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INSIDE THE ARCHIVE

WORKING THE ASTRA 400/1921

AUTOMATIC TOOL CHANGER • BULLPUP AND ELECTRIC TRIGGER, PART 2 • SHOP-MADE LAPPING TOOL • EFFECTIVE SCOP...

ORIGINAL METHODS. MODERN ACCESS.

ARCHIVE EDITION 228

DIGITAL ARCHIVE EDITION

Preserved for the bench.

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MACHINING

Automatic Tool Changer

BY AMERICAN GUNSMITH EDITORS DECEMBER 2022

ORIGINAL PP. 2

Located in Madison, Wisconsin, Tormach Inc. makes CNC equipment ideal for small shops. Their goal is to make top-line CNC automation more affordable. The new Automatic Tool Changer for the Tormach 24R CNC Router is an example. The Tormach 24R CNC Router is a robust CNC router starting at \$15,000 and is designed to accurately cut a wide variety of materials including woods, plastics, aluminum, and more.

With an advanced control, rigid cast-iron bed, welded steel stand, water-cooled chiller, integrated vacuum table, and more than a 2' x 4' work envelope, it can handle 2D and 3D cutting needs. With the Automatic Tool Changer, tools can be changed automatically after programming the design into Path Pilot. This is especially useful with projects that require handling a variety of work materials.

Key specifications of the ATC include spindle specs of 1.5 kW, 10,000- 24,000 rpm, an ISO20 spindle taper, integrated power drawbar with open sensor, positive air pressure spindle nose seal, and liquid cooling. The repeatable tool lengths provide faster tool changes. The new lifting dust shoe feature allows users to check the router's cutting action while the machine is running and leading into a cut.

The ATC Rack has a ten-tool capacity with a maximum tool diameter of 1.75" and maximum tool gauge length of 4.25". "The new ATC is designed for maximum efficiency," said Reid Halvorson, Lead Engineer for the 24R ATC. "It makes operators' lives easier by giving them the ability to multitask.

And since the machine can automatically change tools, it reduces potential operator errors as well as scrap parts." As with all Tormach products, customers will receive free remote technical support via email, phone, and video chat. Visit Tormach.com or call

ORIGINAL SOURCE PAGE

2

MAINTENANCE & REPAIR

Working The Astra 400/1921

thousands of these noteworthy handguns are in American collections.

BY BRIAN R. SMITH DECEMBER 2022

ORIGINAL PP. 3-9



Right: The commercial Astra 400 pistol chambered in 9mm Largo was adopted by the Spanish government as the Model 1921. About 130,000 Astra 400/1921 pistols were made from 1920-1950. It's a heavy pistol and noteworthy because it is blowback operated instead of locked breach as was the case with so many of its contemporaries.

ORIGINAL ARCHIVE IMAGE • PERMISSION CONFIRMED



Left: Use a non-marring tool to press the thin forward end of the barrel bushing against recoil spring force to unlock the knurled barrel bushing lock, allowing it to be rotated 90 degrees to permit its removal forward and out of the slide. An empty 450 Marlin brass case serves the purpose here. Be sure to apply considerable counterforce to control the extremely strong recoil spring to prevent its launch.

ORIGINAL ARCHIVE IMAGE • PERMISSION CONFIRMED

In 1920, the Spanish government began trials for evaluation of anew pistol for its army to replace the 1913-1916 Campo-Giro. Two entries were considered: a Star pistol, essentially a 1911 Colt clone made by Bonifacio Echeverria and Co. of Eibar, and the Astra Model 400, a commercial handgun made by the firm Esperanza y Unceta y Cia. (Esperanza and Unceta & Co.) of Guernica, both in the Basque region in northern Spain.

The testing was performed in late 1920 and early 1921 and the Astra Model 400, designed by Pedro Careaga, was officially adopted as the Pistola de 9 milímetros modelo 1921 (9 mm Pistol Model 1921). Its commercial model number is 400, and I'll use both designations in this article. The Astra 400/1921 has been considered an upgrade of the 1913- 1916 Campo-Giro pistol originally designed by Colonel Don Venancio López de Ceballos y Aguirre, the Count Campo-Giro.

It was a large blow-back action handgun chambered for the 9mm x 23mm Bergman-Bayard cartridge, called 9mm Largo by the Spanish. The Campo-Giro was also manufactured by Esperanza y Unceta y Cia., which perhaps gave them the inside track on the competition for the new Spanish pistol. About 130,000 Astra 400/1921 pistols were made from 1920-1950. It's a

heavy pistol and noteworthy because it is blowback operated instead of locked breach as was the case with so many of its contemporaries.

Regardless, the Astra 400/1921 was a very successful handgun, having been adopted by the Spanish Army, Carabineros (Customs and Border police), Navy, Air Force, and other organizations. Senor Esperanza left the business in 1926, after which it was renamed Unceta Y Cia and later Astra-Unceta & Cia.

During the Spanish Civil War of the late 1930s, Astra 400/1921 pistols were supplied to left wing Republican forces who occupied the region around Guernica, to the Basque independent region of Euskadi in which was located the Astra plant, and later were produced for right wing Nationalist forces after they captured Guernica.

The Republican government made about 23,000 copies of the Astra 400/1921 in two factories in eastern Spain, one in Terrassa just northwest of Barcelona, and in a converted textile plant in Valencia. The 8,000-some Terrassa pistols were marked "F. Ascaso" in honor of Francisco Ascaso, a Republican hero of the Civil War. The 15,000 Valencia-made copies were marked An empty 450 Marlin brass case serves the purpose here.

Be sure to apply considerable counterforce to control the extremely strong recoil spring to prevent its launch. "RE" for Republica Española (Spanish Republic). These are uncommon, as are Carabineros, Naval, and Air Force marked examples. Following the Civil War, Astra continued to make 400/1921 pistols for Francisco Franco's victorious Nationalist dictatorship government, and 6,000 of them for Nazi Germany.

Astra continued commercial production until 1950, four year after the Star Model A became the official Spanish armed forces handgun and the Model 1921 was relegated to surplus/substitute standard status. A total of around 106,175 Astra 400/1921 pistols were made, with an additional 23,000 or so Republican "F. Ascaso" and "RE" copies. The Spanish military inventories of the Model 1921 were sold to civilian wholesalers between 1956 and 1965, and again sporadically in the late 1990s, 2000s, and 2010s.

The largest quantity of these were purchased by the famous Sam Cummings of International Armament Co. (later Interarmco and Interarms) in the mid to late 1960s. Sam Cummings is a story unto himself. It has long been claimed that one of the unique characteristics of the Astra 400/1921 pistol was its alleged

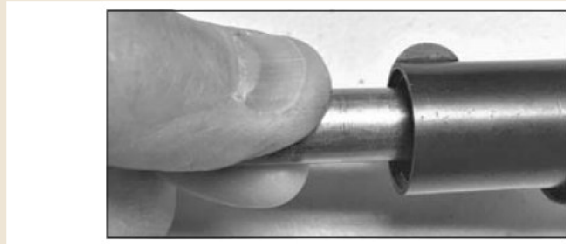
WORKING THE ASTRA 400/1921 CONTINUED

ORIGINAL PAGE 4



Above: With the recoil spring removed, pull the slide to the rear approximately 1.25" and engage the safety catch in the rearmost notch hidden in the slide. This is the configuration necessary for removal of the barrel from the frame and slide.

ORIGINAL ARCHIVE IMAGE • PERMISSION CONFIRMED



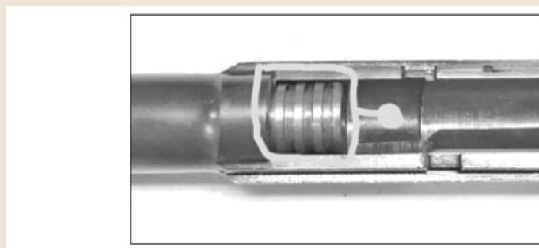
Left: With the safety engaged in the rearmost slide notch, the barrel now projects from the front of the slide. Grasp the serrations and rotate the barrel counterclockwise as far as it will go, a bit more than 90 degrees. The slide and barrel can now be withdrawn forward off of the frame.

ORIGINAL ARCHIVE IMAGE • PERMISSION CONFIRMED



Left: The Astra 400/1921 is shown field stripped. From the top, barrel bushing lock, barrel bushing, recoil spring, slide (underside shown), barrel, and frame.

ORIGINAL ARCHIVE IMAGE • PERMISSION CONFIRMED



Left: The Astra 400/1921 is shown field stripped. From the top, barrel bushing lock, barrel bushing, recoil spring, slide (underside shown), barrel, and frame.

ORIGINAL ARCHIVE IMAGE • PERMISSION CONFIRMED

25" and engage the safety catch in the rearmost notch hidden in the slide. This is the configuration necessary for removal of the barrel from the frame and slide. ability to chamber and fire a variety of cartridges other than the 9mm Largo. Three generations of gun writers have perpetuated this myth, which Sam Cummings initiated in advertising the Model 400/1921 pistols in the 1960s when 9mm Largo ammunition was next to impossible to find in the United States.

