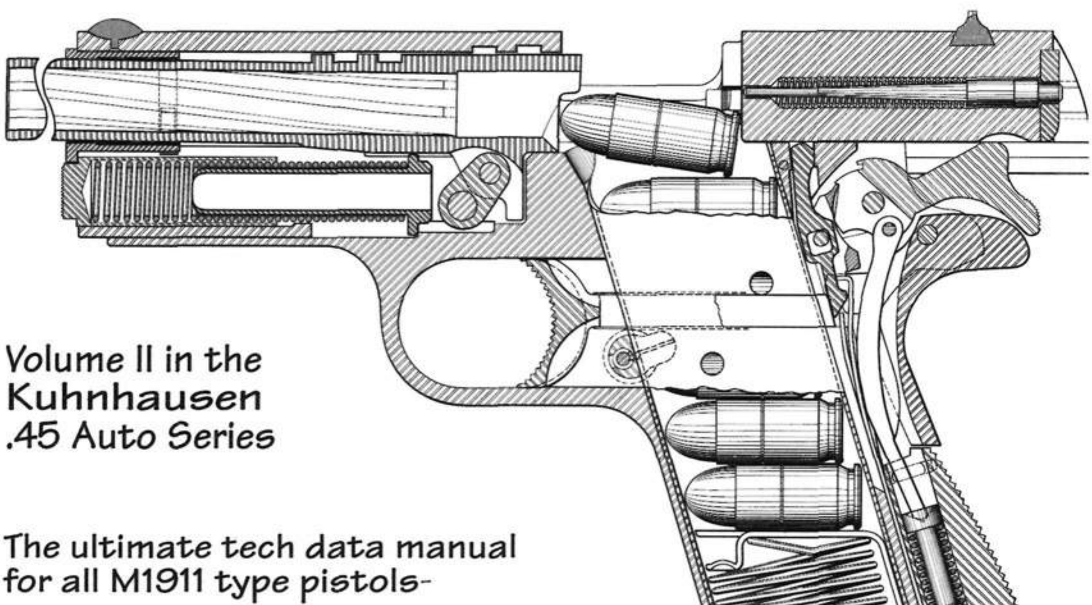
The U.S. M1911/M1911A1 Pistols

& Commercial M1911 type Pistols

A Shop Manual



Volume II in the Kuhnhausen .45 Auto Series

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Jerry Kuhnhausen

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The U.S. M1911/M1911A1 Pistols and Commercial M1911 type Pistols, A Shop Manual

Volume II in the Kuhnhausen. 45 Auto Series

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A Heritage -VSP Shop Manual

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The U.S. M1911/M1911A1 Pistols & Commercial M1911 Pistols

A Shop Manual

.45 Auto Series Volume II

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This book has been assembled from data in the public domain collected by Jerry Kuhnhausen and from loose leaf shop training manuals written by Jerry Kuhnhausen and therefore necessarily reflects the author's experience. The component dimensional data, surface location data, and gauging specifications provided in this manual have been researched and compiled by the author from published reproductions of unclassified ordnance parts drawings, unclassified ordnance gauge drawings, inspection and rebuild/overhaul standards, military field manuals, and military technical manuals which have been in the public domain for 40, or more, years. To the extent necessary, a general public domain exemption is claimed under CFR 125. (1) (a). 22 CFR 125. 4 (b) (6) is also applicable.

With both historical interest and safety in mind, readers are encouraged to read all model applicable M1911 and M1911 Al Pistol training manuals (TM's), field manuals (FM's), depot level repair manuals, and where parts dimensional specifications might be critical, to also consult military specification booklets/manuals, inspection procedures manuals, and latest revision dated reprints of ordnance parts drawings for possible dimensional specification updates and/or other changes. Reproductions of most parts drawings, most FM's, TM, s, Mil. spec, and inspection standards publications were readily available from the various independent publishers at the time of printing.

To our knowledge, other than the published reproductions above, the limited match conditioning data compiled by the various services, and a previous manual by author Kuhnhausen, very little basic gunsmithing information has been published on the U. S. M1911 and M1911A1 Pistols, and little from a civilian gunsmithing viewpoint. In this regard, it is our intention to provide professional gunsmiths and students with as much basic data as possible on the referenced models, particularly now that many thousands of heavily used M1911, M1911A1, and commercial equivalent pistols are in civilian hands.

In the absence of detailed, model specific training programs, we believe that professional gunsmiths and armorers will be better served by the data, safety warnings, cautionary notes, maximum-minimum specifications, and common sense limitations in this manual than if no information was made available, at all. Additionally, it seems only fair that nonprofessionals should have access to, and benefit of, as many of the same specifications, cautions, and safety warnings as possible. In this way, perhaps a cautionary note might be read and heeded before the fact of an unsafe act, mishap, or injury. It is hoped that providing an insight into the mechanical complexity of this subject might serve to inspire the reasonable nonprofessional to refrain from tinkering or substituting critical parts and to take his M1911 type pistol to a qualified pistolsmith for periodic inspection and for servicing or repair, when needed. Before beginning repairs or replacing parts in any of the models discussed in this book, gunsmiths and armorers are advised: (1) to read and fully understand the contents of this book and the above referenced military manuals and publications, and (2) to also have the appropriate tools, gauges, and parts on hand.

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Introduction-

This book **The U. S. M1911/M1911A1 Pistols & Commercial M1911 Type Pistols- A Shop Manual.** is a first publication, in condensed form, (the original totals over 1500 pages) of Jerry Kuhnhausen's personally compiled technical data notebooks on the M1911 and M1911Al Pistols. This publication is best described as a combined basic and advanced M1911/M1911Al Pistol tech. data manual.

The editorial decision to publish this manual (Volume II in the Kuhnhausen .45 auto series) came about as the result of three things: (**1**) The quality of standard grade commercial M1911 type parts currently being sold has slipped considerably. Many of the M1911 parts being sold are very low quality castings. Some components, including frames, slides, and barrels are off-specification both dimensionally and metallurgically. Because of low end pricing, these parts tend to displace the higher quality components that should be used. (**2**) As times become more uncertain, the number of individuals making the choice to rely on or carry a pistol for self defense has increased. Given that self defense is a good thing, it follows that these well intentioned, law abiding folks should be informed and served in every possible way. In this regard, reliable data can only help. (**3**) Magazine articles wherein writers burn considerable oil hoping to make the case that low and reject grade commercial parts failures somehow equal poor original M1911 design are also, admittedly, an additional motivating factor. Truly, journalism at its best. No, Virginia, lousy M1911 commercial parts that can (predictably) only break does not add up to bad M1911 Pistol design.

Kuhnhausen's first book on the M1911 type pistols- **The Colt 45 Automatic - A Shop Manual** (now referred to as Volume I) has been a top seller since initial publication and will remain in print long into the future. Volume I was edited from a series of loose leaf manuals originally used by the author for shop training and is a literal compendium on M1911 45 Auto troubleshooting, repair, hand fitting, custom gunsmithing, and basic accurizing. Volume I was originally intended as a reference for student and working gunsmiths- but it soon became the across the board, preferred maintenance and repair manual amongst gunsmiths and M1911/M1911A1 pistol owners alike.

The U. S. M1911/M1911A1 Pistols & Commercial M1911 Type Pistols A Shop Manual (Volume II), is a specialized service and repair manual which focuses on the *nuts and bolts* mechanics of the M1911/ M1911Al pistols and on pistolsmithing as it specifically relates to the inspection, repair, assembly, and complete rebuilding of these models. All of Kuhnhausen's informative manuals are presented in the same step-by-step sequence followed by professional pistolsmiths and armorers when installing replacement parts and repairing or rebuilding pistols at the bench. The pistolsmithing techniques shown and discussed closely follow original factory and ordnance methods except where nonavailability of original ordnance fixtures, tooling, gauges, etc. make parallel civilian gauging and fitting procedures necessary.

The design theory, historical, and practical information in this manual is intended to help professionals and amateurs analyze and troubleshoot malfunctions and parts related problems in Ml911/M1911A1 type pistols- and if put to full use- enable readers to increase the basic mechanical repeatability (i.e., reliability and accuracy) of the subject models. Emphasis is placed on safety and common sense, correct shop and bench procedures throughout, and the importance of using only within specification parts.

The first section includes a detailed discussion of M1911/M1911A1 safety system operation and function; safety system and other pistol malfunctions; ammunition and pistol related causes of slam and out of battery fires; cartridge and chamber dimensional specifications; pistol reliability; gunsmith safety warnings, and M1911/M1911A1 Pistol tabulated data. Section II includes basic M1911 function and a detailed description of the cycle of operation for those not yet fully familiar; a parts section, including exploded parts diagrams; bench checks, and disassembly in brief (disassembly is covered in greater detail in Vol. I). Section III covers detailed visual and dimensional parts inspections; parts fitting; pistol assembly/reassembly; and improving mechanical repeatability - i. e., accurizing and modifications that help improve reliability in defense and carry pistols. In keeping with Kuhnhausen's original manuals, and with the intent of minimizing the need to thumb back and forth between sections, parts inspections are covered in assembly sequence. Section IV covers optimum performance dimension M1911 components.

Kuhnhausen's model specific manuals are valuable references when parts identification, replacement, and fitting questions come up at the bench- and provide the basic inspection procedures necessary to make 100% certain that all safety systems are functional; components and barrels serviceable, and that pistols are safe to fire before loading or firing. With this in mind, it is suggested that the safety function sections and other pertinent sections of this book be read and fully understood, together with the related military field and technical manuals, before handling, disassembling, servicing, or firing an M1911 type pistol.

With Volumes I and II, the pistolsmith has the most complete gunsmithing reference work available on the U. S. M1911, M1911Al Pistols, and commercial M1911/M1911A1 type pistols.

The U. S. M1911 and M1911A1 Pistols and Commercial M1911 Type Pistols, A Brief Production History -

The Colt Model of 1911 (aka Colt Government Model Pistol) and the U. S. military M1911 .45 caliber version evolved from several earlier Browning pistol designs which included the M1900 38 auto, M1905 .45 auto, and a little known variant, the M1907 (contract) .45 auto. Major M1911 design feature patents (all dated in 1897) included four key Browning patents and another by E. J. Ehbet. Browning's April 20, 1897 patents were so important that all M1911/M1911A1 type pistols manufactured by Colt through 1938 were stamped at least with that date. Themain M1911 U. S. patent was granted on February 14, 1911, followed by a second patent granted on August 13, 1913. Early production Colt, Springfield Armory, and Remington - UMC M1911 pistols were imprinted with the above 1911 and 1914 patent dates and also carried Sept. 9, 1902 and Dec. 19, 1905 patent dates.

The M1911/M1911Al Pistol was the official U. S. military sidearm from 1911 through WW1, WWII, Korea, and Vietnam. This model has been in military and/or civilian production longer than any other Colt firearm. The following collector references include a wealth of information on M1911/M1911A1 production history, slide imprints, manufacturer serial number ranges, inspector markings, and general historical data: Colt Automatic Pistols, by Donald B. Bady; The Book of Colt Firearms, by Wilson-Sutherland; The Colt Heritage, by R. L. Wilson, andFlayderman's Guide to Antique American Firearms and Values, by Norm Flayderman.

M1911 Pistol U. S. Government Contract History	Approx. quantity
Colt's (M1911 pistols manufactured from 1912 to 1924)	674, 030
Colt's (M1911 frames only manufactured in 1917 for service replacements)	4, 999
Springfield Armory (pistols and frames manufactured 1914 & 1915)	30, 971
Remington-UMC (pistols manufactured 1918 & 1919)	21, 676
North American Arms Co., Canada (M1911 pistols, late WWI manufacture)	about 100
Total M1911 U. S. Government contract production	approx. 731, 776

M1911 Pistol Foreign Government Contract History	
WWI British Government contract pistols in .455 cal. (1915 & 1916)	11, 000
WW 1 Russian Czarist Government contract pistols (1915 & 1916)	14, 500
Combined total M1911 U. S and foreign government contract production	approx. 757, 276

M1911A1 Pistol U. S. Government Contract History	
Colt's (M1911A1 pistols manufactured from 1937 through 1945)	637, 070
Remington-Rand, Inc. (M1911A1 pistols through end of contract)	900, 000
Ithaca Gun Co. (includes WWII lend lease M1911Al's sent to British government)	400, 000
Union Switch and Signal Co.	40, 000
Singer Sewing Machine Co.	499
Total M1911A1 production	1, 977, 069
Combined total M1911 and M1911A1 Pistol production-	2, 734, 345

Licensed and unlicensed M1911/M1911A1 Pistol production
This category includes Norwegian M1914 and Argentine Ml 927 licensed production; non-licensed early Spanish (Tauler, etc.), Korean, and Vietnamese close copies; and other design variants such as the Polish Ml935 (Radom), the Obregon and Ballester Molina Pistols, and assorted Star, Llama, Union, etc. pistols. With records being unavailable, experts variously place the total for this broad category at between 800, 000 and something over 2. 7 million pistols. In view of this uncertainty, the reference figure used here is the low estimate. Estimated total, this category- 800, 000

Commercial M1911/M1911A1 Pistol production

Colt's (1912 to present, includes Colt Government models and variations, to date) - Est. 470, 000

Commercial M1911 type frames and/or complete pistols- made by (or brand imprinted for) U. S. and other manufacturers, including: AMT, Randall, Detonics, Springfield, Inc., Caspian Arms, Olympic/Safari Arms Inc., Auto Ordnance, Para Ordnance, Mitchell Arms, Norinco, Kimber, Essex, Nowlin, Baer, McCormick, SVI, STI, Enterprise Arms, Wilson, National Ordnance, and others.
Note: National Ordnance frames were mostly G. I. rewelds. Estimated total, this category- 290, 000

Grand total, all categories- 4, 294, 345

Historical notes: (1) M1911 pistols still in service in 1923 were updated to M1911Al's. (2) Although some new frames were used, most M1911A1 NM pistols were rebuilds on previously serialized frames. (3) Some disagreement exists amongst experts as to whether the above production accounting is exact. Some believe that if all M1911 copies, variants, and look-alikes were factored in, the grand total would probably be double. With this in mind, consider the above figures approximate, only.

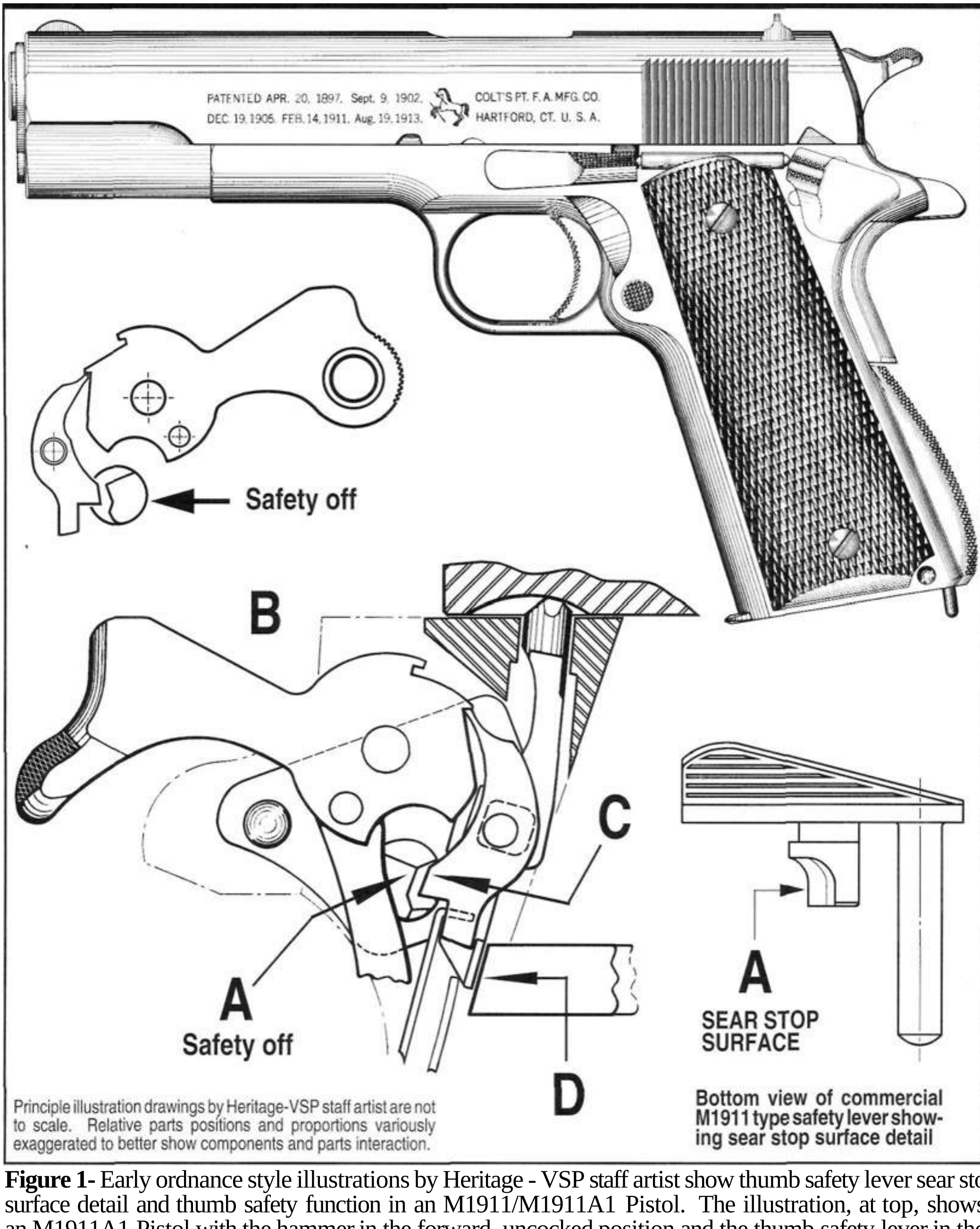


Figure 1- Early ordnance style illustrations by Heritage - VSP staff artist show thumb safety lever sear stop surface detail and thumb safety function in an M1911/M1911A1 Pistol. The illustration, at top, shows an M1911A1 Pistol with the hammer in the forward, uncocked position and the thumb safety lever in the lower, ***safety off*** *or* ***ready to fire*** position (provided the hammer is cocked). The right side parts interactive view in the M1911/M1911Al principle illustration, at bottom, shows the position of the thumb safety's sear stop surface when in the ***safety off*** position, at **A**, relative to the hammer and engaged sear in the full cocked position, at **B** and **C**, and the trigger bow, disconnector, and lower sear hook fingers, at **D.**

Note: In an M1911 /M1911A1 Pistol, the thumb safety will not engage unless the hammer is fully cocked. The hammer itself is safetied by simply drawing it back until the sear engages in the hammer's 1/4 cock (or safety) notch. Engaging the thumb safety to block the sear, if it were possible, would serve no real purpose with the hammer in safety notch position- and would be doubly redundant because of the M1911's other overlapping safety systems- which are always in active or passive place (i.e., the grip safety, disconnector, and inertial firing pin). Safety system function is the same in all true M1911 type pistols. Pistols that resemble the M1911, but depart from the basic design, may have slightly different or completely different safety systems. In such cases, consult the manufacturer for correct, model specific data.

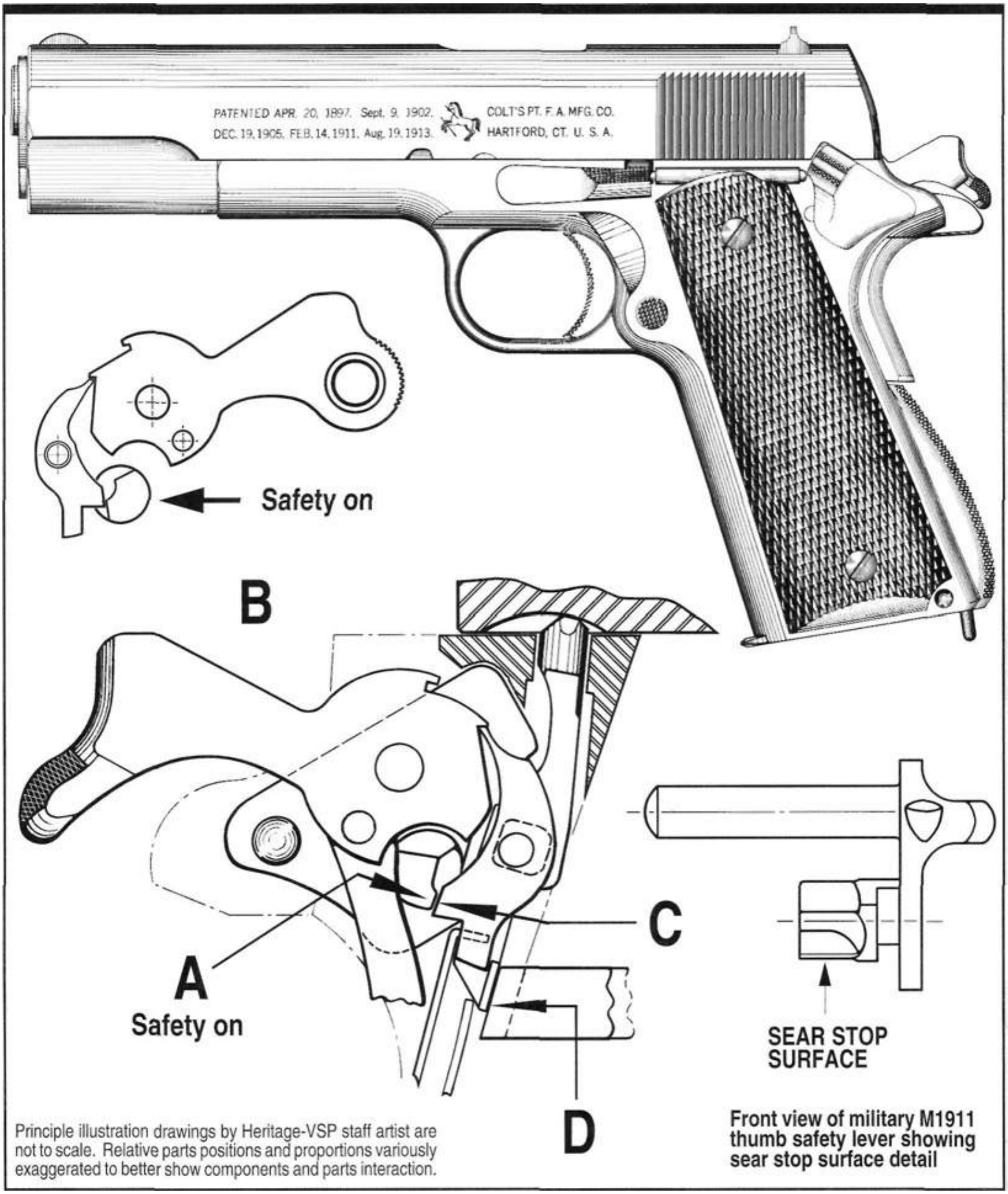
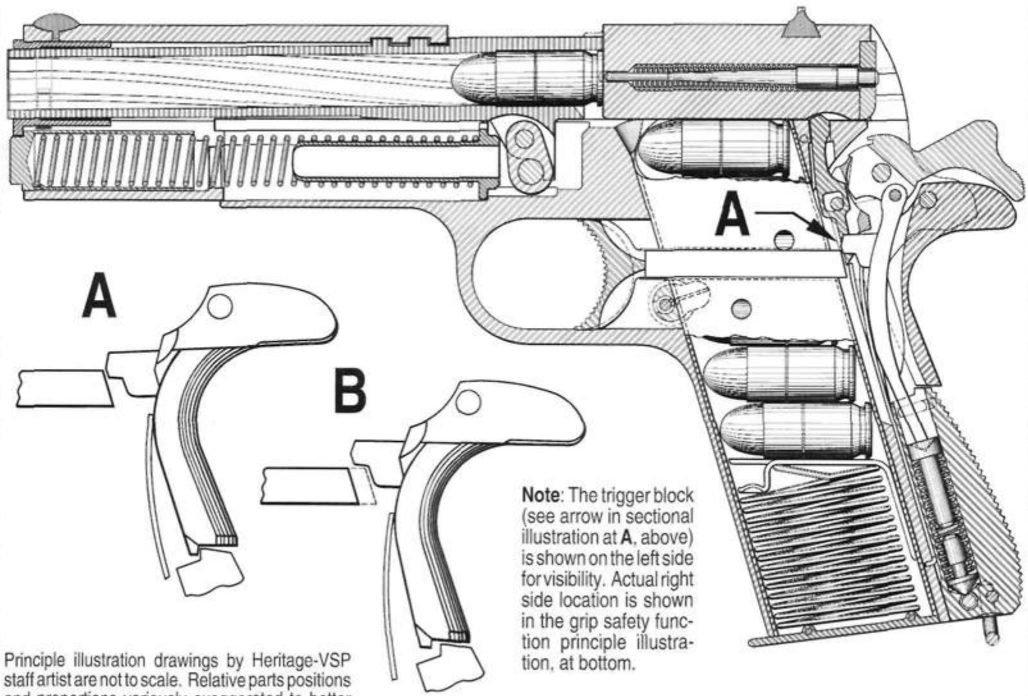


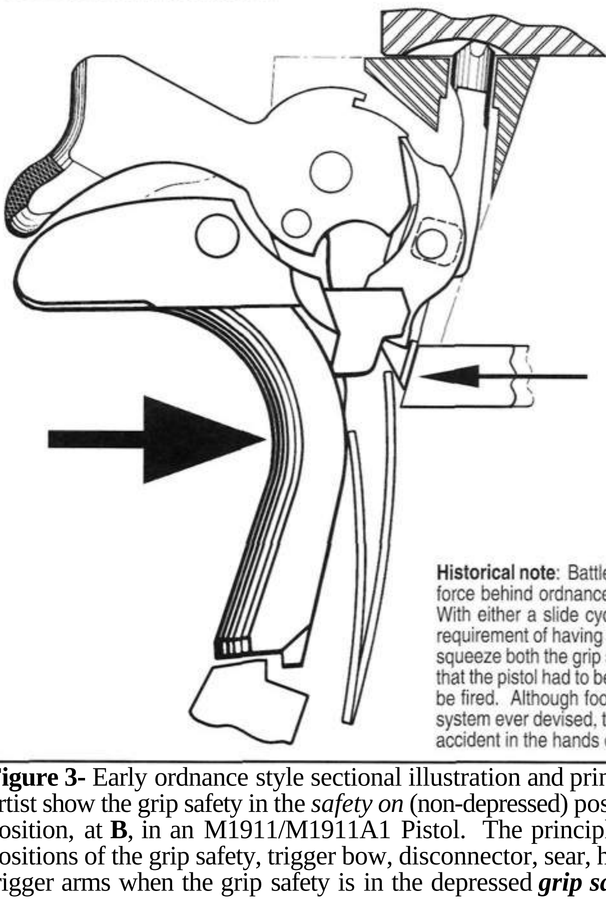
Figure 2- Early ordnance style illustrations by Heritage - VSP staff artist show thumb safety lever function in an M1911/M1911A1 Pistol and thumb safety sear stop surface detail. The illustration, at top, shows an M1911A1 Pistol with the hammer in cocked position and the thumb safety rotated upward to the ***safety on*** position. The M1911/M1911A1 principle illustration (right side parts interactive view), at bottom, shows the thumb safety sear stop surface in correct (contact) position against the flat front of the sear when the thumb safety is in the ***safety on*** position, at **A**. Relative positions of the hammer in full cock position and the safety engaged sear are shown at **B** and **C**. Relative positions of the trigger bow, disconnector, and lower sear hook fingers are shown at **D.**

Caution: Excessive sear engagement surface fitting; excessive thumb safety stop surface fitting; and/or exchanging a previously fit or tuned sear and/or safety lever from another M1911, M1911A1, or M1911 type pistol may cause a safety stop surface/sear clearance problem. **Note 1:** Clearance equal to sear/ hammer engagement can render the thumb safety unreliable, and/or nonfunctional. **Note 2:** Early M1911/ M1911A1 depot rebuild specs, called for safety, sear, and/or frame replacement if sear clearance exceeded. 005" (i. e. if the sear moved more than. 005") when the trigger was firmly squeezed while the thumb safety was on. The non Ml911 safety system caution in figure 1 applies above and throughout this manual.



Note: The trigger block (see arrow in sectional illustration at **A**, above) is shown on the left side for visibility. Actual right side location is shown in the grip safety function principle illustration, at bottom.

Principle illustration drawings by Heritage-VSP staff artist are not to scale. Relative parts positions and proportions variously exaggerated to better show components and parts interaction.



M1911/M1911A1 Grip Safety Function-

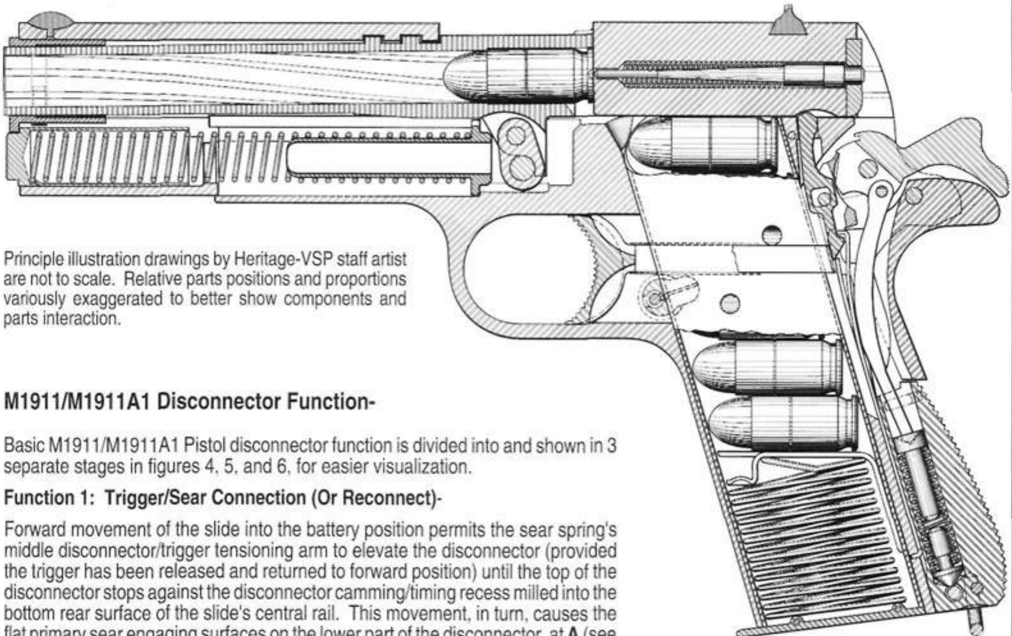
Function 1: Positive trigger block feature- When the grip safety is not squeezed/depressed inward, as shown above at **A**, rearward movement of the trigger bow is mechanically blocked by the grip safety's trigger block (stop) extension.

Function 2: Trigger unblock feature- When the grip safety is squeezed/depressed inward, as shown at **B** in the principle illustration at left, the grip safety's trigger block (stop) extension is elevated to the bypass position. This action then permits rearward movement of the trigger and permits the trigger bow, via contact with the (connected) disconnector, to depress and disengage the sear and thereby release the hammer and fire the pistol.

The parts interactive sectional view, at left, shows the position of the grip safety trigger block extension when the grip safety is squeezed/depressed inward to the ***safety off*** (trigger bow bypass position) in an M1911/M1911A1 Pistol.

Historical note: Battle conditions were the main consideration and guiding force behind ordnance adoption of the M1911 grip safety design feature. With either a slide cycled or a cocked and locked pistol, the mechanical requirement of having to depress the thumb safety to *off* position and then squeeze both the grip safety and the trigger in order to fire the pistol meant that the pistol had to be: (1) in hand; and (2) ready to fire; before (3) it could be fired. Although fools have the uncanny ability to overcome any safety system ever devised, this common sense feature reduced the possibility of accident in the hands of trained combat personnel to virtually zero.

Figure 3- Early ordnance style sectional illustration and principle illustrations by VSP-Heritage staff artist show the grip safety in the *safety on* (non-depressed) position, at **A**, and the ***safety off*** (depressed) position, at **B**, in an M1911/M1911A1 Pistol. The principle illustration, at bottom, shows relative positions of the grip safety, trigger bow, disconnector, sear, hammer, and sear spring disconnector and trigger arms when the grip safety is in the depressed ***grip safety off,*** or ready to fire, position.



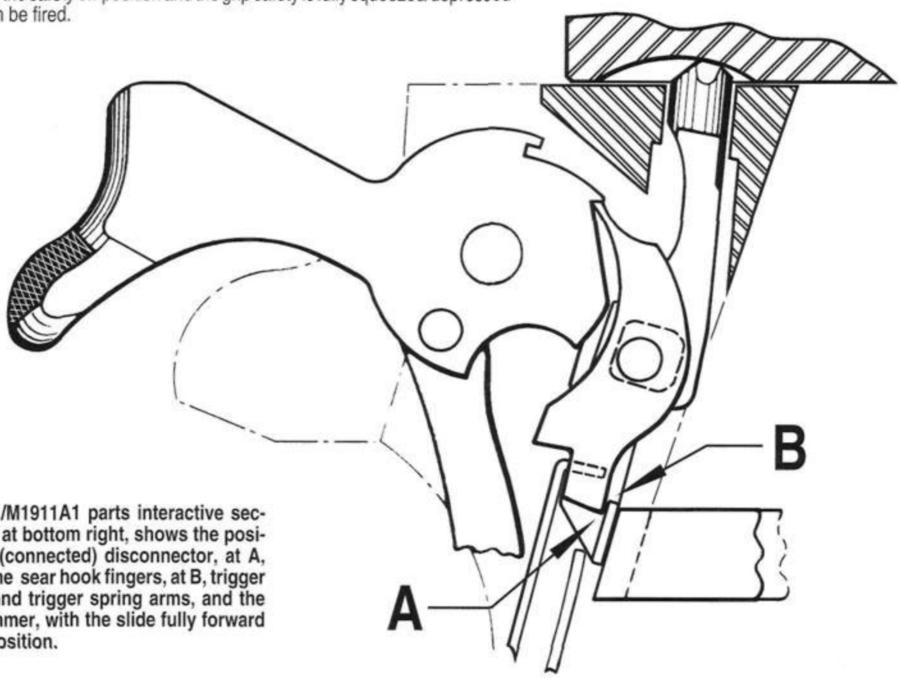
Principle illustration drawings by Heritage-VSP staff artist are not to scale. Relative parts positions and proportions variously exaggerated to better show components and parts interaction.

M1911/M1911A1 Disconnector Function-

Basic M1911/M1911A1 Pistol disconnector function is divided into and shown in 3 separate stages in figures 4, 5, and 6, for easier visualization.

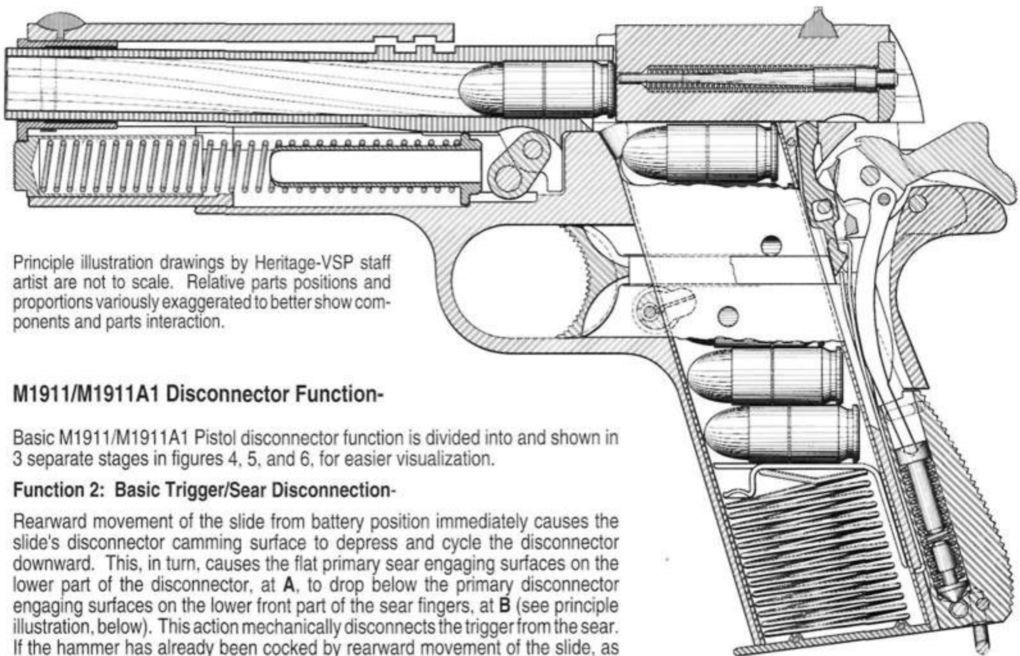
Function 1: Trigger/Sear Connection (Or Reconnect)-

Forward movement of the slide into the battery position permits the sear spring's middle disconnector/trigger tensioning arm to elevate the disconnector (provided the trigger has been released and returned to forward position) until the top of the disconnector stops against the disconnector camming/timing recess milled into the bottom rear surface of the slide's central rail. This movement, in turn, causes the flat primary sear engaging surfaces on the lower part of the disconnector, at **A** (see principle illustration, below) to contact the primary disconnector engaging surfaces on the lower front portion of the sear hook fingers, at **B**. This action mechanically connects the sear and trigger for firing, and- provided that the thumb safety is depressed to the *safety off* position and the grip safety is fully squeezed/depressed- the pistol can be fired.



The M1911/M1911A1 parts interactive sectional view, at bottom right, shows the position of the (connected) disconnector, at A, relative to the sear hook fingers, at B, trigger bow, sear and trigger spring arms, and the cocked hammer, with the slide fully forward in battery position.

Figure 4- Early ordnance style sectional illustration by VSP - Heritage staff artist, at top, shows basic relative positions of the disconnector and slide in a fully assembled M1911/M1911A1 Pistol when the slide is in the full forward battery position and the pistol is ready to fire. The right side detail view in the M1911/M1911A1 principle illustration, below, shows relative positions of the trigger bow, disconnector, and the slide's disconnector camming/timing recess relative to the sear, hammer, and disconnector when the slide is in battery and the hammer is in the fully cocked, ready to fire position. Basic sear disconnect and trigger/sear disconnect functions are shown and discussed in detail above and on the following pages.



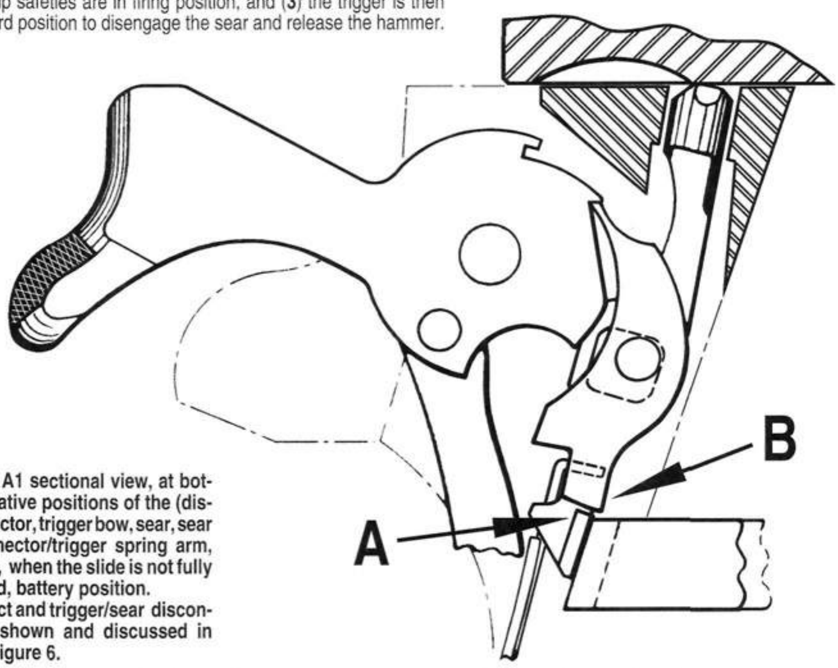
Principle illustration drawings by Heritage-VSP staff artist are not to scale. Relative parts positions and proportions variously exaggerated to better show components and parts interaction.

M1911/M1911A1 Disconnector Function-

Basic M1911/M1911A1 Pistol disconnector function is divided into and shown in 3 separate stages in figures 4, 5, and 6, for easier visualization.

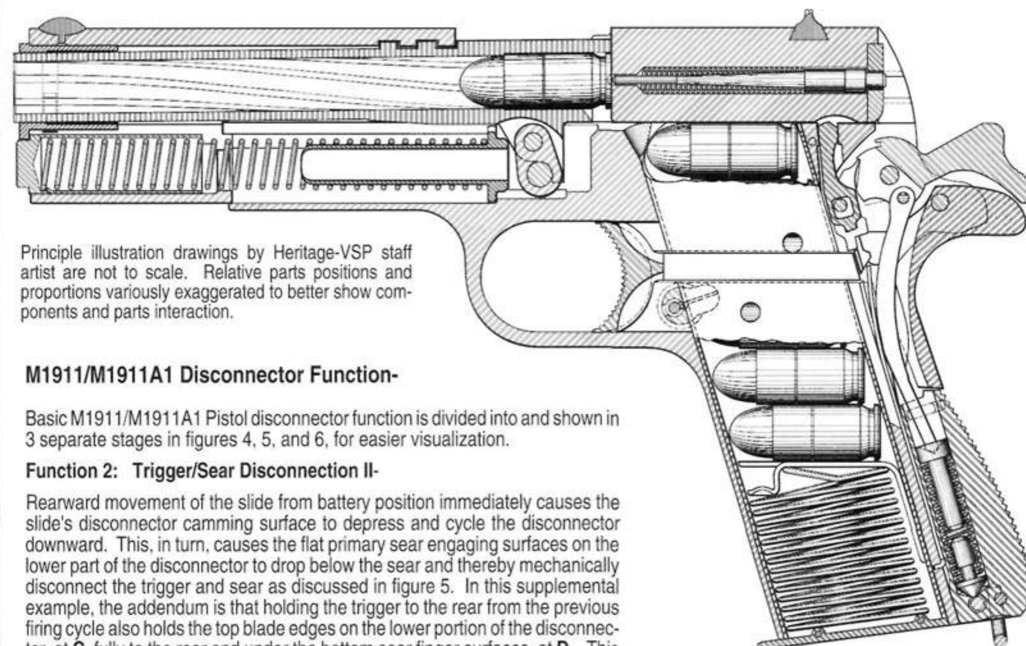
Function 2: Basic Trigger/Sear Disconnection-

Rearward movement of the slide from battery position immediately causes the slide's disconnector camming surface to depress and cycle the disconnector downward. This, in turn, causes the flat primary sear engaging surfaces on the lower part of the disconnector, at **A**, to drop below the primary disconnector engaging surfaces on the lower front part of the sear fingers, at **B** (see principle illustration, below). This action mechanically disconnects the trigger from the sear. If the hammer has already been cocked by rearward movement of the slide, as shown in the M1911A1 sectional illustration above, this action also leaves the M1911 independent sear physically engaged in the hammer's full cock notch. Hammer and sear spring pressure then maintain the hammer and sear in the cocked position until: (**1**) the disconnector is permitted by slide movement to cycle upward under sear spring pressure and into the slide's disconnector camming/timing slot (this action permits the disconnector to mechanically reconnect the trigger and sear- provided that the trigger has been returned to forward position); (**2**) the thumb and grip safeties are in firing position, and (**3**) the trigger is then squeezed from forward position to disengage the sear and release the hammer.



Partial M1911/M1911A1 sectional view, at bottom right, shows relative positions of the (disconnected) disconnector, trigger bow, sear, sear spring arm, disconnector/trigger spring arm, and cocked hammer, when the slide is not fully forward in the locked, battery position.
Basic sear disconnect and trigger/sear disconnect functions are shown and discussed in detail above and in figure 6.

Figure 5- Early ordnance style sectional illustration by VSP - Heritage staff artist, at top, shows relative positions of the disconnector and slide in a fully assembled M1911/M1911Al Pistol when the slide is not in the full forward, battery position. The right side detail view in the M1911/M1911A1 principle illustration, below, shows relative positions of the trigger bow, disconnector, and the slide's disconnector camming/timing recess relative to the sear, hammer, and disconnector when the slide is out of battery.



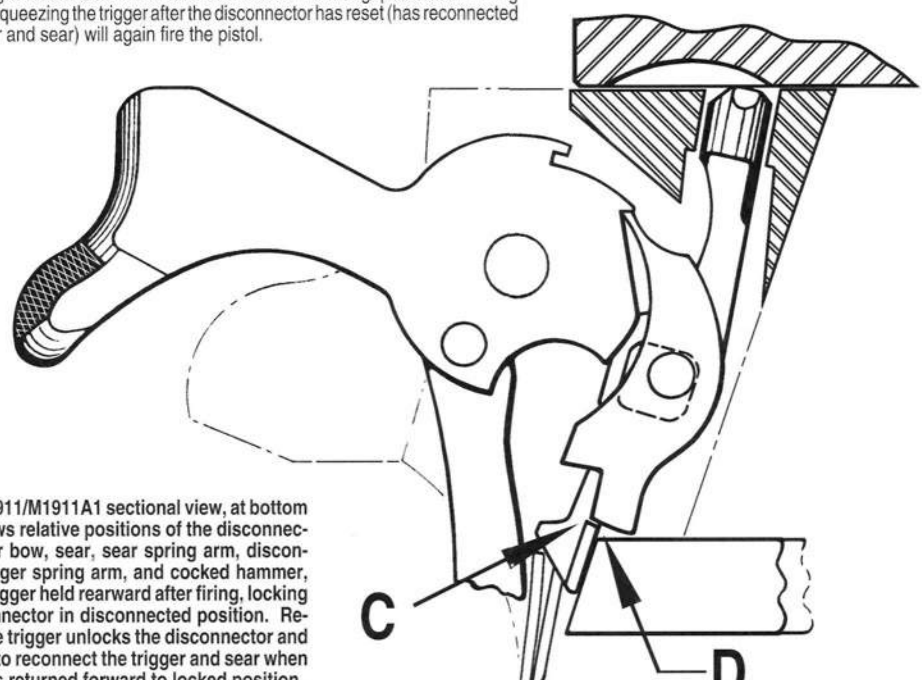
Principle illustration drawings by Heritage-VSP staff artist are not to scale. Relative parts positions and proportions variously exaggerated to better show components and parts interaction.

