITORS MAY 2021

ORIGINAL PP. 24

While I haven't tried testing the forward assist method, the bread crumbs just weren't luring me in that direction. Had the guys who were experimenting with that modification to Doug's technique been coming back with rave reviews and saying they were getting tighter groups I would have been motivated to try it on the machine rest. However, none of this precludes you from trying some groups with both methods and reporting back.

If you do pursue testing, write it up for publication here and contact me directly at NCC1701@penn.com. AG

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