Interarmco ads stated that the Astra 400 was designed with a flexible "accommodating" chamber which could accept not only the 9mm Largo, but also the 38 Automatic (38 ACP, predecessor to Rotating the barrel disengages the barrel lugs from mating lugs in the frame.

The Astra 400/1921 is a blowback action pistol, and in the fully assembled configuration the barrel is fixed to the frame by the lugs. the 38 Super), the 38 Super, and 9mm Parabellum (9x19), as well as 9mm Bergman-Bayard (same as the 9mm Largo), and the 9mm Steyer. A. F. Stoeger imported several hundred Astra 400s in the 1950s, and they had the Unceta factory stamp "Super Power .38" on the left side of the slide at the rear.

Still chambered for 9mm Largo, but was the "Super" and "38" stampings intended to make a subliminal message to the owner/buyer? Personally, I don't think it was a coincidence. This was pre-GCA 1968 time and Astra 400/1921 pistols could be mail ordered directly at prices ranging from just over \$10 to just under \$20. American shooters and collectors took Cummings' outrageous marketing claim as gospel and fired 38 Auto (ACP), 38 Super, and 9x19 in their Astras with mixed results.

Feed and firing issues with the 9x19 were common because the 9x19 case was 4mm shorter than the 9mm Largo case, which headspaced on the case mouth. That the 9x19 fired at all was a function of the Astra's beefy extractor and its ability to hold the 9x19 case against the breech face which enabled the Astra's firing pin to set off those cartridges. Grasp the serrations and rotate the barrel counterclockwise as far as it will go, a bit more than 90 degrees.

The slide and barrel can now be withdrawn forward off of the frame. References show that the 9x19mm standard round's pressure is higher than that of the 9mm Largo, but the real danger is from the 38 Super and its considerably higher pressure. Even worse is the Winchester 9x23. The 38 Super case was the same length and very similar in other critical

dimensions to the 9mm Largo such that it would usually chamber in the Astra 400/1921 pistols.

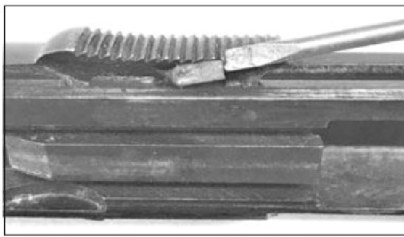
Repeated use of 38 Super, 9x19, and later 9x23 Winchester, 38 Super +P, and 9x19 +P ammunition led to instances of cracking of the slides of Astra pistols so abused. These cracks were manifested at the front and rear of the tubular slide, at or near the safety engagement notches on the left side of the frame, and the forward lower corner of the ejection port on the right side. Some slides were seen to crack almost in half at or near the ejection port.

The "flexible chamber" and the capability to fire different cartridges was pure marketing hogwash. Unfortunately, the story got told and retold; there is an American Rifleman short blurb online from 2006 in which an AR "expert" listed all the cartridges the Astra 400/1921 can allegedly fire, and as of this writing in 2022, the Wikipedia listing for the Astra 400 states "...A powerful pistol, original 9mm Largo Spanish military loads were on a par with 38 Super factory loads." Not true; not even close.

To illustrate the fallacy of the "flexible chamber," I like to draw From the top, barrel bushing lock, barrel bushing, recoil spring, slide (underside shown), barrel, and frame.

WORKING THE ASTRA 400/1921 CONTINUED

ORIGINAL PAGE 5



Left: The extractor and spring are shown removed from the slide with the short L-headed retaining pin beneath the slide. Note that the extractor is serialized.

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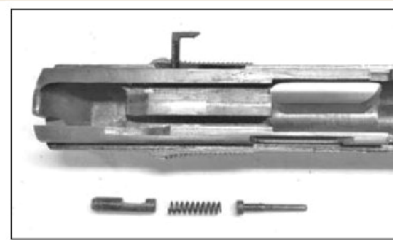
Left: The extractor and spring are shown removed from the slide with the short L-headed retaining pin beneath the slide. Note that the extractor is serialized.

ORIGINAL ARCHIVE IMAGE • PERMISSION CONFIRMED



Left: No. 2 pencil points to the firing pin which has been inserted into the hole slightly beneath the trigger bar following compression of the hammer spring with an awl or other tool. The firing pin keeps the hammer plunger and hammer spring compressed and removes force from the hammer strut, allowing the hammer pin and hammer to be removed. The hammer is shown in the forward position, ready for its axis pin to be pushed out.

ORIGINAL ARCHIVE IMAGE • PERMISSION CONFIRMED



Left: No. 2 pencil points to the firing pin which has been inserted into the hole slightly beneath the trigger bar following compression of the hammer spring with an awl or other tool. The firing pin keeps the hammer plunger and hammer spring compressed and removes force from the hammer strut, allowing the hammer pin and hammer to be removed. The hammer is shown in the forward position, ready for its axis pin to be pushed out.

ORIGINAL ARCHIVE IMAGE • PERMISSION CONFIRMED

The Astra 400/1921 employs four such L-pins for ease of take down. the comparison with the concept of firing 40 S&W cartridges in a semiautomatic pistol chambered for the 10mm round. Who would do that? To my knowledge, no one has advocated such a practice.

Unfortunately, it's the same as loading a 9x19 cartridge in a pistol chambered for the 9mm Largo, and there are some current-day gun writers, particularly younger ones who contribute to Interwebz sites, who keep repeating the Astra 400/1921 multi-cartridge chamber legend. The take away: The Astra 400/1921 is chambered for the 9mm Largo, period. Advise your customers, gun club mates, and range acquaintances to NEVER shoot any ammunition in an Astra 400/1921 other than 9mm Largo.

The legend was just marketing. When assembled, the firing pin is inserted into the firing pin spring. hype by an arms merchant who had thousands of pistols for sale with no ammunition. And we all know how hard it is to sell a firearm for which no ammunition is readily available. Disassembly Moving on to the subject pistol and its take down, first remove the magazine and rack the slide to ensure that the pistol is not loaded and no cartridge is chambered.

Next, take a rigid nonmarring tool and push in on the thin circular collar of the barrel bushing surrounding the barrel and protruding past the knurled barrel bushing lock. With the barrel bushing pushed in, rotate the knurled barrel bushing lock 90 degrees in either direction to align its lugs with slots in the slide.

Note, the recoil spring is extremely forceful in the Astra; make sure you apply sufficient counter force to restrain the spring, barrel bushing, and knurled bushing lock as you allow the recoil spring to decompress. Set aside the barrel bushing lock, barrel bushing, and recoil spring. Retract the slide such that the rear end of the frame is approximately in line with the flared bosses at the rear of the slide grasping grooves and engage the safety lever into the rear of two slots in the slide.

This positions the slide and barrel for removal of the barrel. To do so, rotate the barrel clockwise a bit more than 90 degrees to disengage the barrel lugs with mating lugs in the frame, and "park" the barrel's lugs into a mating recess in the slide, which allows removal of the slide and barrel from the frame off to the front. The Astra shares this lugged, fixed barrel design with that of the M1903

Colt and other pistols which prolifically copied that feature, including the Spanish "Ruby" pistols.

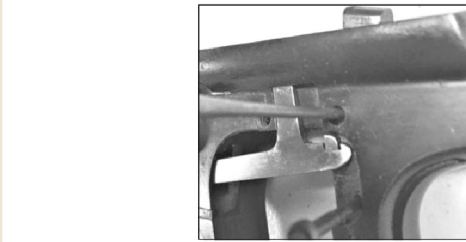
The slide is disassembled by removing two L-headed pins found in a groove in the right side of the slide behind the ejection port. The shorter front L-pin acts as a pivot for the extractor, and the rear, longer L-pin retains the firing pin extension, firing pin, and firing pin spring. These pins are readily lifted out of the groove by prying with a jeweler's screwdriver or some other suitably sized tool.

Be sure to restrain the extractor and firing pin extension when removing the respective Lpins because both are under compressed spring force and you want to avoid an inadvertent launch. To disassemble the frame, first remove the grip panel screws and grip 2 pencil points to the firing pin which has been inserted into the hole slightly beneath the trigger bar following compression of the hammer spring with an awl or other tool.

The firing pin keeps the hammer plunger and hammer spring compressed and removes force from the hammer strut, allowing the hammer pin and hammer to be removed. The hammer is shown in the forward position, ready for its axis pin to be pushed out.