M1911/M1911A1 Disconnector Function-

Basic M1911/M1911A1 Pistol disconnector function is divided into and shown in 3 separate stages in figures 4, 5, and 6, for easier visualization.

Function 2: Trigger/Sear Disconnection II-

Rearward movement of the slide from battery position immediately causes the slide's disconnector camming surface to depress and cycle the disconnector downward. This, in turn, causes the flat primary sear engaging surfaces on the lower part of the disconnector to drop below the sear and thereby mechanically disconnect the trigger and sear as discussed in figure 5. In this supplemental example, the addendum is that holding the trigger to the rear from the previous firing cycle also holds the top blade edges on the lower portion of the disconnector, at **C**, fully to the rear and under the bottom sear finger surfaces, at **D**. This action retains and locks the disconnector in fully disconnected position. Disconnected position is maintained by the trigger bow even after the slide has returned forward to battery. Releasing the trigger and allowing it to return forward then permits the disconnector to cycle upward under pressure of the sear spring and reset (i.e., reconnect the trigger and sear as shown in figure 4). At that point, presuming a chambered round and both the thumb and grip safeties in firing position, squeezing the trigger after the disconnector has reset (has reconnected the trigger and sear) will again fire the pistol.



Partial M1911/M1911A1 sectional view, at bottom right, shows relative positions of the disconnector, trigger bow, sear, sear spring arm, disconnector/trigger spring arm, and cocked hammer, with the trigger held rearward after firing, locking the disconnector in disconnected position. Releasing the trigger unlocks the disconnector and permits it to reconnect the trigger and sear when the slide is returned forward to locked position.

Figure 6- Early ordnance style sectional illustration by VSP - Heritage staff artist, at top, shows relative positions of the disconnector and slide in a fully assembled M1911/M1911Al pistol with the slide in battery and the trigger held rearward after a previous firing cycle. The illustration, below, shows positions of the trigger bow, disconnector, and the slide's disconnector camming/timing recess relative to the sear, hammer and disconnector when the disconnector is in the trigger rearward (trigger locked) position.

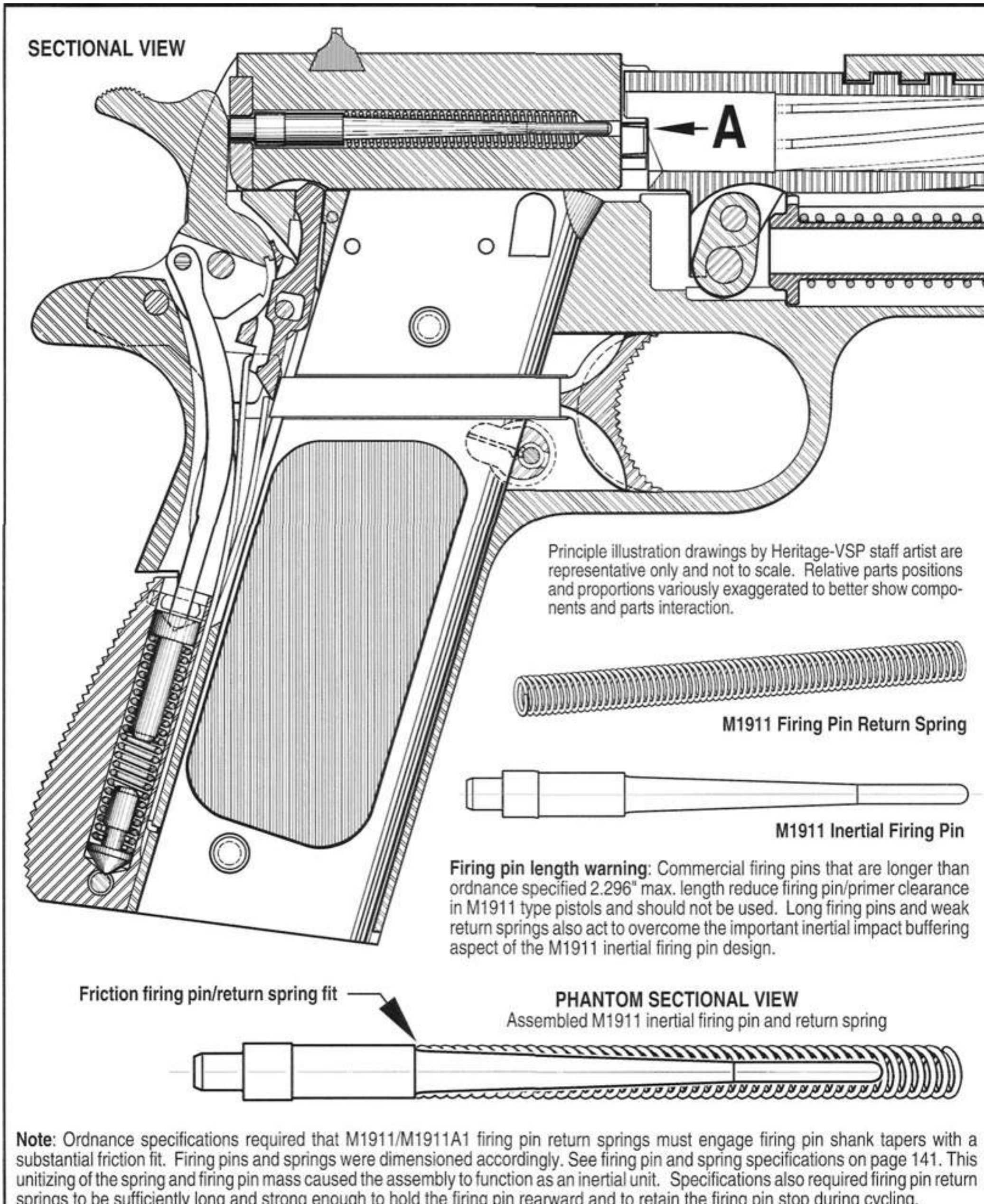


Figure 7- Early ordnance style sectional illustration by Heritage - VSP staff artist shows an M1911/ M1911A1 inertial firing pin in the rearward rest position. Note that firing pin length from rearmost stop position is considerably shorter than the firing pin passage in the slide. This design feature locates the firing pin tip well behind the slide breech face as shown at **A**. In a within spec U. S. M1911A1 Pistol, rearward firing pin return spring pressure exerted against the firing pin is sufficient to maintain firing pin stem/stop plate engagement and thereby retain the firing pin stop plate during slide cycling. A weak (or wrong) firing pin return spring; an excessively worn or otherwise off-dimensioned slide or firing pin stop plate; or any combination would, on the other hand, serve to defeat this basic design feature.

Items that would act to defeat the safety aspect of the M1911 inertial firing pin system: (1) a weak or wrong return spring could fail to hold the firing pin rearward and/or fail to act sufficiently as an inertial impact buffer; (2) an over dimension, bent, or otherwise deformed return spring or firing pin, an off-dimension, or rough firing pin passage/port in the slide, and/or grit or foreign material in the firing pin passage could bind or stick the firing pin and cause failed return. This also applies to commercial M1911 type pistols.

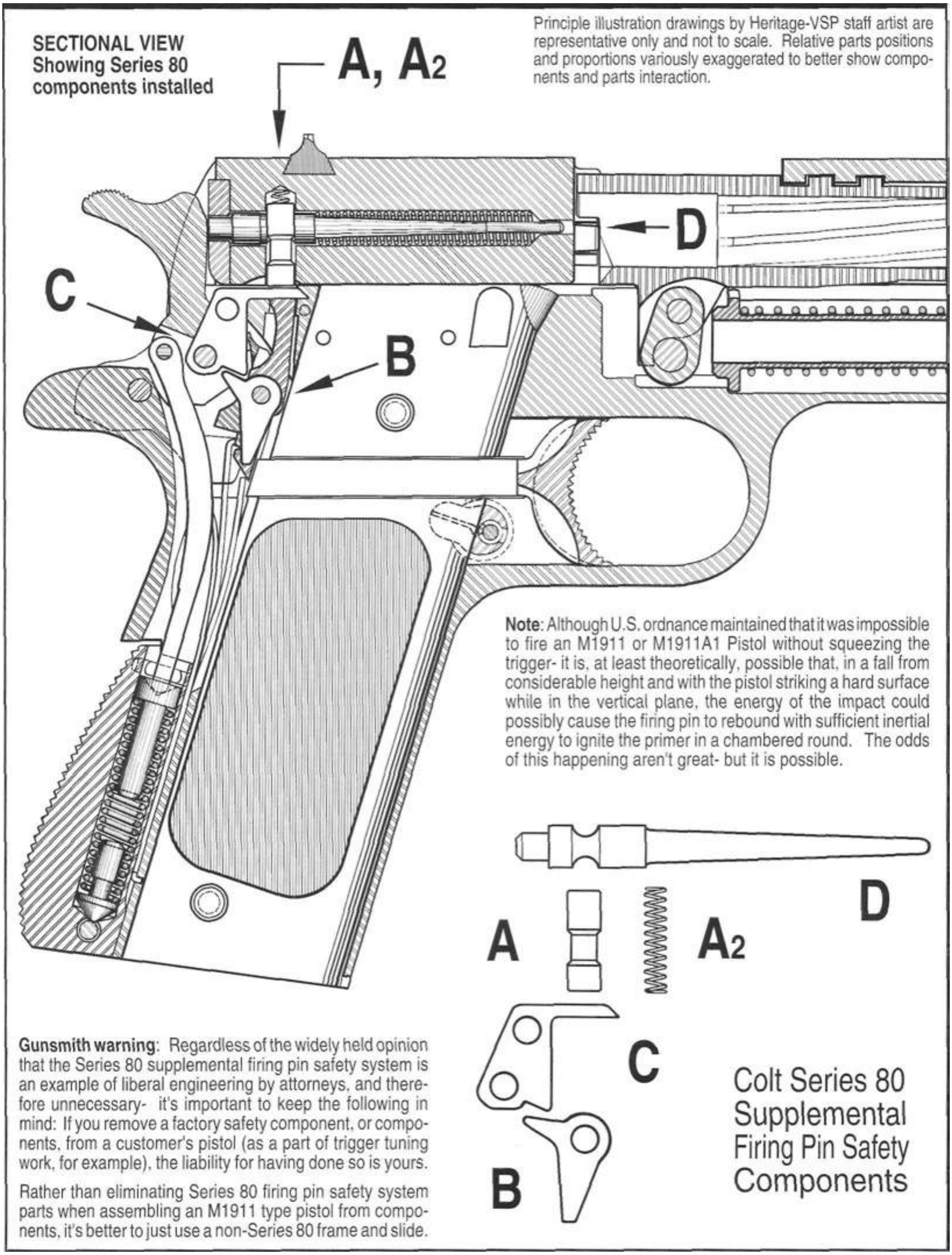


Figure 8- Early ordnance style illustration by VSP - Heritage staff artist, at top, shows relative positions of Colt Series 80 supplemental firing pin safety components in a fully assembled pistol. Series 80 safety components are shown separately, below. The Series 80 firing pin safety system functions as follows: In rest position, the firing pin lock plunger spring (A2) holds the firing pin lock plunger **(A)** downward and thereby retains (locks) the firing pin **(D)** in the rearward position. When the hammer is cocked, and the thumb and grip safety are in the ready to fire position, squeezing the trigger (an intentional action) then causes the trigger bow to cycle the trigger bar lever **(B),** this action, in turn, rotates the firing pin lock plunger lever **(C)** which elevates the firing pin lock plunger (A) to the firing pin clearance position. This action enables the hammer to impact the firing pin **(D)** and to move the firing pin forward with sufficient inertial energy to initiate the primer in a chambered round.

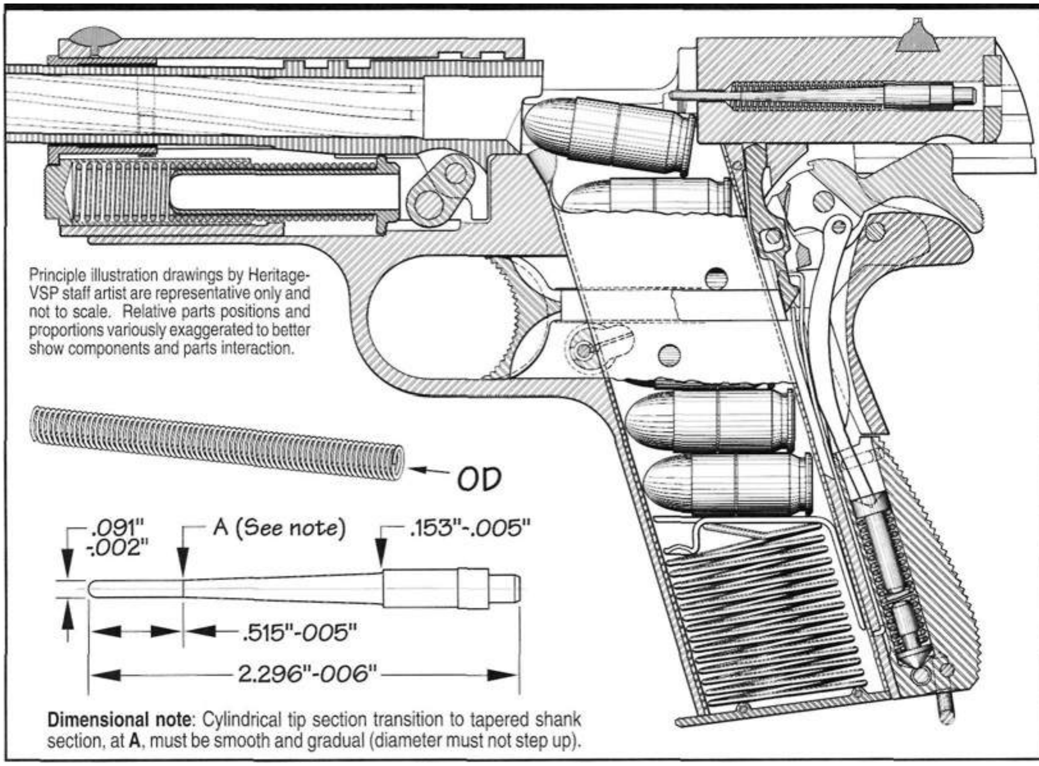


Figure 9- Early ordnance style sectional illustration by VSP-Heritage staff artist depicts an off-specification M1911 type inertial firing pin wedged into (and stuck) in the slide's firing pin port. This condition can be caused by a bent, otherwise deformed, or mis-dimensioned firing pin (notably firing pins that are over diameter and/or are stepped up at the shank transition, at A above); an oversize or deformed firing pin return spring; and/or by a rough or mis-dimensioned firing pin passage or port in the slide. Note: Although the subject here is damaged or off-specification parts, keep in mind that an M1911 firing pin can inertially jump forward 1/2" or more when the hammer is dropped on an empty chamber. This could stick an off-dimension or bent pin. In most cases, this condition would simply block or misfeed/jam a round from a magazine, but could potentially fire a hand chambered round with slide closure, depending on how solidly the firing pin was stuck in the slide.

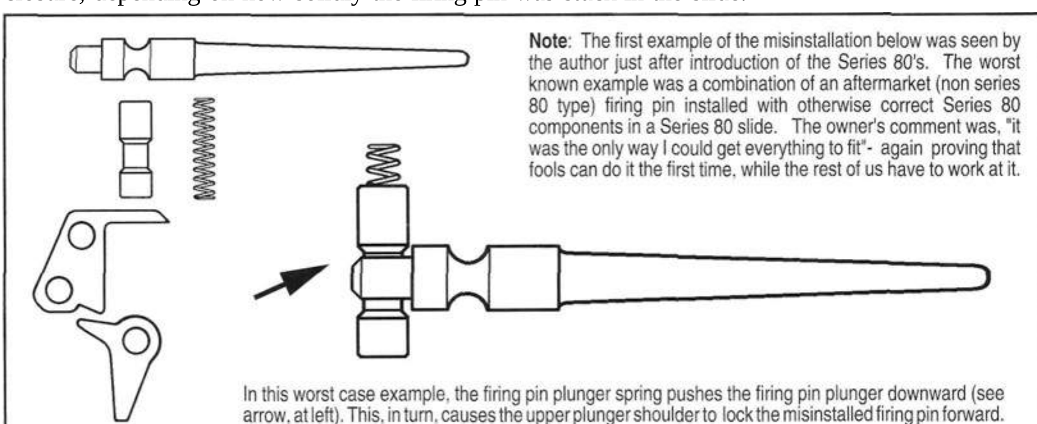


Figure 10- Individual Series 80 components are shown for reference, at left. The principle illustration drawing, at right depicts a Series 80 type firing pin and firing pin plunger in a mis-installed position that would effectively create a condition similar to the stuck firing pin example discussed in figure 9. Although examples of such mis-assembly aren't commonly seen, pistolsmiths are best served by being made aware of the possibility, if they aren't already. Due to variations in parts tolerances, component mis-assembly as shown in the above example is fairly easily done with some slide/component combinations and nearly impossible with others. See Series 80 parts assembly and function in figure 8.

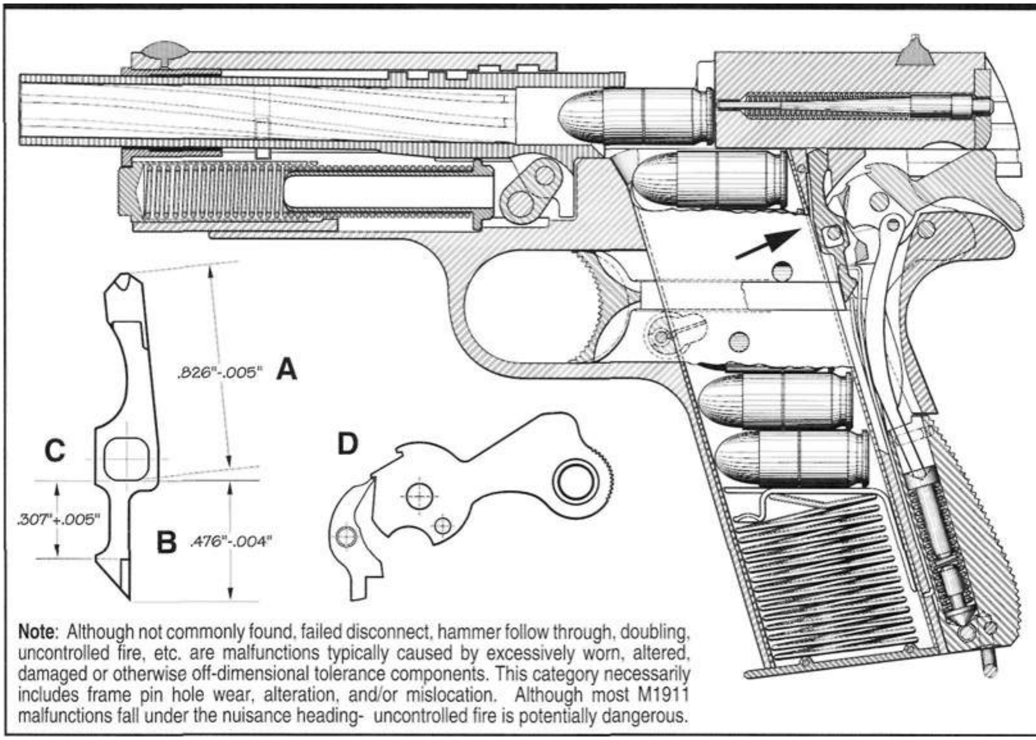


Figure 11- Ordnance style sectional illustration by Heritage - VSP staff artist, at top, depicts an M1911A1 Pistol as the slide moves forward and begins to chamber a cartridge after having cycled rearward, under recoil, to eject a previously fired cartridge case and cock the hammer. Note that the disconnector (see arrow in drawing) is held depressed by the slide to disconnect the trigger and sear. When parts are serviceable, disconnect status is maintained until the slide resumes battery position and the trigger is returned forward. Critical vertical disconnector dimensions at **A, B,** and **C** must be within the basic dimensional specifications shown. A minimum specification or shorter disconnector, an excessively worn, altered, or otherwise off-dimension frame and/or slide, or any combination can cause failed disconnect and hammer follow through. Hammer/sear full engagement problems caused by altered or damaged full cock engagement surfaces, at **D**; weak or altered sear or hammer springs; off-dimension sear/hammer pivot pins and/or pin hole dimension/location problems can cause hammer follow through. In most hammer follow through occurrences, the sear slips off, wobbles off, or bounces out of full cock engagement. This permits the hammer to follow part way through until the sear engages the hammer's safety stop shoulder or notch.

About M1911/M1911A1 Pistol malfunctions and reliability in general-

1. Worn, altered, or damaged component related malfunctions- Failed disconnect and assorted hammer follow through problems (both disconnector and non-disconnector related); doubling and otherwise uncontrolled fire, etc. are caused by excessive parts wear, frame or slide wear, and component alteration and/or damage. In other words, these problems are caused by off-specification components. Remember that M1911 and M1911A1 military pistols range in age from 50 to 85 or more years old. Some Colt commercial Government models are nearly as old. Keep in mind that very few automobiles of this vintage still even exist. So why shouldn't other mechanical devices, guns for example, wear out?

2. Off-specification commercial component related malfunctions- Off-specification commercial parts can cause the same, and, in some cases, exaggerated versions of problems caused by worn out military parts. For example, a new commercial frame with mis-dimensioned and/or mis-located hammer, sear, or slide stop pin holes is no better (and may be worse) than a worn out military frame with worn oversize pin holes. The same principle applies to other M1911 components. That a frame, slide, or other part might be new is not, by itself, a particularly redeeming quality.

3. Feeding/Chambering related malfunctions- From a purely practical viewpoint- expecting an unmodified ordnance spec. M1911 type pistol to feed ammunition with flat nose, soft nose, hollow core, or wadcutter bullets without barrel ramping and other work is a lot like asking a military specification M1911 or M1911Al pistol to feed ball cartridges backwards. Standard M1911/M1911Al

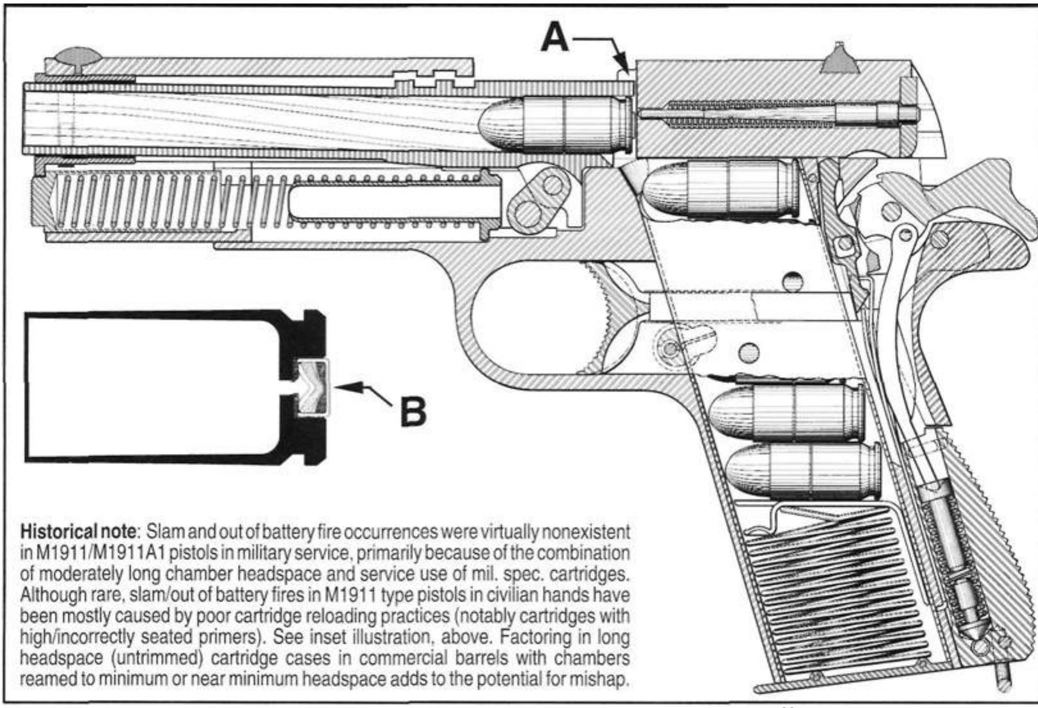


Figure 12- Ordnance style sectional illustration by Heritage - VSP staff artist, at top, depicts an M1911A1 Pistol as the slide completes the cartridge chambering phase momentarily before the barrel begins to link upward into battery (note the high primer in the chambered cartridge, at **A**). The inset illustration depicts a .45 ACP cartridge case with high primer, at **B**. In this example, the primer anvil is seated high on residue left inside the primer cup. In an autoloading pistol, and M191l's are no exception, slam and/or out of battery fires can potentially occur at the approx. above point. Cause factors would be high seated primer position, min. or minus chamber headspace, and max. or excessive cartridge headspace- with the combination being particularly dangerous. Slam fires of this type typically occur as the breech face squeezes (or impacts) the primer as the slide goes into battery

M1911/M1911A1 Pistol malfunctions and reliability in general, continued-
type pistols just won't do it -<u>because they flat weren't designed to</u>. But that's not the end of the matter- there are workable solutions to the feeding/chambering problems created by magazine loaded non-standard (read design mismatched) cartridges in M1911 type pistols. Cartridge feed timing; horizontal and vertical cartridge/chamber alignment; cartridge case extractor pickup; and chambering of other than ball cartridges- is improved by barrel ramping, extractor fitting, installation of a long ejector, the use of timed release magazines, taper crimping of cartridge cases, etc.

These days, magazine writers tend to carry on about imagined M1911 design deficiencies as if having been born to the ordnance system with first hand knowledge of what they bemoan. Are these guys 100 years old, or what? The fact is, that to entitle an article "Dispelling the Myth of Ml911 Reliability" serves only to create the myth (in the style of: "Has the president really stopped beating his dog?") as a ploy to enable the writer to expound on the subject. Great journalism. Articles also have been published grousing about M1911 parts breakage (it's a fact that cast commercial extractors break) and/or how M1911 type pistols with loose goose barrels and bushings group poorly on target at 25 yards and 1. 3 miles. Still other articles lament that unmodified M1911 type pistols won't naturally feed hollow or soft nose cartridges, or shoot rocks. No kidding. History tells us that the M1911 pistol was specifically designed to fire round nose FMJ *ball* cartridges and was tested by the military to the point of literal destruction and then manufactured to the dimensional tolerances and metallurgical specifications found most reliable for combat use. This concept worked so well that it produced functional and reliable military pistols- many of which are still in use nearly a century later. But, substitute off-specification ammunition and/or parts made from who knows what steels, and you throw reliability out the window.

M1911/M1911A1 Pistol slam/out of battery fires-

Slam and out of battery fires are rare in serviceable M1911 type pistols and virtually unheard of in within specification military pistols when ordnance specification ammunition is fired. Keep in mind

M11911/M1911A1 Pistol slam/out of battery fires, continued-

that, rare or not, the slam or out of battery fires that have occurred did not do so for mysterious reasons. Fortunately, military M1911/M1911A1 Pistols are fairly forgiving in this regard largely because of their relatively long .022" chamber design headspace (.898" minimum - .920"maximum headspace range). See pages 22 and 23. Slam and out of battery fires in M1911 type pistols in civilian use are almost always traceable to reloaded ammunition and the additive factors discussed below.

Ammunition related causes of slam/out of battery fires in M1911 type pistols:

1. High primers- This condition exposes the primer to breech face contact/impact as the slide closes.

2. High/deformed primers- Excessive compression is the most common form of primer deformation. Excessive seating pressure reduces primer *bridge* thickness (pushes the primer cup and anvil closer together and correspondingly reduces the thickness of the priming mixture between them). Up to a point, over compression can also increase sensitivity in Boxer primers. Further compression can, but may not, reduce sensitivity. It's an *iffy* situation, at best. Another way to look at it is that a much shallower firing pin indent would typically be needed to fire a compressed primer. This brings us to the main difficulty with overly compressed primers in cartridges reloaded for auto pistols, namely: that over compression (increased primer sensitivity) + high primer position correspondingly reduces the slide inertial energy and breech face impact force needed to fire such primers. Thankfully, most U. S. made Boxer primers will not fire unless the anvil is seated. Some, however, have been known to fire with anvils partially seated, or cocked and partially supported. See reloader responsibility note below.

Secondary or supportive ammunition related factors- These would increase the potential for initiating and firing a high or high/deformed primer during slide cycling: long cartridge headspace (long cases not trimmed to specification) in chambers reamed to minimum or near minimum headspace; long cartridges (bullets not seated to specification) in chambers with short or minimum length bullet seats (throats), or a combination of the foregoing.

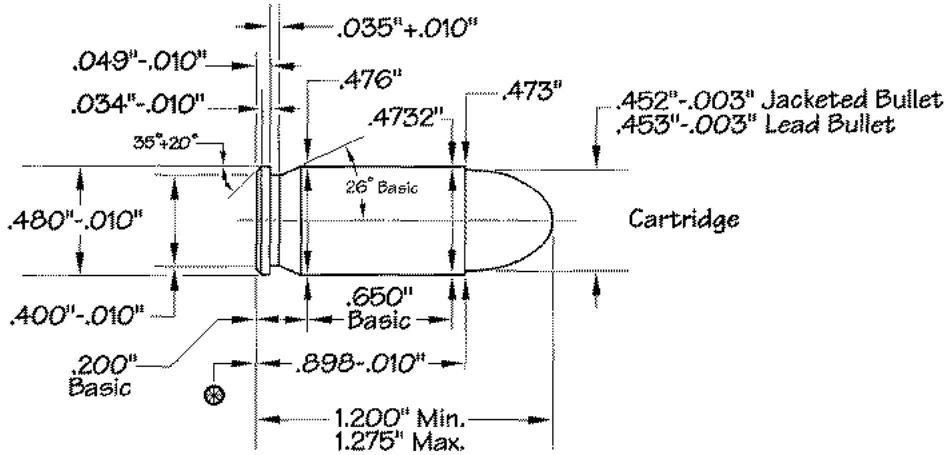
Reloader responsibility note: Regarding primer installation- Contrary to the spin trial attorneys have tried to put on the matter, no primer has ever been known to select, install, or fire itself. In the event of a slam or out of battery fire with reloaded ammunition (ruling out a mechanically stuck firing pin), only the reloader can be the true primary cause of the problem. A high or high + deformed primer; a dirty or otherwise shallow primer pocket; long cartridge headspace; minimum or near minimum chamber headspace, and/or any combination in a given pistol could only be secondary or supportive to the actual cause. At risk of over stressing the point, this would make the reloader himself the actual primary cause- not a reloading component manufacturer who happens to have a much deeper pocket. Although trial attorneys argue that evil objects actually exist (as needed for the sake of optimizing income) it's people who really think and do things- objects do not.

Primer sensitivity note: Basic primer sensitivity is determined by priming mixture, cup hardness/ thickness, anvil design, and, to some extent, installation. Most manufacturers determine relative primer sensitivity by H bar testing wherein a 3. 94 oz. ball is dropped from various test heights onto a firing pin against a primer seated with standard pressure to a standard depth. Although several deviation factors are used, the basic H factor is the height in inches at which 50% of the primers impacted fire and 50% do not. For example, a primer with an H of 14 or 15 is considered less sensitive than one with a rating of 12 or 13. Primer sensitivity is a statistical concept having more to do with the *average* primer than any single primer being installed at the bench. To ensure that primer performance remains within statistical specifications, stay on the conservative side when reloading for autoloading pistols by combining lower sensitivity primers, uniform case preparation, and uniform depth primer seating. Seating primers to. 006" below flush is suggested. Industry max. primer seating depth specification is. 008" below flush.

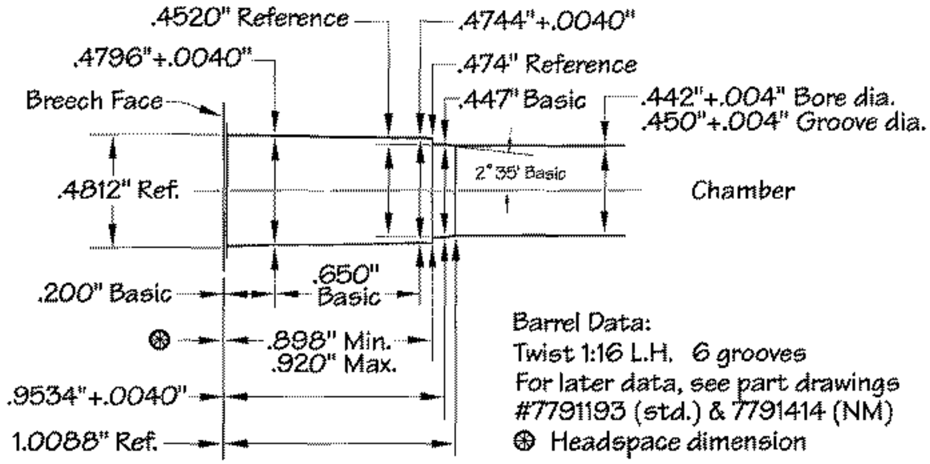
Remaining causes of slam/out of battery fires in M1911 type pistols-
Other remaining causes historically known to have caused malfunctions or slam/out of battery fires in M1911 pistols have been: *(1) firing pin stuck forward-* possibly caused by an off-dimension or wrong firing pin, a bent/wedged, rust/wedged, firing pin or an off-dimension, irregular, damaged, or wrong firing pin return spring; (2) *inadvertent hammer release and/or full hammer follow through-* possibly caused by failed disconnect, sear/hammer disengagement- in turn, caused by off-dimension, worn, altered, broken, or otherwise damaged parts including the hammer, sear, disconnector, trigger and hammer pivot pins/pin holes, the frame/slide and/or soft, weak, altered, or wrong springs.

Note: None of the above factors are indicative of design deficiency- but, instead, fall under the category of failed inspection and maintenance. This category necessarily includes problems related to the installation and use of off-dimensional and/or off-metallurgical tolerance commercial M1911 components.

Ball Cartridge. Caliber .45, M1911

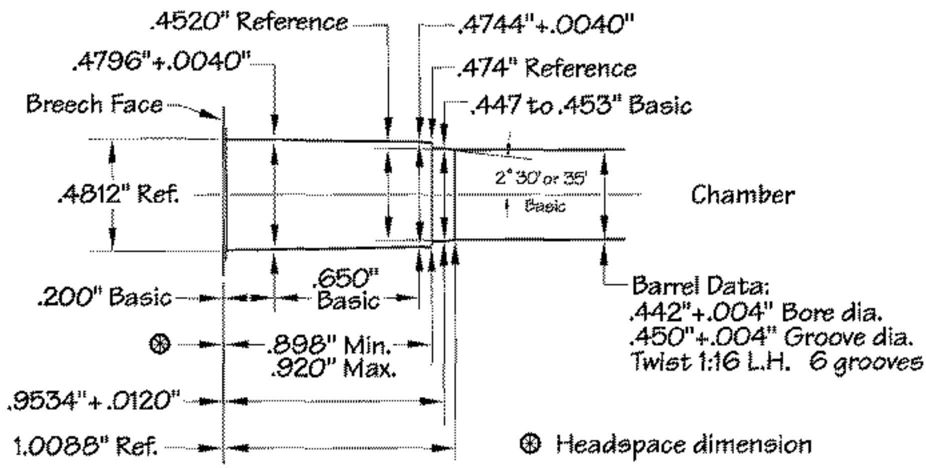


Basic Military Chamber

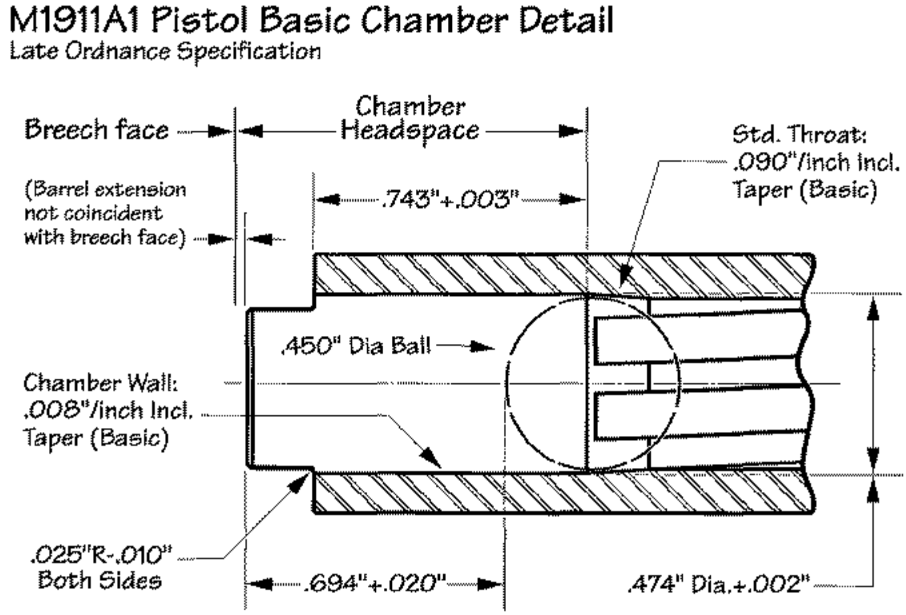


Barrel Data:
Twist 1:16 L.H. 6 grooves
For later data, see part drawings #7791193 (std.) & 7791414 (NM)
⊛ Headspace dimension

Commercial Chamber



⊛ Headspace dimension



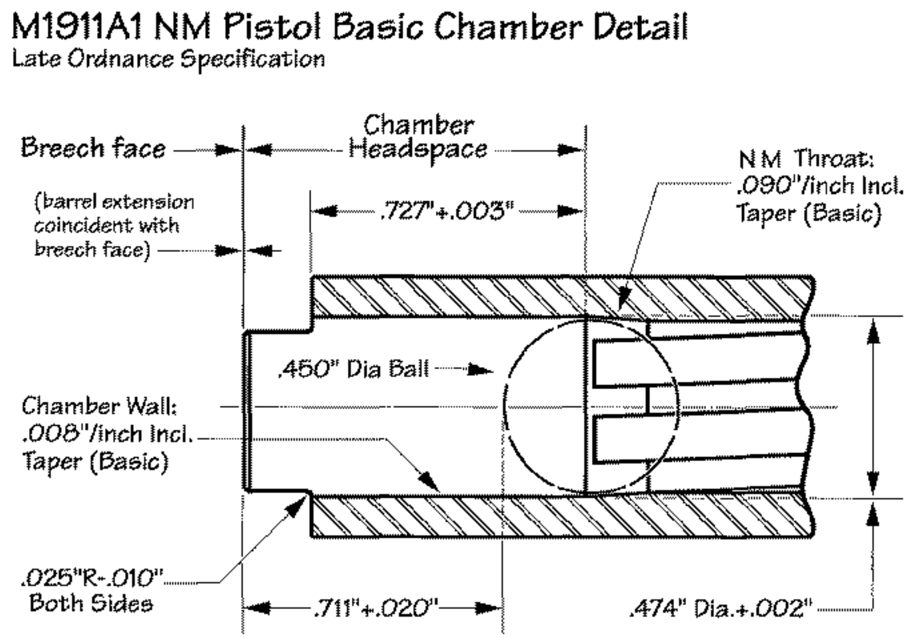


Figure 14- Ordnance style sectional illustrations by Heritage - VSP staff artist show differences between standard M1911A1 and M1911A1 NM barrel chambers. Headspace in both is defined as the distance from the chamber's cartridge case heading seat (case mouth ledge) back to the breech face. The basic difference between the two (barrel recoil face to heading seat dimensions aside) is that headspace essentially, *floats* (within ordnance specified limits) in standard M1911/M1911A1 Pistols and is fixed in NM pistols by fitting the rear barrel extension (hood) to slide breech face contact. See additional barrel/chamber headspace data on pages 104 - 107.

Figure 13- (on page 22) - Illustrations by Heritage - VSP staff artist show ordnance standardized M1911 Ball Cartridge and M1911 chamber dimensions. Except for chamber bullet seat (throat) depth and angle commercial standardization simply followed the military. See commercial chamber drawing, at bottom.

About gunsmithing U. S. M1911/M1911A1 Pistols and commercial M1911 type pistols

There are two important historical points that must be kept in mind: (1) the M1911 Pistol design was originally standardized by U. S. Ordnance. The M1911 was then adopted by the U. S. military based on the ordnance determined dimensional standards considered best for a military service pistol. Colt then offered the Government Model, a commercial pistol based on ordnance dimensional standards, after U. S. Army adoption of the Ml911. The M1911 was intended for use in every imaginable environmental and combat condition. Adhering to this goal, U. S. Ordnance continued in the development of Browning's original M1911 design (improving the metallurgy, adjusting dimensional tolerances, etc.) to maximize its inherent ruggedness and reliability. (2) Although largely forgotten these days, the M1911 was basically designed as a modular component service pistol. Nonetheless, the intended benefit remains: all M1911/ M1911A1 Pistols were originally, and still are, 100% rebuildable - primarily because the frames, slides, and small parts were designed and manufactured to be fully replaceable components.

With (1) & (2), above, established, both the M1911 and the later M1911A1 update were issued with downstream maintenance and rebuilding fully in mind. A simplified, *by the book,* field maintenance system was central to the Ml911/M1911A1 support package. The essential maintenance procedure was that visibly worn, rusted, off-gauge parts (i. e., parts that failed to pass ordnance gauge inspection), broken, or otherwise damaged parts were simply replaced. Most of the ordnance gauges available at the various organizational maintenance and depot levels were simplified or more durable versions of those used at the arsenal or ordnance contractor levels to gauge inspect newly manufactured parts and/ or component assemblies. Ordnance tooling intended for field armorer use was kept basic. Maintenance echelons were established as a matter of practicality, i. e., if the category of repair or the part(s) needing replacement was not authorized at the particular unit level, the pistol was taken out of service and sent to the higher level authorized to do the repair. This simple system was especially time efficient at the combat unit level, nearly impossible to screw-up, and extremely workable when inspection gauges, ordnance tooling, new receivers, slides and small replacement parts were abundant. The key was that pistols could be kept within ordnance specification virtually forever by simply replacing worn or damaged components. Keep in mind that the full civilian retail price in 1948 - 1950 for a Colt Government Model extractor was $1.50; a new magazine was $2.50, and the really expensive parts such as barrels and slides were $8.50 and $20, respectively. Government contract prices were pennies on the dollar by comparison. Since then, the effectiveness of the above maintenance method has become economically unworkable, at least on the civilian side, because of the 10X price multiplying effect of zero value currency and manufacturers product liability cost. **Cost note:** If not for productivity increase (CNC manufacturing equipment, etc.) the above price multiplier would probably exceed 20X.

Even now, (aside from parts cost) the only real difficulty with the above ordnance maintenance system is that most inspection gauges, maintenance tooling, and tons of parts were either shipped to foreign governments or destroyed/scrapped. As a result, the majority of the U. S. G. I. inspection gauges and maintenance tools remaining in existence are now collector's items, and, as such, are no longer in use.

Note: It is now politically incorrect to designate any military or civilian small arm once used by the military or government as *obsolete*- or heaven forbid- as *surplus.* The now valuable and collectable Remington M513 and Winchester M75. 22 L. R. target rifles purchased at taxpayer expense and destroyed at taxpayer expense are but one example. The logic seems to be any expense is justifiable to avoid the "S" (surplus) word. This is not only abject waste- it's enough to bring tears to a patriot's eyes. If there was ever a more conclusive example that government agencies are self serving and fear the unwashed public they no longer serve, I can't imagine what it might be.

About repairing, restoring, and rebuilding U. S. military M1911 and M1911A1 pistols-

U. S. G. I replacement parts in new issue condition are becoming scarce- and some are no longer available at all. This problem is made worse, or at least confused, by those who misleadingly advertise Ml 911/M1911A1 parts as being new G. I. (meaning genuine, new U. S. G. I.), and then ship parts that, in fact, are not. Future parts availability leaves pistolsmiths and collectors who rebuild and restore military pistols with the need to find effective ways to maintain Ml911 and M1911Al Pistols within ordnance specs. Cannibalizing serviceable, within specification components from other M1911's is one option. As this becomes more difficult, and sillier to do from a financial viewpoint, the alternative would be to remove military pistols with collector value from service and preserve them as valuable non-shooting specimens. With loose tolerance military pistols- for example, those with excessive frame/slide or slide/barrel/bushing wear and clearance, the only other option would be to maintain design intent by altering the frame and slide rails to improve fit, and to expand or replace the barrel bushing and possibly the barrel, as well- any of which would lessen or destroy the collector value of a given pistol. From the viewpoint of collector value- it's better to leave such pistols as they are.
It is important to note that the principle illustration drawings, ordnance specifications, gunsmithing data, and related subject matter furnished in the main body of this manual, apply directly to U. S.

About gunsmithing U. S. M1911/M1911A1 Pistols & commercial M1911 type pistols, continued-

Military M1911 and M1911Al Pistols and components manufactured in U. S. arsenals and/or under government contract by U. S. ordnance contractors. It also applies to M1911/M1911A1 Pistols manufactured under license by foreign governments- Argentine M1927 Pistols, for example. The data provided also must apply, by default, to commercially manufactured M1911/M1911Al type pistols and, relatedly, commercial pistol components because there are no specifications for the M1911 Pistol other than ordnance specifications. Even if applied at the most basic level, the parts dimensional and metallurgical data in this manual serve as a useful guide for identifying substandard parts.

About repairing/rebuilding M1911 type pistols or assembling pistols from commercial components-

Keep in mind that: (1) after a whole lot of R&D and destruction testing, U. S. ordnance specs, were ultimately based on the finalized (ordnance standardized) M1911 design; (2) even at risk of over stressing the point- regardless of how many commercial pistols have been made- <u>ordnance specs, are the only M1911/M1911A1 Pistol specifications there ever were, and except for the optimum performance pistol standards proposed later in this book- the only specs, there ever will be;</u> (3) pistols assembled as per ordnance specifications from mil. spec, components were durable and functioned reliably; and, finally, (4) all mechanical devices must, sooner or later, wear out and high stress parts break or wear out first. Low grade commercial parts do all of the above- and at a generally faster rate. The fact that some commercial M1911 type pistol and component manufacturers have allowed considerable dimensional and metallurgical tolerance creep (and have, thereby, violated or abandoned design intent) brings us to two important questions- (1) how do we technically inspect a commercially made 1911 pistol; and (2) what about commercially made M1911 components in general - what are the dimensional and metallurgical/hardness specs for such parts? For the answer- we really have little choice but to return to historical data (i. e., back to ordnance specs). The fact is that for reliability and durability to exist in any M1911 type pistol, the parts it's assembled from must at least meet basic ordnance specs. Start, for example, with the M1911/Al frame to be used in assembling a pistol- the slide stop crosspin hole, the hammer and sear pivot pin holes, the disconnector passage, the safety lever cutout, the slide rails and other critical surfaces, recesses, slots, cuts, etc. all have to be in the standard (ordnance specified) M1911 locations and correctly dimensioned for an M1911 type slide and other M1911, or M1911 type, parts to fit correctly and function within design intent. And what about hardness? Does the frame test at least RC 24-25 (RC 27-30 is optimum for fitting, lubricity, and durability). If the frame is softer than RC 24, or if any critical surface/location/dimension is off, you essentially have a reject component on hand. The question with reference to fractionally off spec. M1911 type frames is purely practical- do you spend the time needed to make everything fit (presuming it's possible), or send the frame back. Returning the frame is an option that is open before fitting- but not after. It's essentially a question of what your time is worth.

The substitution of low grade steels in manufacturing M1911/M1911A1 Pistol parts and/or departures from ordnance specified dimensions, failure to hold parts tolerances/clearances, and/or departures from specified component heat treats all serve to create *low grade copies* rather than the real thing. Extractors, ejectors, barrel bushings, recoil spring plugs, etc, and other parts investment cast from low grade materials are either too soft and peen/batter or are brittle and usually break sooner than later. When low quality cast parts become available to the extent that stylishly negative magazine articles begin to appear questioning the reliability of the basic M1911 design, it is, in fact, well past time to revisit history and ordnance specs, -hence the main thrust of this book. The visual inspection, gauge inspection, function checks, and repair/rebuilding methods discussed in this manual parallel original military maintenance and marksmanship unit procedures as closely as possible. Scarcity of original ordnance gauges, special tooling, and new U. S. G. I parts, as mentioned earlier, make parallel civilian inspection and rebuilding procedures necessary. Adherence to design intent and the desire to *build* high quality M1911 pistols must be guiding principles.

This manual also provides parts inspection and fitting data useful to the pistolsmith in increasing overall reliability and accuracy (i. e., mechanical repeatability) in commercial M1911 type pistols. The last section of this manual provides supplemental data for assembling super accurate and super reliable *optimum performance* pistols from top quality commercially manufactured components.

Accuracy note: Many of the accurizing procedures discussed in this manual were developed over the years by ordnance and service marksmanship unit personnel. This work led to the development of the M1911A1 NM, and to its final, most accurate form. Match components and match conditioning reduced critical tolerances, increased mechanical repeatability, and improved pistol accuracy. Keep in mind that NM fitting procedures produced pistols with optimized features- all of which were within design intent. Certain of these procedures, applied to carry and personal defense pistols serve to make them more consistent performers and more reliable. Trigger work, although primarily shooter assistive, serves to make pistols easier to fire accurately. Installation of mil spec or better (forged, correctly dimensioned & heat treated) extractors, slide locks, and internal parts all add to overall reliability.

Modifying M1911A1 Pistols to feed other than ball ammunition-

The M1911 Pistol was designed to fire M1911 .45 Caliber Ball ammunition- and did the job so well that it easily out performed all other autoloading pistols in every ordnance test and competi---- trial prior to its final adoption in 1911. In the early 6000 round ordnance tests, the M191l's reliability record was exceeded only by one Ml909 service revolver.

Relentless destruction testing (including freezing and slurry tests) ultimately led to ordnance standardized M1911 dimensional and metallurgical design specifications and a U. S. military issue pistol toleranced to maximize basic reliability- the M1911 Pistol had to function even if dropped in sand, dirt, water, mud, etc. Standardized dimensions also made parts fully interchangeable between manufacturers and facilitated parts replacement in the field.

Some hang up on the 50 yard target performance of G. I. M1911A1 Pistols. Moderately loose G. I. pistols typically printed 5" to 6" groups with G. I. ammo. Max. spec. (loose) pistols typically fired 8" to 10" + groups. Keep in mind that personal defense range is typically less than half of 50 yards. Also consider that a 10750 yard group would correspondingly reduce to about 5" at 25 yds. and to about 2" + at 10 yds. This tells us that the *accuracy* of the *average* G. I. pistol was more than adequate for its intended purpose. From the ordnance development viewpoint, trying for match accuracy was counterproductive- in fact, downright silly, in a combat pistol- it was better to opt for a pistol that would shoot, no matter what.

M1911A1 NM Pistols, on the other hand, were toleranced differently (i.e., with maximum target accuracy in mind), which follows because NM pistols were intended for use in competition - and not in combat where overcoming dirt and grit was a necessity. It's interesting to note that the wadcutter and other than ball ammo pistol modifications discussed in figure 15 represent a small shift in dimensional parameters but still fall fully within original M1911 design intent. As an old armorer friend used to say: "If the M1911 had been standardized as a match pistol, that's how it would have been made... Even so, human nature being what it is, our main ambition now would be finding ways to loosen M1911's up to make them shoot better full of dirt. "

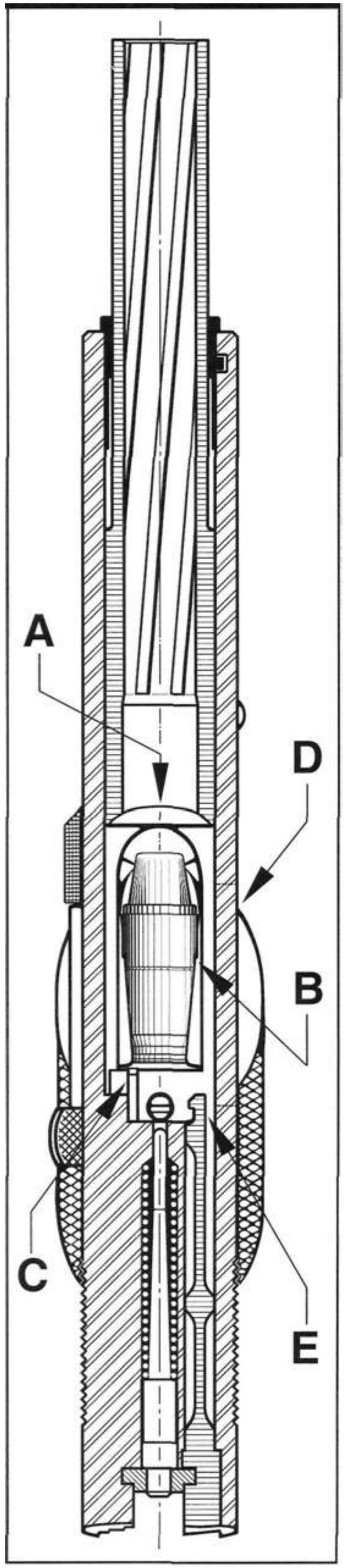


Figure 15- The longitudinal sectional illustration, at right, shows a top view of a magazine loaded with wadcutter type cartridges in an M1911Al Pistol. Arrows indicate areas where modifications are needed to enable M1911 type pistols to feed other than ball ammunition- including cartridges with wadcutter style, blunt, soft nose, or hollow core bullets. Expecting any M1911 type pistol to reliably feed and chamber other than ordnance specification ball ammunition without at least ramping the barrel, at **A**; modifying standard magazine feed lips at **B**, (or using a timed release commercial magazine) to time cartridge release and, relatedly, extractor case rim pickup; installing a long (NM type) ejector, at **C**; porting the slide, at **D**; fitting/ adjusting extractor tension at **E**; and, with lower mass/velocity bullets, also adjusting recoil spring tension, is a bit much to ask- in fact, it's an impossible request.

Accurizing note: Further modifications such as: reducing slide/ frame clearance and fitting match grade barrels and bushings also help optimize cartridge feeding and chambering because both enhance mechanical repeatability by mechanically centerlining the slide and barrel relative to the frame and magazine.

A Gunsmith's safety rules- Or how to stay out of trouble & possibly out of court at the same time:

1. **NEVER** touch the trigger or hand (or receive) a pistol unless the magazine has been removed, the slide has been locked open- and you have inspected the chamber to be 100% certain the pistol is not loaded.
2. **NEVER** trust anybody- **GUNS ARE ALWAYS LOADED!**
3. **NEVER** believe what anyone says about the condition of any firearm or any part thereof- always fully inspect the firearm yourself.
4. **DON'T** work on any firearm with a safety system part altered or removed- unless the work includes replacement or reinstallation of the safety system part(s).
5. **WHEN** inspecting or repairing a Colt Series 80 M1911A1 type pistol - always make sure that the additional firing pin safety components, i. e., the Series 80 firing pin, plunger lifting linkage, plunger, plunger spring, etc, are correct, in place, and are fully functional. If not, caution the customer and write a warning on the shop ticket as discussed below.
6. **IF** you begin work on a firearm that you determine is not reliably repairable, or simply inspect a firearm that you determine is not in good working order- always write a shop ticket and include: **"WARNING- NOT SAFE TO FIRE"** on the face of the ticket.
7. **FOR YOUR PROTECTION-** Always keep detailed records of inspections and work done.
8. **WHEN** inspecting, servicing, or repairing an M1911, M1911A1, or M1911/M1911A1 type pistol- always check parts for excessive wear, alteration, or damage and make sure that all parts are functionally correct for the model. Advise/caution customers about cheap/low grade cast parts.
9. **NEVER** forget to check chambers and bores for corrosion, restrictions, irregularities, obstructions, bulges, or other damage. Just do it- it's only common sense.
10. **ALWAYS** cast and measure an unknown or questionable chamber and/or bore.
11. **ALWAYS** inspect M1911, M1911A1, and M1911/M1911A1 type pistol fire control mechanism parts for excess wear, alteration, or damage. Also check for possible sear spring weakness, set, or alteration. Then, check trigger pull.
12. **ALWAYS** test fire M11911, M1911A1, and all M1911/M1911A1 type pistols by loading and firing two rounds from the magazine until it has been positively determined that the pistol does not double or otherwise demonstrate uncontrolled fire.
13. **DON'T** do patch-job repairs - do the work right or skip it.
14. **DON'T** work for those who insist on substandard parts or work.
15. **ALWAYS** wear safety glasses and ear protection when needed.
16. **ALWAYS** heed all cautions when using solvents or chemicals.
17. **DO NOT** permit live ammunition in the work area.
18. **NEVER** point any firearm-except at a target.
19. **THINK IT THROUGH FIRST-** you'll always save time later.
20. **FOLLOW** these safety rules- after all, the life you save could be your own.

If you violate these simple rules- you will, sooner or later, pay the price for it.

Additional Industry Shop Safety Warnings -

The following supplemental industry safety warnings and cautions are suggested for all gunsmiths and armorers. These warnings would actually apply to all who handle and/or work with firearms:

1. **Before handling, inspecting, disassembling, or cleaning, always ensure that the gun is not loaded -** so that the gun cannot fire.

2. **Do not permit live ammunition at the bench or in the shop work area.**

3. **Safety glasses should be worn at the bench at all times.** This is particularly important in the event you lose control of a spring, plunger, or other spring loaded component which could cause eye damage or bodily injury.

4. **Safety glasses should be worn in the shop at all times -** to protect against flying particles. This is particularly necessary when operating, or working near, sanders, grinders, and cutting machines of all types. Shop injuries can result from careless work habits. Examples include: failing to properly secure work in machines before operation (flying fragments from broken cutting tools and/or parts thrown); attempting to hand stop drill press chucks (sharp edges and burrs can cut or gouge hands); and failure to remove lathe and drill press chuck keys before start-up (thrown chuck keys can cause serious eye damage and bodily injury).

5. **Always take precautions when handling or using solvents, cleaning fluids, lubricants, or any chemicals.** Consult manufacturers instructions, advisories, and safety warnings before use. Make it a practice to wear protective clothing; a rubber apron and gloves, a face shield, etc., when using chemicals and solvents. Splattered chemicals, particularly acids and hot bluing salts, can cause permanent injury.

6. **Always wear eye and ear protection when shooting/test firing-** to reduce the risk of cumulative, long term hearing loss and/or eye injury.

7. **Take precautions to avoid contamination-** by accumulations of solvent fumes and/or chemical vapors. Take similar precautions against toxic gas fumes and/or lead dust where firearms are tested indoors or within a confined space such as an indoor range.

8. **Prevent buildup of potentially explosive atomized or evaporated solvents -** by cleaning and drying gun parts only in a well ventilated area.

9. **Use care to prevent forcing solvent or foreign materials under the skin-** when using compressed air to blow parts dry by using safety nozzles and directing air blast away from face, hands, and fingers.

It is also suggested that gunsmiths, armorers, and all others who own, use, or handle firearms fully familiarize themselves with safety system operation and action function of the specific models being handled before loading or test firing.

M1911 Pistol

U.S. .45 Caliber M1911, M1911A1, and M15 Autoloading Pistols & Commercial Pistols of M1911 type

M1911A1 Pistol

M1911A1 differences: frame clearance cut to improve trigger pull, short/knurled trigger, wide front sight blade, longer grip safety tang, arched/knurled mainspring housing, replacement of diamond grips with plain checkered. Magazine lanyard loops and long/wide spur M1911 type hammers were phased out.

See M15 Pistol data on pages 136~137.

Colt Commander, U.S. M15 Pistol, & other similar short barrel M1911 personal defense variants

Early ordnance style illustrations Heritage-VSP staff artist are representative only and not to scale.

Tabulated Data, U. S. Pistol, Caliber .45, M1911/M1911A1

Weight of pistol with empty magazine........2. 437 lbs.
Weight of empty magazine........0. 156 lbs.
Weight of pistol without magazine........2. 281 lbs.
Weight of loaded magazine (7 rounds)........0. 481 lbs.
Weight of pistol with loaded magazine (7 rounds)........2. 762 lbs.
Weight of recoiling components........1. 120 lbs.
Weight of barrel........0. 20 lbs.

Length, overall........8 3/8 in.
Sight radius (fixed sights)........6. 481 in.
Front sight blade height (above bore axis)........05597 in.

Front sight, Std. (late)........080" W x. 102" H fixed blade
Front sight, NM (late)........#7268316 (. 125" x. 357" H) serrated fixed blade
Rear sight (see note 1)........fixed (dovetail mount) notched
Rear sight NM (late)........#11010180 adjustable rear sight, Micro, Kenfix, Bomar

Barrel dimensional data & specifications:
Length of barrel........5. 03 in.
Length of rifling........minimum 4. 118 in.
Rifling twist........L. H. 1 turn in 16 in.
Cross-sectional area of bore........0. 1581 sq. in
Caliber of bore........0 .45 in.
Lands diameter........Std.. 441" min.,. 444" max. NM. 4110" min.,. 4125" max.
Groove diameter........Std.. 449" min, .452" max. NM .450" min, .452" max.
Number of grooves........6
Width of grooves........Std. and NM. 147" min,. 160" max.

Mechanism type........semiautomatic, locked breech/short recoil
Loading device........detachable magazine
Cooling........air

Trigger pull, new Std. issue/rebuilt pistol........5. 5 lbs, minimum - 6. 5 lbs, maximum
Trigger pull, Std. pistols in hands of troops........5. 0 lbs, minimum - 6. 5 lbs, maximum
Trigger pull, NM pistol........4. 0 lbs minimum - 4. 5 lbs maximum

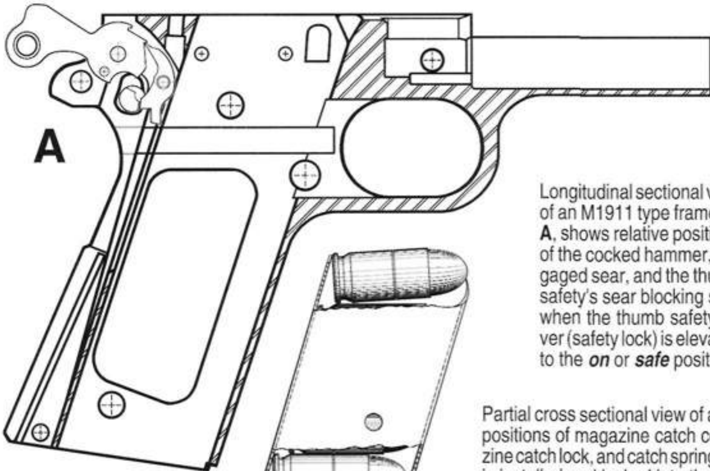
Ammunition type........Cartridge, Ball, Caliber .45, M1911, ball; match; T30 tracer
Chamber pressure, Std. M1911 ball cartridge........17, 700 psi (approx. 19, 900 CUP) max.
Muzzle velocity, Std. M1911 ball cartridge........Approx. 830 fps
Maximum range, Std. M1911 ball cartridge (see note 2)........Approx. 1640 yds.
Range with pistol fired at a 45° elevation angle (see note 2)........Approx. 1955 yds.
Bullet penetration, moist earth at 25 yards (see note 3)........9. 95 in.
Bullet penetration, dry sand at 25 yards (see note 3)........7. 8 in.
Bullet penetration, white pine at 25 yards (see note 3)........6. 0 in.
Bullet penetration, white pine at 250 yards (see notes 3 & 4)........4. 0 in.

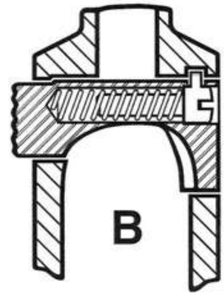
Note 1- The rear sight can be moved (by drifting) to align with bore centerline.

Note 2- Early artillery oriented ballistic studies defined max. range as the distance downrange from the muzzle that an M 1 9 1 1 bullet would impact the ground with the pistol fired at an elevation angle of 45°. Maximum range was later calculated with the pistol fired at an elevation angle of 30°, hence the above revised 1640 yard figure.

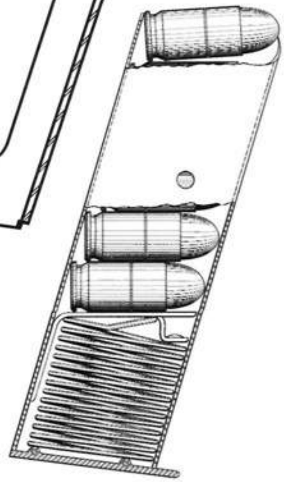
Note 3- Bullet penetration data from early ordnance tests

Note 4- Early ordnance tests determined M1911 bullet velocity and energy remaining at 250 yards to be approx, 666 fps and 226 foot pounds. Tests also demonstrated consistent 4. 0" bullet penetration in white pine boards at 250 yards. 1" penetration in white pine was considered by ballistic experts of the time to be the equivalent of a dangerous wound.





Longitudinal sectional view of an M1911 type frame, at **A**, shows relative positions of the cocked hammer, engaged sear, and the thumb safety's sear blocking stud when the thumb safety lever (safety lock) is elevated to the ***on*** or ***safe*** position.



Partial cross sectional view of an M1911 frame, at **B**, shows relative positions of magazine catch components (magazine catch, magazine catch lock, and catch spring) when the magazine catch assembly is installed and locked into the frame.

The sectional view of the loaded M19ll magazine, at **C**, shows relative positions of .45 caliber rounds, the magazine follower, and the compressed magazine follower spring.

Cutaway pistols are especially helpful in the shop because they can be used to graphically demonstrate component function. The slide, hammer, trigger, etc, can be moved incrementally while looking into the mechanism. This enables the pistolsmith to: (1) directly view the operating cycle and changes in parts positions in slow motion; and (2) literally freeze frame function by stopping slide and component movement at any given point.

SECTION II
Basic function & Operating cycle

Figure 16- Ordnance style M1911/M1911A1 sectional drawings by Heritage - VSP staff artist, at top, and cutaway pistols, shown below, are useful aids in visualizing parts interactions in M1911 type pistols and additionally helpful in understanding the basic M1911/M1911A1 operating cycle.

Figure 17- Cutaway pistols and partial sectional illustrations show M1911A1 interior views. Cutaway pistols are particularly useful in shop training and especially helpful in troubleshooting difficult problems. Virtually every parts function and interaction can be visually demonstrated in a cutaway M1911 pistol including: cartridge feeding; disconnect/reconnect function; hammer/sear engagement; trigger bow/disconnector/sear interaction; thumb safety/sear interaction; barrel link up/link down, and inertial firing pin function. Parts and interactions can *be, freeze framed* by simply stopping slide motion at any point. Headspace relationships also become apparent when headspace gauges are installed in cutaway barrels. Also see M1911/Ml1911Al pistol basic function and cycle of operation beginning on page 37.

M1911/M1911A1 Pistol Storage and Carry Modes -

Warning: The storage, ready storage, and carry mode data in this manual is furnished to provide historical information on military storage/carry/use of the M1911 & A1 Pistol. These modes were common security measures also used by law enforcement and civilians in earlier times, and not considered an unsafe or questionable practice because: self defense was legal, and children were taught firearms safety. Today, any firearm and ammunition combination in unauthorized hands is either potentially dangerous or, legally, a high liability scenario. None of the modes discussed is therefore recommended.

Long term storage - Pistol unloaded; detail cleaned and stored with empty magazine(s); hammer not cocked; and recoil spring and plug removed to preserve tension. Apply a protective coating such as cosmoline or a rust preventive/nonhygroscopic grease inside and out and wrap in wax paper or chemically impregnated rust preventive wrapping. Store in a sealed moisture/air free plastic bag and container. For extra long term storage or storage under high humidity/wide temperature range conditions, evacuate or purge and fill storage container with nitrogen or argon.

Ready storage mode 1 - Pistol fully assembled, unloaded, and hammer not cocked. Pistol parts and interior/exterior coated with nonhygroscopic oil. Pistol stored with unloaded, oil coated magazine(s).

Ready storage mode 2 - Pistol assembled, unloaded, lightly oiled, wiped dry, and hammer not cocked. Pistol stored with loaded magazine(s) or loaded magazine(s) stored separately and readily accessible.

Ready storage mode 3 - As in #2, above, except loaded magazine installed in pistol. In this mode, the slide must be cycled to place the first round in the chamber.

Ready storage mode 4 - As above, except the first or an extra round is placed in chamber, loaded magazine installed, the hammer cocked, thumb safety engaged (pistol in cocked & locked condition), or the hammer let down to engage the sear in the hammer's 1/4 cock/safety notch (pistol in hammer safe condition).

Carry Mode 1 - Pistol holstered with or without an unloaded magazine installed, hammer not cocked.

Carry Mode 2 - Pistol holstered with loaded magazine installed, but no round in chamber, and hammer not cocked. The slide must be cycled to cock the hammer and place the first round in the chamber.

Carry Mode 3 - Pistol holstered cocked & locked- i. e, the first, or an extra round, in the chamber, hammer cocked, thumb safety engaged, and loaded magazine installed. The first round is fired by manually disengaging the thumb safety then simultaneously squeezing the trigger and grip safety to release the hammer.

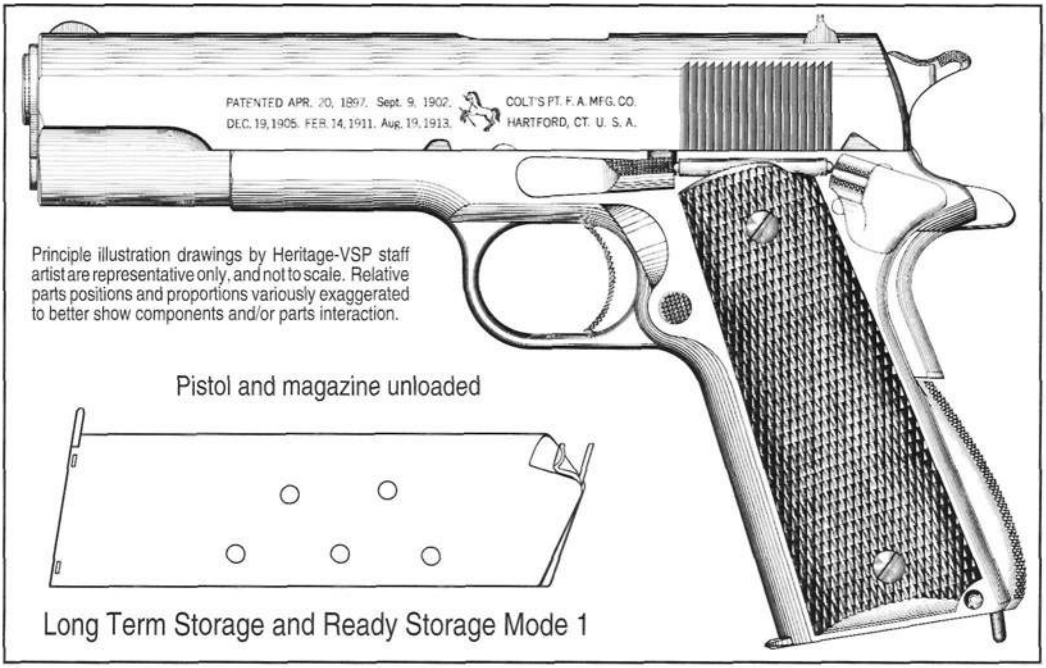


Figure 18- Long term storage- pistol is stored cleaned & unloaded with empty magazine(s). All parts and interior/exterior surfaces are coated with rust preventive/nonhygroscopic grease. The pistol and magazines are wrapped in waxpaper and placed in a heavy sealable plastic bag with either Rust Blox or silica gel packet(s) inside. For long term storage in extreme temperature/humidity conditions- purge storage container with argon before sealing. Ready storage mode 1- store unloaded pistol and magazine(s) after coating with nonhygroscopic oil, wrap in waxpaper and place in sealable plastic bag with air removed.

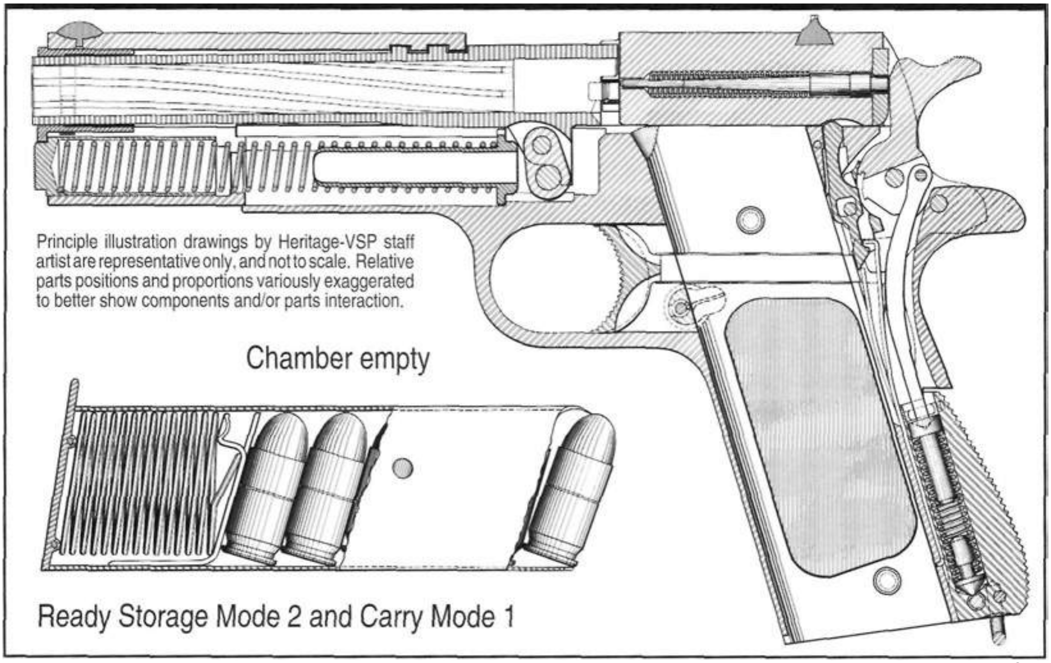


Figure 19- Sectional illustration depicts an M1911A1 Pistol in Ready Storage Mode 2- The pistol is fully assembled, unloaded, lightly oiled and wiped dry, and hammer not cocked. In this mode, the pistol may be stored with loaded magazine(s), or loaded magazine(s) stored separately but readily accessible to the owner of the pistol. See warning on page 33. Carry Mode 1- The pistol is holstered unloaded with or without an empty magazine, hammer not cocked. Loaded magazine(s) stored in pouches on pistol belt.

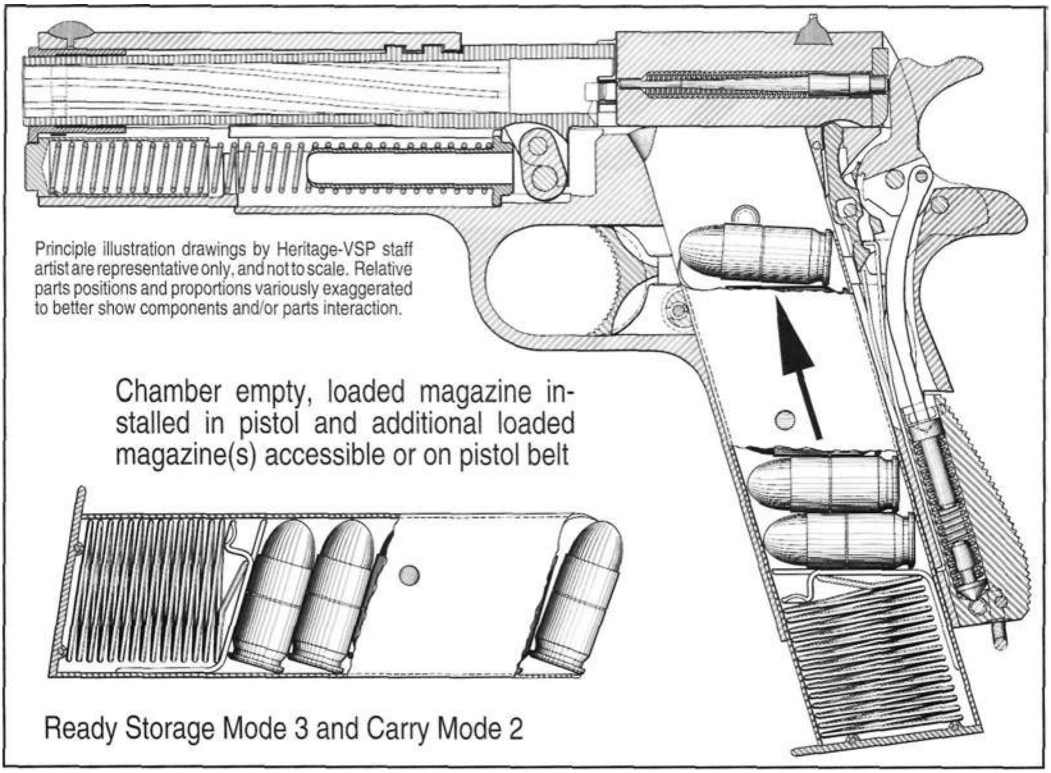


Figure 20- Sectional illustration depicts an M1911Al Pistol in Ready Storage Mode 3. Carry 2 is the same except the pistol is holstered; the chamber is empty; the hammer is not cocked and a loaded magazine is placed in the pistol. The slide is cycled to place the first round in the chamber. See warning on pg. 33.

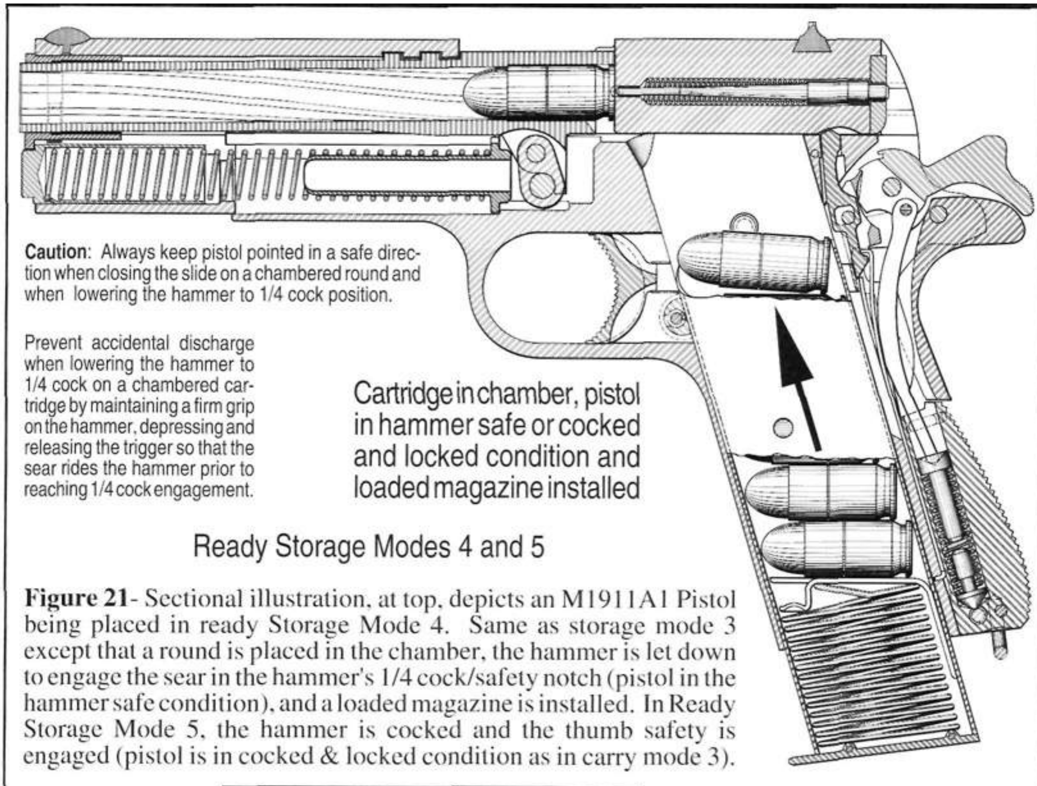


Figure 21- Sectional illustration, at top, depicts an M1911A1 Pistol being placed in ready Storage Mode 4. Same as storage mode 3 except that a round is placed in the chamber, the hammer is let down to engage the sear in the hammer's 1/4 cock/safety notch (pistol in the hammer safe condition), and a loaded magazine is installed. In Ready Storage Mode 5, the hammer is cocked and the thumb safety is engaged (pistol is in cocked & locked condition as in carry mode 3).

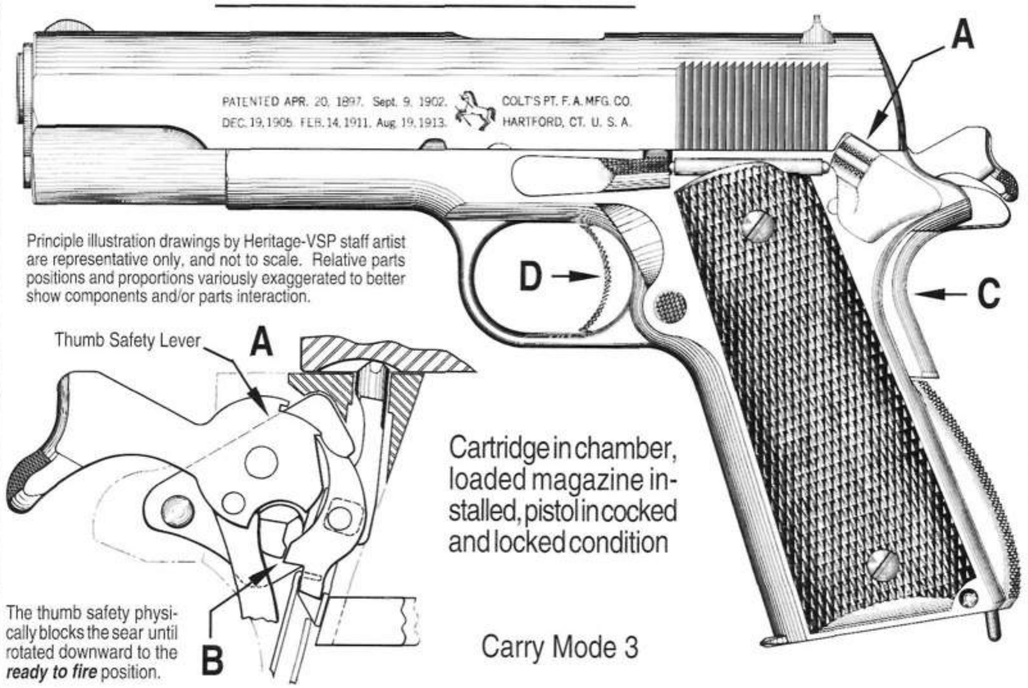


Figure 22- Illustrations depict an M111A1 Pistol in Carry Mode 3, at bottom. Pistol is holstered in cocked & locked condition - i. e., a round is chambered, the hammer cocked, the thumb safety engaged, and a loaded magazine installed. A serviceable M1911 type pistol in cocked & locked condition can't be fired because the thumb safety, at **A** mechanically blocks the sear, at **B**. This, in turn, retains the sear in the hammer's full cock notch. The grip safety, at **C**, redundantly blocks the trigger, at **D**, making it impossible for the trigger to engage the sear and release the hammer, even if the thumb safety was not engaged.

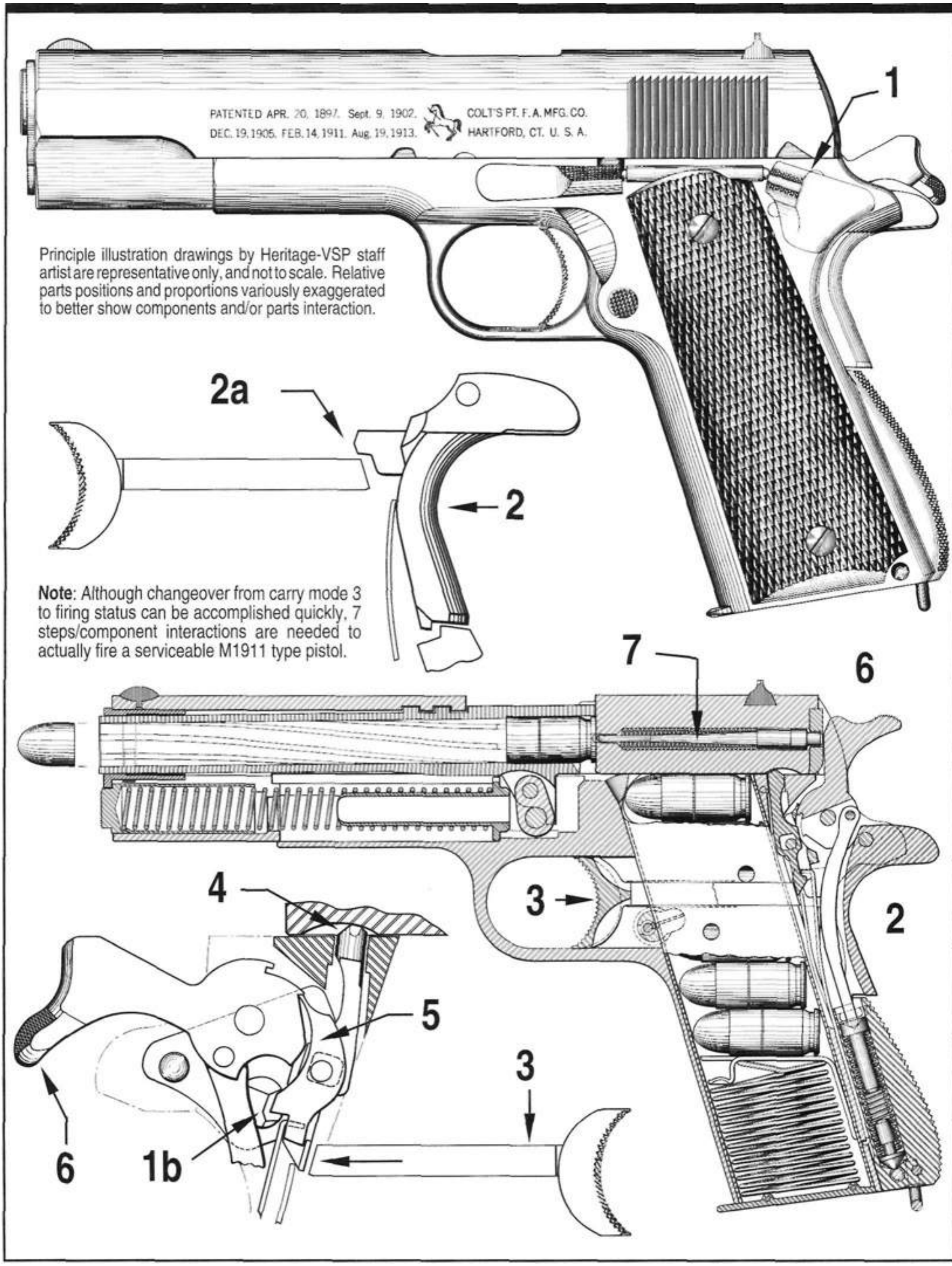


Figure 23- Illustrations show the mechanical steps/functions required to change the status of an M1911 type pistol from ***cocked and locked*** condition, to ***ready to fire,*** to ***firing*** mode - and the sequence of component interactions that must occur. The thumb safety is moved to the ***ready*** position, at **1**, in order to rotate the sear stop (**1b**) and thereby unblock the sear. The grip safety, at **2**, must be depressed to elevate the trigger stop (**2a**) to permit rearward movement of the trigger, at **3**. With the slide forward and the disconnector connected as shown at **4**, squeezing the trigger (**3**) applies pressure to the disconnector, causing it to rotate the sear, at **5**. This action releases the hammer, at **6**. The hammer (**6**) then strikes the inertial firing pin (**7**) which, in turn, fires the chambered round. This sequence can occur only as the result of deliberate action- hence the ordnance truism that serviceable M191/M1911A1 Pistols have to be intentionally fired. Carry Mode 3 was used by the military in combat and security enforcement zones.

M1911/M1911A1 Pistol Basic Function

1. After a loaded magazine has been installed and the slide is cycled to chamber a round from the magazine, or the pistol has been brought to ready to fire condition from carry mode 3 or storage modes 4 or 5, the trigger is pulled to fire each round. When the last round has been fired, the slide is locked to the rear by engagement of the slide stop in the slide stop detent notch.

2. Each time a round is loaded and fired, components and parts assemblies in the pistol function in a given order known as ***the cycle of operation.*** Although this basic cycle is similar in almost all autoloading pistols, there are individual model differences and seeming beginning point of cycle differences, depending on mode of use. See M1911/M1911A1 Pistol storage and carry modes on pages 33-36. Regardless of cycle entry point, once the operating cycle begins, there is only one sequence of operation. Familiarity with the cycle of operation is helpful and necessary when clearing malfunctions, servicing, repairing, and troubleshooting problems in Ml911 type pistols.

3. The cycle of operation of M1911 type pistols is shown in a sequence of 8 consecutive steps, or stages, as illustrated on the following pages. An ordnance style description is given at each stage and also described in detail below and on page 38. Since it's a given that an operating cycle must begin at some point- the basic M1911 operating sequence, i. e., operating cycle illustrated on the following pages is based on a loaded magazine having been first loaded into the pistol and the slide having been manually drawn back and released forward underpressure of the stored energy in the compressed recoil spring, or having been released forward from the locked open slide position.

M1911/M1911A1 Pistol Basic Cycle of Operation-

To prepare the pistol for firing, at some point the slide must be drawn fully to the rear. This action compresses the recoil spring; moves the hammer strut downward; compresses the mainspring (hammer spring); engages the sear in the main hammer notch, and thereby cocks the hammer and enables the operating cycle to begin.