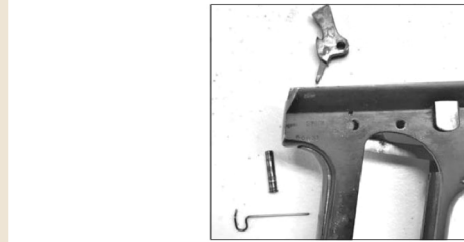
WORKING THE ASTRA 400/1921 CONTINUED

ORIGINAL PAGE 6



Above: A punch is shown drifting out the hammer axis pin from left to right. The hammer is loose, because the hammer spring force is restrained by the firing pin that was inserted in the takedown hole beneath the rear of the trigger bar.

ORIGINAL ARCHIVE IMAGE • PERMISSION CONFIRMED



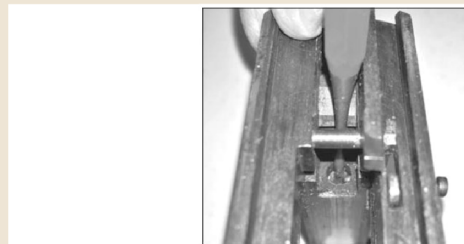
Left: The hammer assembly, headed hammer axis pin, and wire slide stop spring are shown removed from the frame. The loop on the slide stop spring rests under the head of the hammer axis pin, and the straight end of the spring projects into a hole in the slide stop.

ORIGINAL ARCHIVE IMAGE • PERMISSION CONFIRMED



plunger. Remove the firing pin (projecting out at right) using the same or similar tool. Slowly ease up on the punch to decompress the hammer spring. Left: A screwdriver blade is shown levering the hammer spring and hammer plunger up and out of the frame. Those components in this particular Astra 400/1921 needed such persuasion because of years of accumulated schmutz that effectively retained them in their recess in the frame.

ORIGINAL ARCHIVE IMAGE • PERMISSION CONFIRMED



Below left: Remove the hammer plunger and hammer spring from the frame with an awl or punch to apply counter force against the hammer

ORIGINAL ARCHIVE IMAGE • PERMISSION CONFIRMED

The hammer is loose, because the hammer spring force is restrained by the firing pin that was inserted in the takedown hole beneath the rear of the trigger bar. panels. I recommend that the hammer be removed next, because that entails unloading the powerful hammer spring and lowering the frame's state of potential energy. To do so, move the hammer to its forward, uncocked position by reinserting the magazine to move the magazine safety lever out of the magazine well and allow the trigger to be pulled.

Restrain the hammer when doing this so that it does not snap forward against the frame crossmember. Once the hammer is forward, select a punch or awl and apply counter force to the cupped hammer plunger which acts as the seat for the hammer strut. I find an awl with its rounded handle is convenient. With the bottom of the frame against the bench, continue to apply force to the hammer plunger until the firing pin or another small punch can be inserted in the takedown hole in the side of the frame.

Withdrawing force on the awl will allow the hammer plunger to rest against the firing pin or other tool, removing any force from the

hammer. Take a punch and drive the hammer axis pin out the right side of the frame. The right end of the hammer pin is headed and retains the loop in the rear end of the wire-form slide stop spring. With the hammer pin partially out of the frame, the slide stop spring can be removed using a small needle-nosed pliers and set aside in the parts tray.

Push the polished in-the-white slide stop on the right side up through the top of the frame and set it aside too. Finish pushing out the hammer axis pin and then remove the hammer and its attached strut.

Take up the awl or punch again, apply counter force to the hammer plunger so that the firing pin or other The loop on the slide stop spring rests under the head of the hammer axis pin, and the straight end of the spring projects into a hole in the slide stop. tool can be removed from the take down hole, then carefully ease off the awl and allow the hammer spring to extend fully. Use a small screwdriver to lift the hammer spring and hammer plunger at the top, and magazine catch plunger at the bottom.

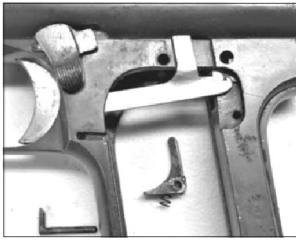
Another L-headed pin is located behind the trigger and beneath the trigger bar and retains the magazine safety. This pin has along L-shaped head, and the L-pin on which the trigger pivots has the same body diameter but a shorter length "L" head. It helps to start these pins out with a small diameter punch and a couple light taps from the right side, and then a small screwdriver or needle-nose to lever them out from the left side.

Once the magazine safety L-pin is removed, take care to lift out the magazine safety lever and its coil spring beneath. The rotating pistol safety catch is removed next by ensuring it is in the disengaged position and by pushing on the "button" end on the right side with a brass punch. There is a detent plunger and spring in the frame that serve to retain the safety catch, so plunger. Remove the firing pin (projecting out at right) using the same or similar tool.

Slowly ease up on the punch to decompress the hammer spring. Those components in this particular Astra 400/1921 needed such persuasion because of years of accumulated schmutz that effectively retained them in their recess in the frame.

WORKING THE ASTRA 400/1921 CONTINUED

ORIGINAL PAGE 7



Above: Another L-headed pin located behind the trigger and beneath the trigger bar retains the magazine safety, which is shown in the center of the grip window. This pin has a long "L" and is shown beneath the trigger guard. None of these pins are identical, so it is recommended that they be kept with their respective parts groups.

ORIGINAL ARCHIVE IMAGE • PERMISSION CONFIRMED



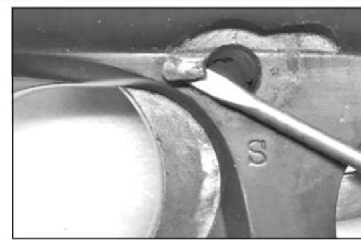
Left: The safety lever is removed by drifting it out from right to left using a non-marring punch. Note that the safety detent plunger and spring are located in a blind hole in the right of the frame. Use a small screwdriver to lever the spring and plunger out the hole in the right rear of the frame lug area.

ORIGINAL ARCHIVE IMAGE • PERMISSION CONFIRMED



Left: Grip safety and magazine catch are retained by two pins; the lower is hidden beneath the lanyard loop and is driven out from left to right. Use a small diameter punch as shown to start the magazine catch pin out to the right. The magazine catch pin is headed and is readily pried out from the right.

ORIGINAL ARCHIVE IMAGE • PERMISSION CONFIRMED



Left: Grip safety and magazine catch are retained by two pins; the lower is hidden beneath the lanyard loop and is driven out from left to right. Use a small diameter punch as shown to start the magazine catch pin out to the right. The magazine catch pin is headed and is readily pried out from the right.

ORIGINAL ARCHIVE IMAGE • PERMISSION CONFIRMED

This pin has along "L" and is shown beneath the trigger guard. None of these pins are identical, so it is recommended that they be kept with their respective parts groups. you need to overcome the force of the detent plunger in the mating recess in the safety catch. Use caution when pushing out the safety, because the punch will retain the detent plunger and spring as long as it remains in the frame.

Withdraw the punch carefully and place a finger over the hole in the top of the frame at the right rear corner of the lugged area to prevent a parts launch. Note that none of the four L-headed retaining pins in an Astra 400 are identical, so it is recommended that they be kept with their respective parts groups.

If they get mixed up It is removed using a small slotted screwdriver or other appropriate prying tool. you can sort it out eventually—but ain't nobody got time for that, and time is money, to load up the paragraph with metaphors. With the safety catch removed, the last of the four L-pins can be removed, this one being the trigger axis pin. As with the magazine safety lever retaining pin, start

the trigger axis pin out as mentioned above, then use a screwdriver or pliers to lift it out the rest of the way.

The trigger is connected to the trigger bar by a peened-over pin and the joint contains a torsion spring; disassembly is not recommended unless absolutely required. To remove the trigger and trigger bar assembly, you must rotate the top of the trigger forward against the torsion spring force in order for the trigger itself to pass through the window in the frame and into the magazine well.

Use of a small screwdriver through the top of the window in the front of the magazine well allows force to be applied to the top of the trigger to rotate it forward. In addition, the rear end of the trigger bar needs to be sprung slightly out of the shallow recess in which it rests with the pistol assembled.

With the trigger tilted forward at the top, carefully Use a small screwdriver to lever the spring and plunger out the hole in the right rear of the frame lug area. guide the trigger and bar assembly to the rear and out of the frame. To remove the magazine catch and grip safety, take a small diameter punch and hammer, and with the grip frame on a bench

block locate the small diameter pin on the left side of the frame beneath the lanyard loop.

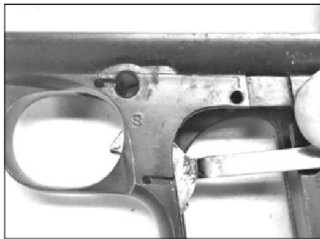
The punch will not align straight with the pin because the lanyard loop interferes, but you need only tap the pin out maybe 1/8" of an inch because the right side of the pin is headed and can be pried with a screwdriver, or grasped with nonmarring pliers and removed. With the small pin removed, next press out the larger diameter pin directly above it. The grip safety has a flat spring and may pop out of the frame along with the magazine catch, so it's best to control them as the larger pin comes out.