1. Cartridge feeding: Cartridge feeding takes place when a round in the magazine is moved upward into the path of the slide by the magazine follower and spring assembly which exerts a continuous upward pressure on the bottom round in the magazine and, thereby, upward pressure on all rounds in the magazine.

2. Cartridge chambering: Chambering occurs when a round is placed in the chamber. This takes place as the slide moves forward under pressure of the compressed recoil spring; picks up and strips the elevated top round from the magazine, and pushes the cartridge forward, up the barrel ramp, and into the chamber. The initial portion of the chambering phase is complete when the cartridge *breaks over* into axial alignment with the chamber. The chambering phase is considered completed as the barrel links upward into locked battery position as the slide reaches the end of forward movement.

3. Locking: Barrel link up/cam up and locking lug engagement occurs fractionally before the slide reaches the full forward position. Link up/locking is accomplished as the slide breech face contacts the barrel's rear extension surface and exerts forward pressure on the barrel extension. This action, in turn, causes the barrel to swing upward on the barrel link and engage the locking lugs on the top of the barrel with the corresponding locking lug recesses machined into the inside under surface of the slide. Forward movement of the locked barrel and slide assembly ends as the stop surfaces on the bottom barrel lug come to rest against the back of the slide stop crosspin. Aggregate frame, slide, slide stop crosspin, barrel vertical dimensional tolerances and barrel link pin hole center dimensions determine the extent to which locking lugs will actually vertically engage in a given pistol. When the locking phase is completed, the pistol is in battery and ready for firing.

4. Firing: Firing occurs when the hammer strikes the inertial firing pin and the firing pin, in turn, initiates and ignites the primer in a chambered round. The following conditions must exist in serviceable Ml911 and M1911A1 type pistols in order to release the hammer and fire the pistol: the thumb safety must be in the down, safety off (or *ready)* position which unblocks the sear; the grip safety must be depressed or squeezed forward enough to permit the trigger to move fully rearward when the trigger is pulled or squeezed. The locked slide/barrel assembly must be in full forward position with the barrel's bottom lug stop surfaces against the slide stop crosspin to thereby position the disconnector camming/timing recess in the bottom of the slide's central rail above the top, slide contact surface of the disconnector. This, in turn, enables the disconnector to rise to the connected, ready to fire position under pressure of the disconnector spring. At this point, squeezing the trigger moves the trigger bow rearward and into initial contact with the flat trigger contact surface on the bottom front of the disconnector. Continued rearward trigger pressure causes the disconnector to exert rearward pressure on the lower front portion of the sear (sear hook fingers) which simultaneously rotates the sear's hammer engagement surface forward and out of engagement with the full cock notch on the hammer.

M1911/M1911A1 Pistol Basic Function and Cycle of Operation, continued-

This action releases the hammer. The released hammer then rotates forward under pressure of the mainspring (hammer spring) and strikes the firing pin, which causes the inertial firing pin to accelerate forward, strike and indent the primer cup, ignite the primer, and fire the chambered round. The barrel and slide remain locked firmly together during the firing phase. This interaction, caused by the firing of the propellant charge in the cartridge, generates gas pressure in the barrel between the bullet and cartridge case which mechanically forces the barrel forward (from an intermediate position in ordnance std. pistols) to engage the barrel's front facing (vertical) locking lug bearing surfaces with the rearward facing (vertical) locking lug bearing surfaces machined into the slide. Locked barrel position (front/vertical locking lug surfaces engaged) is maintained until pressure drops to zero as the bullet leaves the barrel.

4A. Firing supplement - for Colt Series 80 type supplemental inertial firing pin lock mechanisms: In a Series 80 type pistol (an M1911Al design variant), firing is accomplished as in a standard M1911 type pistol as described in #4, above, but with the following addendum: Series 80 type firing pins are retained in rearward position by other Series 80 components- notably the firing pin lock plunger and firing pin lock plunger spring. The firing pin lock plunger is pushed upward to unblock and free the firing pin by interaction of the trigger bow with the Series 80 trigger bar lever and plunger lever. See Series 80 component illustrations and detailed description on page 17.

5. Unlocking and barrel link down: (1) The initial (horizontal) unlocking phase occurs fractionally after the firing of a chambered round. Specifically, unlocking occurs when breech pressure drops to zero as the bullet leaves the barrel and, under pressure of the recoil spring and prior to slide movement, the barrel moves rearward just enough to discontinue front facing top barrel locking lug surface/rear facing slide locking lug bearing surface contact. Taken from an overview, the greater relative rest mass/inertia of the barrel/slide assembly plus locking lug friction and the added energy of the recoil spring aggregately exceed the inertia of the fired bullet and act to retard rearward inertial movement of the slide and the (horizontal) separation of the locking lugs until the bullet has left the barrel. (2) Locking lug (vertical) disengagement then occurs as the barrel links down. Specifically, (in a standard ordnance specification pistol) vertical locking lug disengagement begins after the barrel locking lugs have reached rearward rest position; the barrel's recoil surfaces are in proximity to the front facing slide recoil surfaces, and the slide has recoiled (or is otherwise moved) rearward enough to enable the barrel link to draw/rotate the rear of the barrel downward to fully linked down position. At this point, (in a standard ordnance specification pistol) the rear portion of the barrel and the barrel's top locking lugs are sufficiently below and clear of the slide to permit full recoil and continued rearward movement of the slide.

6. Extraction: Extraction occurs with rearward movement of the slide under firing recoil inertia as the breech begins to open and as the barrel links down. The rim of the fired cartridge case, already engaged by the extractor during feeding/chambering is drawn back by the energy of the recoiling slide, thus breaking fired (expanded) cartridge case/chamber friction. Continued rearward movement of the slide then fully withdraws the fired cartridge case from the chamber.

7. Ejection: As the slide continues rearward inertial movement and withdraws the fired cartridge case from the chamber, the case head is held against the breech face by the extractor. Continuing rearward movement of the slide then brings the left side of the cartridge case head into sharp contact with the front portion of the ejector located on the left side of the frame. This action causes the fired case to pivot upward and to the right and ejects the cartridge case from the opening breech.

8. Cocking: Cocking occurs as the hammer is forced into proper position for firing of the next round by further rearward inertial movement of the slide. Specifically, the slide rotates the hammer back; moves the hammer strut downward; compresses the mainspring (hammer spring), and engages the sear in the hammer's main (full cock) notch. Continuing rearward inertial movement of the slide fully compresses the recoil spring, and (given a serviceable recoil spring) stores sufficient inertial energy to return the slide forward, strip, feed, and chamber a next round from the magazine, link-up and lock the barrel and slide, and place the slide in battery position, thus enabling the next firing cycle to begin.

8A. Lockback: When the last round has been fired and the magazine is empty (or the slide is manually drawn rearward with an unloaded magazine in the pistol), the slide stop actuating surface on the left arm of the magazine follower, underpressure of the magazine spring, forces the rear of the slide stop to rotate upward into engagement with the slide stop notch located on the bottom left side of the slide. This action locks the slide to the rear and leaves the breech open for inspection or installation of a loaded magazine.

Firing cycle notes: Holding the trigger to the rear maintains disconnect status. The trigger must be returned forward after each round is fired to permit the disconnector to reset and reconnect the sear and trigger for the next firing cycle. The Ml911 operating cycle is graphically shown on the following pages.

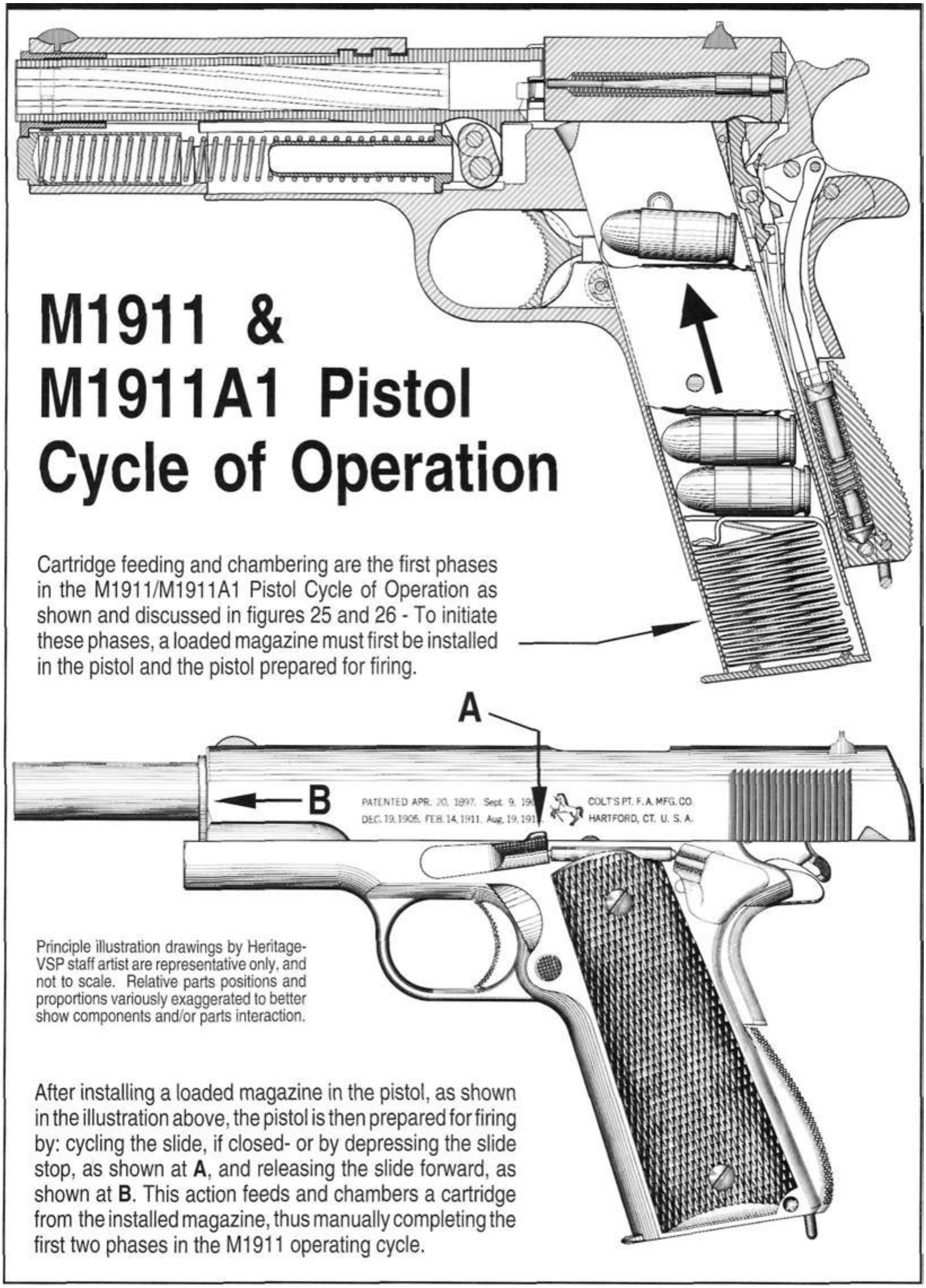


Figure 24- The cycle of operation in M1911 type pistols is shown in a sequence of 8 consecutive *freeze-framed* stages, or phases, as illustrated on the following pages. An ordnance style description is included with each phase. Since it's a given that all operating cycles must begin at some point- the basic M1911 operating cycle illustrated is based on a loaded magazine first being loaded into the pistol, as shown in the ordnance style illustration, at top, and the slide either having been manually drawn back and released or having been released forward from the slide locked open position under pressure of the stored energy in the compressed recoil spring, See manual slide release illustration, at bottom.

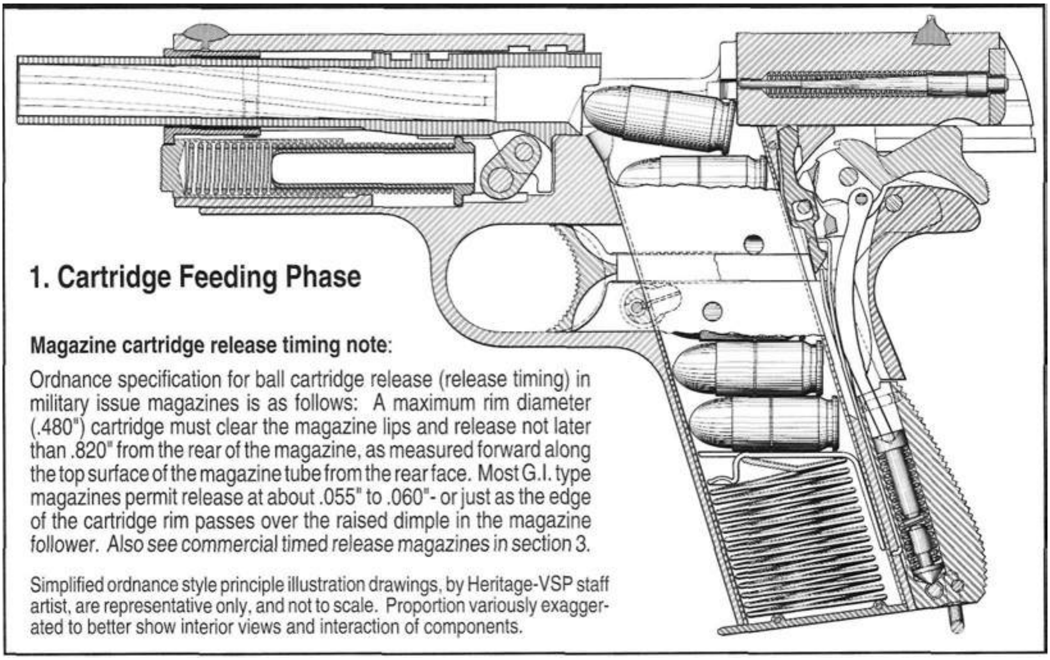


Figure 25- Ordnance style sectional illustration by Heritage - VSP staff artist shows relative positions of components in an M1911/M1911Al Pistol as the slide assembly moves forward and begins to strip and feed a round fed upward from the magazine. Specifically, cartridge feeding takes place and is completed when a round in the magazine is moved upward into the path of the slide by the magazine follower/spring assembly which exerts a continuous upward pressure on the bottom round in the magazine and, thereby, on all rounds in the magazine. Cartridge ramping is also considered to be part of the feeding phase.

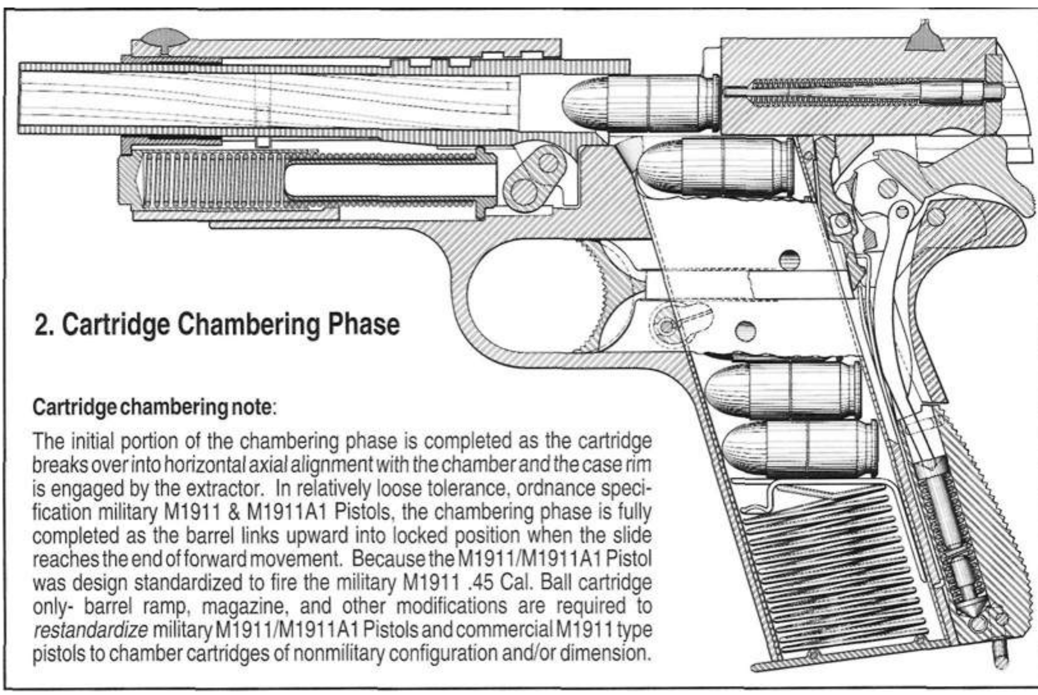


Figure 26- Ordnance style sectional illustration by Heritage - VSP staff artist shows relative positions of components in an M1911 type pistol at the beginning of the cartridge chambering phase. Chambering occurs when a round is fed from the magazine, as shown above, and placed in the chamber. This function takes place as the slide assembly moves forward under pressure of the compressed recoil spring, strips a cartridge from the magazine, and then pushes the cartridge up the barrel ramp and into the chamber.

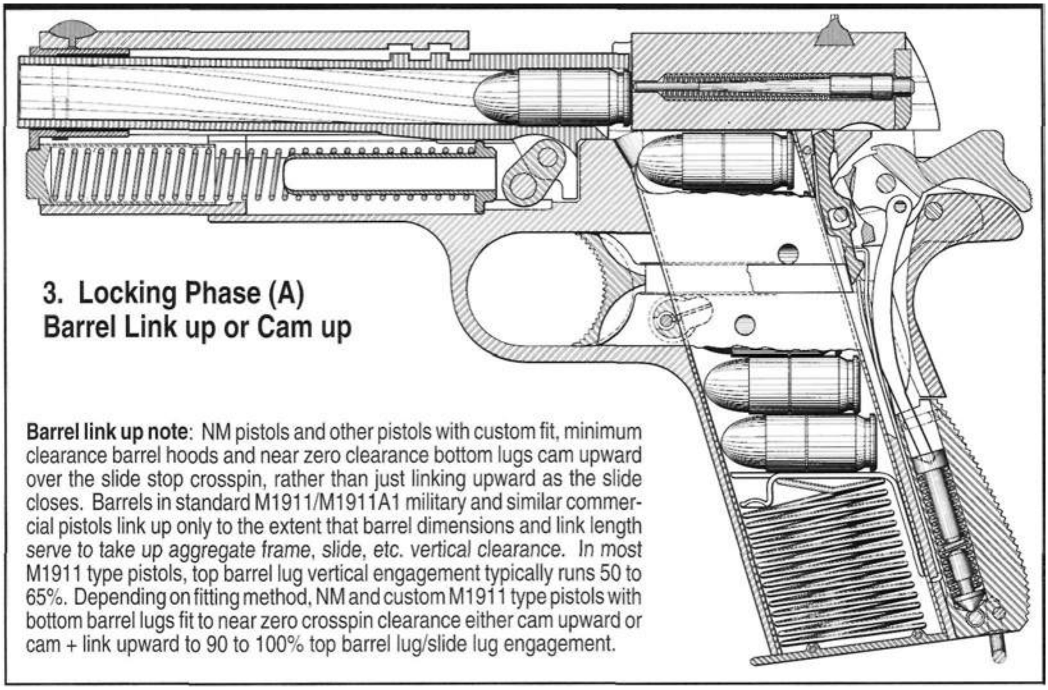


Figure 27- Ordnance style sectional illustration by Heritage - VSP staff artist shows relative positions of components in an M1911/M1911A1 Pistol as the slide assembly moves forward and the barrel begins to link upward to vertically lock the barrel and slide. Aggregate frame, slide, slide stop, and barrel vertical dimensional tolerances and barrel link hole center to center dimensions determine the extent to which the barrel will link upward and the locking lugs vertically engage in a given pistol.

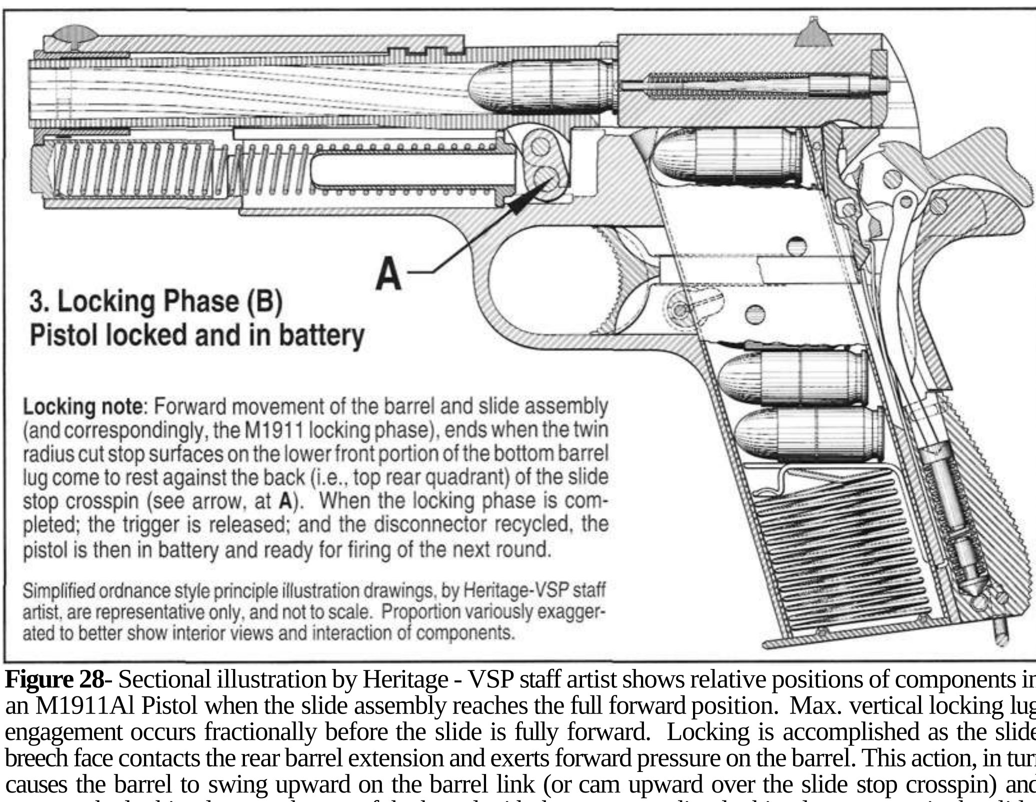


Figure 28- Sectional illustration by Heritage - VSP staff artist shows relative positions of components in an M1911Al Pistol when the slide assembly reaches the full forward position. Max. vertical locking lug engagement occurs fractionally before the slide is fully forward. Locking is accomplished as the slide breech face contacts the rear barrel extension and exerts forward pressure on the barrel. This action, in turn, causes the barrel to swing upward on the barrel link (or cam upward over the slide stop crosspin) and engages the locking lugs on the top of the barrel with the corresponding locking lug recesses in the slide.

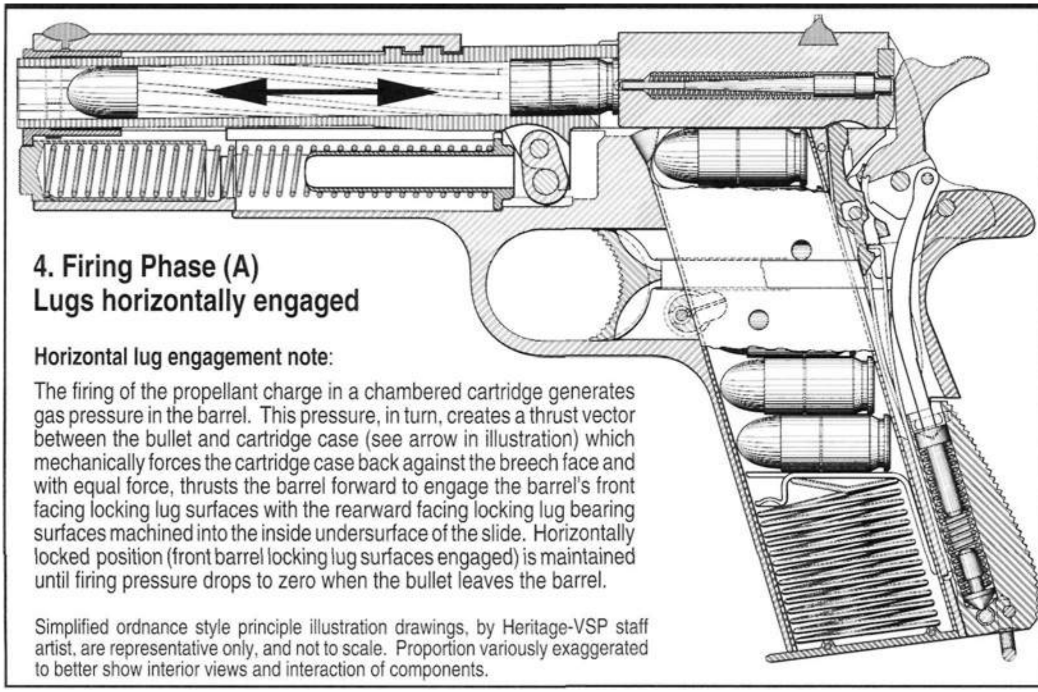


Figure 29- Sectional illustration by Heritage - VSP staff artist shows relative positions of components in an M1911Al Pistol during the initial firing phase, when the bullet is still in the barrel. Firing occurs in an M1911 type pistol when the grip safety is depressed; the trigger is squeezed; and interaction of the trigger bow, disconnector, and sear releases the hammer. The hammer then rotates forward and strikes the inertial firing pin which, in turn, initiates and ignites the primer in a chambered round. The barrel and slide remain locked firmly together (both horizontally and vertically) during the initial firing phase, as shown above.

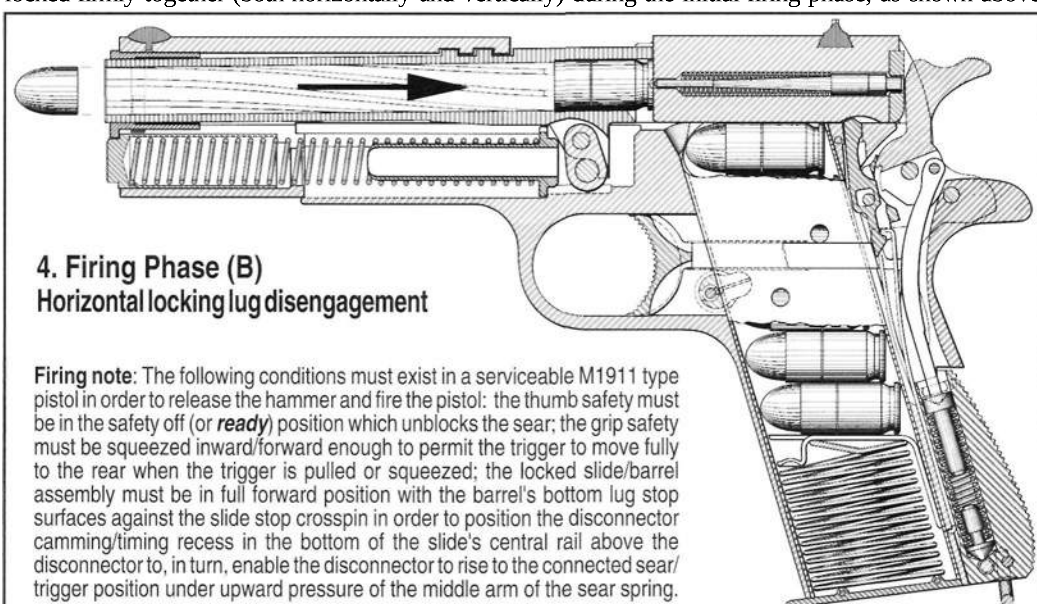


Figure 30- Sectional illustration by Heritage - VSP staff artist shows relative positions of components in an M1911A1 Pistol during the firing phase, momentarily after the bullet has left the barrel. Departure of the bullet drops the pressure in the barrel established in the initial portion of the firing phase (i. e., when the bullet was still in the barrel as shown in fig. 29) to zero. Seen from the viewpoint of effect on the pistol, this imparts a rearward force on the slide assembly (see arrow in illustration) equal to the inertia of the departing bullet. Because the recoil assembly (slide/barrel assy.) has greater relative rest mass, plus the added benefit of a calibrated recoil spring, inertial energy is fully absorbed as the slide recoils to the rear.

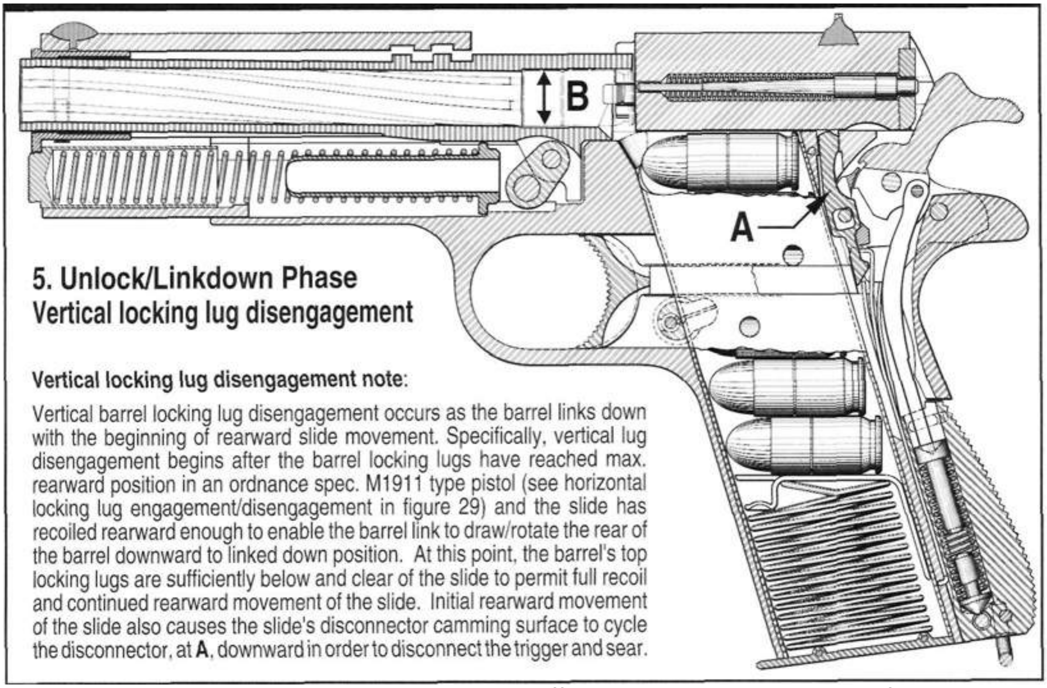


Figure 31- Sectional illustration by Heritage - VSP staff artist shows relative positions of components in an M1911Al Pistol during the vertical locking lug disengagement/barrel link down phase. Vertical locking lug disengagement occurs just after horizontal locking lug disengagement (both at zero breech pressure) after the firing of a chambered round. Cartridge extraction (see fig. 32) actually begins with the initial breaking of fired/expanded cartridge case/chamber friction, as indicated at B, in the above illustration.

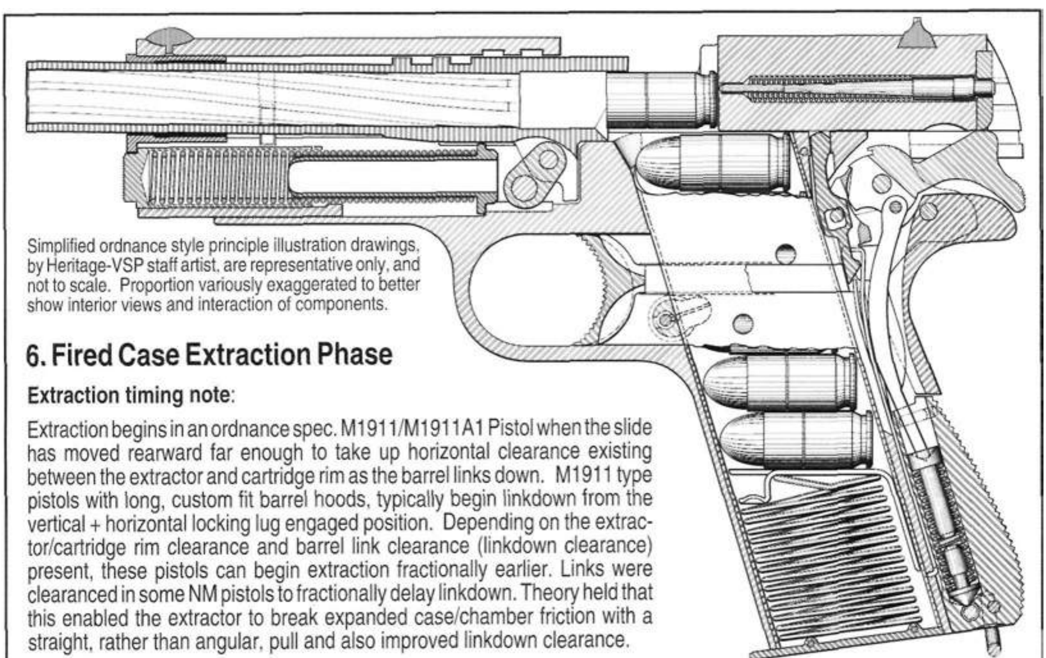


Figure 32- Sectional illustration by Heritage - VSP staff artist shows relative positions of components in an M1911Al Pistol during the extraction phase. Fired cartridge case extraction occurs with rearward inertial movement of the slide and as the breech begins to open as the barrel links down. The rim of the fired cartridge case, already engaged by the extractor during feeding/chambering is drawn back by the energy of the recoiling slide, thus breaking expanded cartridge case/chamber friction. Continued rearward movement of the slide then fully withdraws the fired cartridge case from the chamber.

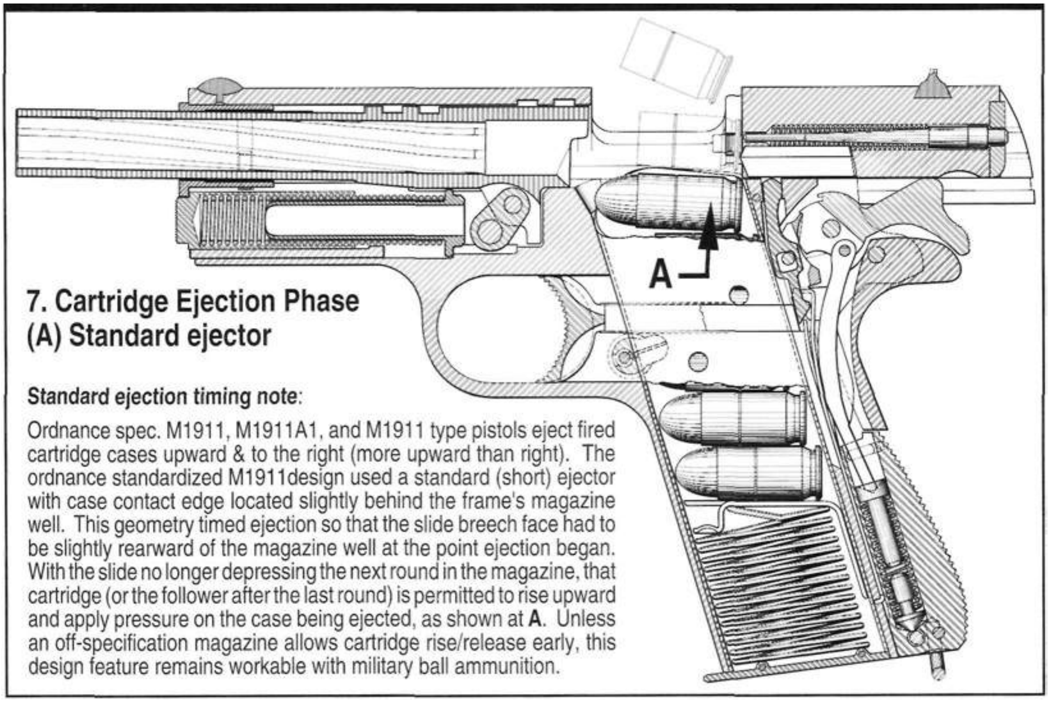


Figure 33- Sectional illustration by Heritage - VSP staff artist shows relative positions of components in a standard, ordnance spec. M1911A1 Pistol during the cartridge ejection phase. As the slide continues rearward after firing, inertial movement withdraws the fired cartridge case from the chamber as shown in figure 32. The cartridge case head is held against the breech face by the extractor. Continuing rearward movement of the slide then brings the left side of the cartridge case into sharp contact with the front of the ejector located on the left side of the frame. This action causes the fired cartridge case to pivot upward and to the right; frees it from the extractor, and ejects the cartridge case from the opening breech.

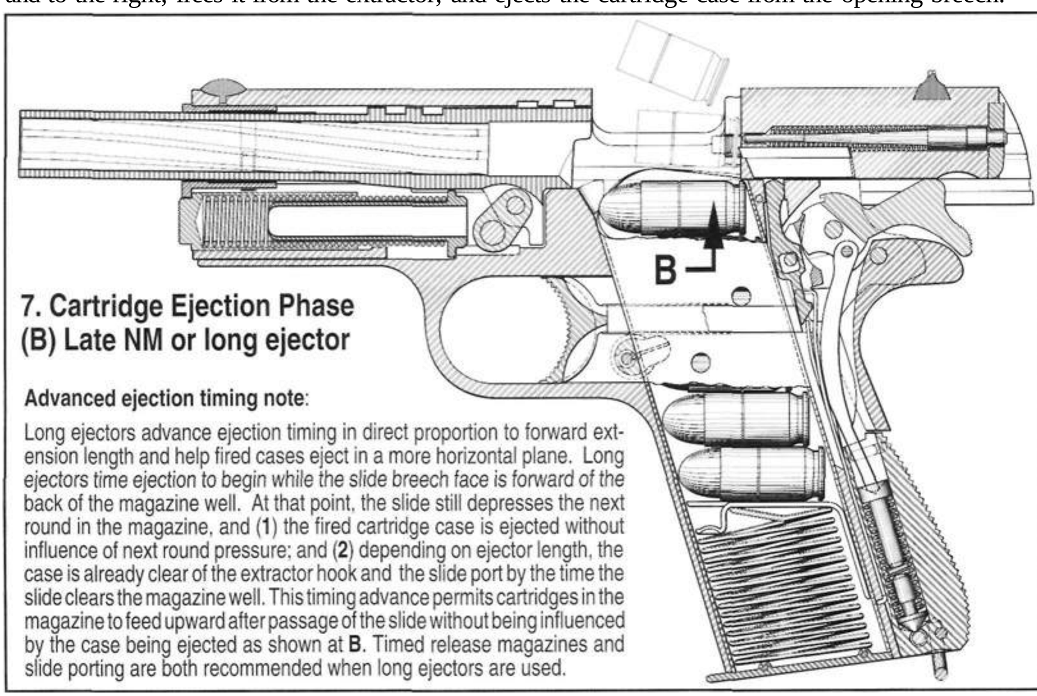


Figure 34- Sectional illustration by Heritage - VSP staff artist shows relative positions of components in an M1911A1 Pistol with a late NM type, or long, ejector during the cartridge ejection phase. Function is as above in figure 33, except that ejection timing is considerably earlier and the resulting ejection angle flatter.

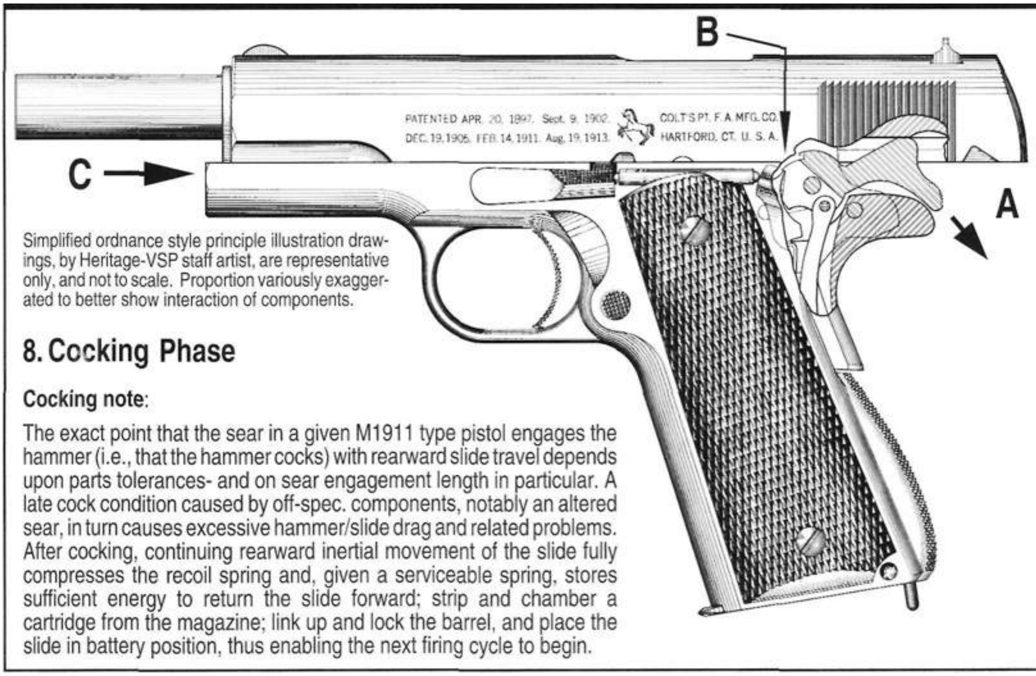


Figure 35- Partial sectional illustration by Heritage - VSP staff artist shows relative positions of components in a standard, ordnance specification M1911A1 Pistol during the cocking phase. Cocking occurs as the hammer is forced into proper position for firing of the next round by rearward inertial movement of the slide. Specifically, the slide rotates the hammer back, as shown at **A**; moves the hammer strut downward; compresses the mainspring (hammer spring), and enables the sear, under sear spring pressure, to engage in the hammer's main cocking (full cock) notch, at **B**. Continued rearward inertial movement of the slide, at **C**, then fully compresses the recoil spring for the next firing cycle.

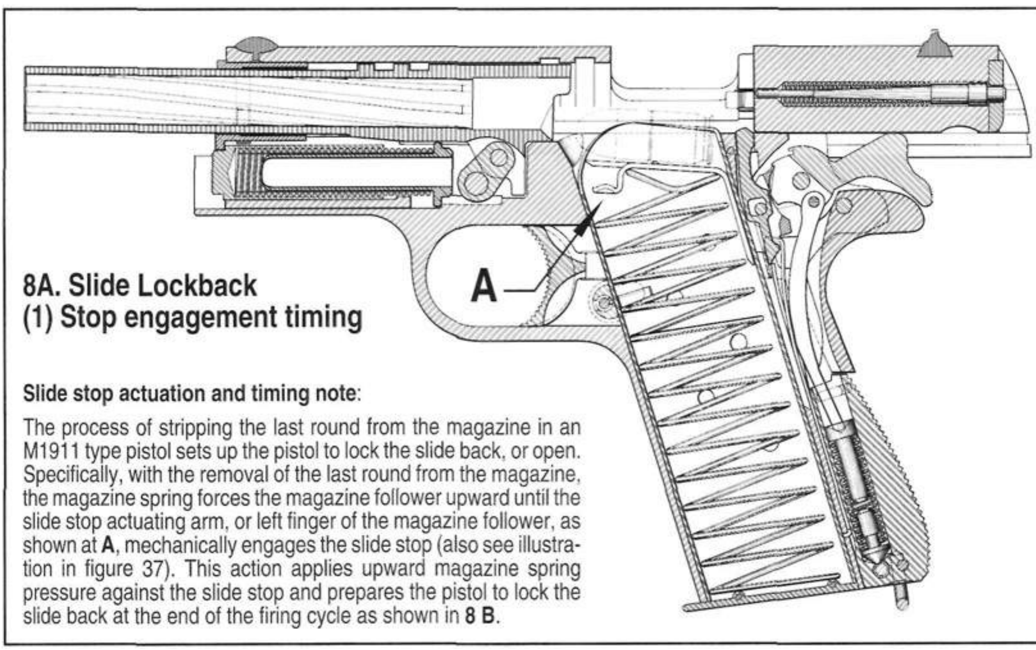


Figure 36- Sectional illustration by Heritage - VSP staff artist shows relative positions of components in a standard, ordnance spec. M1911A1 Pistol at a point in the operating cycle preceeding slide lockback (lock open). Stripping of the last cartridge from the magazine causes the magazine follower to move upward under magazine spring pressure and to thereby engage and apply upward pressure against the slide stop. The slide stop can't engage in a serviceable pistol until the slide is cycled rearward as shown in fig. 37.

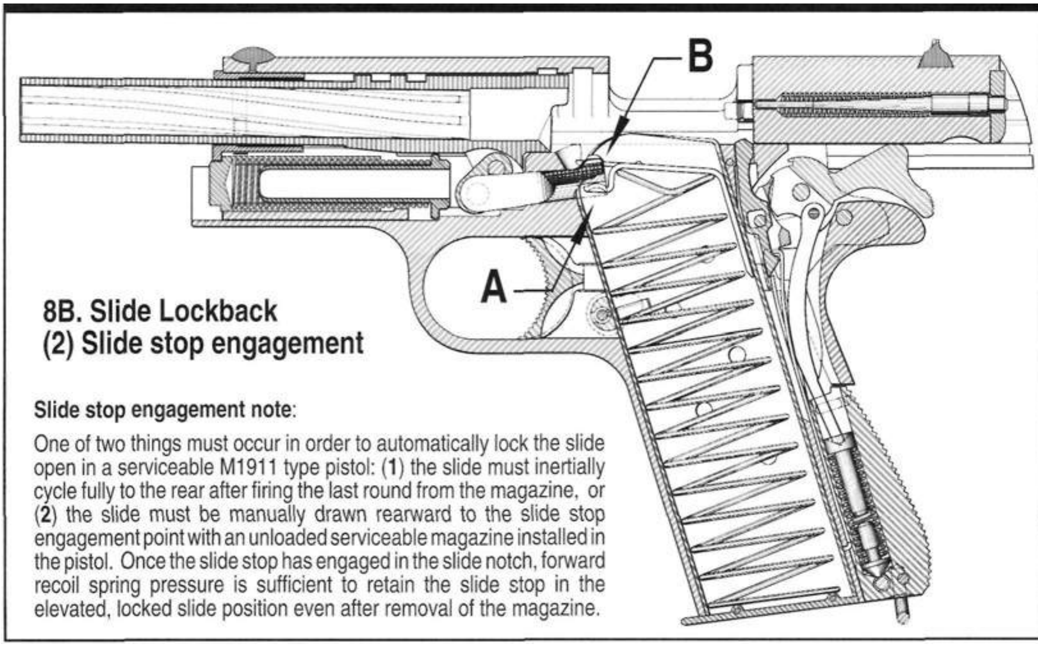


Figure 37- Sectional illustration by Heritage - VSP staff artist shows positions of components in a standard, ordnance spec M1911A1 Pistol relative to the elevated slide stop with the slide in locked back, or open, position. The sequence that must occur to automatically lock the slide back is: after the last round has been stripped and fired from the magazine (see slide lockback setup detailed in figure 36) the slide stop actuating surface on the outside left finger of the magazine follower, at **A**, under pressure of the magazine spring, forces the rear of the slide stop to rotate upward, at **B**, and into engagement with the slide stop notch milled into the bottom left side of the slide. This action mechanically retains the slide and leaves the breech open for inspection and/or the installation of a loaded magazine.

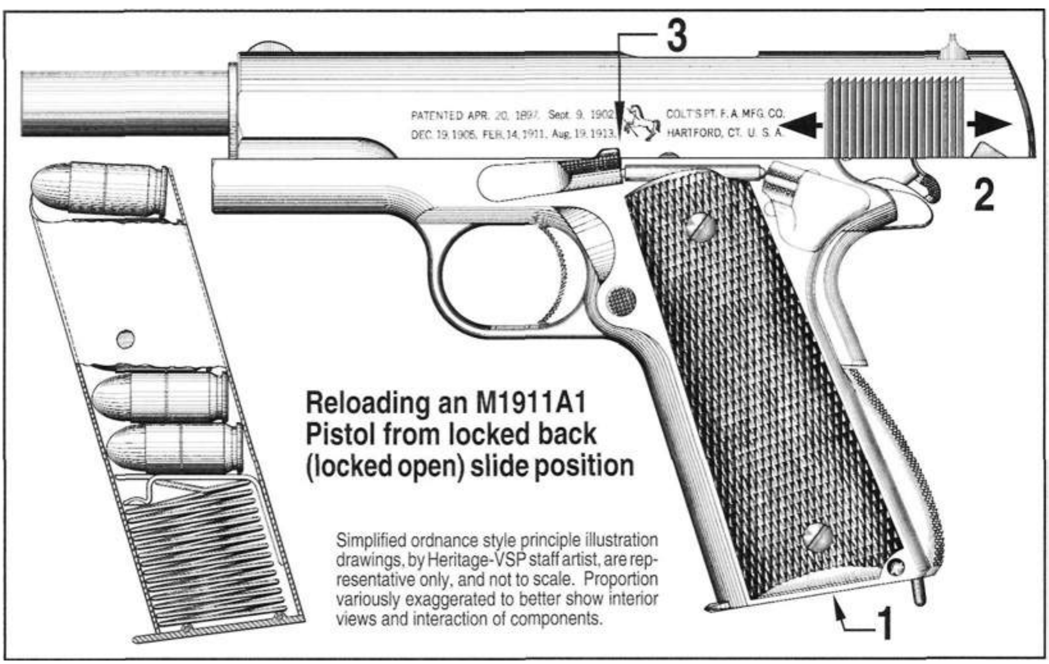
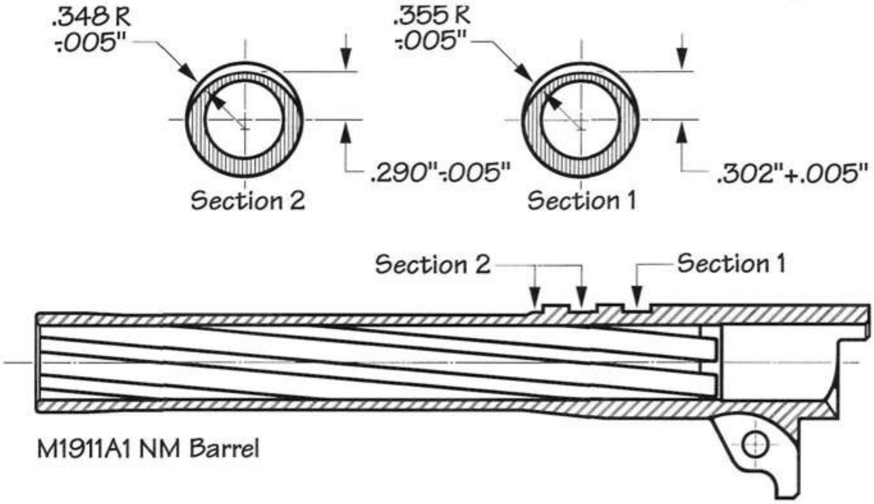


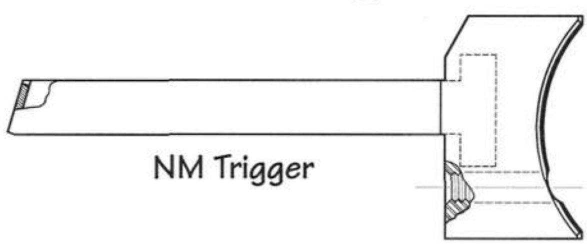
Figure 38- Sectional illustration by Heritage - VSP staff artist shows relative positions of components relative to slide stop position in a standard, ordnance spec. M1911A1 Pistol with the slide in locked position. Placing a loaded magazine in the pistol, at **1**, drawing the locked slide rearward, at **2**, to disengage the slide stop, at **3** (or thumb depressing the slide stop to release the slide) strips and chambers the first round from the loaded magazine and brings the operating cycle full circle. See Phase 1 on pg. 40.

Parts note: U.S. military M1911 and M1911A1 Pistols are commonly found with mixed model frames, slides, and parts.

M1911 M1911A1 Pistol



M1911A1 NM Barrel



NM Trigger

Parts Section

Sources for replacement parts, tools, gauges, accessories and services:

Brownells, Inc. Route 2, Box 1 Montezuma, IA 50171 (515) 623-5401	Gunsmithing tools, gauges, supplies, books, and manuals M1911 custom components
Caspian Arms, Ltd. 14 North Main Street Hardwick, VT 05843 (802) 472-6454	Custom M1911 Components Frames, Slides, barrels, and other commercial M1911 parts.
Springfield, Inc., Custom Shop 25144 Ridge Road Colona, IL 61241 (309) 441-5549	Basic M1911A1 military type pistols and custom competition and carry configuration M1911 pistols
Cylinder & Slide, Inc. 245 E. 4th Street Fremont, NE (402) 721-4277	Custom M1911 pistols, P35 & S&W auto, Colt & S&W revolver tuning & custom work. Custom components.
Kings Gun Works 1837 W. Glenoaks blvd. Glendale CA 91201 (818) 956-6010	Custom handgun accessories, parts, and match grade barrels, Custom gunsmithing
Texas Armament Co. 905 Pecan St. Brownwood, TX 76801 (915) 646-5827	Ordnance style manganese phosphate metal finishing.
Schuemann Barrels 5232A Highway 50 East Carson City, NV 89706 (702) 885-7362	Highest quality M1911 match barrels, ported barrels, bull barrels and M1911 timing test kits
Badger Ordnance P.O. Box 3277 Rapid City, SD 57709-3277	Tools, gauges, and publisher of first quality reproduction prints of original ordnance parts drawings

Although any number of U. S. firms offer Ml911 type pistol parts, accessories, and services, the above commercial suppliers are listed because all items and services ordered from them, to date, have been as advertised and were well worth the advertised or quoted price. Thus far, the only surprises have been that item quality and finish appearance has often been better than expected. Custom and competition grade components sold by these suppliers typically meet, and where advantageous for durability and/or fitting, exceed original military dimensional and metallurgical specs. It's a pleasure to deal with suppliers who possess genuine expertise in their fields and deliver exactly what they promise.

On the other hand, parts from certain other suppliers- often advertised as being new U. S. G. I, mil. spec, of highest quality, and 100% machined, etc. - flat are not. Some of these- cast extractors for example- are low grade *lookalike* parts, at the very best. With low end parts often being priced in the quality range- purchase price, by itself, is no index of what you'll get. Basic metallurgy is all important. The metal alloy, grade, grain structure, and the pre machining and final heat treats used in manufacture aggregately determine the essential hardness/toughness ratio in a given part and, relatedly, its strength and durability. If you repair or rebuild M1911 pistols or assemble custom M1911's from components, keep reliability in mind. To this end, I would strongly suggest staying with name brand manufacturers and suppliers with a quality reputation. In the case of carry or defense pistols, your life, or a customer's, may depend on it.

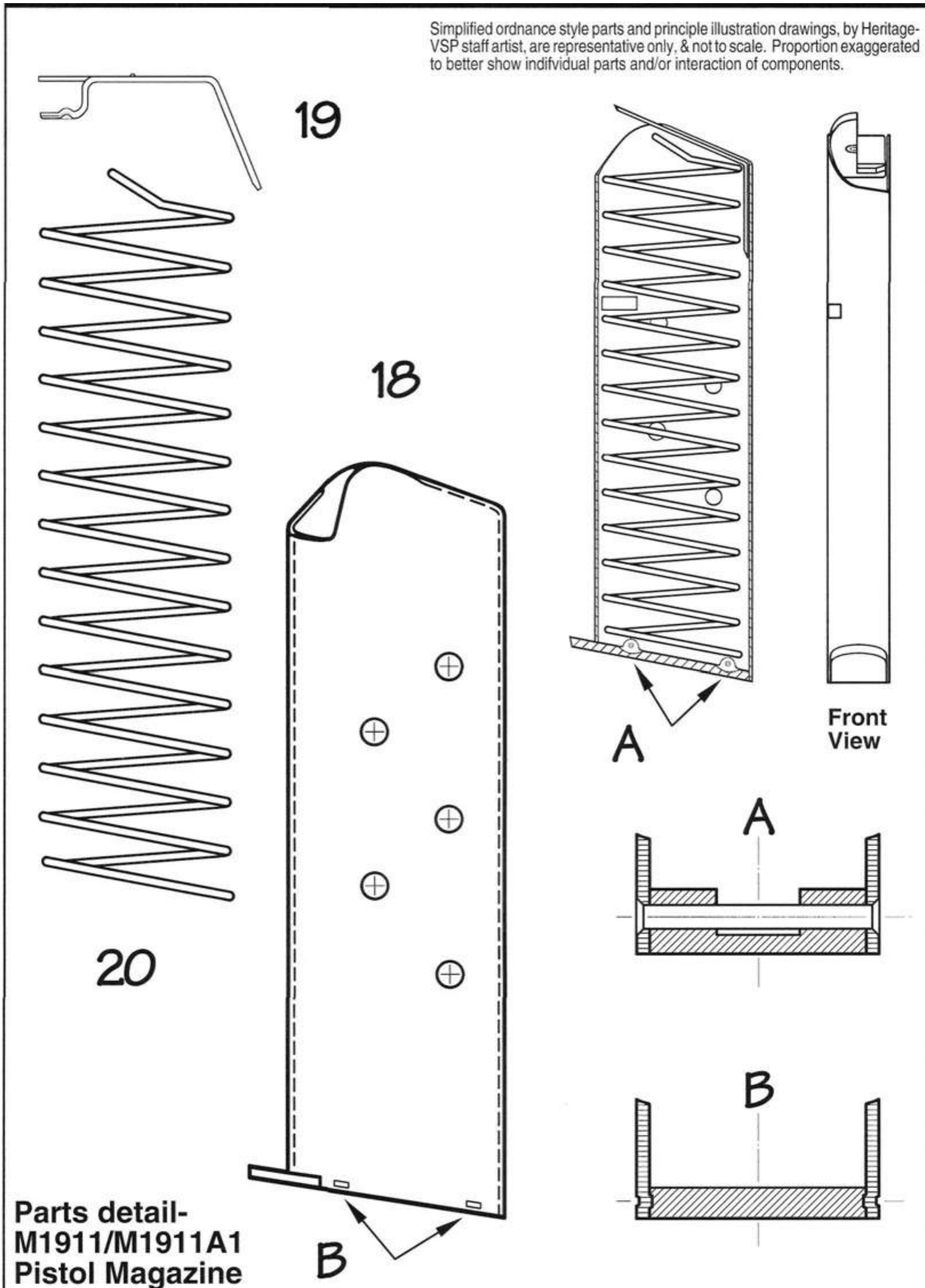


Figure 39- Ordnance style illustrations by VSP-Heritage staff artist show exterior and sectional views of assembled M1911Al mil. spec, magazines and components. The early M1911 magazine base lanyard loop is not shown. Item numbers, above, are keyed to exploded parts diagrams and nomenclature on pages 50 through 58. Early and late style M1911/M1911Al magazine tube/base assembly methods are shown at arrows in exterior views and in the partial sectional illustrations, at lower right. Early style (pinned base) magazine tube assembly is shown at **A**, and late style assembly (crimp weld - TIG spot weld optional) is shown at **B**. Magazine followers and springs (# 19 & 20) interchange between early and late magazines.

Parts List and Nomenclature-

Reference numbers and parts nomenclature, listed below, is keyed to the U.S. M1911 & M1911A1 Pistol; Commercial Government Model Pistol; and Colt Gold Cup, Commander, and Officer ACP Pistol exploded parts drawings on pages 49 through 58.

Drawing Ref. #	Part or assy. Name
1.	Barrel
2.	Barrel Bushing
2A.	Barrel Collet
3.	Barrel Link
4.	Barrel Link Pin
5.	Disconnector
6.	Ejector
7.	Ejector Retaining Pin
8.	Extractor
8A.	Extractor, Series 80
9.	Firing Pin
9A.	Firing Pin, Series 80
10.	Firing Pin Spring
11.	Firing Pin Stop
11A.	Firing Pin Stop, Series 80
12.	Frame (Receiver)
13.	Grip Safety
14.	Hammer
15.	Hammer Pin
16.	Hammer Strut
17.	Hammer Strut Pin
18.	Magazine Body (Tube)
19.	Magazine Follower
20.	Magazine Spring
21.	Magazine Catch (body)
22.	Magazine Catch Lock
23.	Magazine Catch Spring
24.	Mainspring (Hammer Spring)
25.	Mainspring Cap
26.	Mainspring Cap Pin
27.	Mainspring Housing
27A.	Mainspring Housing Lanyard Loop
28.	Mainspring Housing Pin
29.	Mainspring Housing Pin Retainer
30.	Plunger Tube
31.	Plunger Spring (Safety/Slide Stop)
32.	Recoil Spring
33.	Recoil Spring Plug
34.	Recoil Spring Guide
35.	Safety Lock (Thumb Safety Lever)

Drawing Ref. #	Part or assy. Name
36.	Safety Lock Plunger
37.	Sear
37A.	Gold Cup Sear (Series 70 & 80)
38.	Sear Pin
39.	Sear Spring
40.	Slide
41.	Slide Stop
42.	Slide Stop Plunger
43.	Sight, Front, Fixed
44.	Sight, Rear, Fixed
45.	Sight, Rear, Adj. (body)
45A.	Sight, Rear, Elevation Screw
45B.	Sight, Rear, Elevation Spring(s)
45C.	Sight, Rear, Pin
45D.	Sight, Rear, Assembly Pin
45E.	Sight, Rear, Blade
45F.	Sight, Rear, Detent Ball
45G.	Sight, Rear, Detent Spring
45H.	Sight, Rear, Windage Screw
45 I.	Sight, Rear, Windage Spring
46.	Stock (grip) Panel, Left
46A.	Stock (grip) Panel, Right
47.	Stock Screw (4)
48.	Stock Screw, Bushing (4)
49.	Trigger Assembly
49A.	Trigger Adjusting Screw
Series 80 models:	
8A.	Extractor, Series 80
9A.	Firing Pin, Series 80
11A.	Firing Pin Stop, Series 80
50.	Trigger Bar Lever
51.	Firing Pin Lock Plunger
52.	Firing Pin Lock Plunger Spring
53.	Firing Pin Lock Plunger Lever
Gold Cup Model (Series 70 & 80):	
37A.	Sear, Gold Cup
54.	Sear Depressor
55.	Sear Depressor Spring
Gold Cup Model (.38 WC):	
56.	Barrel Return Spring

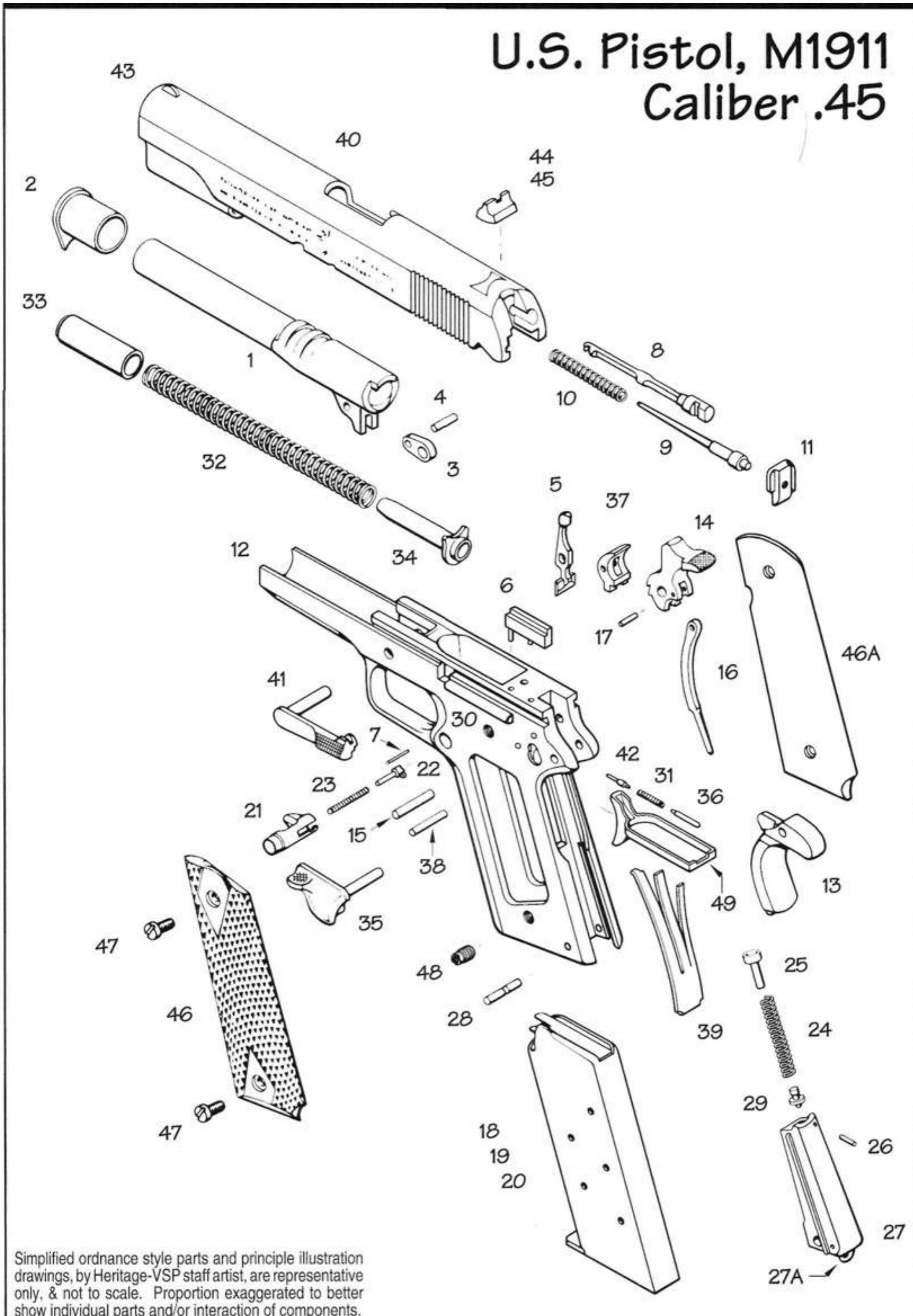


Figure 40- Exploded parts diagram by Heritage - VSP staff artist shows Ml911 Pistol components. Magazine sectional views and magazine components are shown in figure 39. The above illustration, based on earlier ordnance drawings, is provided here as a pistol assembly/disassembly and parts identification reference. M1911A1 Pistol and Commercial M1911 type pistol exploded parts diagrams are shown on pages 52 - 58. Also see installed parts location reference illustrations on pages 199 and 200.

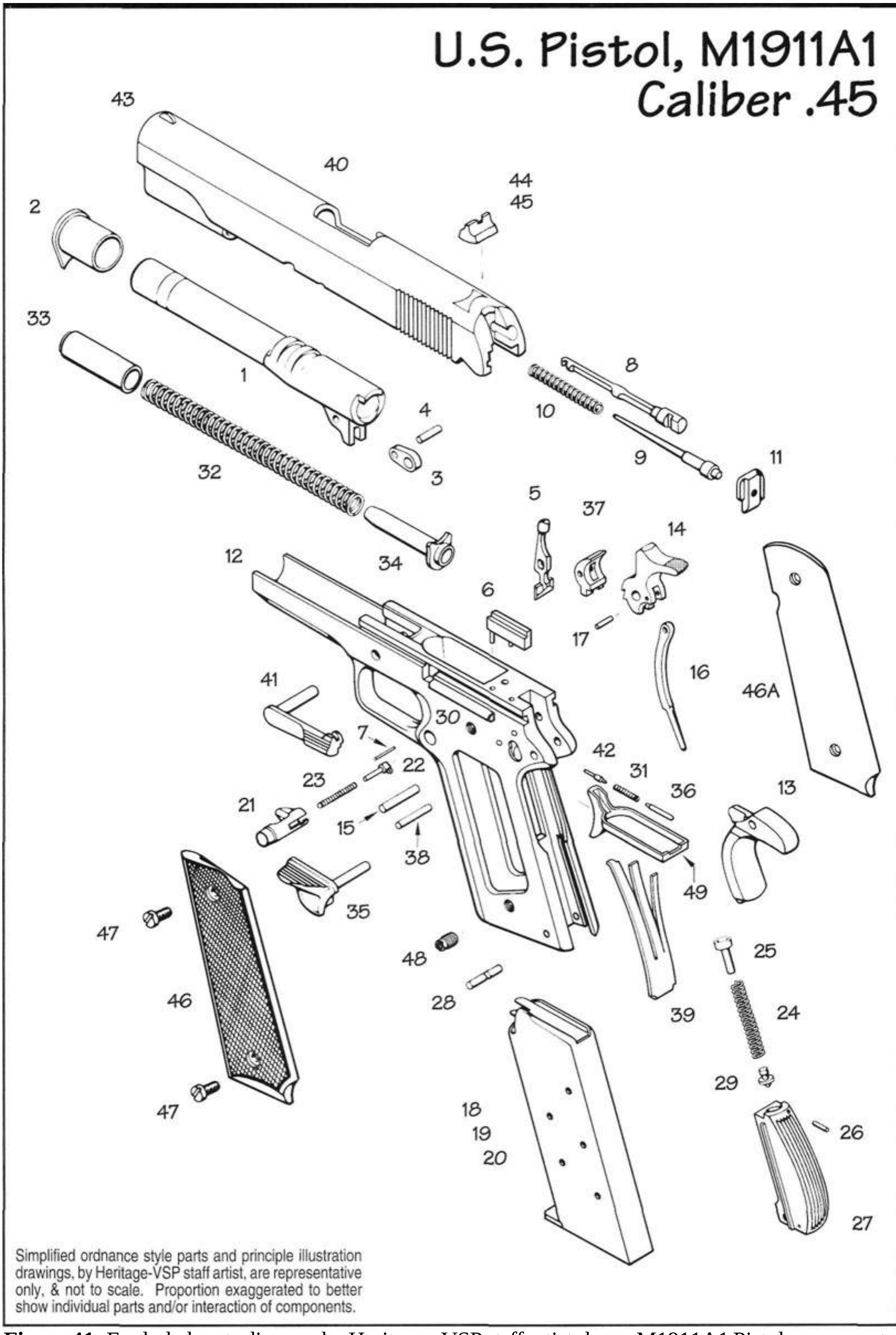


Figure 41- Exploded parts diagram by Heritage - VSP staff artist shows M1911A1 Pistol components. Magazine sectional views and individual components are shown in figure 39. The above illustration, based on earlier ordnance drawings, is provided here as an assembly and parts identification reference. Commercial M1911/M1911A1 type pistol exploded parts diagrams are shown on the following pages.

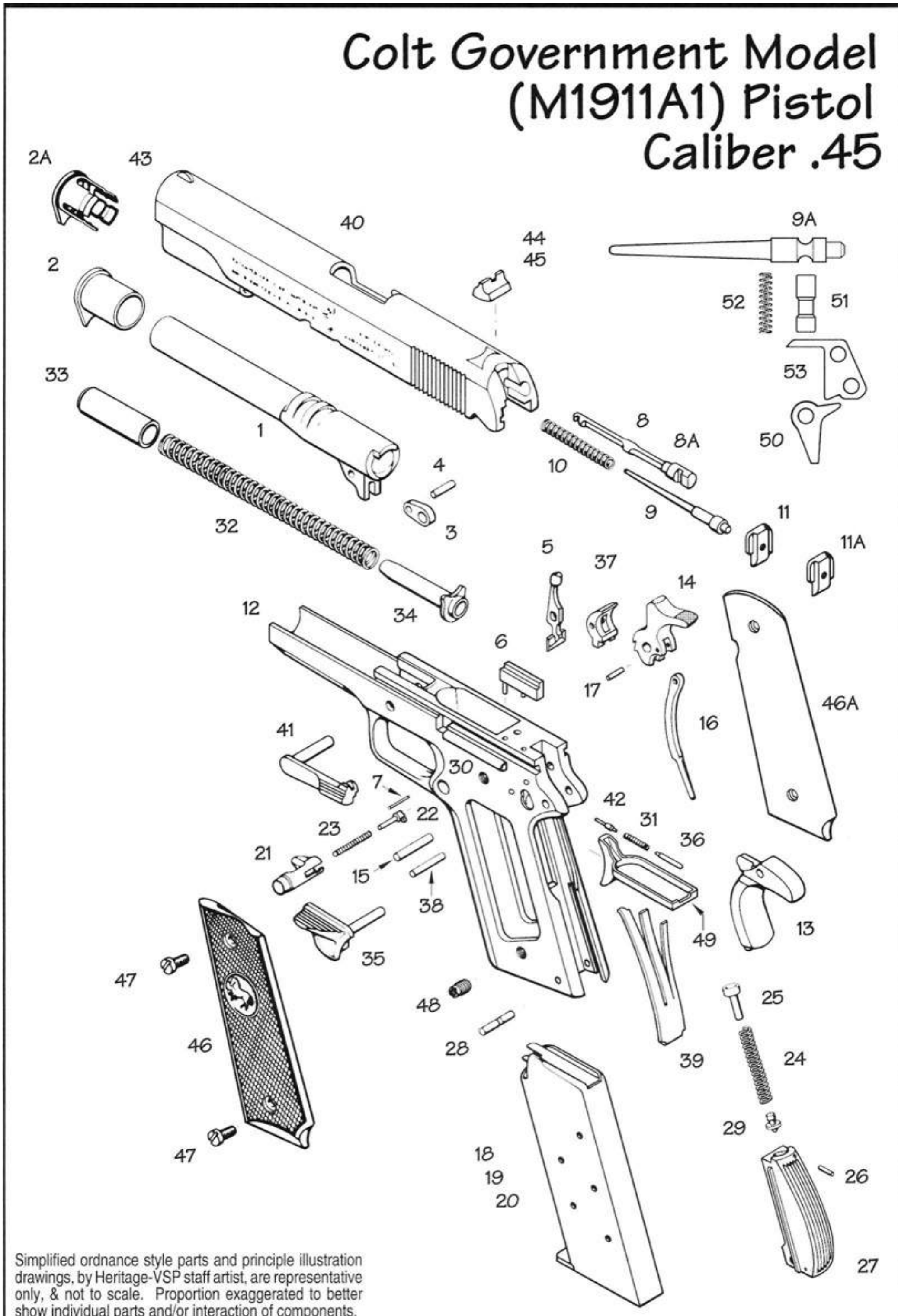


Figure 42- Exploded parts diagram by Heritage - VSP staff artist shows Colt Government Model Pistol components (M1911A1 configuration through Series 80). Magazine sectional views and individual components are shown in figure 39. The above illustration, based on earlier ordnance drawings, is provided as an assembly and parts identification reference. Collet style bushings (2A) are now discontinued.

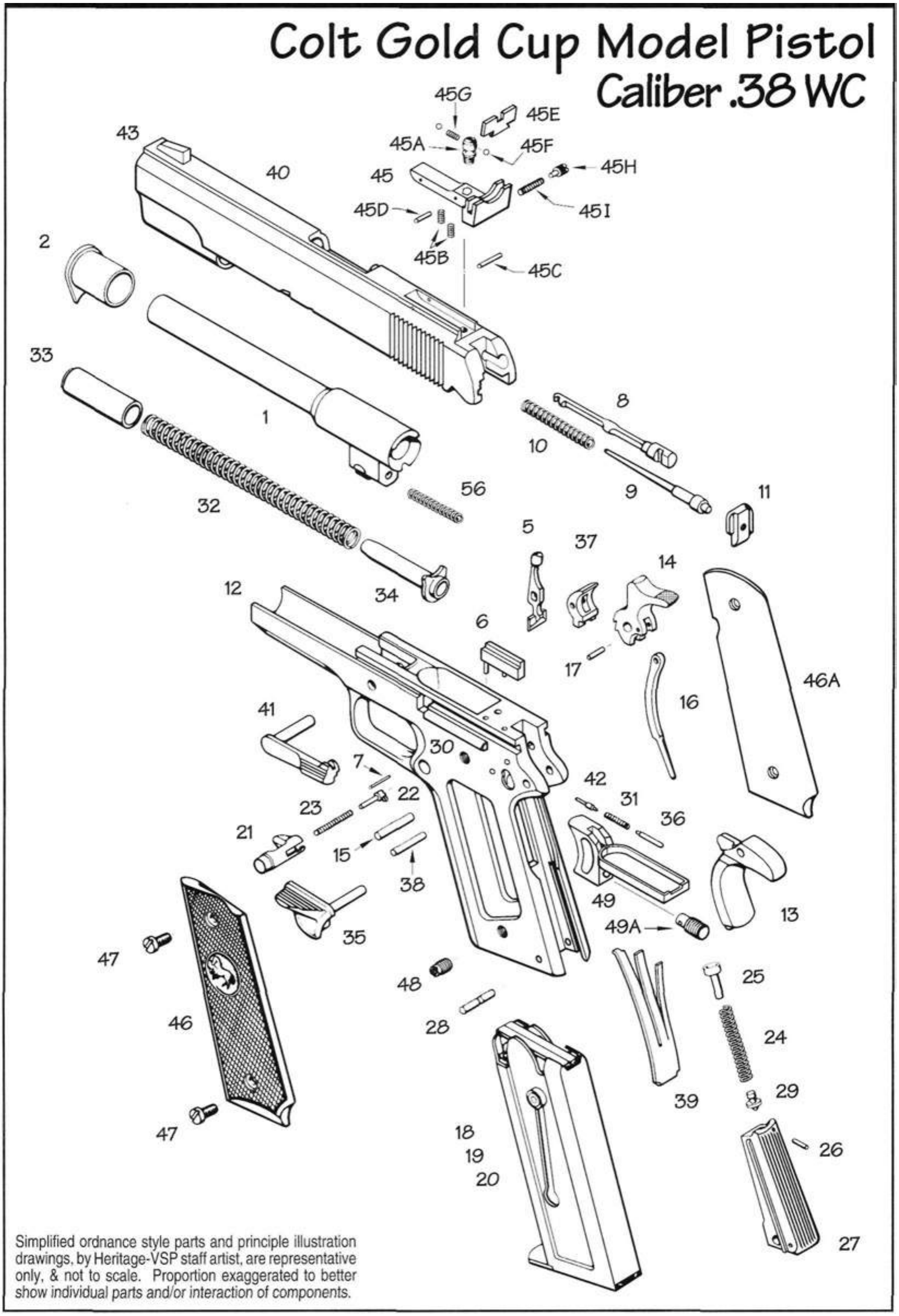


Figure 43- Exploded parts diagram by Heritage - VSP staff artist shows Colt Gold Cup Mk. III NM Model Pistol components. This model was mfg. to fire the. 38 Spl. wadcutter cartridge. Magazine, barrel, slide and several other components depart from Ml911 design. This illustration is provided as an assembly reference and to identify parts. The. 38 Special WC model was manufactured from 1960 through 1974.

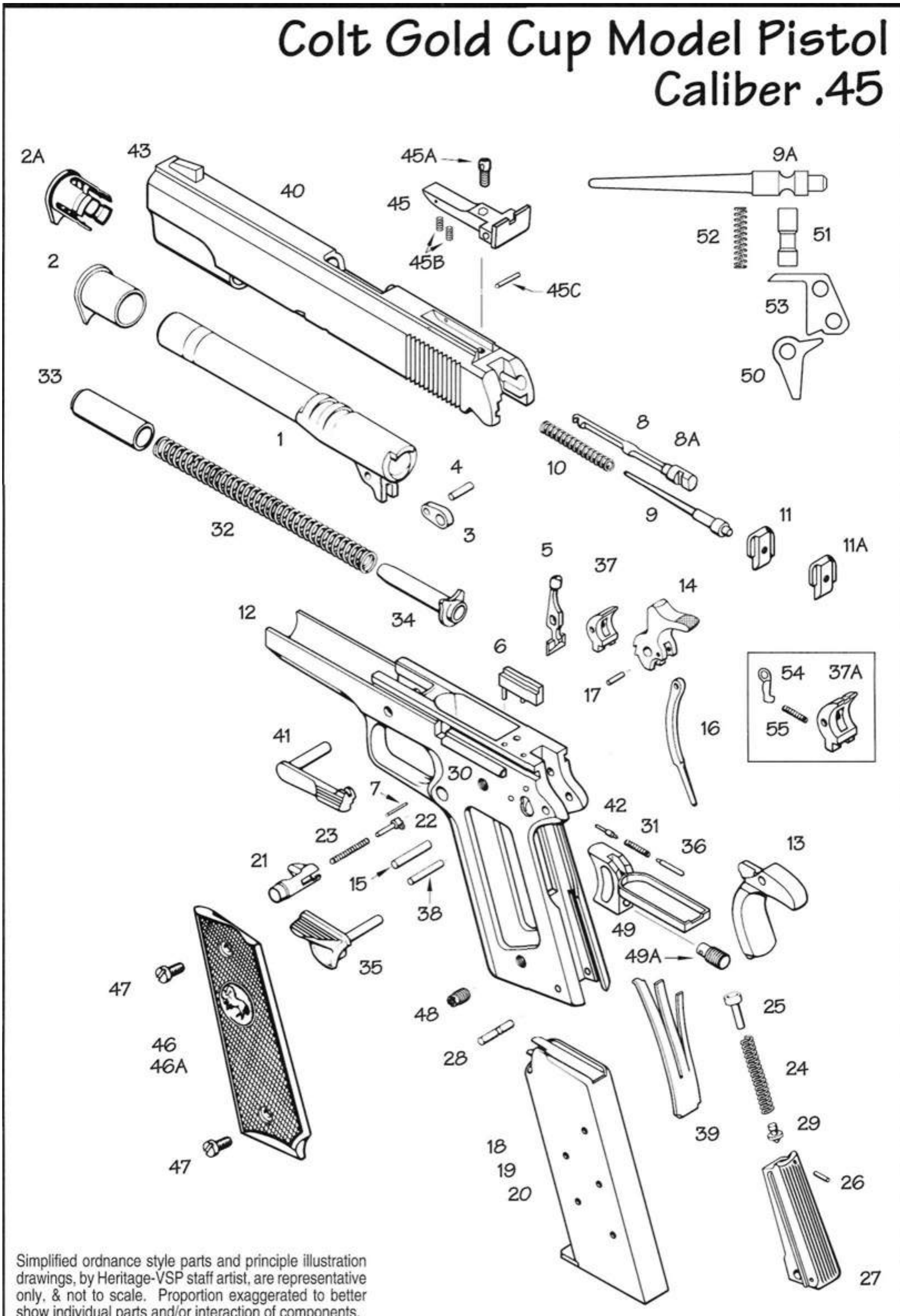


Figure 44- Exploded parts diagram by Heritage - VSP staff artist shows Colt Series 70 and later Gold Cup NM Model components. Magazine sectional views and components are shown in figure 39. The above illustration is provided as an assembly reference and to identify parts. The Gold Cup Model replaced Colt's original NM Model manufactured from 1932 to 1940. Collet style bushings (2A) are discontinued.

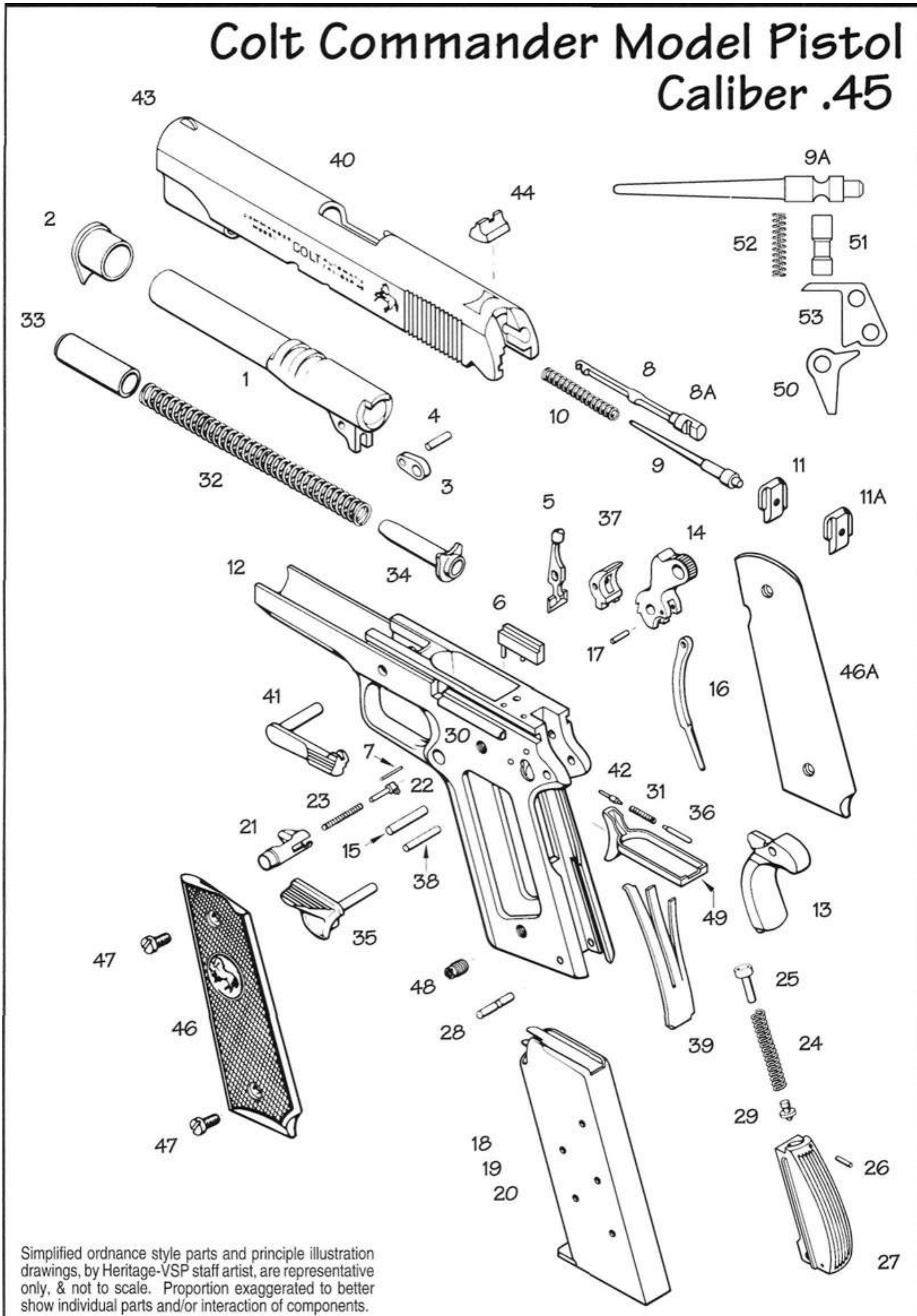


Figure 45- Exploded parts diagram by Heritage - VSP staff artist shows Colt Commander Model and later Series 80 components. Magazine sectional views and components shown in fig. 39. Except for its shorter slide, barrel, bushing, and P-35 style hammer, the Commander is the same as the Government Model. The Commander L. W. Model (aluminum alloy frame) was introduced in 1951. The steel frame Combat Commander was introduced in 1970. Illustration provided as an assembly and parts identification reference.

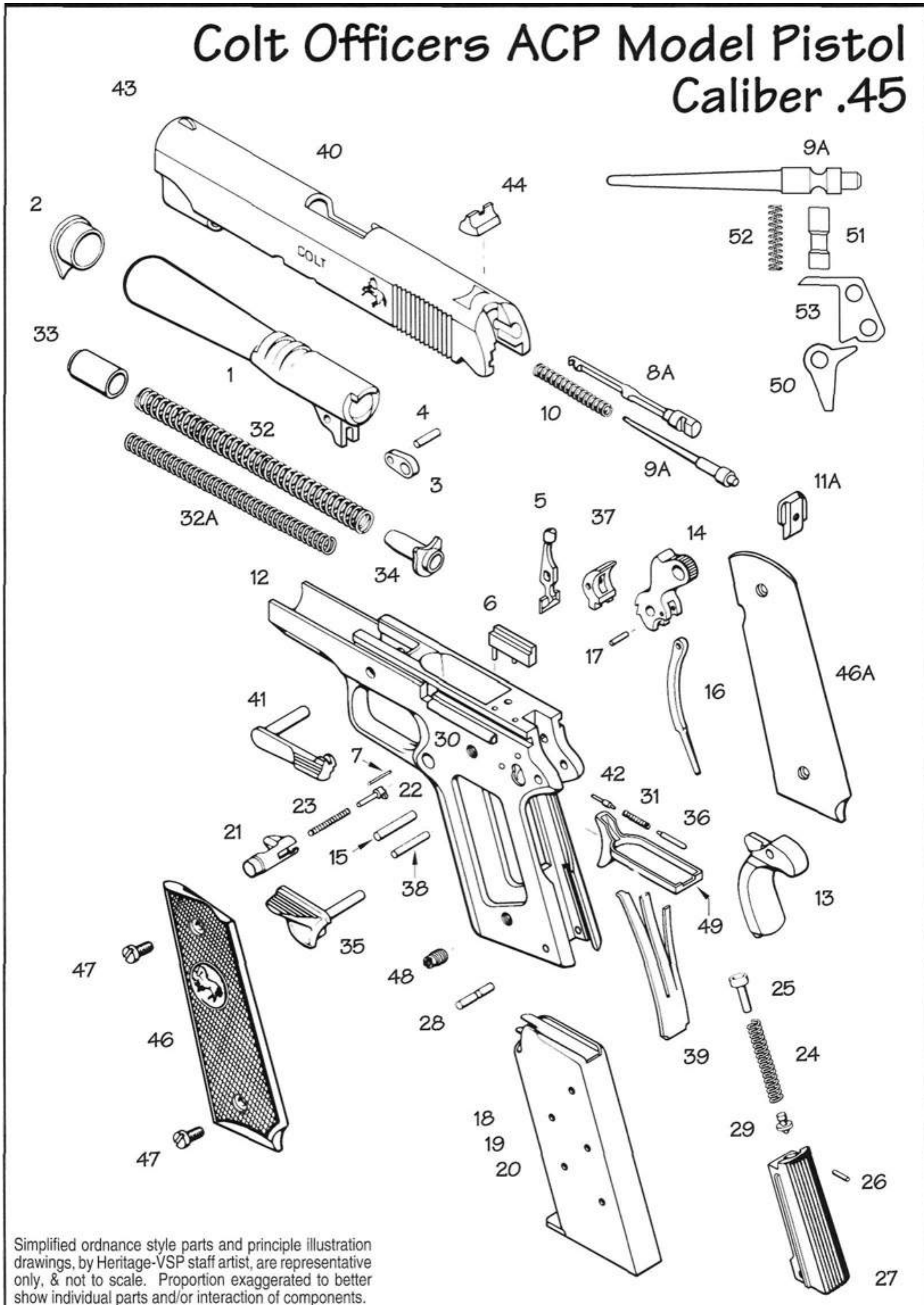


Figure 46- Exploded parts diagram by Heritage - VSP staff artist shows Colt Officer's ACP Model components. This model (introduced 1984) followed the ultra short/reduced height concealed carry pistols pioneered by Detonics and others. The Colt brand name and the practical size of the Officer's ACP served to popularize the extra short M1911 variants. Major differences, other than smaller dimensions, include: a conical barrel and bushing and a redesigned recoil system (2 recoil springs, a short follower, and a reverse plug with lock detent). Illustration provided as an assembly & parts identification reference.