Reassembly Tips The trigger / trigger bar assembly is reinstalled in the same manner as which it was removed; the top of the trigger must be tilted forward against trigger bar spring force to be guided through the "window" in the frame, and the trigger bar must be kept relatively level, that is, extending straight back until its tail snaps into its recess in the frame. Use a small diameter punch as shown to start the magazine catch pin out to the right.

The magazine catch pin is headed and is readily pried out from the right.

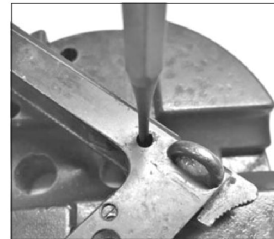
WORKING THE ASTRA 400/1921 CONTINUED

ORIGINAL PAGE 8



Left: For removal or reassembly, the rear end of the trigger bar needs to be “sprung” out of its recess in the frame to allow it and the trigger to be removed. The trigger must be tilted forward to pass through the slot in the frame. The assembly is shown here being reinstalled in the frame, but removal is the same.

ORIGINAL ARCHIVE IMAGE • PERMISSION CONFIRMED



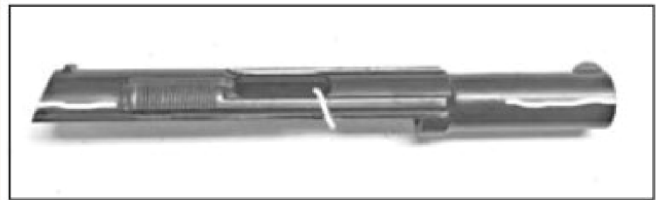
Above: The larger diameter upper pin retains the grip safety and is easily pushed out from left to right using a punch. The grip safety has a captured leaf spring on its inner side and will fly across the bench unless restrained. The magazine catch fits into a mating slot in the bottom of the grip safety. Once the grip safety is removed, the sear and sear spring can be removed forward and out through the grip windows.

ORIGINAL ARCHIVE IMAGE • PERMISSION CONFIRMED



Left: Cartridges shown left to right are 9mm Largo, 9mm Bergman-Bayard, 38 Super, 9mm Luger (9x19). The only two cartridges shown here for which the Astra 400/1921 is chambered are the two left-most: 9mm Largo and 9mm Bergman-Bayard. Do NOT use any ammunition other than 9mm Largo or 9mm Bergman-Bayard in the Astra 400/1921.

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Left: Cartridges shown left to right are 9mm Largo, 9mm Bergman-Bayard, 38 Super, 9mm Luger (9x19). The only two cartridges shown here for which the Astra 400/1921 is chambered are the two left-most: 9mm Largo and 9mm Bergman-Bayard. Do NOT use any ammunition other than 9mm Largo or 9mm Bergman-Bayard in the Astra 400/1921.

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The grip safety has a captured leaf spring on its inner side and will fly across the bench unless restrained. The magazine catch fits into a mating slot in the bottom of the grip safety. Once the grip safety is removed, the sear and sear spring can be removed forward and out through the grip windows.

For reinsertion of the trigger axis pin, which is the small diameter Lpin with the short “L”, use a small screwdriver as a lever through the trigger “window” in the front wall of the magazine well to get the trigger axis hole aligned with the hole in the frame, then insert the L-headed pin. The “L” section fills the recess in the frame for the pin head, and the head stops at the round bore for the safety lever shaft.

The sear and sear spring must be back in the frame before the grip safety and magazine catch are reinstalled. The sear and sear spring are The cracks can appear on either side of the slide; the crack at the forward end of the ejection port manifests in the left side of the frame in the safety notch. reinserted through either the left or right grip window in the frame. It may help to use small needle-nosed pliers or tweezers to guide the sear into place.

A dab of light grease such as Weapon Shield or RIG on the sear will reduce friction and smooth the trigger pull a bit. The short spring-loaded hinged fork at the top of the grip safety mates into the rear underside of the sear with a “snap.” Then swing the grip safety into the frame, and insert the upper end of the magazine catch into the lower end of the grip safety. Install the upper, larger diameter pin first, then drive in the lower, smaller diameter headed pin and tap it flush with a soft-faced hammer.

When installing the magazine safety behind the trigger, use a small punch to push the magazine safety down against its spring force so that its cross hole aligns with that in the frame, and install the other small-diameter L-pin, this one with the long “L” head that fills the rectangular recess in the frame.

After oiling the magazine catch plunger, hammer spring, and hammer plunger, reinsert them into the bore in the back of the frame, and use the small punch to apply coun- The trigger must be tilted forward to pass through the slot in the frame. The assembly is shown here being reinstalled in the frame, but removal is the same. ter force to the hammer spring such that the hammer plunger travels below the takedown hole in the frame.

Insert the firing pin or similar small diameter punch or tool to restrain the hammer spring components for re-installation of the hammer. After the hammer strut is in place in the hammer plunger cup, adjust hammer position so that the headed hammer axis pin can be inserted from the right. Just start the hammer axis pin into the hammer, then insert the slide stop in place from the top of the frame, and take the slide stop spring and insert its front end into the hole in the rear edge of the slide stop.

Slip the slide stop spring loop under the hammer pin head, and around the hammer pin body and align the short end of the slide stop spring with its hole in the right side of the frame. With the slide stop spring seated in place, then tap the hammer axis pin fully into the frame. The pin’s head captures the slide stop spring, and the right grip panel captures the hammer axis pin. Screw on the grips; this completes the frame sub-assembly.

To reassemble the slide, the shorter of the two L-pins retains The only two cartridges shown here for which the Astra 400/1921 is chambered are the two left-most: 9mm Largo and 9mm Bergman-Bayard. Do NOT use any ammunition other than 9mm Largo or 9mm Bergman-Bayard in the Astra 400/1921.

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Astra 400 (Specifications subject to change without notice) 1 Recoil Spring 2 Barrel 3 Extractor 4 Extractor Spring 5 Firing Pin Retainer Pin 6 Right Grip 7 Barrel Bushing Lock 8 Barrel Bushing 9 Slide 10 Safety Catch the extractor and its spring, with the "L" head pointing forward. Place the firing pin spring onto the forward end of the firing pin and insert them into the firing pin channel in the slide. The firing pin extension follows; make sure the notched end is inserted first.

Use a small needle-nosed pliers to rotate the firing pin extension so that the notch aligns with the hole for the longer L-headed pin. Once aligned, the pin is readily inserted into the frame.

The barrel is reinserted into the slide, and the lugged area is rotated 21 Hammer and Strut 22 Sear 23 Sear Spring 24 Extractor Pin 25 Trigger Pin 26 Trigger and Trigger Bar 27 Magazine Safety Pin 28 Magazine Safety Spring 29 Magazine Safety 30 Frame 11 Safety Detent 12 Safety Spring 13 Firing Pin Spring 14 Slide Stop 15 Slide Stop Spring 16 Firing Pin 17 Firing Pin Extension 18 Hammer Pin 19 Hammer Plunger 20 Hammer Spring 31 Left Grip 32 Grip Screws (4) 33 Grip Safety Pin 34 Magazine Catch Stop 35 Magazine Catch Pgr. 36 Magazine Grip Spring 37 Grip

Safety 38 Magazine into the recess in the top of the slide to allow the barrel/slide assembly to be slid back on the frame rails.

Use this time to apply a few drops of gun oil or light grease to the frame rails. When installing the barrel/slide assembly to the frame, some wiggling of the barrel may be necessary for the barrel hood to line up and clear the lugged area of the frame, on which the edge of the chamber usually catches. Once the barrel lines up just right, the barrel/slide travel back another half inch or so and the chamber area covers the frame lugs when observed through the ejection port in the slide.

At this point, rotate the barrel so that the two sets of lugs mate and the feed ramp is at the 6 o'clock position. Lock the slide in place using the safety in the rear-most recess, with the rear end of the frame in line with the bosses at the rear end of the slide's grasping grooves. Then insert the recoil spring into the slide around the barrel until seated, and place the barrel bushing and knurled barrel bushing lock on the forward end of the spring with the their lugs at 3 and 9 o'clock.

Apply counter force to the parts until the barrel bushing and its knurled lock are in the front of the slide, and spin the knurled lock 90 degrees, feeling for the "click" as

the recoil spring pushes the knurled lock's lugs forward against their mating recesses in the slide. Thousands of Astra 400/1921 pistols have been imported to the USA from the 1950s to the 2010s.

I have had three of them on my bench in as many years, mostly just giving them a once-over for new owners, and one came in the proverbial "box of parts" and needed reassembly. They may be heavy, ungainly, fire a somewhat unusual cartridge, and require a higher than usual effort to retract the slide. However, the 400/1921 also tends to be comparatively accurate when the bore and muzzle are in excellent condition, on account of the fixed barrel.