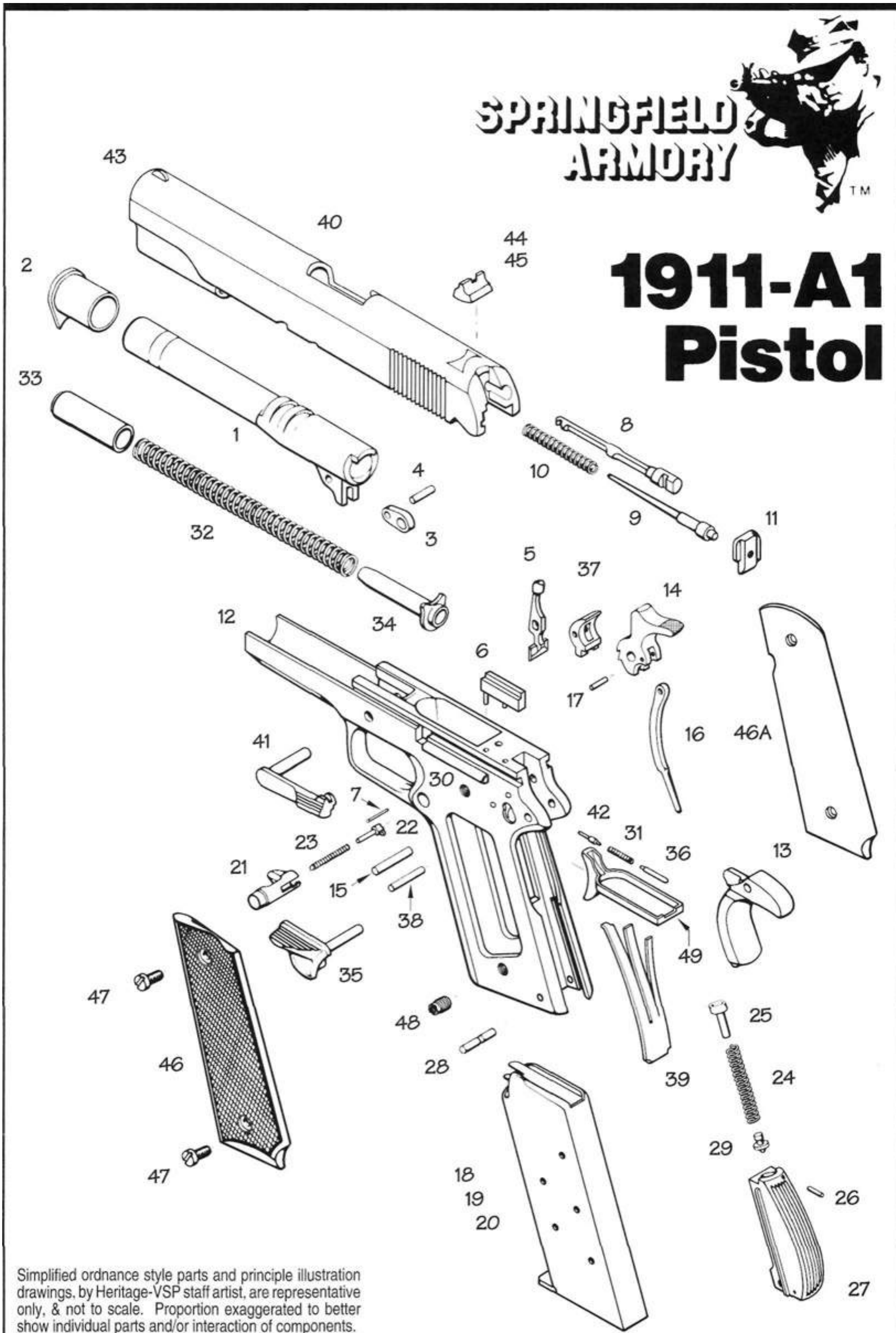
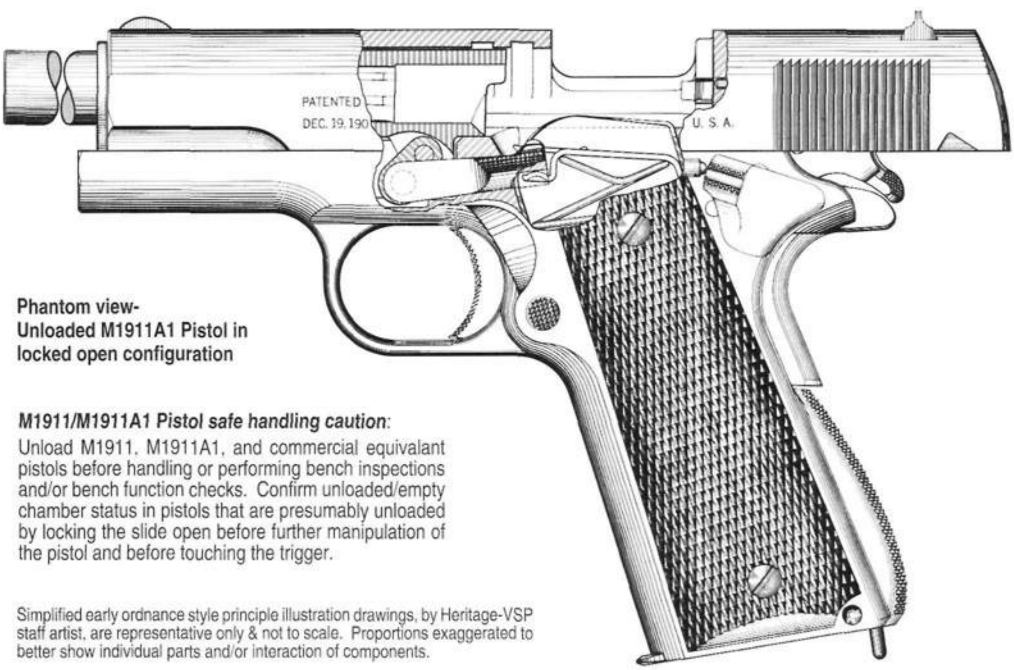


Figure 47- Exploded parts diagram by Heritage -VSP staff artist shows Springfield, Inc. M1911-A1 Pistol components. .45 ACP magazine sectional views in fig. 39 and parts nomenclature on page 50 also apply. M1911-A1 parts illustration is provided as an assembly/disassembly and parts identification reference.

Phantom view- Loaded M1911A1 Pistol in cocked and locked condition

Bench Inspection & Function Checks



Phantom view- Unloaded M1911A1 Pistol in locked open configuration

M1911/M1911A1 Pistol safe handling caution:

Unload M1911, M1911A1, and commercial equivalant pistols before handling or performing bench inspections and/or bench function checks. Confirm unloaded/empty chamber status in pistols that are presumably unloaded by locking the slide open before further manipulation of the pistol and before touching the trigger.

Simplified early ordnance style principle illustration drawings, by Heritage-VSP staff artist, are representative only & not to scale. Proportions exaggerated to better show individual parts and/or interaction of components.

Figure 48- Ordnance style phantom sectional illustration by Heritage - VSP staff artist, at top, depicts a loaded M1911Al Pistol in cocked and locked condition. The phantom illustration, below, shows an M1911A1 Pistol with the slide locked open on an empty magazine for interior inspection. This step must be done before Ml911 type pistols are handled and inspected, as discussed above. The two methods to unload and lock open an M1911 Pistol in cocked and locked condition are: (**1**) remove the loaded magazine; depress the thumb safety to *off* position; and while holding upward pressure on the slide stop (lock), draw the slide rearward to eject the chambered round and engage the slide stop; (**2**) remove the loaded magazine; install an empty magazine; depress the thumb safety to *off* position, and draw the slide rearward to eject the chambered round and lock the slide open on the empty magazine.

M1911/M1911A1 Pistol Bench Inspection and Function Checks

Before fully disassembling military or commercial Ml911 type pistols for parts inspection, repair, rebuilding, and/or refinishing, experienced pistolsmiths always take the few minutes needed to perform an overall visual inspection and to bench check mechanical function. The same function check list is used after reassembly of M1911/M1911A1 pistols and after final assembly of M1911 type pistols *built* from components. Headspace, if unknown, should be gauge checked as a routine part of bench inspection. See barrel, chamber, and cartridge headspace on pages 106 through 108. With an investment of only a few minutes, the pistolsmith can discover problems that might exist in a given pistol, gain insight into known or suspected problems, and, as well, get an idea as to what will be needed for repair. With gunsmith liability and M1911/M1911A1 service history in mind, military and civilian M1911/ M1911A1 Pistol technical/visual inspection steps and operation/function checks are consolidated, together with a few practical additions, into the following expanded bench checklist:

A. Clear the Pistol before touching the trigger or further handling:

1. Depress the magazine release and remove the magazine from the pistol
2. Keeping fingers clear of the trigger, lock the slide open as discussed in figure 48
3. Visually inspect the chamber to 100% ensure that the pistol is not loaded

B. With the slide locked open, inspect the bore and chamber with a bore light, and:

1. Make certain the bore and chamber are not plugged or restricted
2. Make certain the chamber is smooth and unpitted and is not bulged, damaged, or otherwise deformed
3. Make certain the bore is not cracked, surface damaged, bulged, or otherwise deformed
3a. Range rod (plug gauge) check the bore for basic roundness and serviceable lands diameter
4. Make certain that the rifling in the bore is sharp and well defined
5. Make certain the muzzle crown is undamaged and that rifling at/near the crown is not excessively worn

Military pistol bore inspection notes: (1) Clean the chamber and bore with solvent and a brush and patch dry for visual and plug gauge inspection. (**2**) Chamber walls should be completely smooth and barrel bores/rifling well defined and unpitted; lines and tool marks in the bore and chamber should be limited to those normally created in the manufacturing and headspace reaming processes. (**3**) Military field maintenance inspection standards allowed for the presence of a small amount of pitting. See TM 9-2951-1 for description of bore serviceability in military barrels and allowable pitting limits. (**4**) If there is any question about a bore or chamber, cast the chamber and section(s) of the bore with Cerrosafe and measure. **Chamber inspection note:** always check barrels, and especially two piece barrels (see examples in Vol. 1) for chamber expansion and/or downward swelling of the thin chamber wall area just above the barrel link clearance cut.

C. With the slide locked open, visually inspect the exposed interior to be sure that:

1. The frame and barrel ramps appear serviceable and barrel does not extend past the frame ramp
2. The extractor hook appears serviceable
3. The ejector appears serviceable
4. The top of the disconnector appears serviceable and spring tension feels normal
5. The trigger bow is straight and lies below flush in the frame (shows no magazine drag marks)
6. The slide breech face and the slide's (2) barrel breeching surfaces appear serviceable
7. The firing pin port is not oversize
8. The firing pin moves forward and returns to stop freely and the firing pin stop stays in place
9. The firing pin fits the firing pin port without excessive clearance and the tip appears spherical
10. The slide center rail, disconnector camming/timing recess, and firing pin stop appear serviceable

D. Depress the slide lock and ease the slide forward (don't slam on empty chamber) and check:

1. Barrel/slide/bushing aggregate clearance (check by attempting to move the barrel with thumb pressure)
(**a**) Std. military and commercial pistols- zero to a few thousandths max. clearance
(**b**) Pistols with custom fit bushings/barrels-zero clearance

2. Barrel hood deflection & aggregate vertical clearance (check by firmly depressing barrel hood with thumb)
(**a**) Std. pistols- combined barrel link deflection and clearance take up should not exceed .020"
(**b**) Max. accuracy pistols- combined deflection and clearance take up should be at or near zero

3. Trigger pull: (**1**)squeeze trigger slowly and check for presence/absence of creep, drag, roughness or bind; (**2**) check trigger pull weight (use ordnance/NRA weight system for best accuracy)
M1911/M1911A1 trigger pull specifications: Military Pistols- 5 1/2 lbs. min. and 6 1/2 lbs. max.
M1911 NM- ball ammunition: 4 lbs.; WC ammunition: 3 1/2 lbs. (both + an initial 1/4 lb. for wear-in)
Suggested specifications for M1911 type carry pistols-5 lbs min. and 5 1/2 lbs max.

M1911/M1911A1 Pistol Bench Inspection and Function Checks, continued -

Trigger pull warning: An uncontrolled fire condition (i. e., doubling- or in worst cases, full auto fire) can result when trigger pull is reduced below ordnance specification. Whether doubling or full auto fire actually would occur with any reduction in trigger pull would depend on a number of interactive factors including: mainspring (hammer spring) and/or sear spring pressure/tension; disconnector, sear, hammer condition and operating surface dimensions; the extent of sear/hammer engagement; hammer and sear pin dimensions and corresponding frame pin hole locations/dimensions; vertical slide/frame dimensions, and with trigger pulls approaching or below 41/2 lbs., trigger assembly mass (weight). **Trigger mass note:** Lightweight triggers with aluminum or nylon, etc. finger pieces transfer considerably less inertial energy to the disconnector and sear as the slide cycles and closes and are therefore less apt to bounce rearward with sufficient force to cause the sear to release the hammer. This factor becomes more important as trigger pull is red

E . Cycle the slide and check safety system and disconnector function as follows:

1. With the thumb safety in the **off** or ***ready to fire*** position, pull the trigger without depressing the grip-safety - the hammer must not release

2. With the cocked pistol in hand (grip safety depressed) and with the thumb safety in the ***on*** or ***safe*** position, again pull the trigger- the hammer must not release

3. With cocked pistol in hand (grip safety depressed) and with the thumb safety in the ***off*** or ***ready to fire*** position, once again pull the trigger - the hammer must release

4. Repeat #3, above, and while holding the trigger to the rear, cycle the slide to the rear and return forward to cock the hammer- the hammer must cock and remain in the full cock position

5. Repeat #3, then slowly return the trigger forward listening for positive disconnector reconnect click

6. After #5, resqueeze the trigger- the hammer must release

M1911 safety system and disconnect cycle notes: (**1**) After final assembly and inspection, M1911 type pistols must be test fired to make certain that a failed disconnect or uncontrolled fire condition is not present. (**2**) See safety system function on pages 10 -12 and disconnector function on pages 13 -15.

F. Headspace, dummy round feeding, chambering, extracting, and slide lock back checks:

1. Gauge headspace and note chamber length for reference (replace barrel if headspace is excessive)
2. Inspect magazine(s) Note replacement of magazine(s) or magazine springs/followers if unserviceable
3. Place 4 or more dummy cartridges in each magazine to be used
4. Install magazine in pistol and make certain the magazine catch positively captures the magazine
5. Hand cycle the slide at moderate speed to make sure that cartridges feed, chamber, extract, and eject
6. Check to be sure that the slide locks back with ejection of the last cartridge and that the magazine catch releases each magazine

G. Inspect overall exterior surface mechanical & cosmetic condition (including slide/frame fit):

1. Check slide/frame rail sideplay and vertical play (horizontal and vertical clearance)
2. Visually and manually check the front and rear sights Check for damage, alteration, or looseness Make sure that sights are correctly installed (final check, drift/adjust sights on test firing)
3. Inspect the thumb safety lever- Also check for positive safety lever plunger/detent engagement
4. Visually inspect the magazine release lock screw driver slot (disassembly slot) for damage
5. Check the slide for indications of false lockback (seen as peening in the slide disassembly notch)
6. Inspect the plunger tube to make certain the tube is serviceable and secured tightly to the frame
7. Inspect the grips and grip screw condition

H. Test fire (test fire pistols that pass all bench and function checks, only):

Load and fire 2 rounds per magazine, followed by 3, until the pistol demonstrates reliable disconnect function. Check eject angle/throw and examine fired brass for possible problems including bulging and primer flow.

Ml911 qualified armorers and pistolsmiths have historically used various inspection sequences and function checking methods based, largely, on individual experience. If you use a different checklist that works well with M1911 type pistols and that covers all the necessary bases- continue to use it by all means. Otherwise, I would suggest a basic checklist such as the above to which supplemental items can be added, as you see fit. What is most important, regardless of the exact inspection sequence or checklist used, is to determine whether or not critical pistol components are serviceable and whether mechanical, safety system, or accuracy related problems might exist in the pistol being checked.

Note any problems found during before disassembly checks for later attention. Prevent parts mix-up by keeping the parts for individual pistols in parts boxes marked with the serial number of the parent frame.

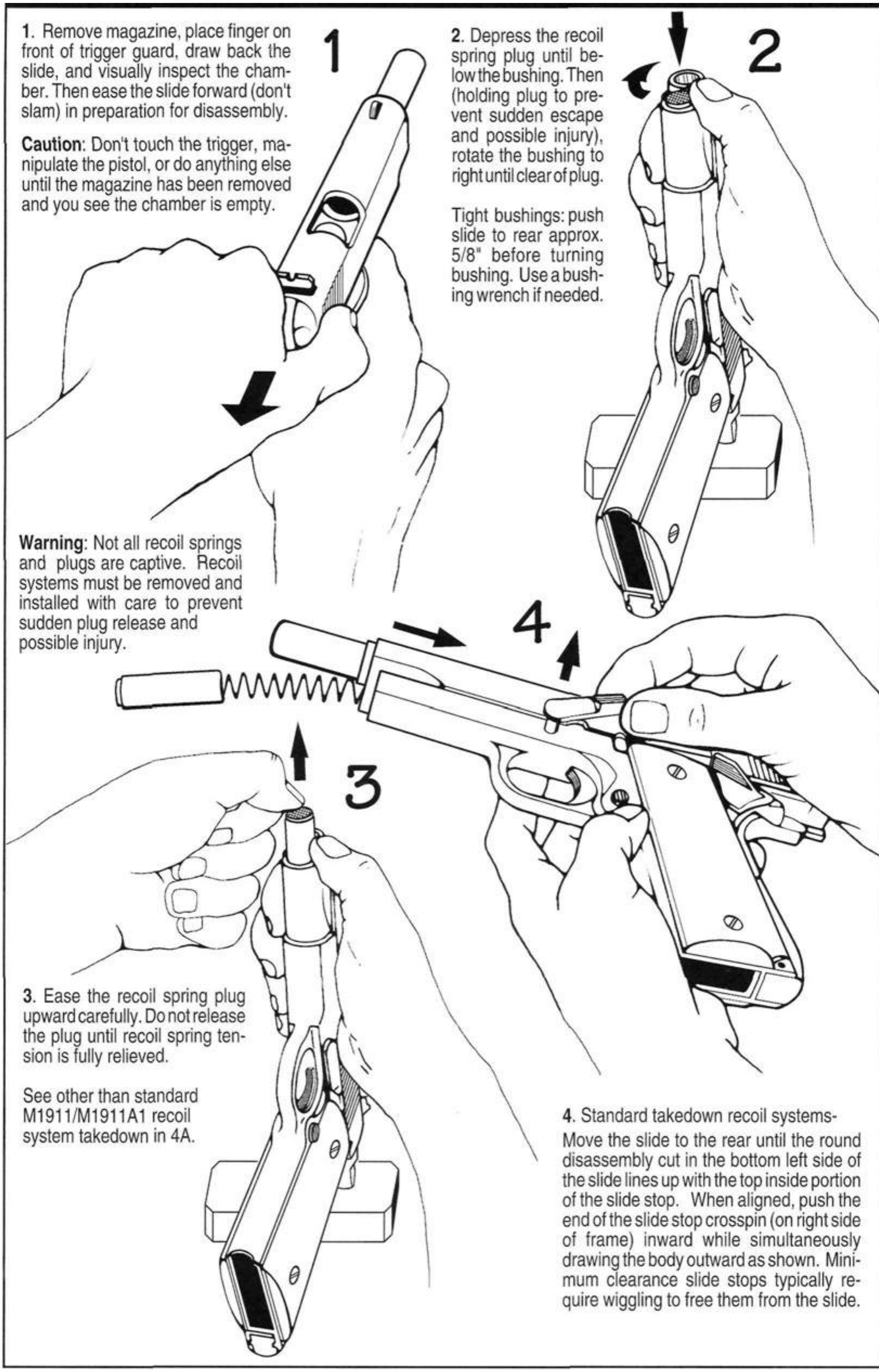


Figure 49- Ordnance style illustrations show M1911/M1911Al Pistol disassembly steps 1 through 4.

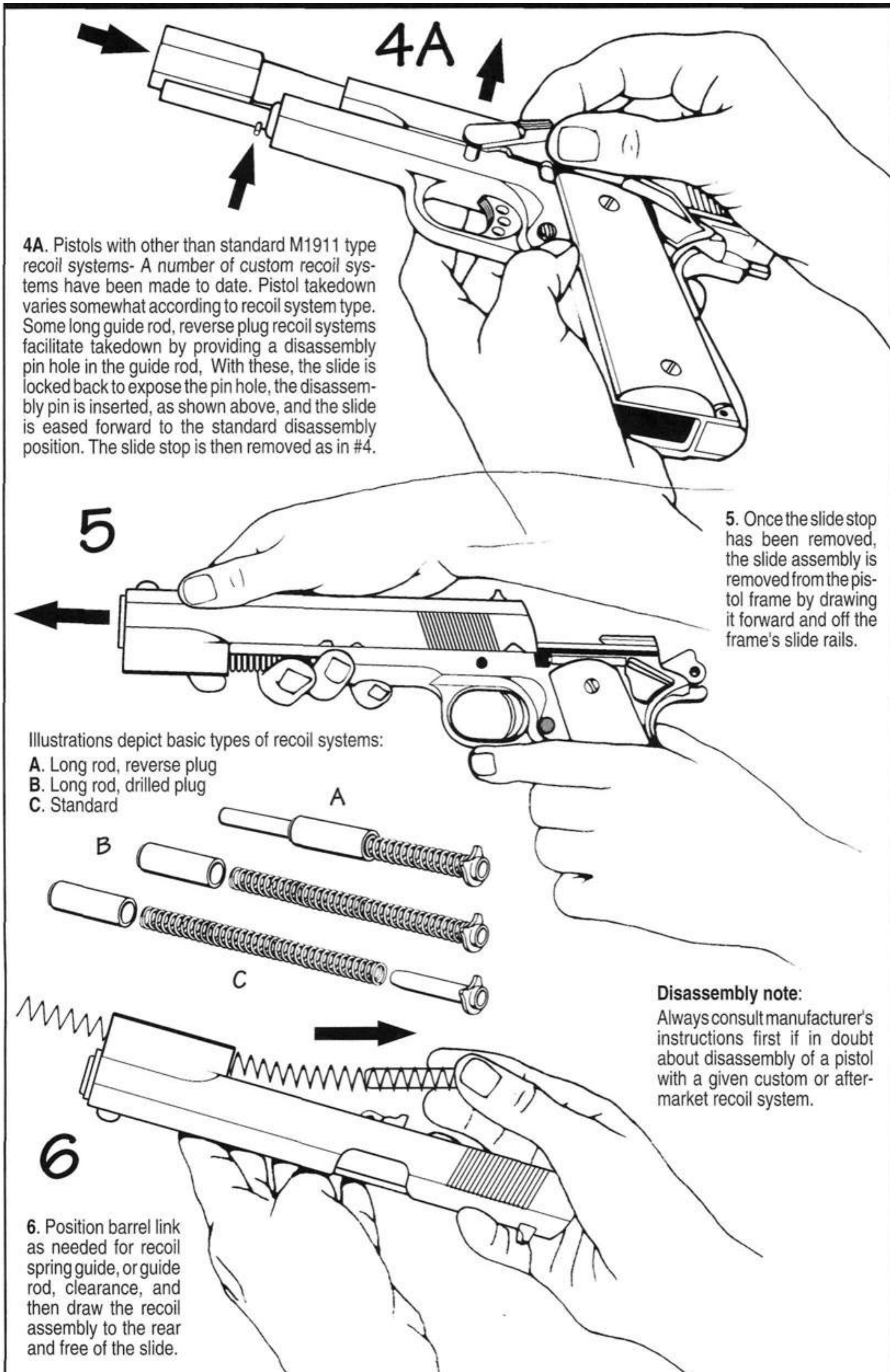
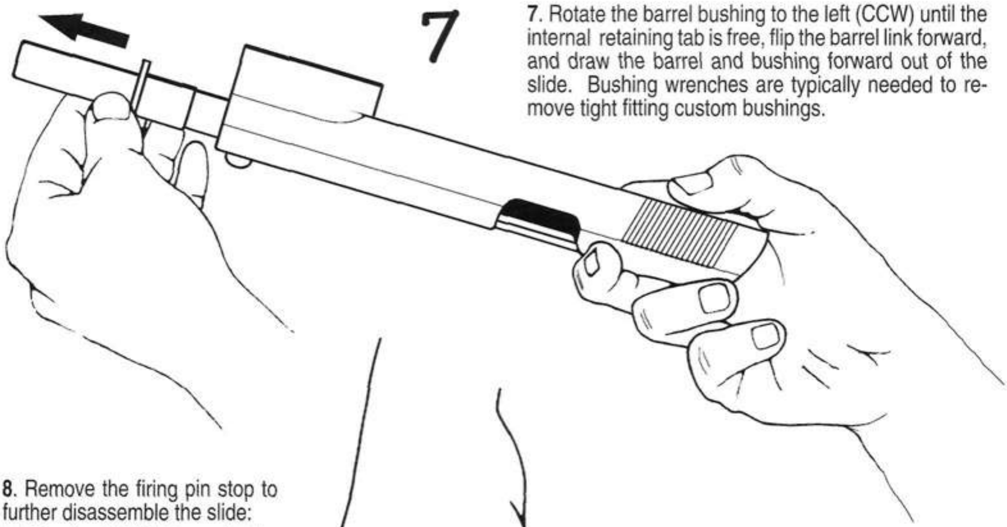
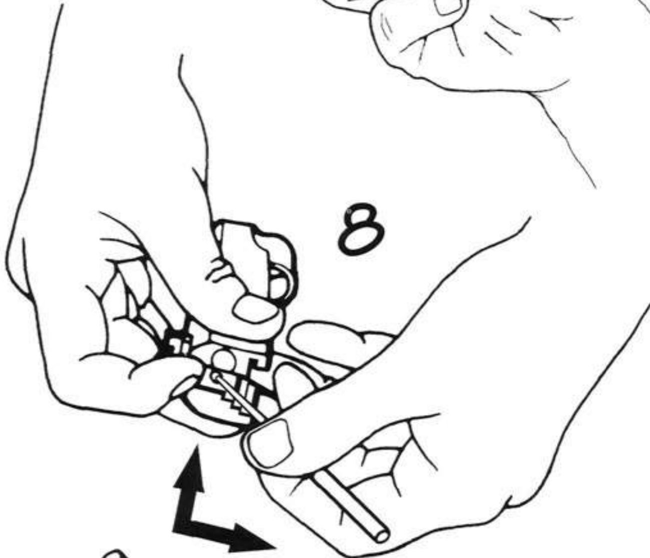


Figure 50- Ordnance style illustrations show M1911/M1911Al Pistol disassembly steps 4A through 6.



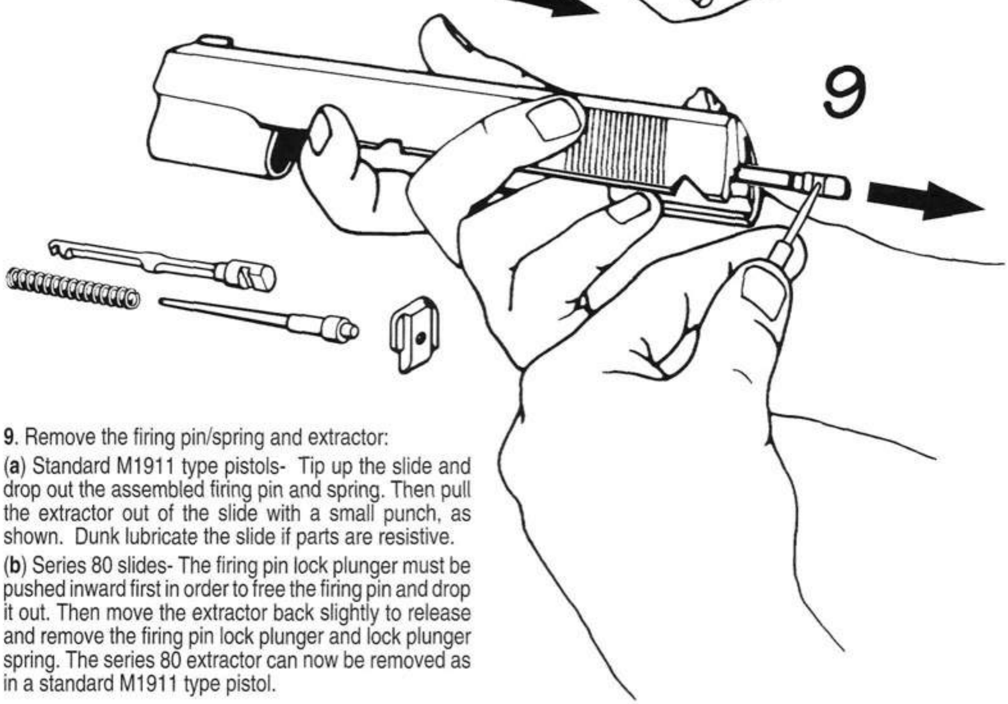
7. Rotate the barrel bushing to the left (CCW) until the internal retaining tab is free, flip the barrel link forward, and draw the barrel and bushing forward out of the slide. Bushing wrenches are typically needed to remove tight fitting custom bushings.



8. Remove the firing pin stop to further disassemble the slide:

(**a**) Standard M1911 type pistols- Push the back of the firing pin inward with a small punch and, with the pin held in, pull the firing pin stop out of its slot in the slide.

(**b**) Series 80 slides- The firing pin lock plunger must be pushed inward before the firing pin can be pushed forward. Otherwise, firing pin stop removal is the same as in a standard M1911 type pistol.



9. Remove the firing pin/spring and extractor:

(**a**) Standard M1911 type pistols- Tip up the slide and drop out the assembled firing pin and spring. Then pull the extractor out of the slide with a small punch, as shown. Dunk lubricate the slide if parts are resistive.

(**b**) Series 80 slides- The firing pin lock plunger must be pushed inward first in order to free the firing pin and drop it out. Then move the extractor back slightly to release and remove the firing pin lock plunger and lock plunger spring. The series 80 extractor can now be removed as in a standard M1911 type pistol.

Figure 51- Ordnance style illustrations show M1911/M1911A1 Pistol disassembly steps 7 through 9.

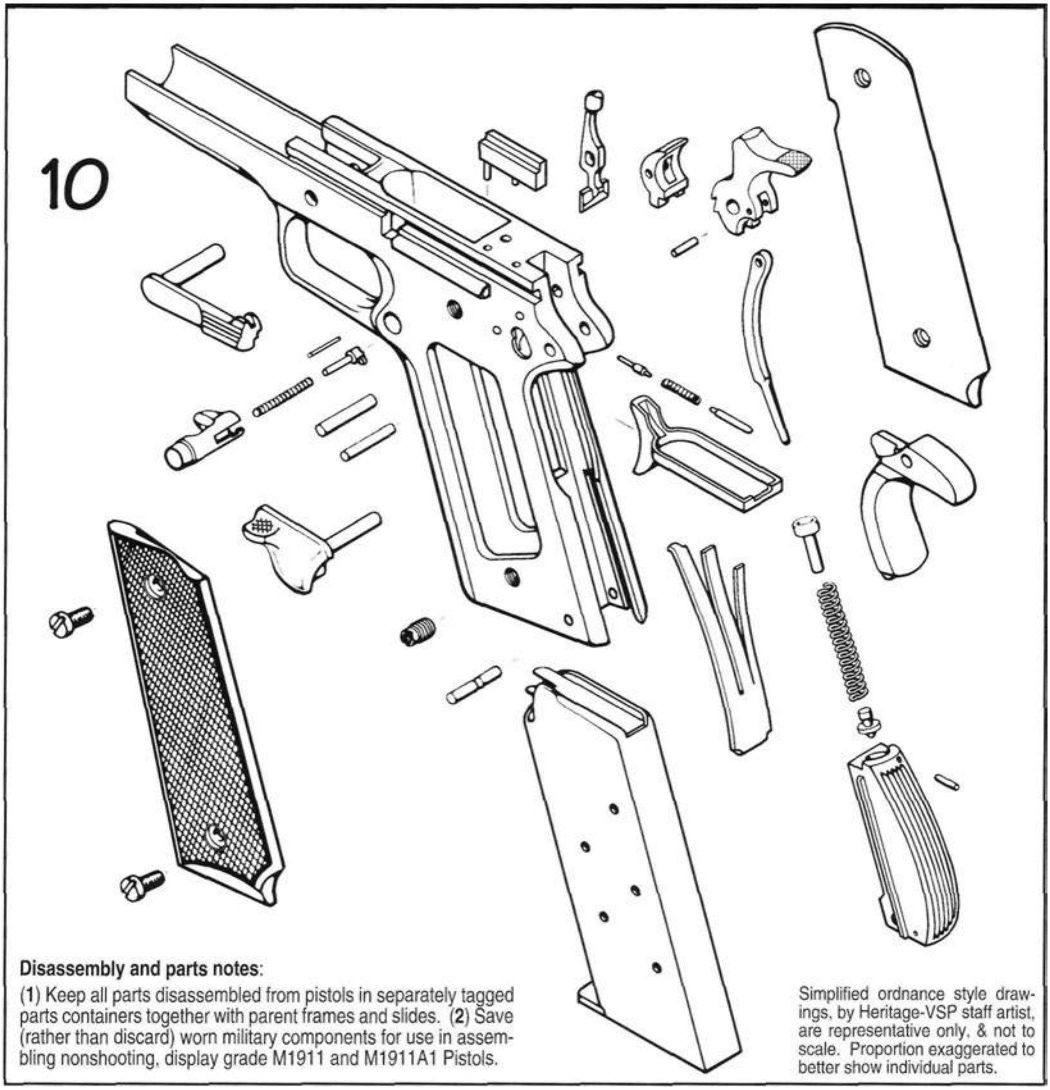


Figure 52- Ordnance style illustration by VSP-Heritage staff artist shows an exploded view of an M1911A1 Pistol receiver parts group. Receiver parts group disassembly is step 10. Although unnecessary for routine cleaning, pistols must be fully disassembled to visually and dimensionally inspect components. Disassemble the receiver parts group as follows: (**1**) remove magazine if installed; (**2**) remove stock screws, (using correct screwdriver bit) and stock panels; (**3**) cock the hammer, partially elevate the thumb safety, and wobble it upward and out of the frame; (**4**) retain the hammer, squeeze the trigger, and lower the hammer; (**5**) drift out the mainspring housing pin; (**6**) slide the mainspring housing assy, out of the frame and lift out the grip safety and sear spring; (**7**) push the hammer and sear pins out of the frame and drop out the hammer/hammer strut assembly and the sear and disconnector; (**8**) remove the magazine catch assy, by pushing the button side in to free the lock tab in the frame- then, turn late style locks (screw driver slotted) 1/4 turn CCW- turn early ordnance style locks 1/2 turn CCW (requires a wrench), then push the retained magazine catch assy, out of the frame: (**9**) slide the trigger out of the frame; and (**10**) push the spring/plunger assy, to the rear and out of the plunger tube. To disassemble the mainspring housing assy.: (**a**) place the housing with cap depressor pin endways between soft vise jaws; (**b**) apply tension and drift out cap retaining pin; (**c**) ease vise and mainspring tension while simultaneously retaining components to prevent sudden release and loss and/or injury. To disassemble the magazine catch assy: (**a**) secure the catch body between soft vise jaws, (**b**) then push in and turn the lock CW to the release point. Use care to prevent sudden escape and loss of the lock and lock spring. **Disassembly note:** The ejector, plunger tube, and stock screw bushings should be left on the frame, unless being replaced or the flat sides of the frame are being surface ground as a part of high grade restoration and refinishing work.

Begin M1911/M1911A1 Pistol parts inspection and assembly-

This section covers M1911/M1911A1 Pistol and commercial Ml911 type pistol frame, slide, barrel, and individual small parts visual and dimensional inspections; frame, slide, barrel, and parts fitting and installation; headspace checks; parts interaction checks as pistol components are assembled, and final after assembly function and test firing checks. Ordnance specifications, including min. / max. dimensional specs., parts materials, hardnesses, and wear limits are discussed throughout. This section provides the pistolsmith with the basic nuts and bolts mechanical information needed for complete troubleshooting, repair, rebuilding, and mechanical restoration of M1911 and M1911A1 Pistols and, relatedly, all the data needed for assembling M1911 type pistols from commercial components.

Experienced Ml911 qualified pistolsmiths may prefer to use a parts inspection, reassembly, and function checking sequence somewhat different than that provided in this section. To that end, the following: If you now use a reliable, performance proven parts inspection and pistol assembly/rebuild procedure that covers all the necessary steps and produces a top quality final product, by all means continue to use it. Otherwise, I would suggest following the basic parts inspection, parts fitting, assembly, and function checking sequence on the following pages. Extra steps can be easily added in the event that a particular pistol or individual parts condition make it necessary.

Although it took some time to trickle down, a lot was learned about the mechanics and performance of the ordnance standardized version of the Ml911 Pistol during its 50+ years in first line service. Given the foundational benefit of: (a) the ordnance development work in adapting Browning's original M1911 Pistol design to military use; and (b) M1911/M1911A1 Pistol combat service and maintenance history to date, service marksmanship unit armorers and pistolsmiths engaged in the work of pushing the Ml911 accuracy and mechanical repeatability envelope have assembled a considerable body of additional data. This practical knowledge, developed at the bench and by trial and error engineering has, in fact, led to a defacto second standardization of the basic M1911 design. This later commercial standard, incidentally, lies well within original design intent, and if it had to be summed up in a name it could be called the Ml911 Pistol *optimum performance standard.*

In pistols assembled on this standard, vertical dimensional tolerances are reduced to about mid ordnance specification. Vertical and horizontal frame, slide, and component clearances are also reduced; frame pin hole/pin clearances are minimized, and sears and hammers are precision fit based on actual frame pin hole locations. Barrel link up/or cam up, barrel link down, barrel link down stop position and barrel/slide clearance in the linked down position (aka link-down timing), are also optimized. When fully and correctly done, this work improves both clearances and timing and, relatedly, optimizes the three and four way parts relationships extant in M1911 type pistols.

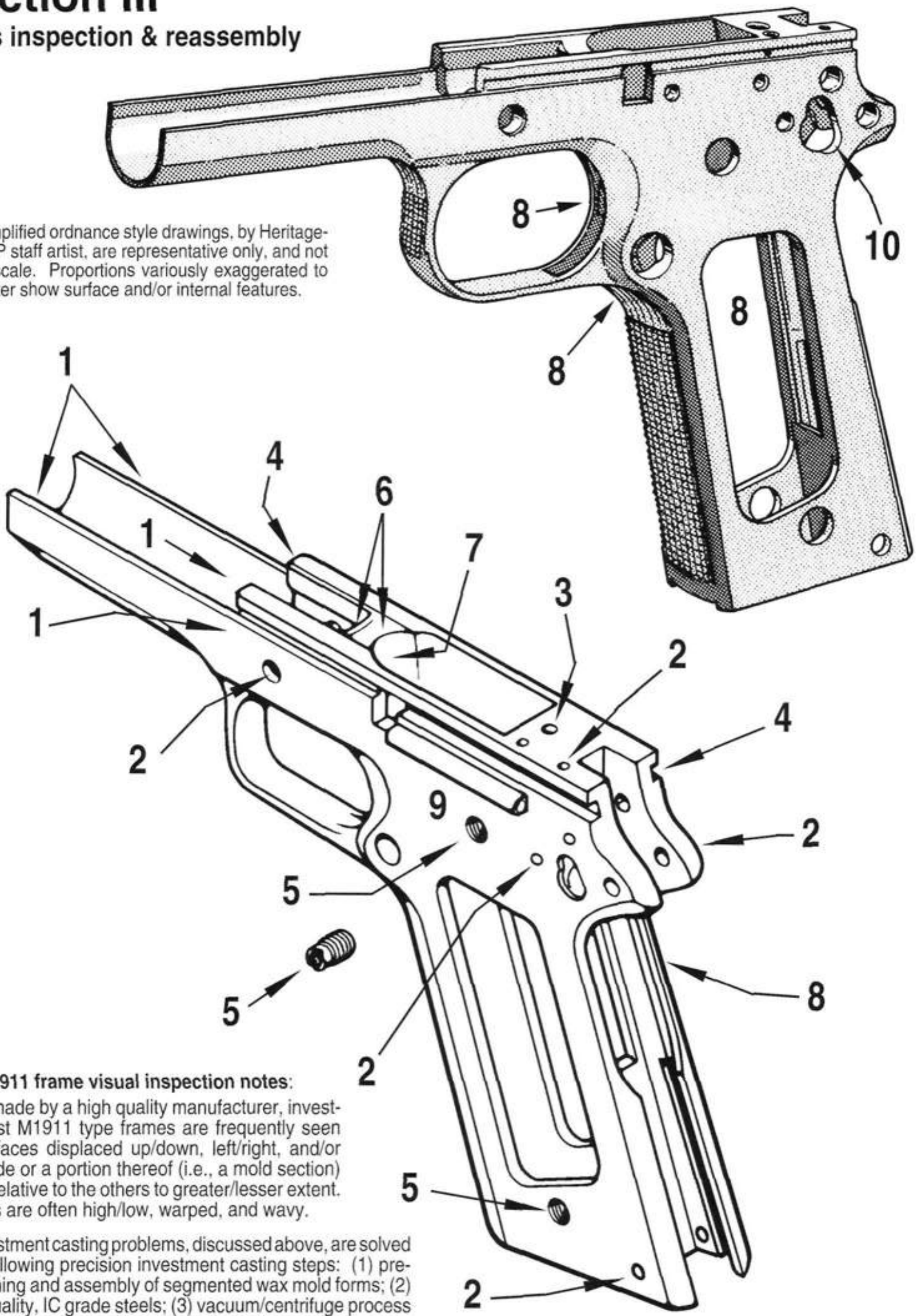
There are new and older generation armorers and pistolsmiths out there who may benefit from the practical and historical data in this section- hence the provision of critical parts surface dimensional data and applicable metallurgical data. For example: what is the minimum quality material that a given part should be made from and how hard should it be? This data provides a basis for comparison and helps call attention to the current abundance of fair and poor quality commercial Ml911 type parts on the market. Low quality parts are typically off-specification dimensionally, metallurgically, or both. If repairing, rebuilding, or assembling an M1911 type pistol from commercially manufactured components- always select the best components for the intended purpose. Keep in mind that low grade parts can only subtract from, rather than add to, reliability and durability. If nothing else, the time spent in fitting low grade parts is counterproductive. To borrow a formula from computer programmers: garbage in = garbage out. This truism applies in the field of mechanics as well. See quality component source listings on page 48.

About reliability & durability of Ml911 type pistols built to optimum performance standards- when quality components are used and fit to ideal clearances and pistols are correctly timed, pistol durability will vastly exceed that of military issue pistols. Although small part failures can occur and trigger (sear engagement) freshening is needed periodically, a life expectancy well in excess of 25, 000 rounds is not considered unreasonable in a well fit and timed pistol.

Note: The foregoing is not suggested as being corrective of supposed design deficiencies in ordnance specification U. S. military pistols- which follows, essentially, because there are none- but is discussed to provide insight into the shift in direction toward a closer toleranced pistol capable of greater reliability and accuracy given a non military combat scenario. The only shortcomings (and there are two) associated with Ml911 type pistols built to optimum performance standards, is that (1) all components must be of the best quality and carefully hand fit; and (2) close tolerance pistols make lousy military service pistols. For further data, see optimum performance M1911 Pistols on page 183.

Section III

Parts inspection & reassembly



Simplified ordnance style drawings, by Heritage-VSP staff artist, are representative only, and not to scale. Proportions variously exaggerated to better show surface and/or internal features.

Cast M1911 frame visual inspection notes:

Unless made by a high quality manufacturer, investment cast M1911 type frames are frequently seen with surfaces displaced up/down, left/right, and/or with a side or a portion thereof (i.e., a mold section) rotated relative to the others to greater/lesser extent. Surfaces are often high/low, warped, and wavy.

The investment casting problems, discussed above, are solved by the following precision investment casting steps: (1) precise forming and assembly of segmented wax mold forms; (2) use of quality, IC grade steels; (3) vacuum/centrifuge process casting; & (4) casting critical operating surfaces slightly oversize and then machining to exact dimensional specification.

Figure 53- Arrows in M1911/M1911A1 receiver (frame) 3/4 view illustrations show basic M1911/M1911A1 frame visual inspection points. Visual inspection points indicated above are listed and discussed in detail on pages 68 and 69. Ml911 frame illustrations with dimensional inspection data and critical operating surface dimensional inspection detail drawings are also included on the following pages. For complete M1911A1 receiver dimensional data, see ordnance receiver drawings #6508389, 7790428, 7790368, and #6535359, sheets 1 & 2 and drawings #6508389 and #7790428 (receiver assy.). Also see cast frame inspection notes, above. Front, 3/4 view frame art, at top- courtesy Caspian Arms Ltd.

Ml911 frame basic visual and dimensional inspection points-

Always inspect M1911 and M1911 type frames for evidence of excessive wear, misfitting, alteration, surface mislocation, and/or damage. See cast frame notes in figure 53. The following basic frame inspections must be performed before reassembling an M1911 type pistol and before initial assembly of an M1911 type pistol from components.

1. Frame exterior surfaces - Visually inspect the exterior of the frame and interior/exterior frame recoil spring tunnel surfaces. Reference check the flat side and top surfaces against a straight edge to be sure that surfaces are not indented, twisted, warped, etc. The U shaped recoil spring tunnel, or front frame extension, must be straight, and the flat exterior surfaces in parallel agreement with the sides of the frame. The recoil spring/guide assembly slot must be in central agreement (in both planes) with the longitudinal axis of the frame. Inspect used frames for signs of battering at the recoil spring guide seat and closely examine for corresponding stress cracks in the thin frame wall areas on either side of the spring guide seat. If there is any doubt about possible stress cracks, have the frame magnafluxed. **Note:** If the ejector (not shown) is installed on the frame and is the ejector that will be used, make certain it's correctly aligned and tight on the frame. See pages 71 and 78 for ejector dimensional inspection data and pages 70 - 76 for frame dimensional inspection data.

2. Frame pin holes - Frame pin hole locations and diameters are critical in M1911 type frames. The slide stop crosspin hole is the most critical of all because virtually all frame surfaces/pin holes, etc. are primarily or secondarily located with reference to the horizontal, vertical, or transverse centerlines through this pin hole. See frame pin hole location relative to slide stop crosspin hole and location check on page 75.

A. Slide stop crosspin hole - specified diameter: .201" + .002" (.201" min. & .203" max.) A #7 drill shank (.201") can be used as a min. gauge, and a #6 drill shank (.204") as a no go gauge.

B. Sear pin hole - specified diameter: .110"+ .002" (.110" min. & .112" max.) A#35 drill shank (.110") can be used as a min. gauge, and a #33 drill shank (.113") as a no go gauge.

C. Hammer pin hole - specified diameter: .1575" + .0015" (.1575" min. & .1590" max.) A #22 drill shank (.1570"), although smaller than minimum spec, can be used as a min. reference gauge, and a #21 drill shank (.1590") as a max. gauge.

D. Thumb safety pin hole - specified diameter: .1558" + .0015" (.1558" min. & .1573" max.) A tool rod ground to .1558" can be used as a min. gauge, and a #22 drill shank (.1570") as a max ref. gauge.

E. Mainspring housing pin hole - specified diameter: .157" + .002" (.157" min. & .159" max.) A #22 drill shank (.157") can be used as a min. gauge, and a #21 drill shank (.159") as a max. gauge.

Notes: Holes **A-D** are 60° countersunk on the left side of the frame, depth specification is given on the following pages. Also see frame pin hole relative location check in figure 59. Select frames to be used in assembling optimum performance pistols for closest to min. specification pin hole diameters.

3. Disconnector port - specified port diameter: .164" + .003" (.164" min. & .167" max.) A tool rod ground to .164" can be used as a min. gauge, and a #18 drill shank (.1695") as a no go gauge. See port hole location and angle relative to the frame slide stop crosspin hole on page 71. Port diameter must be within specification and the disconnector passage below the port must be concentric, smooth, and free of burrs. See dimensional detail **#3** on page 72

4. Frame slide rails and slide rail slots - Visually inspect the frame slide rails and rail slots for irregularity, edge nicks/dents, galling, misfitting, alteration, and/or damage. Both are located and defined with reference to the longitudinal centerline through the frame slide stop crosspin hole as follows: Late ordnance specification for both M1911A1 and M1911A1 NM Pistol top frame surface location (the tops of the frame rails) is: .450"-.005" (.450" max. & .445" min.) above slide stop crosspin hole horizontal centerline as shown on page 70. Frame rail and rail slot width are then defined by two additional specifications referenced downward from the above specified top receiver (top of frame slide rail) location. Frame slide rail width specification is: .100"-.002" (.100" max. & .098" min.). Frame rail slot width specification is: .119" + .002" (.119" min. & .121" max.). See dimensional detail **#8** on page 74.

Vertical tolerance accumulation note: The combination of a .445" min. frame top + a .100" max. rail width + a .119" min. rail slot width would provide a lower and tighter slide fit than if vertical tolerances were stacked in reverse. More about frame/slide fit on pages 96 and 97.

5. Frame stock screw bushing threads (or stock screw threads in stock screw bushings, if bushings are installed in frame)- Thread serviceability is checked by trial screwing in stock bushings (or stock screws in the event bushings are installed). Standard frame bushing thread specifications are shown on page 70. Stock screw bushing and stock screw thread dimensional specifications are shown on page 79.

Ml911 frame basic visual and dimensional inspection points, continued -

Commercial oversize stock screw bushing threads are cut with a .255" -60 tap.

6. Frame barrel link down stop surfaces (Both surfaces are critical, but often disregarded) -

A. Barrel stop surface (vertical surface beginning at the forward edge of the barrel link down clearance recess)- This vertical surface must be located far enough forward to contact the rear facing vertical bottom barrel lug face and stop the barrel at the end of barrel link down. **Note:** If this surface is too far forward it can prevent full barrel link down and cause top barrel lug/slide drag. If this surface is not forward enough, barrel link down will stop on the link or when the bottom of the barrel contacts the top of the frame. This condition stresses the barrel link and/or the bottom barrel lug and is one of the main causes of bottom lug separation in stainless steel barrels.

B. Barrel link down clearance recess (curved horizontal surface located at the top of the frame) - Given optimum vertical barrel stop location and barrel fit, this surface must be fractionally clear of the bottom of the barrel at full link down to prevent stressing the bottom barrel lug and/or the barrel link, as discussed above. When assembling improved performance and competition pistols, select components with sufficient surface material for hand fitting. Frame barrel stop and frame link down clearance surfaces are then trial fit to compensate for aggregate vertical tolerance accumulation and selected barrel link length (all of which affect barrel link down swing and rearward barrel position at full link down). When fit is correct, the barrel's bottom rear lug face will stop against the frame's vertical barrel stop surface rather than stopping on the top of the frame and/or on the barrel link. With optimum stop fit, when the barrel is linked down, the slide should clear the top barrel lugs (and the entire top of the barrel) approx .005" when cycled rearward. See stop surface location in Detail **#4** on page 72, and Detail **#8A** on page 74. Also see link down timing and barrel lug/slide clearance gauge check on page 135.

7. Frame ramp- Inspect for surface roughness, alteration, or damage. This surface must be lightly polished, only. Changing the forward angle (moving the top forward) can cause cartridges to catch on the bottom of the barrel ramp or thrust upward (in worst cases, bump upward) on reaching the apex of the barrel ramp- one of the causes of jams. This critical surface is also located relative to the frame's slide stop crosspin hole. Frame ramp angle and location specifications are shown on page 71.

8. Frame interior passages/slots, etc.- Inspect interior passages, slots, component bearing/contact surfaces and inside frame walls for edge burrs, surface roughness, alteration, and/or damage. Deburr and level nicks and high spots in component bearing/contact surfaces. Magazine well, magazine catch button hole/recess, trigger passage, barrel lug recess, and rear component well dimensional inspection specification are shown in the illustrations and detail illustration on pages 71 and 72.

9. Frame plunger tube mounting holes (and plunger tube inspection data if the plunger tube is installed on the frame)- Visually inspect the mounting holes in the frame for evidence of misfitting, alteration, and/or damage. If the plunger tube is installed, inspect for tightness on the frame and for correct staking. See staking data and staking tools on page 77. Also check the tube for nicks, dents, and plunger passage roughness or burrs. Plunger tube mounting hole locations are also referenced from the vertical and horizontal centerlines through the slide stop crosspin hole. See mounting hole location dimensional detail on page 70. Plunger tube mounting hole specifications: specified dia.: .0988"+.0015" (.0988" min. & .1003" max.). A tool rod ground to .0988" can be used as a min. gauge, and a #39 drill shank (.0995") as a max. reference gauge. Plunger tube mounting hole countersink data is shown in detail **#3** on page 72. Plunger tube I.D. specifications: front plunger passage dia. .091" +.004" (.091" min. & .095" max.). A tool rod ground to .091" can be used as a min. gauge, and a #41 drill shank (.0960") as a no go gauge. Rear plunger passage dia. .109"+.006" (.109" min. & .115" max.). A tool rod ground to .109" can be used as a min. gauge, and a #32 drill shank (.116") as a no go gauge. See plunger tube visual inspection on page 77, dimensional inspection data on page 78, and staking on page 80.

10. Frame safety lever installation cutout- Visually inspect the safety lever compound cutout in the frame for evidence of misfitting, alteration, and/or damage. The safety lever cutout can be generally reference checked using a within specification safety lever as an inspection gauge. The cutout is located in the frame with reference to the thumb safety lever crosspin hole (see detail **#6** on page 73) and the safety lever crosspin hole location is, in turn, referenced from the frame slide stop crosspin hole as shown on page 70.

Ordnance specified M1911/M1911A1 receiver (frame) material is SAE 1035 or 1127 steel. Forged billets were heat treated to RC 22-27 (early spec. RC 22-24) before machining. Heat treatment prior to, rather than after, machining minimized warpage in the thin wall areas which make up the majority of the frame. Workable commercial M1911 frame materials are 4130 and 4140 steels, heat treated to RC 27-30 and 410 and 416 stainless with similar hardnesses.

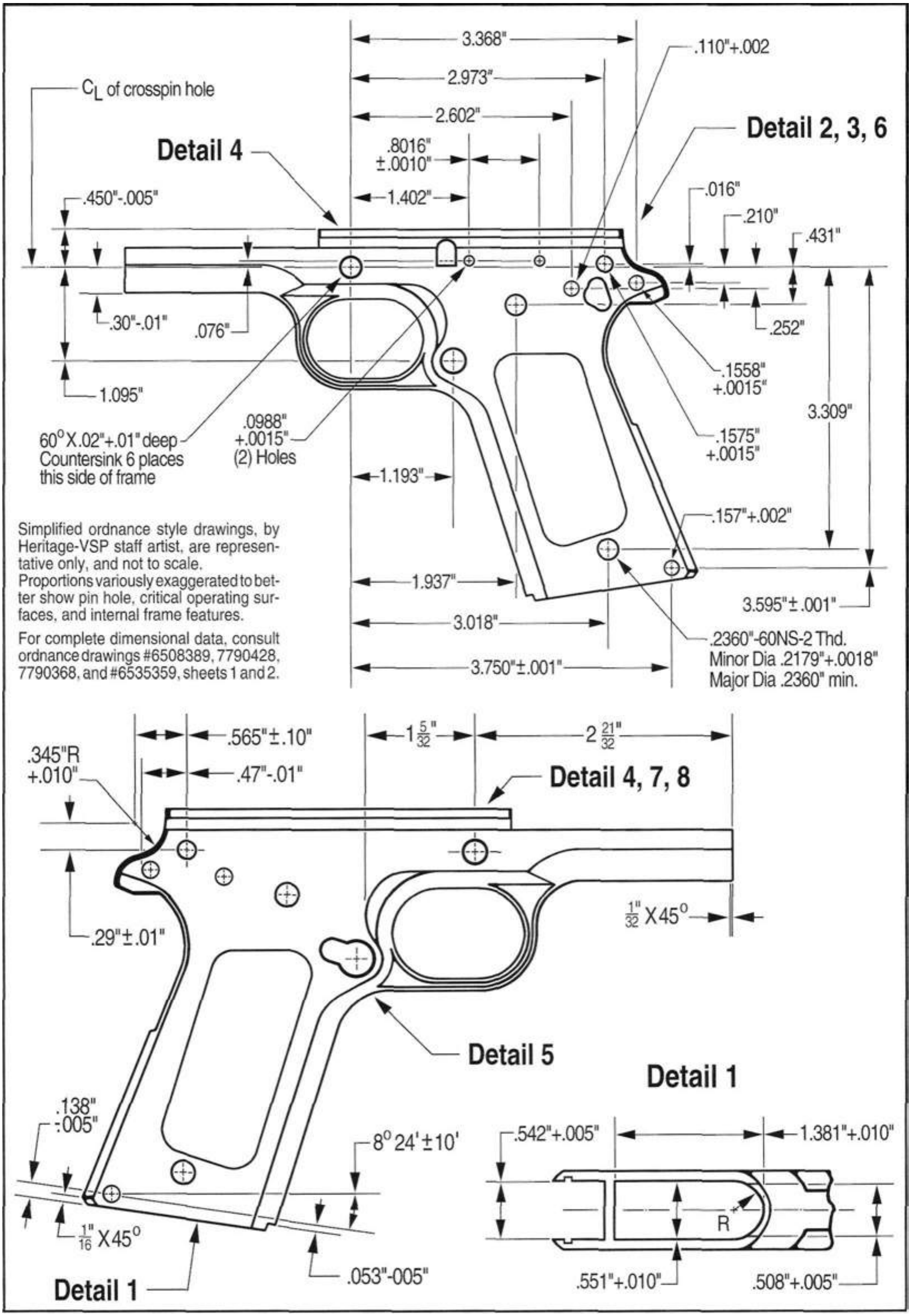
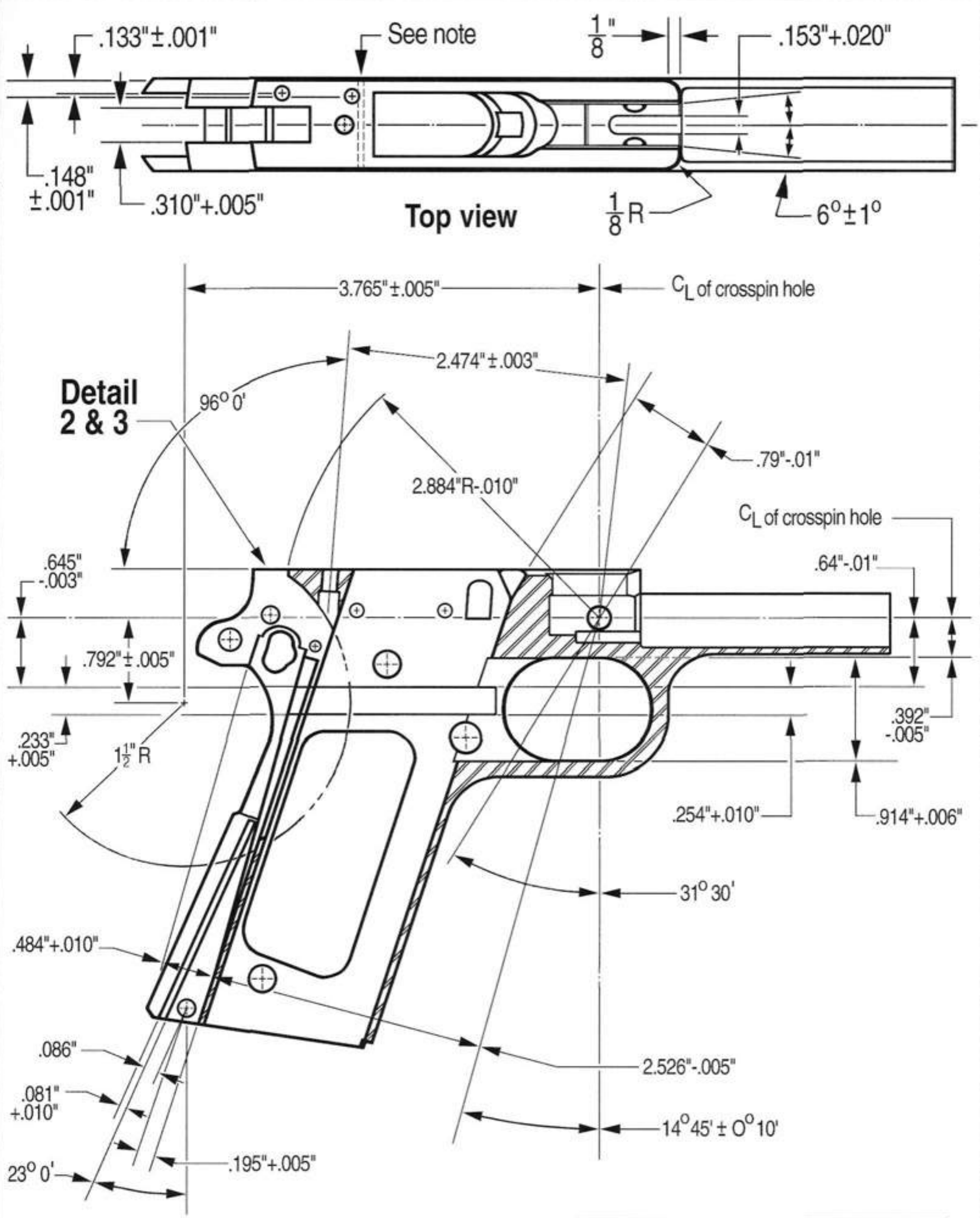


Figure 54- Illustrations by Heritage - VSP staff artist show M1911/M1911A1 frame views and critical operating surface locations and dimensions. Enlarged surface/area detail views, included above and on the following pages, provide additional component dimensional inspection data. Note that all critical frame dimensions are either primarily or secondarily referenced from the vertical, horizontal, and transverse centerlines through the frame's slide stop crosspin hole.



M1911 frame ejector retaining pin hole location note:

Ordnance assembly specifications required this pin hole to be located and drilled in the frame after installation of the ejector. Although specified retaining pin hole diameter is .062"+.001", many G.I. frames have been redrilled with #52 (.0635") and larger bits. Specified retaining pin hole location is .071"+/-.003" forward of the frame's front ejector mounting hole centerline. This location corresponds with the .030" radius cut in the ejector's front mounting post as shown in the M1911 ejector illustration, at right.

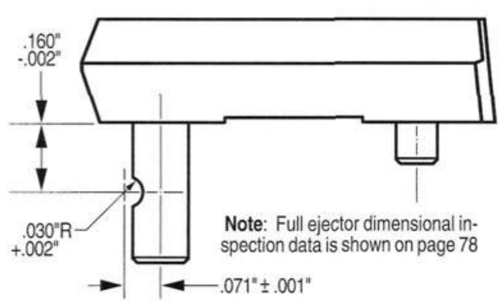


Figure 55- Ordnance style illustrations by Heritage - VSP staff artist show M1911/M1911A1 top frame and longitudinal sectional views with critical surface locations and dimensions.

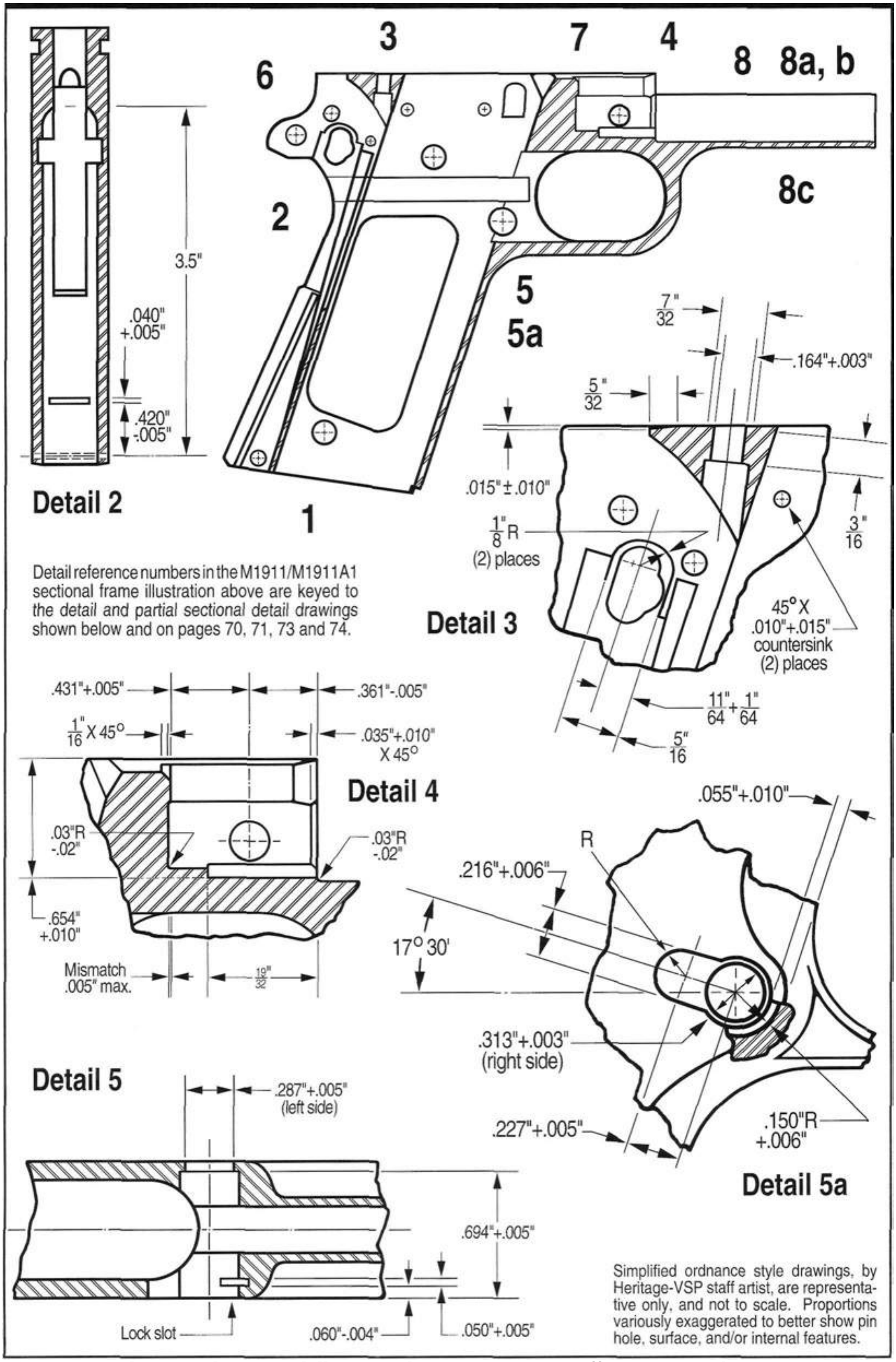


Figure 56- Ordnance style sectional illustration by Heritage - VSP staff artist, at top, shows an interior view of an M1911/Ml911Al frame. Reference numbers are keyed to detail views above and on pages 70 - 74.

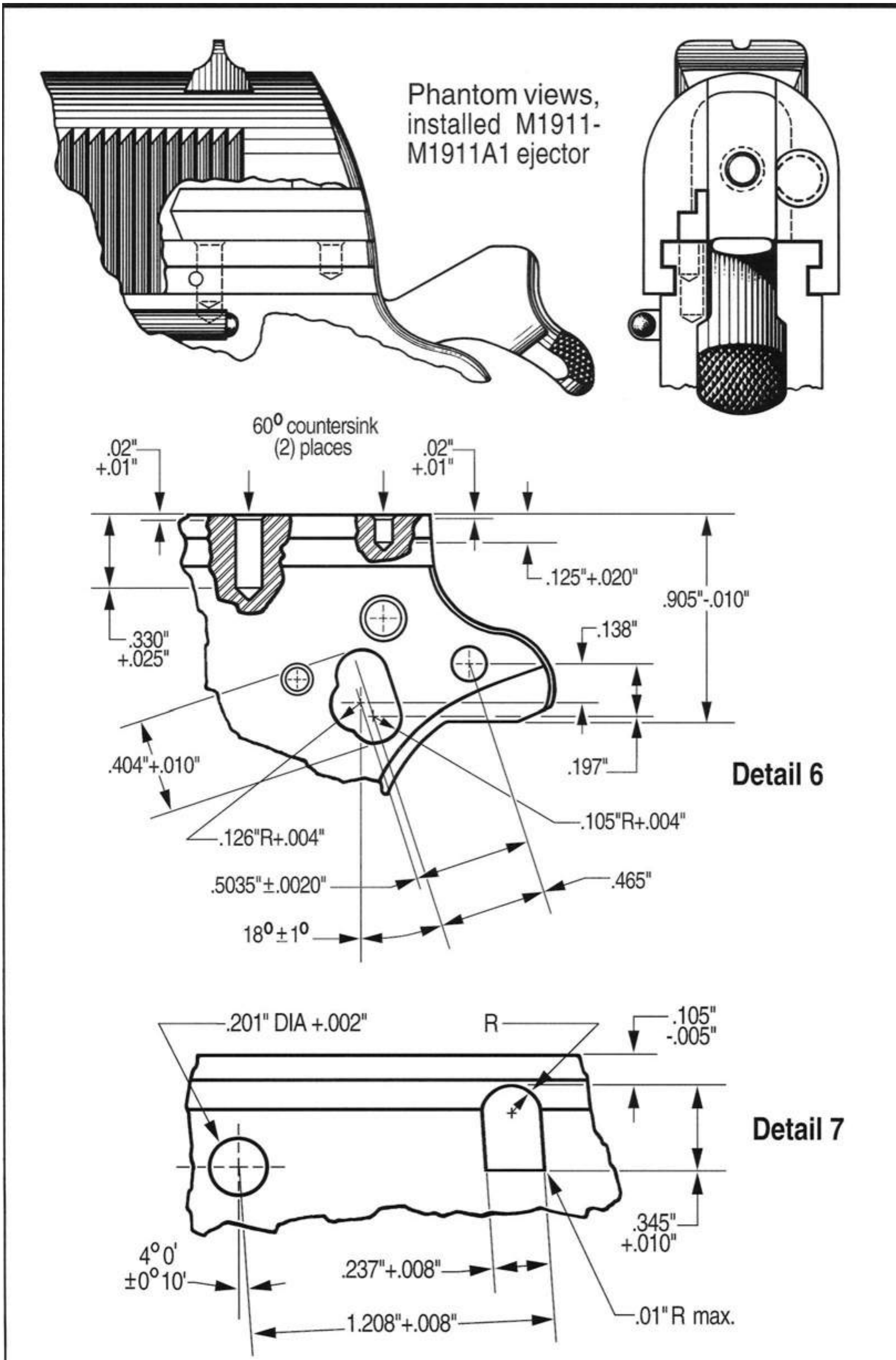


Figure 57- Ordnance style illustrations by Heritage - VSP staff artist, show detail views of critical M1911Al frame surfaces. Reference numbers are keyed to illustrations on pages 70 and 72.

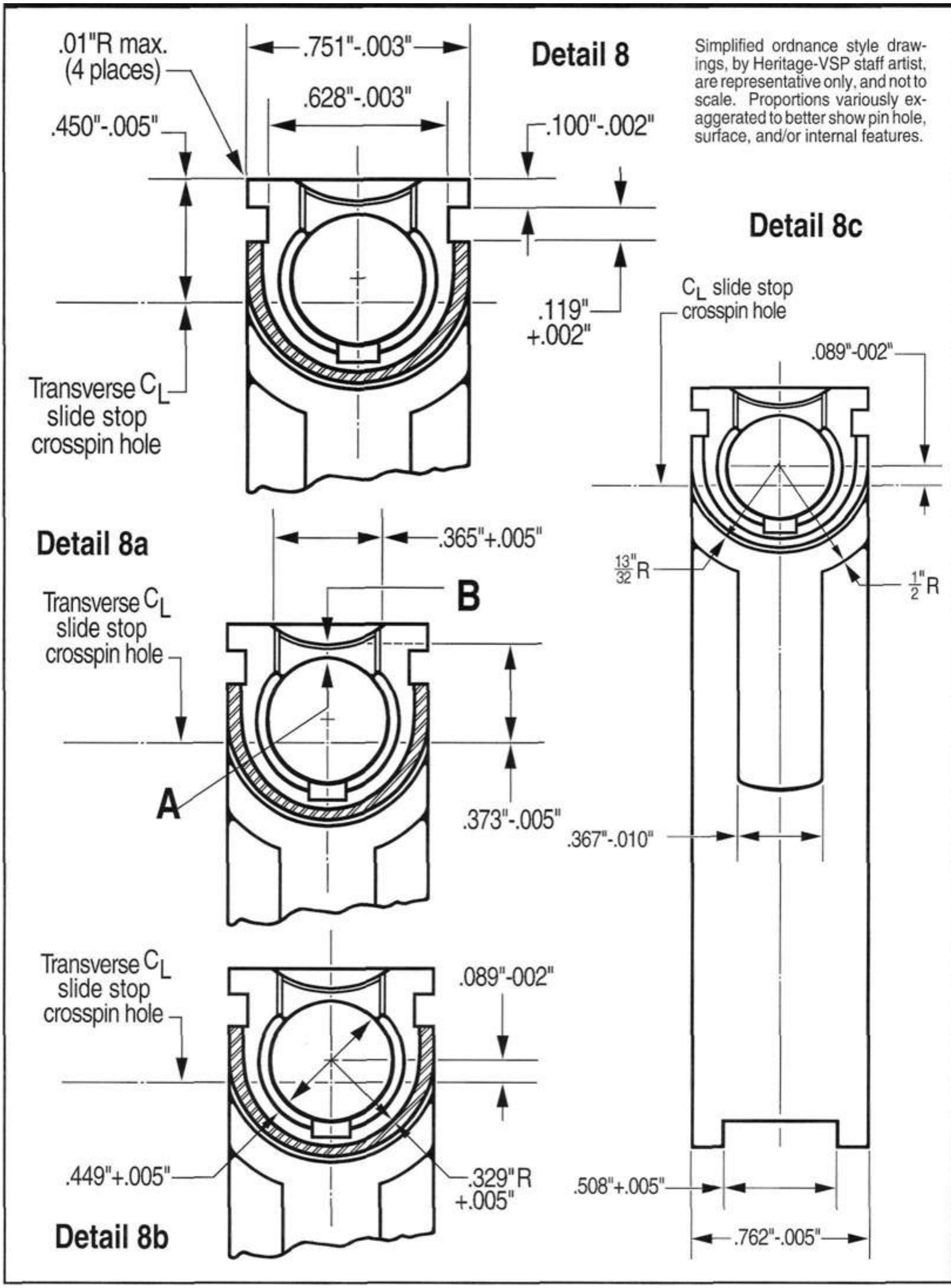


Figure 58- Ordnance style illustrations by Heritage -VSP staff artist, show detail views of critical M1911A1 front frame surfaces. Reference numbers are keyed to exterior and sectional illustrations on pages 70 and 72. Note that top of frame location (see detail **#8**, above) is referenced upward from the slide stop crosspin hole transverse centerline and that both frame slide rail and slide rail slot dimensions are referenced downward from that critical dimension. Vertical rail/rail slot dimensions in a given frame, slide stop crosspin diameter, and vertical dimensions of the selected slide and barrel together determine barrel link length and resulting rearward barrel swing at link down. Relatedly, in the front detail view **#8a**, the frame's barrel stop (link down stop) surface is indicated at **A**. The nom. .348" radius cut barrel link down clearance surface is indicated at **B**.

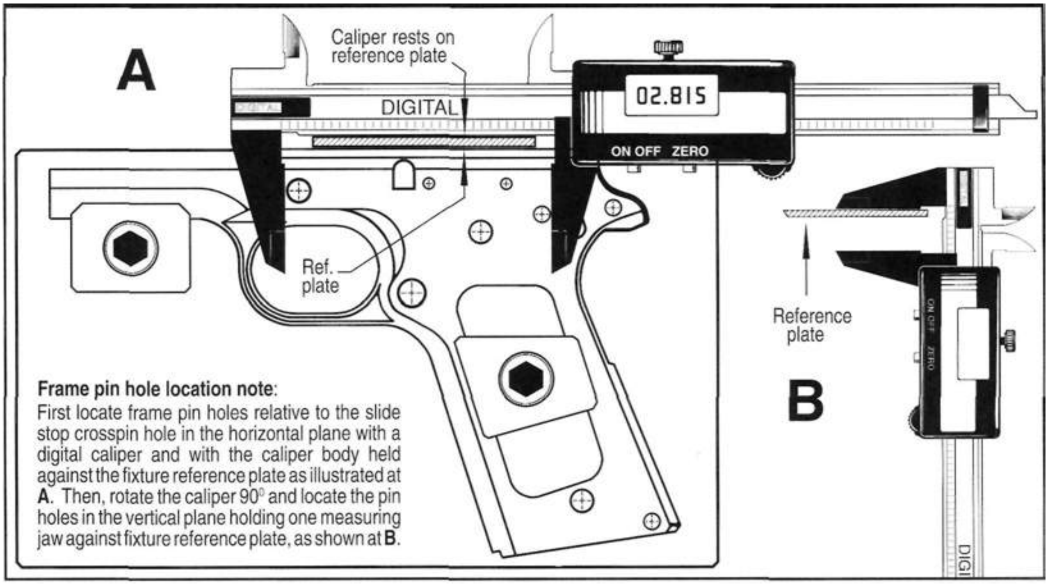


Figure 59- Shows easily made frame slide stop crosspin, sear, hammer, and safety pin and plunger tube mounting hole locating fixture designed and used by author. To use fixtures of this type: (**1**) align the frame so that the top surface evenly contacts the vertical reference plate on the top of the fixture and tighten both frame retaining clamps; (**2**) trial install gauge/locating pins, selecting the pin that fits each hole with least clearance; (**3**) use the reference plate on the top of the fixture to horizontally align the digital caliper and measure locating pins outside to outside and note the readouts; (**4**) subtract half of the diameter of each of the two reference pins from the readout (this figure = the distance between hole centers); and (**5**) then measure again vertically (from the top of the reference plate to the bottom of each reference pin) subtracting ref. plate thickness + half of reference pin diameter to locate the hole.

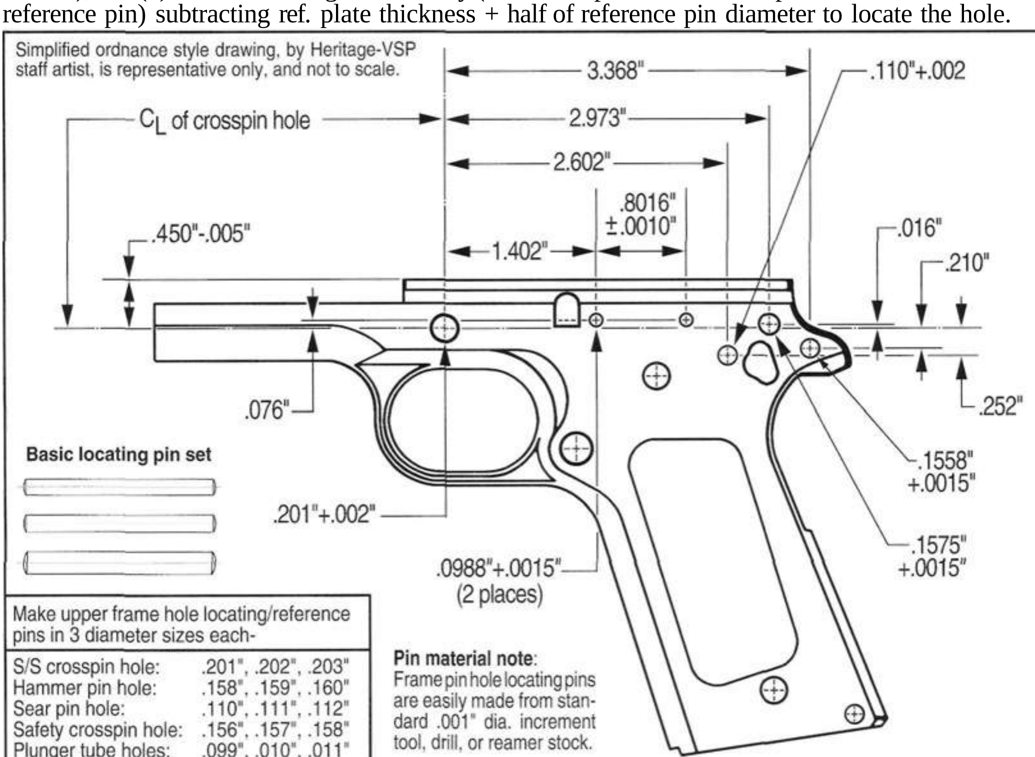


Figure 60- Ordnance style illustration by Heritage - VSP staff artist, shows critical M1911A1 upper frame pin hole locations and min./max. hole dia. specs. Note that except for the 2nd plunger tube hole, ordnance specified hole locations are actual (i.e., not max./min. toleranced). See locating in figure 59.

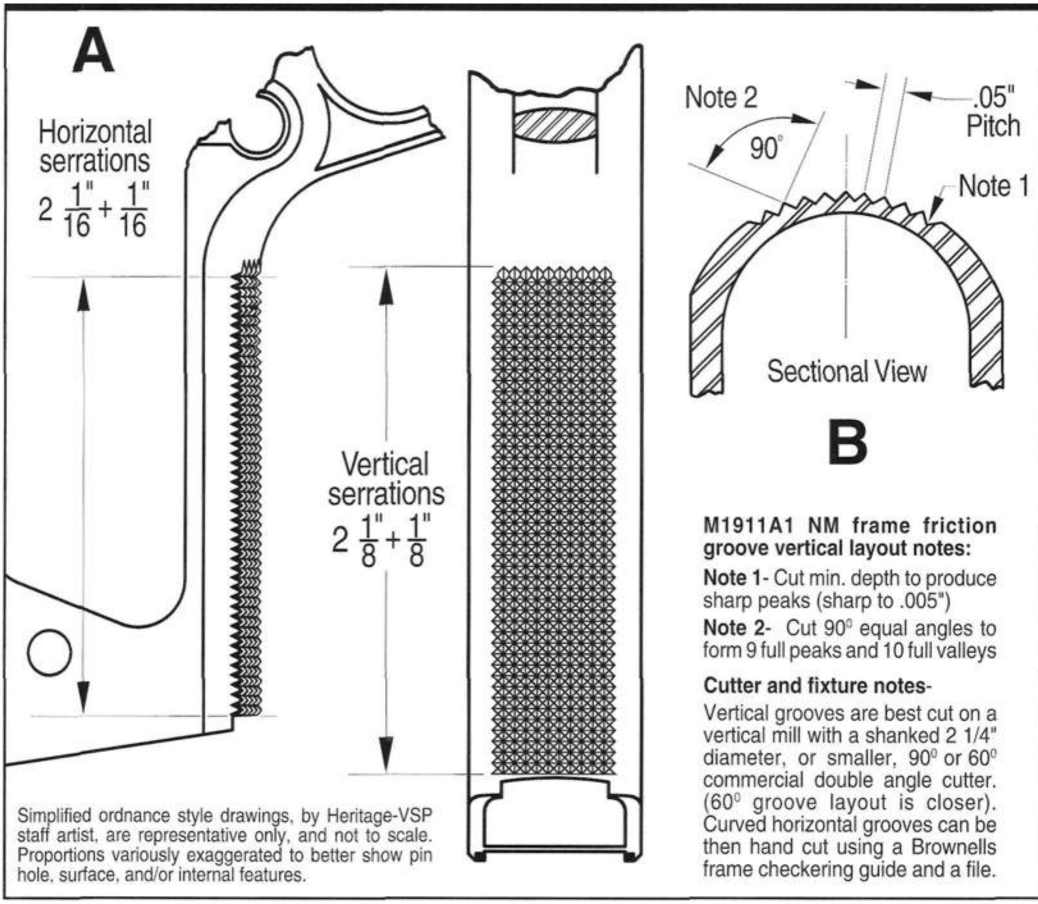


Figure 61- Ordnance style illustrations by Heritage - VSP staff artist, show 90° diamond cut M1911A1 NM style front frame friction groove (frame checkering) modifications at **A**. Cutting vertical grooves in the frame as shown in the layout, at **B**, is the first step in cutting the 90° diamond pattern checkering, illustrated at **A**. Reasonably sharp parallel vertical grooves, although not as stylish in appearance, usually provide sufficient frame grip friction by themselves.

The following frame component related assembly steps are optional, depending on frame work remaining to be done after basic visual and dimensional frame inspections are completed:

Frame mounted component installation options:

1. If the plunger tube, ejector, and stock screw bushings are already installed on the frame- visually and dimensionally inspect these components and check for correct staking and tightness on the frame. With this done, the stock panels are temporarily installed to check for correct fit on the bushings and alignment on the frame. See staking and dimensional inspection data on pages 77 through 80. See Volume 1 for plunger tube removal and replacement.

2. If the plunger tube, ejector, and stock screw bushings are not installed and no other frame work is to be done, inspect and install these components as discussed on pages 77 through 80.

3. If the above components are not yet installed and further frame work is to be done such as frame rail adjustment; slide/frame rail lapping; machining the frame to receive an integral ramp type barrel; frame grooving or checkering as shown in figure 61; and/or the flat sides of the frame are to be surface ground and/or polished to remove irregularities and/or pits- inspect the plunger tube, ejector, bushings, and stocks that are to be used now- but install components after frame work has been completed.

Note: Some higher quality component manufacturers offer matched, (very closely toleranced) slide/ frame sets suitable for building improved performance and competition pistols with the plunger tubes, ejectors, and stock bushings already installed. With some matched sets, the slide/frame rails simply have to be lightly honed and lapped-in. Primarily because of the high cost involved, all components should be dimensionally inspected before fitting or lapping the slide, just in case.

M1911/M1911A1 frame installed component visual and dimensional inspection-

1. Plunger tube - Visually inspect the plunger tube body and, if already installed, also check plunger tube leg staking. The tube body must fit tight on the frame and must not be dented, flattened or otherwise distorted. Internal spring/plunger passages and end openings must be free of burrs and within the specified .091" + .004" (front) and .109" + .006" (rear) I.D. specifications. If installing anew plunger tube, visually and dimensionally inspect as discussed above and as referenced in the plunger tube detail illustration on page 78. Then, lightly deburr and check fit on the frame. If, after deburring, tube mounting leg or frame hole centers do not permit seating with moderate thumb pressure, trial select another plunger tube. With the selected plunger tube in fully seated position against the frame, inspect to be sure that both mounting legs are approx. flush, or slightly beyond flush, with the inside of the frame. Also check to be certain that the 45° mounting hole countersinks on the inside of the frame are deep enough to positively stake the plunger tube legs. Deepen the countersinks, if needed. With this done, stake with tooling as shown on page 80. Plunger tube removal from the frame and replacement is covered in detail in Volume 1.
Ordnance specified plunger tube steel is 1017 - 1025 or 1117 or 18 with material heat treatment before machining to RC 22-25 equivalent. For further dimensional data see ordnance drawing #6008594.

2. Safety-slide stop spring/plunger assembly- Visually and dimensionally inspect this too often ignored assembly as referenced in the detail illustration on page 78. Both plungers must be full length and the ends must be spherical and smooth- if not, replace the assembly. The plunger spring must be captive and offset as shown and must fit in the plunger tube with resistance- but must not bind. Plunger spring tension must be sufficient to maintain positive plunger/detent engagement when a serviceable safety lever is installed. For complete plunger and spring dimensional data, consult ordnance drawings #5013193, #5013194, and #5019195. Ordnance specified plunger steel is 1117 with heat treatment to 15N 78-82 (RC 36-43 approx, equivalent).
Note: Non superficial C scale equivalents are provided as a more familiar hardness reference.

3. Ejector- If the ejector is already installed, visually inspect straightness on the frame (inspect for slide and/or hammer drag marks) and manually check for tight fit on the frame. If installing the ejector, dimensionally inspect as referenced in the ejector detail views on page 78. Then deburr and trial check fit and straightness on the frame. If the frame is not drilled for the ejector retaining pin, install and seat the ejector, and locate and drill the hole with a #52 drill as discussed in figure 55. If the retaining pin hole has already been drilled, install and seat the ejector and carefully chase the frame pin hole before drifting in the retaining pin. **Warning:** use extra care not to catch and break the drill bit as it enters and passes through the harder ejector stem. For complete dimensional data consult ordnance drawing #11010485 (NM & late std. ejector). Ordnance specified ejector steel is 1040 - 1080 with heat treatment to RC 33-38.

4. Ejector retaining pin- If this critical pin is too hard and/or oversize for the frame pin hole, the ejector retaining pin can snap in the process of being drifted into place. If the ejector retaining pin is too soft, or soft and oversize for the frame pin hole, it can distort and stick part way into the pin hole (these are sometimes hard to remove). Late ordnance specifications called for setting the ejector pin in Locktite. For complete dimensional data consult ordnance drawing #5013203. Specified pin material is tool steel drill rod heat treated to RC 34-41.

5. Stock screw bushings- If the stock screw bushings are already installed, visually inspect condition and check for tightness and correct frame staking. Check internal threads by hand starting in a serviceable stock screw or a .1500" -50 tap. If installing bushings, dimensionally inspect both standard and oversize stock screw bushings as referenced in the bushing detail illustrations on page 79. With this done, stake bushings with tooling as shown on page 80. Stock screw bushing removal and replacement is covered in Volume 1. For complete dimensional data see ordnance drawing #6019022. Ordnance specified bushing steel is 1020, 1116, or 1117 with material heat treat before machining to RC 22-25 equivalent.

6. Stock screws - Visually inspect and trial check fit by hand starting screws into stock bushings. Do not use screws if the threads or slots are damaged. See dimensional inspection illustration on page 79. Long stock screws (or bushings) may cause magazine drag or offset the magazine. Select shorter screws or trim threads as needed. For complete dimensional data, see ordnance drawing #6019023. Ordnance specified screw steel is 1018, 1020, or 1117 with final heat treatment to file hardness.