The pistol is robust and can provide years and thousands of rounds of service if only 9mm Largo ammunition is used. Reloading the 9mm Largo is simple, because 9x19 bullets can be used and new brass is available from Starline. For US firearms enthusiasts, the Astra 400/1921 meant an opportunity to own another piece of history from the turbulent 20th century, and at time of importation even in the 2010s, a low-cost opportunity.

With thousands in collections since the 1950s and still in secondary market circulation, you now have the information with which to work on them. AG

RIFLES

Bullpup and Electric Trigger, Part 2

A custom 22 Long Rifle bullpup rifle with an electric solenoid trigger system installed in a completed aluminum chassis.

BY GLEN CALVERT DECEMBER 2022

ORIGINAL PP. 10-13

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Original caption: Top: Aluminum channel with the barrel support on the right end.

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The wooden mockup chassis in Part 1 was a proof of concept build for the electrically actuated trigger system. The aluminum chassis is a more practical design with better ergonomics and parts fit up. It resembles a real bullpup rifle, as opposed to looking like a wooden rifle case that left the barrel sticking out and had a funny looking handle. With that prep work complete, I moved on to building the aluminum chassis.

I decided to use a readily-available aluminum stock for the build to minimize the amount of machining required. The 1.50" wide channel with 1.00" high walls and 0.125" wall thickness was a natural choice for the major component of the chassis. The nominal 1.25" inside width of the channel was very close to the 1.256" receiver width

The hole for the action screw is on the right side, the four mounting holes for the solenoid are on the left, and required milling only a few thousandths on each side to provide a close tolerance fit for the receiver. The channel ended up being 25" long.

I made a template of the opening in the bottom of the Ruger stock for the action and trigger group (referenced from the action screw location) and transferred it to the aluminum channel and there are a few extra holes due to my not paying attention when marking the hole locations. The barrel support screws are on the right, then milled out the contour. I determined the correct location for the solenoid and drilled the holes for the mounting screws.

I used a 10/22 barrel that I had removed from a previous build, shortening it to 16.5" and then chamfering and cold bluing the muzzle. It was installed into the receiver and the barreled action set into the chassis. The barrel was not quite aligned with the centerline of the chassis, so some additional fitting was required to center the action horizontally. I leveled the action to the chassis and measured the height for the barrel support at the front of the chassis.

I machined it from the 0.75" thick aluminum plate that I also used for the pistol grip. It's attached to the chassis with two 6-32 thread screws. As I mentioned in Part 1, the 10/22 receiver only has one action screw and the barrel is supported at the front of the stock with the sides of the receiver supported in the stock

BULLPUP AND ELECTRIC TRIGGER, PART 2 CONTINUED

ORIGINAL PAGE 11

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as well. After installing the barrel and receiver supports on the chassis, I bedded the action. The barrel support filled in most of the opening on the front of the chassis to help keep out debris. Pistol Grip The pistol grip on the mockup was too small due to the shape of the 25round magazine and wanting the length of pull (LOP) to be between 14" and 15". I measured the LOP on Below center: Cordless tool battery as purchased. a few of my rifles and found that it varied from 13" to 15.5".

The 15.5" LOP was comfortable so I decided to increase the bullpup LOP to 15.5" to allow a larger pistol grip and still be able to use the 25 rounder. A 15-round mag is available and

its shorter length provides additional clearance. I machined the outside of the grip to the desired shape and then milled the interior to reduce the weight and accommodate the trigger micro-switch.

I thought about including the grip safety but decided it was not needed as the 10/22 cross bolt safety was easily operable with the aluminum chassis. The pistol grip required a few setups on the mini-mill and I got a lot of practice making chips. I radiused the front and rear of the pistol grip and installed 1911 style grip panels to add a little width and make the grip more comfortable. I made the trigger from 0.25" thick steel. Its pivot pin is inside the chassis as on the mockup.

I considered making the pistol grip longer vertically to contain the trigger pin but the added length would have interfered with the magazine. The trigger and pin are contained in a separate block which is mounted on the chassis. Exterior Shells I used 0.040" aluminum sheet for the exterior shells on the top and bottom of the chassis. The shells had left and right side L-shaped sections with a 30 degree transition from the vertical to the horizontal plane.

When assembled, the horizontal sections overlapped, doubling the thickness and increasing the stiffness. My sheet metal brake

BULLPUP AND ELECTRIC TRIGGER, PART 2 CONTINUED

ORIGINAL PAGE 12

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Original caption: Top: Assembled bullpup with 15-round magazine and red dot installed, right side. The mockup; a reduction of almost half of a pound. The Bosch battery had a triangular cross-section, about 1.5" across the lobes after I removed the grip cap with a few careful cuts with a hacksaw. It was slightly shorter at 3.25" compared to 3.75" for the original.

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was not wide enough for the longer pieces so I had them made at a local shop. I chose to bond the left and right sides together at the horizontal sections as opposed to welding to prevent heat distortion. I drilled and tapped the channel with 6-32 threaded holes and attached the shells to the channel with button head screws. I added a Picatinny rail section to the upper shell to mount optics.

A vertical cutout on the right side of the upper shell was required to allow it to slip over the bolt charging handle during assembly. The front and rear openings on the lower shell were covered with the 0.040" aluminum sheet. The rear cover of the lower shell acts as a buttplate while the rear cover on the up-

per shell allows access to the battery. All the external edges were deburred and the corners rounded to protect the shooter's hands.

The upper shell fits closely to the receiver. Fortunately, the battery fit snugly into the upper shell and did not require any retaining clips. I had intended to plug the battery into the rear of the stock like on a cordless tool. I wanted the battery to be fully enclosed in the stock as opposed to a cordless tool where the battery was readily accessible.

Trying to orient the battery so that it would line up with an internal plug proved to be impossible, so I decided to insert the battery into the stock and then plug the connector into the wooden mockup. This allowed a better cheek

weld and eliminated the need for the riser when installing optics. A thin sheet of textured rubber was added to the buttplate. A foregrip with radiused edges was added to the bottom of the chassis forward of the pistol grip.

I painted the upper and lower shells with flat black paint but left a section of the upper shell and the pistol grip frame unpainted to give some contrast. A piece of neoprene was added to the left side of the upper shell as a cheek pad. Battery. Wanting to reduce the weight of the bullpup, I kept looking for a lighter battery.

I found a Bosch cordless tool battery that weighed only 5.6 ounces compared to the 12.9 oz. lead acid battery that I used in

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1 Barrel 2 Barrel Band - Barrel Band Nut 3 Barrel Band Screw 4 Barrel Retainer 5 Barrel Retainer Screw - Barrel Shroud 6 Bolt 6A Bolt Assembly 7 Cocking Handle 8 Bolt Lock 9 Bolt Lock Spring 10 Bolt Stop Pin 11 Buttplate - Recoil Pad 12 Buttplate Screw - Recoil Pad Screw 13 Disconnecter 14 Disconnecter Pivot Pin 15 Ejector 16 Escutcheon 17 Extractor tors into it.

To remove the battery, the end cover of the upper shell is removed, the connectors are removed and the battery drops out when the bullpup is held vertically. The solenoid requires very little current when actuating the trigger as compared to a cordless tool so the battery will stay charged for months. Removing the battery disables the bullpup unless the lower shell is removed. I used soldered connections to reduce the number of connectors.

The wires from the 18 Extractor Plunger 19 Extractor Spring 20 Firing Pin 21 Rebound Spring 22 Firing Pin Stop Pin 23 Front Sight 24 Hammer 25 Hammer Bushing 26 Hammer Pivot Pin 27 Hammer Spring 28 Hammer Strut Assy.

29 Hammer Strut Washer 30 Magazine - Magazine Cap - Magazine Cap Nut 31 Magazine Latch 32 Latch Pivot/Ejector Pin 33 Magazine Latch Plunger 34 Latch Plunger Spring - Magazine Release - Magazine Rotor - Magazine Rotor Spring Ruger 10/22 (Specifications subject to change without notice) - Magazine Screw - Magazine Shell - Magazine Throat 35 Rear

Sight 36 Receiver Cross Pin - Receiver Filler Screw 37 Safety 38 Safety Detent Plunger 39 Safety Plunger Spring 40 Sear 41 Sear Spring 42 Stock - Stock Medallion 43 Takedown Screw 44 Trigger 45 Trigger Guard 45A Trigger Guard Assembly 46 Trigger Pivot Pin 47 Trigger Spring Plunger 48 Trigger Plunger Spring - Auto Bolt Release - Flash hider - Front Band - Muzzle Cap - Muzzle Cap Escutcheon - Muzzle Cap Screw - Muzzle brake - Pistol Grip Cap - Grip Cap Medallion - Pistol Grip Cap Screw - Spring Stop Pin - Scope Base - Scope Base Adaptor - Scope Base Screw - Sing Swivel, Front - Sing Swivel, Rear - Sing Swivel Base - Sling Swivel Plate - Sling Swivel Screw - **Unnumbered Items Not Illustrated trigger switch to the battery and solenoid are routed along either side of the receiver.

At the Range The aluminum chassis version was more comfortable to handle and shoulder than the mockup and it was better looking; none of these facts are surprising. The aluminum chassis with the pistol grip, battery, and solenoid weighed 2.80 pounds. The outer shells with the optic rail mounted weighed 0.98 lb. The barreled action weighed 2.81 lb. without a mag. Overall weight with an empty 10-round mag was 6.72 lb. and the overall length was 26.25".

This compares to 6.44 lb. and 29.5" for the mockup which had a 20" barrel. I shot the bullpup at 50 yards from the bench and standing. I installed a red dot optic to keep the overall weight to a minimum and a red dot seemed more appropriate for this type

of rifle. On the bench, it averaged 2.16" for three, five-shot groups. The standing groups averaged 6.23". Not quite as good as the mockup that had a scope.

After completing the accuracy tests, I started plinking at the steel plate at 50 yards and just enjoyed the fun of shooting a .22 rimfire rifle. The bullpup functioned without any problems in typical 10/22 fashion. The electric fire control system provided a very light and crisp trigger pull that is typically not found on bullpup rifles, or most other firearms for that matter.

After putting about a hundred rounds through the bullpup, I switched to my Ruger GP100 wheel gun which has a decent single action trigger pull of 4.5 pounds. The GP100 trigger felt very heavy after shooting the bullpup. It took several rounds to adjust to the GP100 trigger again. The major drawback of the electric trigger system was obviously the weight and size of the solenoid and battery.

Designing a trigger system specifically for a bullpup using this concept would likely result in a lighter and smaller solenoid and battery as compared to the "off the shelf" components that I used with the standard 10/22 fire control group. This was an interesting project; it challenged and improved my design and fabrication skills. Some may say this project was an answer to a question that nobody asked. Maybe so, but it kept me entertained during those cold winter months. AG

RIFLES

Shop-made Lapping Tool

A bright new look at making your own inexpensive tool for lapping bolt lugs.

BY CHARLIE BRIGGS DECEMBER 2022

ORIGINAL PP. 14-15

As many of you know, lapping the lugs of the bolt and the locking recesses of the receiver in most rifles is an important part of the accurizing process. However, until recently, the only way I knew to do this was to first remove the barrel, apply lapping compound to the mating surfaces of the bolt and receiver, and then screw into the receiver a thread-specific tool for that particular brand of rifle.

With that all done, the gunsmith uses this set up to put rearward pressure on the bolt and then work the bolt in and out, lapping the aforementioned surfaces. There are several possible negatives in this method: The first is the need to remove the barrel. Many Ruger barrels are known to be extremely difficult to remove, even if you have the complex and heavy-duty barrel vise these jobs require. Ditto many (most?) surplus military rifles; did someone say Mosin-Nagant?

Then, there is the little item of the thread-and-brand-specific tool I mentioned. They usually consist of an adapter or insert which screws into the forward end of the receiver. Inside this component is a powerful spring and plunger which together exerts the necessary rearward pressure on the bolt. Fine, you say, but rifles have different threads. Before long, you will want a Remington 700 adapter, one for a Ruger, at least one for Winchester, Savage, Weatherby, maybe Sako, etc.

This does not count the possibility of military surplus rifles such as the Mosin-Nagant or even an AK-47. If you can find just these adapters, you will have something like \$450 in tooling. My buddy gunsmith, Mike Dietrich, says he has over \$1,000 in these kinds of tools

and adapters, not counting the barrel vise that looks strong enough to remove a tank of a barrel... provided you can rotate the receiver!

Even if you have one of these vises (I don't) and the needed tooling, you still face the arduous task of clamping the barrel and separating the barrel and receiver!

However, on a random Wednesday night, Mike's fertile mind just changed everything when he came up with one of those ideas that when you first hear it, you slap yourself on the side of the head and say, "Why didn't I think of that?" In fact, I wanted to entitle this article, "A Brilliant New Look..." but was afraid everyone would see it and say "Briggs is calling himself brilliant?" Here's what Mike did.

First, he took an empty brass case in the same cartridge the rifle is chambered for and cut a 3/8" section out of the middle using a cutoff wheel in his Dremel tool. Then, he filed and deburred the new cuts of the top and bottom pieces. Next, he cut some off the neck of the brass, deburred it, placed a little tape over the shoulder end, and closed that end with a little epoxy. However, he did leave about 5/16" of it open at the rear.

When the epoxy at the front end of the deburred cartridge front had hardened, he removed the tape and selected a reasonably-strong compression spring from his "miscellaneous spring drawer"—we all have one of those, don't we? After some experimenting with cutting coils off, he epoxied the spring into both open ends of this new "cartridge". Waiting a day for full curing of the epoxy, Mike was ready to lap the lugs.

SHOP-MADE LAPPING TOOL CONTINUED

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To use this new tool, begin by applying a little Dykem layout fluid to gauge progress. Add a dab of 600-800 grit lapping compound to the primary recoil lugs of the action—not the bolt, because the compound has a tendency to just wipe off the bolt lugs and not do its job.

Then, as the bolt is closed to chamber this springloaded cartridge, instead of allowing the complete closing of the bolt, the spring pushes back on the bolt and against the lugs, allowing you to work the bolt handle and lap the For the cost of a spent case, a scrap box spring, a dab of epoxy, and a little labor, you can lap a rifle's lugs without having to remove the barrel and without needing to buy an expensive rifle-specific adapter! And this new adapter is reusable, job after job. This has to be a win-win.

In addition, these are cartridgespecific lapping tools but are not manufacturer-specific. In other words, one made for a 308 Winchester should work for Ruger, Remington, or Winchester rifles chambered in 308 Winchester, again saving you some serious money. I asked Mike if he would be interested in making multi-caliber kits for sale to the trade but he's just more interested in helping other gunsmiths, like with this article. However, he would consider it if there is enough interest.

Mike can be contacted at gunsmith_25@verizon.net. AG lugs! The example shown here was for a 308 Winchester, but virtually any cartridge adapter can be made.

FROM THE ARCHIVE

Eective Scope Mounting

Here's the procedures I use in my shop for stress free scope mounting with final sight in.

BY DAVID A DUMEAH DECEMBER 2022

ORIGINAL PP. 16-19

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My operation is in the “Venison Belt” in Northern Michigan. Deer hunting season is a very important event in this area. Generally, from the first of October through to opening day (November 15) hunters are scrambling to get their equipment ready for the hunt. One of the most common opportunities that presents itself to my business that I refer to as a “sight-in”; this is where the customer has a rifle, the desire to hunt, and needs it all thoroughly gone over, set up, and ready to go.

In my many years of installing and setting up glass optics on sporting as well as target rifles, I have taken the opportunity to read any materials on the subject I could find in the hopes of improving my final product. When I take on one of these sight-in jobs, I have distilled it down to only one approach. Whether it is a 22 Long Rifle or a 300 Winchester Magnum chambered in a light mountain rifle, the procedure and materials remain the same.

I do tell the customer this complete service is not inexpensive and assure him it will provide him with Bedding will get it right on. outstanding benefits. I let the customer know that the person working the counter at a big box store may well put the rifle scope on his rifle for free, however, sometimes “free” can be very costly in the end. As for the glass itself, I encourage the customer to provide the optic he has decided on. I am amazed at the current quality of Pacific rim optics.

I have discovered most of these optics are quite clear and have modern coatings. Unfortunately, durability is commensurate with cost. They all start out well enough but the lower end models tend to fail sooner, especially when mounted on high recoiling, light weight rifles. Unfortunately, this problem becomes compounded by the affordable “moon” scopes with the big objectives available today.

Since the newer optics are so much better than those of twenty years ago, I do encourage the customer to pursue anew rifle scope instead of trying to push an older

model of questionable performance into service. I am surprised how little actual attention is given to a good solid stress-free optic mounting system. With many hunters and casual shooters, good mounting is an afterthought. A few thousands at the receiver end translates into inches at the point of impact end.

I have found dents and clamp marks on the scope body of systems I have removed. Rifle scopes with their ring sets misaligned or the turret adjustments at or near their maximum tend to give poor performance and fail sooner than those rifle scopes resting stress free and near nominal settings for elevation and windage. The mounting system of the rifle scope is a very critical component that is frequently glossed over in the active pursuit of sighing in accurately.

I have tried and abandoned several of the techniques to mount a rifle scope as stress free as possible. I have used the machined pointer rods, lapping rods, and even a custom reamer made for that purpose.

EFFECTIVE SCOPE MOUNTING CONTINUED

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Top Try to estimate the eye relief needed before the customer comes for a fit-up. Bottom After the customer has been informed of what the procedure is and his equipment brought into the shop, I take a good look at what was already installed. I check the pre-drills both They helped but just weren't as effective as I had expected. I have found the procedure that follows to be the most effective I've used thus far. factory and aftermarket. I have located a number of discrepancies at this point with customer rifles.

One example, I've found it is not uncommon to find bits of soda cans trimmed and slipped into the mounting system in an attempt to

get the scope to align with the rifle.

If the discrepancy is not severe, I will continue, moving my attention to the unit itself, checking stock fit, tightness, and action operation, all to Setting the cross sticks before bedding aids in stretching the rubber bands evenly over the scope using both hands at once, minimizing scope roll. ensure the unit itself is in good working order and up to the task. I follow this with a thorough barrel cleaning all the way down to the bare steel.

I then borescope the chamber, leade, bore, and crown to see if there are any problems that may directly impact accuracy. If neces-

sary, I will take digital photos of any areas that may look questionable as well as areas that are as they should be and email them to the customer. If the issues are significant, decisions are made and agreed upon as to how to proceed. A quality borescope really pays off for this kind of work.

As you can see, this is much more thorough than the freebie job offered by a big box store counter clerk! Scope Mounting I have chosen to use the Weaver mounting system as it is so adaptable and readily available. I have found Weaver's Tip-Off design

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(the steel strap over the top with the two screws on the one side) to secure the most unruly recoiling light rifles. This system also is favored by many in our industry because they work. It is also a system that has extension models that will accommodate the eye relief of the individual shooter. I clean the mounting threads and fixing screws with a non-residue solvent (everyone has a personal favorite) and pipe cleaners.

I go ahead and mount the bases to the unit and tighten to the recommended torque and secure using blue Loctite. I then select a ring height that will provide minimal clearance of the scope objective to the top of the barrel and an eye relief that I think will suit the customer's fit needs. When this is ready, I call the customer for a fit.

In the shop, I have the customer adjust the loosely mounted scope while sitting in the bench position and the optic set at its lowest power magnification to find an ideal eye relief and then the highest power, followed by a check in the standing/ offhand with the optic again set at lowest and highest power. I use a pencil to mark the scope at the front ring in

each position and generally have four markings from each check on the scope body from this.

While the customer is still there, I set the scope eye relief to an "average" of these marks unless the customer specifies a preferred setting. During this eye relief adjustment, it is not uncommon to need to open another package of extended rings to get a good eye relief for the customer. This step alone seems to really give the customer an idea of how important a good fit really is. Our area is heavily wooded and snap shots are often required.

Once the customer is satisfied with the fit I put a narrow (2-3 mm) white tape stripe on the scope just in front of the front ring set. This tape will stay on the unit all the way out the door. I take the selected ring set and scuff the contact area of the scope ring where it will meet the scope body. I then secure the ring bases (I refer to them as saddles) to the bases securely, taking care to preload the saddles forward against the slot wall in the bases to make sure recoil cannot shift them on firing later.

I clean the scuffed area with a non-residue cleaner and begin taping off the sides, edges, and top of the receiver itself with a masking tape, trimming with a snap-off knife as needed. I use J-B Weld as the bedding agent for several reasons. The most significant is the ability to clean up and trim this bedding before it gets too cured to work easily. J-B Weld is a bonding product so the releasing agent used is very critical; it is possible to get a scope glued in if a quality releasing agent is not used.

I have found a thick coating of Brownells Acra-Release to be up to the task. Do not skimp on this! Before proceeding further, I set-up my elastomeric (rubber band) retention system. I use two stout wooden pieces (cross sticks) to stretch rubber bands over each made from three craft or popsicle sticks glued together. Be certain the sticks are strong enough as a broken stick during this process really makes a mess. I secure the sticks as cross sticks to the action without the scope in place. Hav-

EFFECTIVE SCOPE MOUNTING CONTINUED

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Far ing the sticks ready to go really helps when setting the scope. At this point I apply a heavy coat of Acra-Release to the scope body anywhere the J-B Weld may contact and set it aside, taking care to not disturb the film layer. I mix the J-B Weld according to package instructions and apply it to the scuffed saddle area, being careful to work out any potential voids. I then gingerly set the scope straight down into the J-B Weld, confirming excess J-B is oozing out around all the sides of the saddle area.

I keep the white tape stripe from earlier a little ahead of the front saddle. Make every attempt to not allow the scope to rotate as that may make removal more difficult. With the scope set straight in and not rotating, stretch rubber bands evenly over the top of the scope and over the tips of the cross Three-shot targets were the norm but currently not practical. sticks simultaneously. This helps keep

the scope from rotating. I apply the rubber bands equally and evenly over both scope ring sets.

Put a small quantity of excess J-B material aside on a card as an indicator of cure rate. Note, it seems the sample does cure a little faster than the material in the job so take that into account. It is now time to wait for the J-B to cure. Depending on temperature, it may be 6-20 hours to reach a workable consistency. I like it to be soft enough to take on a fingernail dent with some effort, but not too soft. There is a pretty good margin of allowable error here. When cured, remove the rubber bands and save them.

Now comes the moment of truth. Try to pull the scope straight up from the saddles. If it resists, I use two soft pine wedges to slide carefully under the scope body against the receiver. It usually does not require this step, as just a firm, steady upward pull should do it. After the scope is removed, clean any stub-

born J-B off of the scope body and reapply a thin layer of release agent for the final curing step.

If there are misalignments between the scope bases and/or rings, it will be readily visible by thin and thick areas of J-B. This particular previously mis-drilled 99 receiver of many years ago did benefit and zeroed very well from this procedure. Turn your attention to the saddles. Carefully remove all of the tape and trim the excess J-B from the edges of the saddles. Dust out any debris from the saddles, making certain they are clean, and reset the scope with the thin layer of release agent applied back in.

The J-B Weld is still somewhat soft at this point. Reapply the rubber bands as before and let the assembly cure for 24-48 more hours, depending on the ambient temperature. There may be situations where rings other (Continued on page 21)

than Weaver rings must be used. Most other ring systems will benefit from this procedure as well. A mounting system, where the fixing screws are located through the saddles, can be easily dealt with by filling the access holes with clay bedding putty before applying the epoxy bedding. The thin bedding compound over the putty will trim out best after the full cure has taken place. After curing is complete, remove the rubber bands, and clean the saddles and scope body of all residual releasing agent.

This is also a good time to set the adjustments on the scope to nominal. This can be done by counting clicks stop to stop and dividing by two. Or, better yet, use a mirror and the “ghost reticle technique” to get a nominal, centered adjustment for both elevation and windage. With the saddles and scope body clean, dust a light layer of powdered rosin in the saddles where the scope will rest and set I then boresight with a conventional spud-type laser out to 70 yards.

It is not uncommon, with this bedding method to find the previous nominal adjustments of the scope are quite close as they are. This is always a reassuring find that the scope will be operating well within the limits of its internal adjustment range. Most of my customers prefer I finish the job with an actual fired target. Generally I do this with a 100-yard, three-shot group fired from a rest after confirming zero with the customer’s preferred ammunition.

I have found the use of a barrel cooling fan device to speed Upon pick up, I remind the customer of the benefits as well as the limitations of this process. The scope and rings can be removed as a unit and replaced later with a minimal, if any, shift in point of impact. Additionally, as long as the ring bases (saddles) are left in place, any similar sized scope replacement will benefit from this bedding process.

Unfortunately, if the rings are separated from the receiver as well as from the scope, the bedding benefits will be compromised. I then ask the customer to monitor the white tape ring to see if the scope should start to shift on recoil and notify me for adjustment if it does. With the rosin in place, scopes stay put without having to overtighten the scope ring caps. I regularly receive repeat work on customer’s other units as well as their referrals. This system is reliable and works well. AG

FROM THE ARCHIVE

Casting Bullets

Getting started with the oldest method of bullet making.

BY EARL ROBERTS DECEMBER 2022

ORIGINAL PP. 20-21

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Most people associate casting bullets with muzzleloader or black powder shooting, but casting a bullet is also an option for some slower velocity modern firearms as well. Casting is both an art and science. The science is pretty straight forward, and I will do my best to cover it here. The art of it will come with practice; you will know you have mastered the art when you consistently cast a bullet that meets your standards.

To cast a bullet, you will need a few basic tools designed to heat, shape, and size metal into a projectile capable of firing from your

weapon. To begin with, you will need some type of metal to form into the bullet; lead is the most common. Lead is generally soft in its pure form, so tin or antimony can be added in order to make it harder. I am going to concentrate on casting a bullet for reproduction 1800s muzzleloaders so soft lead is appropriate, no need to mix in additional metals.

In addition to lead and alloying additional metals to increase hardness, you will also need to ensure your lead is clean. Adding spoonful of flux to the melted lead will draw and cling to the dirt and debris, allowing you

to use a spoon to skim the debris off the top. You can use a commercial flux, such as Brownells Marvelux or Frankford Clean Cast, or rosin, paraffin, tallow, or wax.

Casting bullets also requires a heat source capable of reaching temperatures of around 600 degrees, such as an electric casting furnace or a cast iron pot used over a hot fire. A furnace may or may not be designed to dispense the melted lead from the bottom; some, like the Hot Pot, have the heating element connected to a pot equipped with a handle and pour spout. If just using an iron pot, you Far

CASTING BULLETS CONTINUED

ORIGINAL PAGE 21

will need a dipper or ladle to scoop out the melted lead and transfer it to the bullet mold. The bullet mold is required to give the bullet its shape. There are several reputable brands of bullet molds out there offering hundreds of sizes to choose from. Know your bore and recommended bullet size and weight before selecting a mold; refer to owner's manuals, casting guidebooks, and reloading charts to find this information.

New molds should be cleaned with a mild detergent and soft bristled brush to remove machining and packing grease, then thoroughly dried. Then, to aid in bullet release, "smoke" the mold; strike a wooden match and expose it to the mold cavity. A little bullet lube can be applied to the hinges and alignment rods to keep it moving smooth, however, don't apply lube to the mold cavity as it will prevent molten lead from forming nice bullets until removed.

For brand new molds, I usually cast a dozen or so preliminary bullets, cycling them back into the melted lead as they're imperfect, before I feel the mold is ready to go. I also always warm up my broken in molds before I begin casing by exposing it to the melting lead. You will want to ensure you set up your casting station outside, or at the very least, in an extremely well-ventilated area if you must cast indoors. The area should be free the scope in using the white tape stripe as a guide.

Install ring caps loosely and set the rifle in a secure position for reticle leveling. I use an EXD Engineering Vertical Reticle Instrument (an over barrel scope leveling device) as well as a plumb line hung at 70 feet. Regardless of how you establish a truly vertical line, set the vertical stadia to plumb with it, secure the ring caps, and re-confirm vertical has been maintained. and clear of any possible exposure to water; if water were to combine with your melted lead it could cause explosive bubbling.

A fire extinguisher should be nearby, and children and pets should be far away. Personal protective equipment should be made of natural materials and consist of long pants, long sleeve shirt, thick leather gloves, a respirator, and eye protection. Now, it's just a matter of melting the lead, pouring it into the mold, and letting it cool. Then, using a mallet, rotate the spur, open the mold, and release the bullet onto a padded surface.

You now have formed a bullet ready to be sized and lubricated for loading new ammunition. AG sighting in for the final cold bore shot. Rarely, different ammunition is needed to be tested to get a target that will satisfy the customer. I provide the final cold bore shot target with the completed job.

MAINTENANCE & REPAIR

Reader Forum

BY AMERICAN GUNSMITH EDITORS DECEMBER 2022

ORIGINAL PP. 23-24

Marlin Magazine Fix I have an early Marlin rifle with a malfunctioning magazine tube I'm trying to repair. The magazine has an outer tube that pulls forward and the inner tube stays in the receiver. How does the pin in the follower catch and release in the outer tube? How long should this pin be? Mark Hollensen responds.

I would need to know what model Marlin you're working on for any specific recommendations, perhaps with a photo of the magazine tube end where the mag tube follower fits into to help with identification. As written, this description almost reads backwards of how the two should operate unless it is a different model? Contact Poppert's Gun Parts (PoppertsGunParts.com). Numrich Gun-PartsCorp.com) and The Gun Garage (GunGarageStore.com) also list Marlin magazine parts.

Mini Thirty Magazines I own a Ruger Mini Thirty manufactured in the 1980s (serial number 189-194XX) made with a tapered bore (0.310 to 0.308) chambered in 7.62x39. The rifle seems to function just fine with ordinary metal magazines but I have a number of Lexan plastic magazines marked "Eagle 3020, Patent #4,580,364". The dimensions of these magazines precisely match with the exception of the plastic magazine wall thickness being double that of the metal mags. This makes me suspicious of the feed lips.

Despite the uniform dimensions, the plastic magazines cannot be seated into the rifle without the bolt held open, however, seating them with the bolt open jams the bolt such that the bolt cannot be closed. I hesitate to file on the feed lips, but maybe these mags are junk anyway. Any advice on how to remedy this? Larry Tripp Blackwell, OK Steven D. Weedman RK Campbell responds. I have modified metal magazines with great success; plastic magazines, no such luck.

Until Ruger introduced their X-series for the Ruger 10/22, 100 per cent of aftermarket magazines did not function properly. When Pro Mag made metal Mini Thirty magazines I was able to weld them up and convince them to function properly. Since your magazines don't work as they are, I would go ahead and modify the feed lips, however, never trust these magazines for serious duty such as personal defense. There Is No Going Back I read "There Is No Going Back" by Scott J. N.

Smith (October 2022) and found it really well written and enjoyable. I do wonder though: If the customer had chosen not to proceed with the repair would you have given up? Somehow I don't think so: Just a paragraph later you write: "For my own personal knowledge..." Gunsmithing isn't my thing and I wasn't going to subscribe, but I enjoyed this article so much that I paid for a subscription. Sanford Moos Scott J. N. Smith responds.

Thanks for reading and contacting me about the article; your compliments are greatly appreciated. I must confess, yes, I would have continued with the repair on my own accord in this particular instance. The issues with the firearm had already resulted in the tragic loss of one person's life and I could not in good conscience return the firearm without knowing for certain that it was now functioning as originally intended.

I believe we as gunsmiths have certain inherent responsibilities that are associated with certain repairs. Had the client told me they never used the firearm and had no intentions of using it, that it was guaranteed to just stay in the safe, I still would have chosen to continue with this particular firearm. However, if it were another firearm without such a tragic association, I may have deferred to the client's request and left the firearm inoperable.

Westport, KY In my shop, when someone purchases anew firearm I make certain all of the factory grease has been cleaned away prior to displaying the item and that the firearm is in proper working condition. It is rare, but factory defects do occur and oftentimes these flaws can be discovered during the cleaning process. New Sniper Book American Gunsmith contributor Gary Yee recently released World War II Sniper: The Men, Their Guns, Their Stories. This project started

READER FORUM CONTINUED

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around April 2019 and both he and his editor had been making changes up to the last minute. This book has over 200,000 words, 352 pages with 12 pages (over 1,100) of endnotes, 12 pages of bibliography, and over 400 photos. From Gary Yee: "The book was supposed to have been *Voices of Snipers* and comprised first hand accounts. However, British copyright laws limited the words from each memoir and with only about 11 known WWII memoirs, I declined the contract.

Still, I had amassed over 70k words of raw material (much of which had to be paraphrased to shorten it) and since it was started, I decided to finish it. "Unlike other writers, I don't outline a book and then fill in the details. The problem with that is that there may be no details to fill in. Language barriers, money, and a lack of ability to travel meant it could only be on what was uncovered during the research.

The difficulty was taking over 1,000 unrelated but important facts and blending them into an educational and enjoyable narrative. Since there was no organization for the book, that was developed along the way. "The experience drawn from *Sharpshooters (1750-1900): The Men, Their Guns, Their Story* provided the pattern here and it was decided to organize it in three basic groups: selection and training, combat accounts by snipers or witnesses, and the equipment.

Research often entailed reading a book to find a paragraph or even just a sentence that would provide insights into sniping or snipers. As the information was gathered, it was decided to break down the selection and training by nationality. That made sense to me. The heart of the book is the combat section broken down into Western Europe, Eastern Europe, and the Pacific Theatre. Each of these were further broken down into three chapters.

While the book really doesn't attempt to give an in-depth appreciation of the campaigns or battles, some cursory coverage is given so that the sniping incident can be told in the context under which it happened. "An example is the Western Europe chapters. From reading them you can see how different things were interwoven to tell the story of WWII snipers and sniping. Obscure, little known, or long forgotten incidents were brought back to into a narrative that I hope is both fun and educational.

The entire book is like that. Originally, the manuscript had a chapter containing a lot of interesting little things that couldn't quite be woven into the narrative. Insufficient background on the incident or lack of date or location meant inclusion could be awkward. Here the publisher and editor did a terrific job in placing those factoids into text boxes and there are numerous text boxes, many with pictures, that help illustrate the book.

Some text boxes can be several pages long but most are just inserts into the text; much like what one would find in a magazine. "The book is a bit too pretty and the designer did a smashing job. My fear is that the reader will be overwhelmed by its presentation, read the text boxes and illustration captions while ignoring the text and the introduction which sets the tone for the book. Another factor is the sheer volume at 352 pages in an oversized 10 x 8" format instead of 9 x 7" as I had hoped.

Since it is thicker than any other Casemate Illustrated History series book, the publishing team had a special meeting to approve the additional pages. Having gotten into woodworking just to make more bookcases, I've now five shelves filled with accounts by GIs or Marines, three with German, one and a half of Soviet, and one of British. This is in addition to all the sniping books that I already had before the project was started." AG

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