7. Stock panels- Visually inspect and trial check fit over stock screw bushings and on/against frame by hand starting screws into stock bushings. Dimensionally inspect as referenced in the detail drawing on page 79. Adjust stock panels and panel bushing passages as needed for correct frame fit. To improve panel/bushing/stock screw fit (or to simply raise the stock screw binding surfaces), coat non bonding surfaces with mold release compound and recast bushing passages and screw seats with Brownells Acraglas Gel. For complete stock panel dimensional data, see ordnance drawing #7790350.

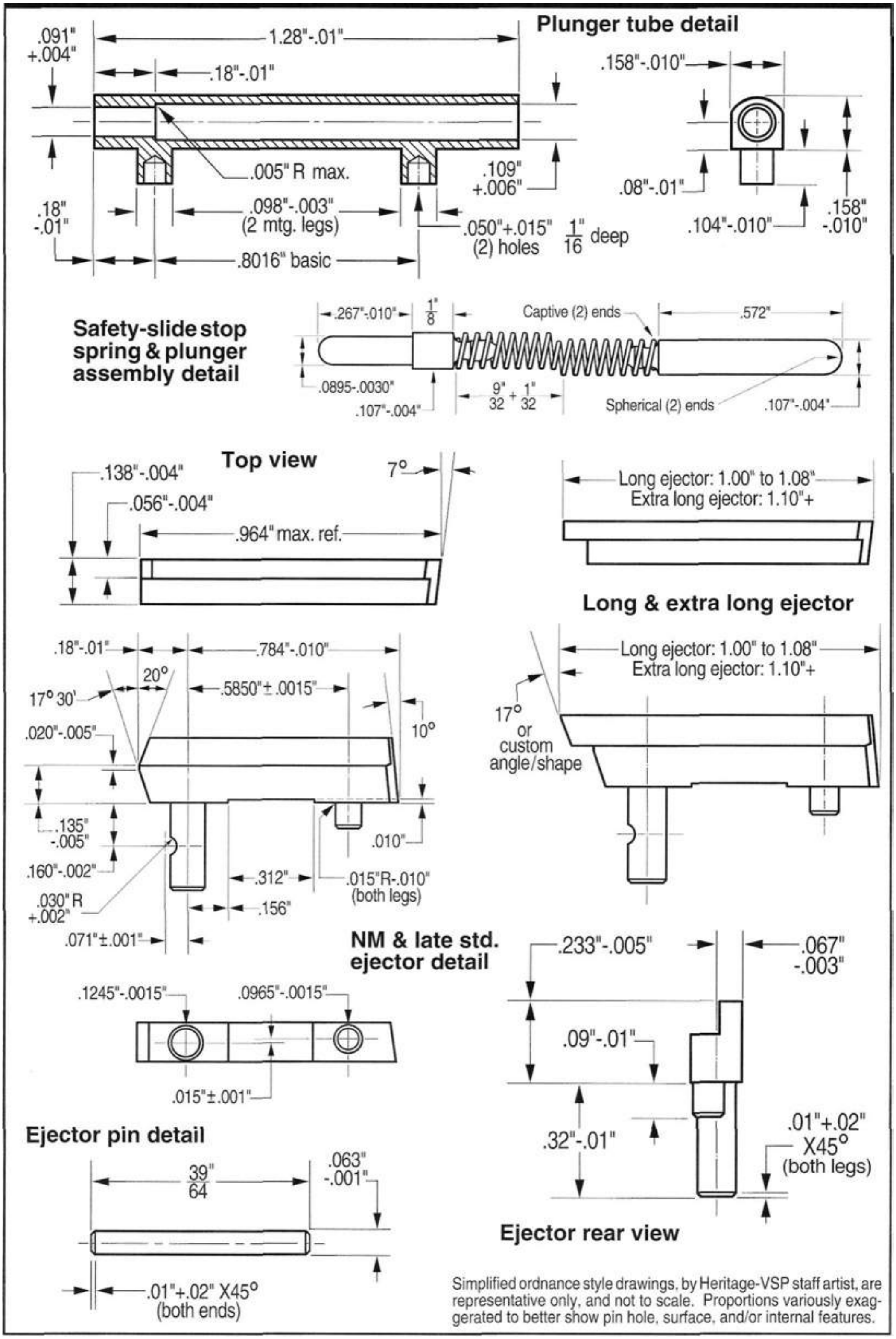


Figure 62- Ordnance style detail drawings by Heritage - VSP staff artist show M1911A1 plunger tube, safety-slide stop spring/plunger assembly, ejector, and ejector retaining pin dimensional inspection data. Additional specs, visual inspection, and component/frame assembly are discussed on pages 77 and 80.

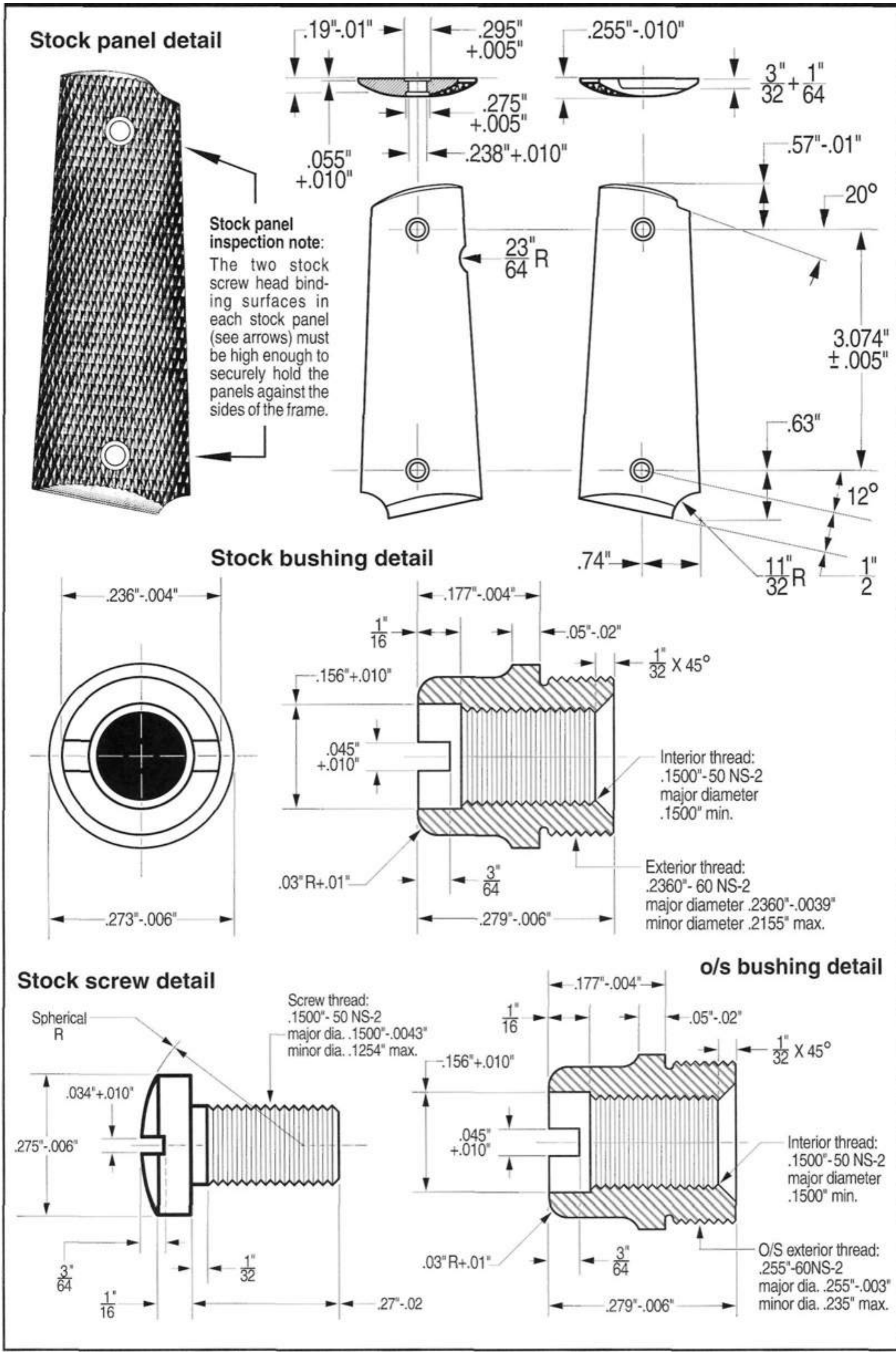


Figure 63- Ordnance style detail drawings by Heritage -VSP staff artist show M1911A1 stock panel, stock screw bushing, oversize stock screw bushing, and stock screw dimensional inspection data. See frame installed component visual and dimensional inspection on page 77 and installation on page 80.

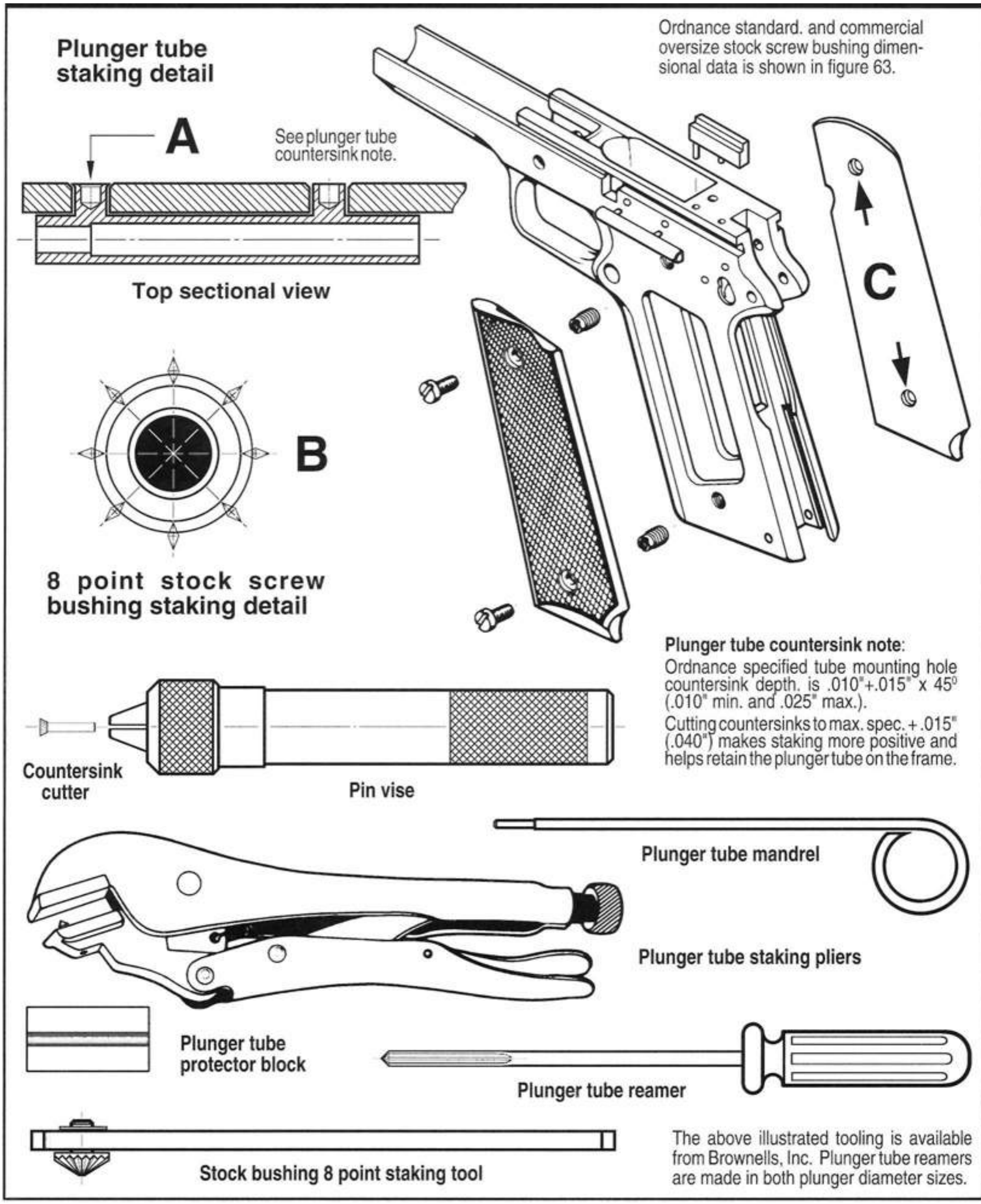


Figure 64- Ordnance style illustration by Heritage -VSP staff artist, at top shows M1911/M1911A1 frame assembly components that are inspected and installed after visual and dimensional frame inspection has been completed. (Stocks are temporarily installed for fit check, only.) Correct plunger tube leg staking is shown, at arrow, in detail illustration, at **A**. Ordnance specified 8 point stock screw bushing staking is illustrated in the detail view, at **B**. Plunger tube and bushing staking tools, available from Brownells, Inc., are illustrated at bottom. Frame mounted component inspection is discussed on page 77. It's a good idea to check the stock panel bushing head recess cuts, at **C**, for correct bushing fit and to check stock panel alignment on the frame at this time. Otherwise serviceable stock panels that are loose on the stock screw bushings (oversize panel bushing holes and/or low, or no, draw screw binding surfaces) can be tightened by coating metal surfaces with mold release compound and filling-in the over dimension areas with Brownells Acraglas Gel. Then remove stock panels & reinstall on final assembly. **Note:** When further frame work is to be done, such as surface grinding or polishing the sides of the frame, rail modification, internal machining for an integral ramp type barrel, or front strap checkering/grooving, as discussed in figure 61 - install the plunger tube, ejector, and stock screw bushings after completion of the work.

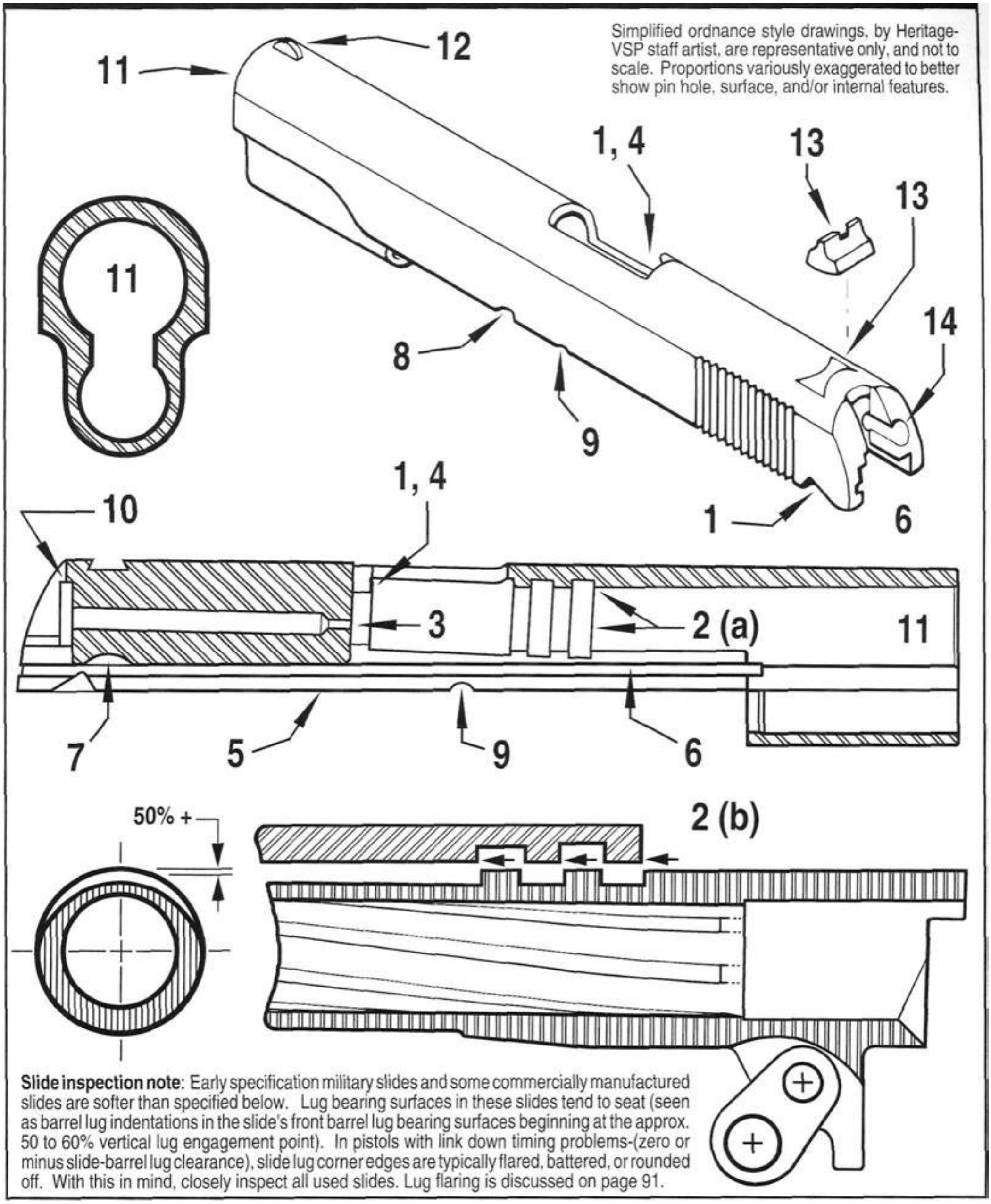


Figure 65- Arrows in 3/4 view and sectional illustrations show basic M1911/M1911A1 slide visual inspection points. Visual inspection points above are listed and discussed together with slide dimensional inspection on pages 82 - 95. M1911Al slide critical operating surface dimensional inspection data and basic Ml911Al NM slide dimensional differences are shown in the various detail drawings included on the following pages. Because the slide and barrel are the two highest stressed components in an Ml911 type pistol- both must be closely inspected. Relatedly, magnetic particle inspection was specified to detect stress cracks in U.S. military slides (a) after heat treatment; and (b) as a routine part of the ordnance major overhaul inspection process. Late ordnance specified slide material is gun quality 4140 or 8650 steel, austenitic grain size 5 or smaller. Although specifications call for a uniform heat treat, hardness test specifications are: RC33-46 at the slide central rail and RC40-46 at the 4 additional test points shown in the illustration on page 86. **Note:** Late (alternate) specifications permitted M1911A1 slides to be precision investment cast from IC 4140 or IC 8650 steels, grades A and B, per specs Mil-S-22141 and Mil-Std-2175. For complete M1911A1 slide dimensional data, consult ordnance drawings #7790314, sheets 1 & 2, and for M1911A1 NM slides, see drawings #7791463 & 7790414 sheets 1 & 2.

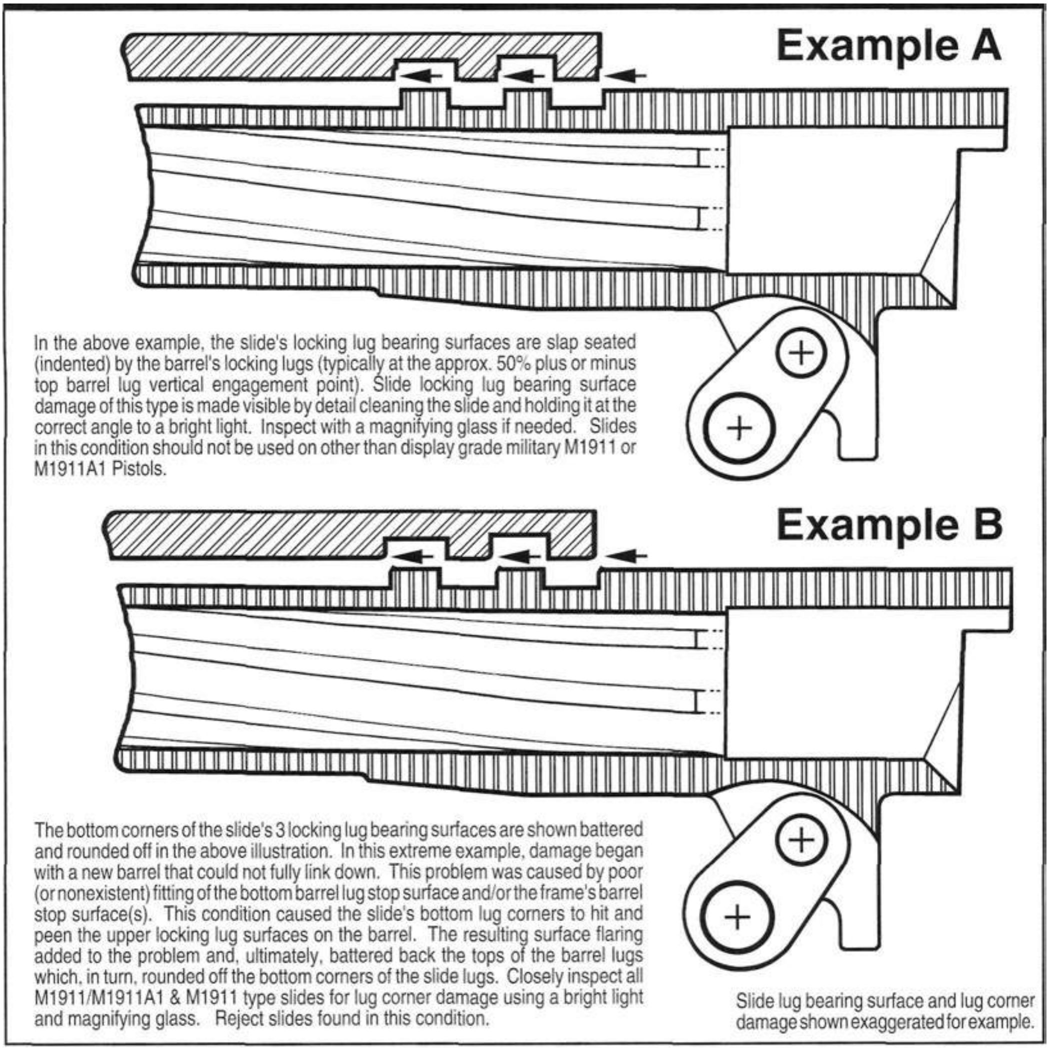


Figure 66- Ordnance style sectional illustrations by Heritage - VSP staff artist show examples of the two most common types of slide locking lug bearing surface damage in Ml911, M1911A1, and commercial Ml911 type pistols. Locking lug bearing surface seating damage (lug indentation) depicted in **Example A**, is found in M1911 type pistols with softer slides that: (1) have been fired a lot; (2) have been fired with higher than ordnance standard pressure ammunition; and (3) typically have vertical barrel lug engagements in the 50 to 60% range. Locking lug corner damage, as shown in **Example B**, is seen in varying degrees in pistols with insufficient slide/top barrel lug clearance at link down. In these pistols, barrel/frame stop fit does not permit the barrel to swing rearward and/or down far enough to create a minimum of .005" slide clearance above the barrel lugs. The second cause of this mechanical problem is off-tolerance components. Barrel link down timing and slide clearance is discussed in detail under barrel fitting on page 135. **Note:** slide/barrel combinations with uneven lug seating, flaring, or battering damage may also have off-dimension lugs or lug slots. See slide lug slot dimensional and location data in Detail **E**, on page 87 and barrel lug dimensional and location data on pages 109 and 110.

M1911/M1911A1 slide basic visual and dimensional inspection points-

1. Slide body - Visually inspect for cracks (usually at or near the rails, ejection port, or safety lever slot cuts), other damage, and evidence of misfitting and/or alteration. Dimensionally inspect and hardness check as referenced in the detail illustrations on the following pages. Cast slides: closely examine operating surfaces for possible displacement or mismatch caused by mold form misalignment and/or rotation. Also, check the slide body for warp by comparing the sides and bottom against a surface plate, or other trued surface, and measuring parallelism of the rails. See dimensional

M1911/M1911A1 slide basic visual and dimensional inspection points, continued -

inspection data and slot and passage gauge checks on the following pages.

2. Slide locking lug bearing surfaces - (a) Deburr lug edges in new slides as per specification: ordnance specification for standard M1911A1 and NM slide corner edge chamfer is: .010"+.005" X 45°, (.015" max.), all around, (**b**) Used slides-visually inspect the slide locking lugs for evidence of bearing surface seating, corner edge damage (battering or round off), and/or corner edge modification. See examples illustrated in figure 66. See slide lug dimensional inspection and surface location data in Detail **E** on page 87; lug flaring check on page 91, and equal bearing surface check on pg. 92.

3. Firing pin port - Port diameter must be within specification of .094"+.003" (.094" min. & .097" max.). A #42 drill shank (.0935") can be used as a min. reference gauge and a #40 (.098") drill shank as a no go gauge. **Note:** this specification does not apply to most commercial M1911 type slides made for other than 45 ACP cartridges. Vertical firing pin port location in the slide (center of the port in the breech face) must be within ordnance specification of .437"+/-.004", referenced upward from the slide rail cut surfaces. See dimensional inspection data in Detail **F** on page 87 and detail **H** on page 88. See passage/port alignment gauge check and port location check on page 90.

4. Breech face - The cartridge seat and breech face area below the seat must be sufficiently smooth to allow unimpeded cartridge feeding and cartridge rim engagement by the extractor. The 45° edge break at the coincidence of the bottom of the breech face and the central slide rail must not exceed the ordnance specification of .001"+.006". **Note:** This vertical dimension creates an angled face which is wider than .007". See breech face dimensional inspection data, location, and angle in Details **E** and **F** on page 87.

5. & 6. Slide rails, bottom rail surfaces, and rail slots - Visually inspect and reference check slides for apparent warp against a surface plate or other trued surface. Reject slides if warped beyond specified allowable surface dimensional tolerances. If vertical warp is minimal, the bottom of the slide can be trued prior to lapping-in. See slide rail parallelism and uniformity checks on page 100. **Note:** Slides that are even slightly warped in the horizontal plane should not be used for competition pistols. Measure and note slide rail vertical height, rail slot height, and the horizontal distance between the inward facing rail surfaces. Then check measurements against dimensional inspection data in detail **F** on page 87. Also see rail slot Not Go gauge check on page 93. Slide rail adjustment (tightening the slide rails by squeezing) is covered in Volume 1,

7. Slide disconnector camming/timing recess - Ordnance print specifications for this nom. .375" radius cut may seem sketchy, but precisely follow original design intent which required that, with the slide in battery position and the trigger forward: (1) the disconnector must connect the sear and trigger; (2) the top of the disconnector must be in contact with the disconnector camming surface located at the front of the camming/timing radius cut in the slide; and (3) the disconnector must instantly cam downward and thereby disconnect the sear and trigger as the slide begins rearward movement. Instant disconnect with rearward slide movement and sufficient disconnector recess height to permit sear/trigger reconnect are necessary. See dimensional inspection data in detail **C** on page 86 and disconnector camming/timing recess check on page 93.

8. Slide stop detent (slide stop notch) - Visually inspect the slide stop notch engagement surface for evidence of alteration, damage, or surface seating (contact surface flaring is seen in some softer slides). See dimensional inspection and location data in Details **B** and **L** on pages 86 and 88. One of the five specified slide hardness test points is located above the slide stop detent, Detail **B,** pg. 86.

9. Slide dismount radius cut (disassembly notch) - Visually inspect the radius cut for evidence of alteration, damage, or false slide lockback. False lockback is typically seen as slide stop marking inside the radius cut, or as slide stop corner indents in softer slides. The several possible causes for this problem include: (a) insufficient slide/slide stop clearance; (b) an off-dimension slide stop; (c) a sharp slide stop corner; and/or (d) an off-dimension magazine follower. See dimensional inspection and location data in Details **B** and **J** on pages 86 and 88. One of the five specified slide hardness test points is located just above the slide dismount radius cut.

10. Slide firing pin stop plate slot - Slide firing pin stop slot dimensions should be within ordnance specifications, primarily because loose slide notch/stop plate fit can cause stop plate and firing pin loss during cycling. Fortunately, oversize commercial firing pin stops can be fit, or modified to fit, otherwise serviceable slides with loose firing pin stop notches. See firing pin stop slot length dimensional inspection data, ordnance gauges, and firing pin slot Go-Not Go gauge checks on page 93.

11. Slide barrel bushing seat and bushing locking slot cut - This area should be within ordnance specified .699"+.003" diameter (.699" min. & .702" max.), although oversize barrel bushings can be

M1911/M1911A1 slide basic visual and dimensional inspection points, continued -

fit (or barrel bushing skirts expanded to fit) in slides with oversize barrel passages.
Note: Ordnance specified slide bushing seat Not Go gauge diameter was .704". The bushing locking slot must engage the bushing retaining lug with minimum clearance and permit full rotation of the retaining lug. See dimensional inspection and location data in Detail **E** and **G** on page 87.

12. Front sight- Front sight blades must be straight, undamaged, and staked tightly to the slide. See standard and NM front sight dimensional inspection data in the detail drawings on page 89.

13. Rear sight/rear sight dovetail- The rear sight must be serviceable and mounted securely in the dovetail. Loose fitting rear sights can be tightened by punch peening the top of the dovetail with a bronze drift and/or by center punching inside the dovetail to raise dovetail bottom material and then reinstalling the sight. See rear sight dovetail dimensional and location data in Detail **E** on page 87 and Detail **K** on page 88. Std. rear sight dimensional inspection data is shown in detail drawings on page 89
Note: M15 Pistol front and rear sight dimensional data is shown on page 137.

14. Slide extractor passage & extractor head counterbore - The counterbore must be concentric with the main extractor passage and within ordnance spec, of .2075"+.0030", and preferably closer to min. for a minimum head clearance extractor installation. See dimensional inspection data in Detail **I** on page 88 and passage/counterbore concentricity gauge check on page 90.

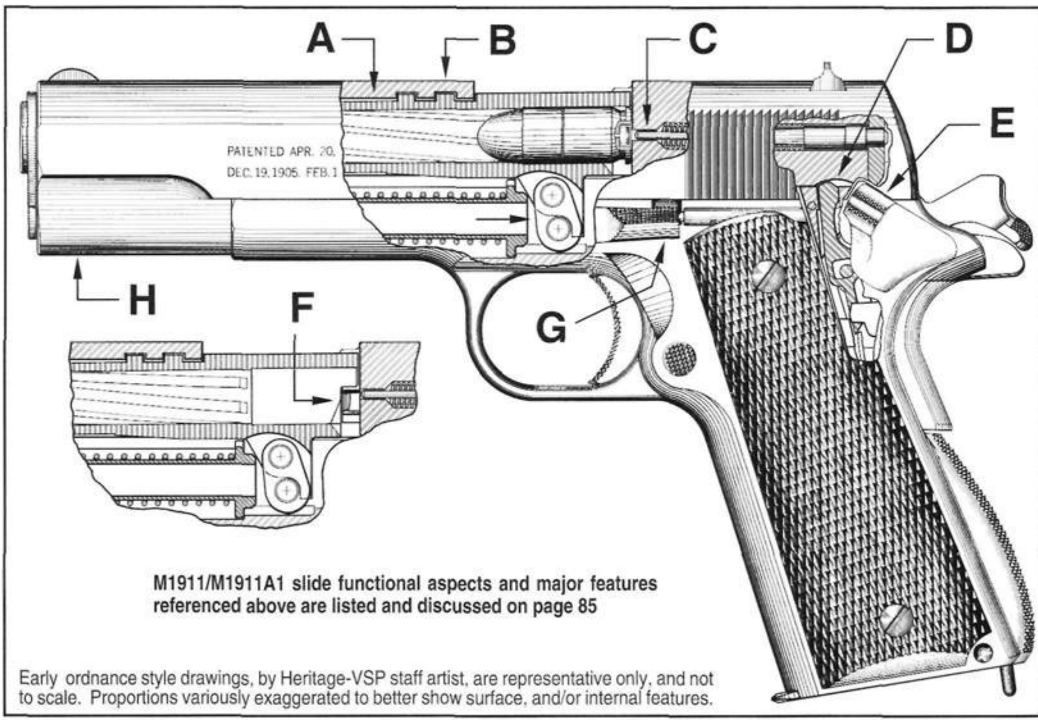


Figure 67- Early ordnance style phantom sectional illustration by VSP staff artist shows relationship of slide lugs and top barrel lugs; firing pin and primer in a chambered round; and slide disconnector camming/timing recess cut and frame mounted disconnector. Note that locked barrel position within the slide and firing pin/bore axis alignment are both determined by aggregate vertical dimensional tolerances of surfaces that are, mostly, within the slide. Also note that, with the pistol in battery, as shown, the disconnector rests against the slide's disconnector camming surface. In this position, even the slightest rearward movement of the slide must instantly begin to cam the disconnector downward to disconnect the trigger and sear. This illustration is shown here to make the point that Ml911 slides are not just monolithic chunks of steel needed to fire the pistol. The fact is that the slide is the major, most important, and most complex moving part on an Ml911 type pistol. At risk of belaboring the point- it must be stressed that Ml911 slides are not things that operate in a vague, general way- but, instead, have vertical and horizontal operating surfaces, slots, grooves, and internal passages that are absolutely critical to correct and reliable pistol function. For this reason, all Ml911, M1911A1, and commercial equivalent slides must be detail inspected for basic serviceability before use. The dimensional inspection and locational data on the following pages is provided for that purpose.

A few words about the importance of the slide in Ml911 type pistols -
Viewed objectively, the M1911 slide is the most important and most dynamic moving part on an M1911 Pistol. The slide serves multiple duty as a barrel mounting, aligning, and locking fixture; a disconnector sequencing device; a cartridge feeding/ramping device; an extractor retaining and ejector sequencing fixture; a firing pin assembly and sight mounting platform, and finally, a recoil spring retaining device and recoil mass. By comparison, the frame serves largely as a holding fixture for the slide assembly, magazine, and lock work.

Ml911 slide features and surface dimensions that are critical, and why:

A. Nom. .699" slide barrel passage - Actual passage diameter and passage axis height relative to the slide's rail slot cuts (see detail illustration on page 91) defines and locates the barrel passage in the slide and thereby locates the bottoms of the slide locking lugs.

B. Slide barrel passage location (Nom .699" passage in A) - Barrel passage height above the slide's rail slot cuts, together with the other vertical dimensions present, including top barrel lug height and barrel lug slot depth relative to bore axis, and barrel link radius (as defined by barrel link pin hole center to center length) determine how far a given barrel will link upward to vertically engage the lugs and, correspondingly, what the resulting lug engagement percentage will be. See operating cycle phase 3A in figure 27 and vertical locking lug engagement in figure 115.

C. Firing pin passage and firing pin port location - Although it's true that all vertical dimensions in M1911 type pistols interact on a plus/minus basis, vertical firing pin port/firing pin location relative to the primer axis of a chambered round in a vertically locked M1911 barrel is primarily determined by two variables: (1) basic firing pin port location, referenced upward from the slide's rail slot cuts- see Detail **H** on page 88; and (2) how far the barrel actually links upward to vertically lock. The greater the barrel angle, the greater the bore/axis/firing pin vertical misalignment. This subject is discussed further in the following sections as it relates to ordnance std. dimension, improved performance, and competition grade Ml911 pistols. For additional data see optimum performance dimension M1911 slides in section IV.

D. Nom. .375" radius disconnector camming/timing recess - This critical machine cut in the bottom surface of the central slide rail cycles the frame mounted disconnector to disconnect and reconnect the frame mounted portion of the firing mechanism.

E. Slide safety lever detent slot - This critical machine cut in the left rear slide rail enables the frame mounted safety lever to physically lock the slide and mechanically block the frame mounted sear and thereby disable the frame mounted portion of the firing mechanism.

F. Firing pin and extractor passages- These passages permit installation of the extractor and firing pin assembly. Dimensions & locations of both passages are critical for reliable/correct pistol function.

G. Slide stop detent cut and dismount radius cut- These critical machine cuts in the bottom of the left slide rail enable the pistol to automatically or manually lock open and also to be disassembled.

H. Slide recoil assembly housing - This housing (at bottom front of the slide), in conjunction with the slide mounted barrel bushing, retains the recoil spring, recoil spring plug and spring follower in the slide.

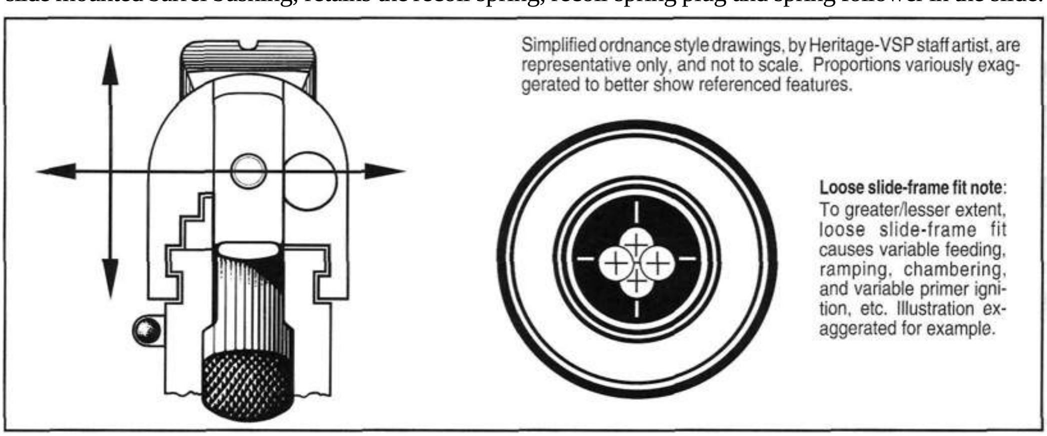


Figure 68- Ordnance style illustration by VSP staff artist, at left, depicts random slide movement during cycling due to excessive slide/frame clearance. The illustration, at right, relatedly depicts random primer indentation- the main cause of variable primer ignition. This is only one of the effects of a loose fitting slide.

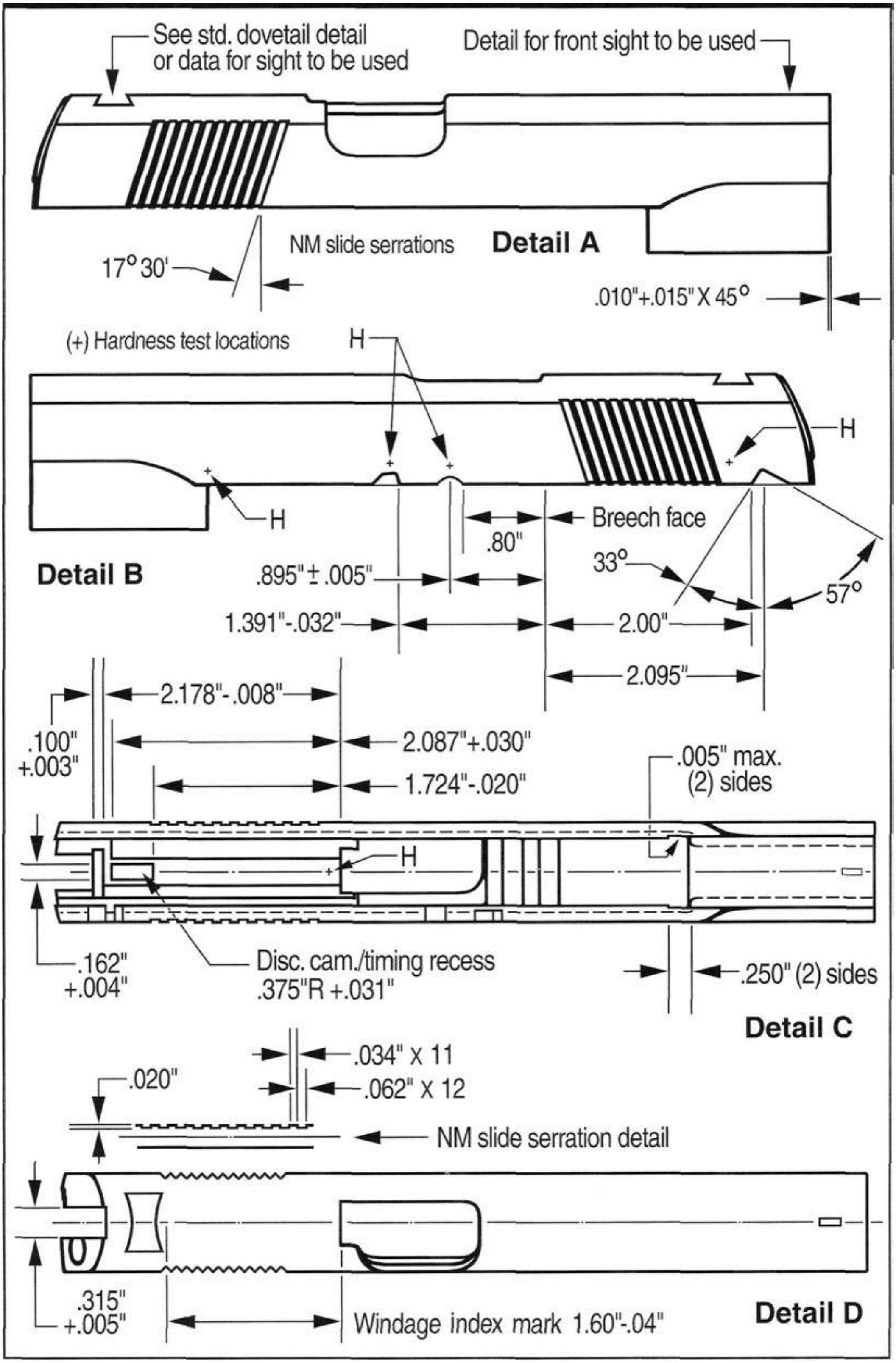


Figure 69- Ordnance style sectional and detail illustrations by Heritage -VSP staff artist show critical M1911/M1911Al slide exterior and interior operating surface dimensions and locations.

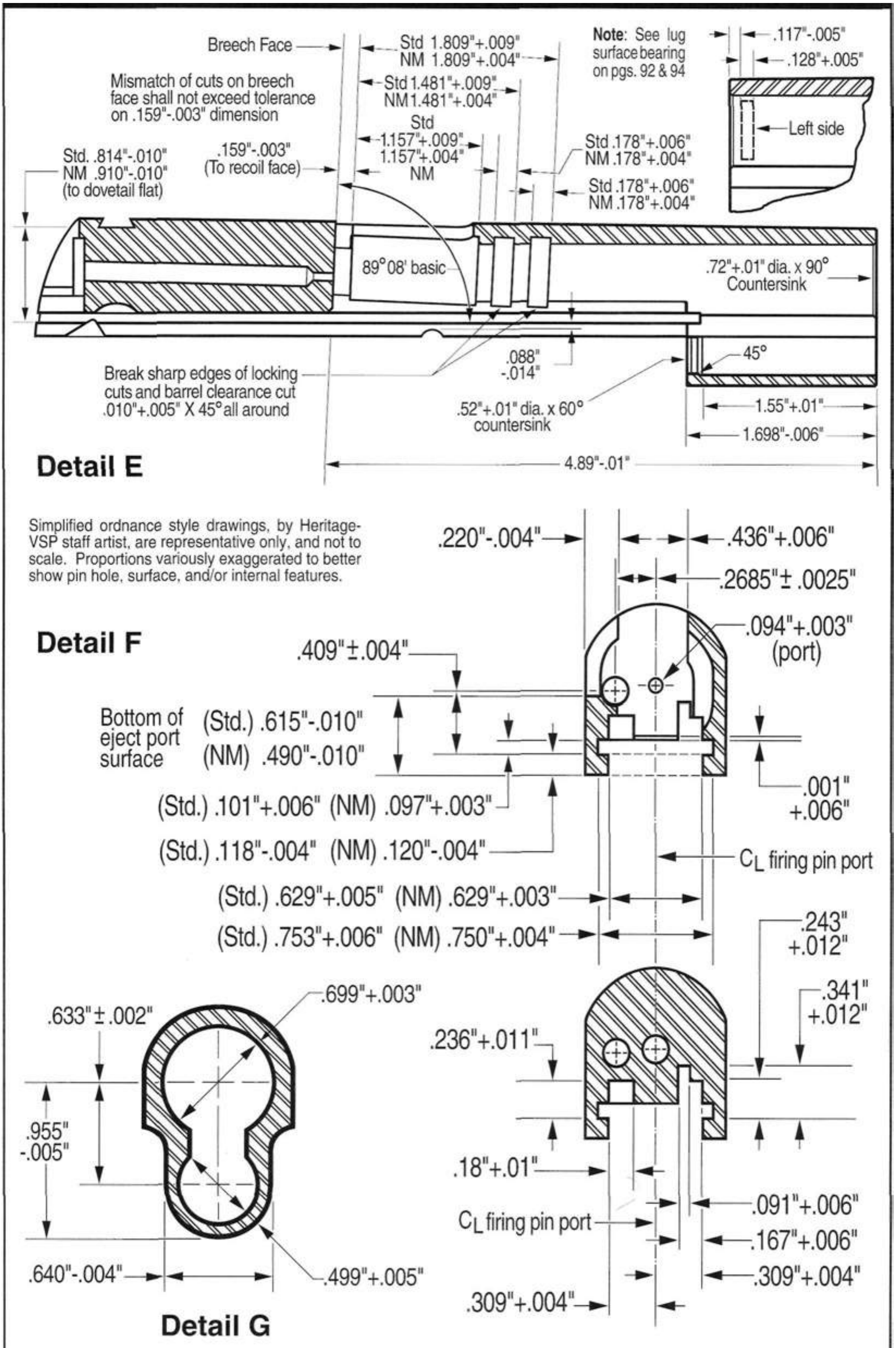


Figure 70- Ordnance style sectional and detail illustrations by Heritage -VSP staff artist show critical Ml911, M1911A1, and M1911A1 NM slide interior operating surface dimensions and locations.

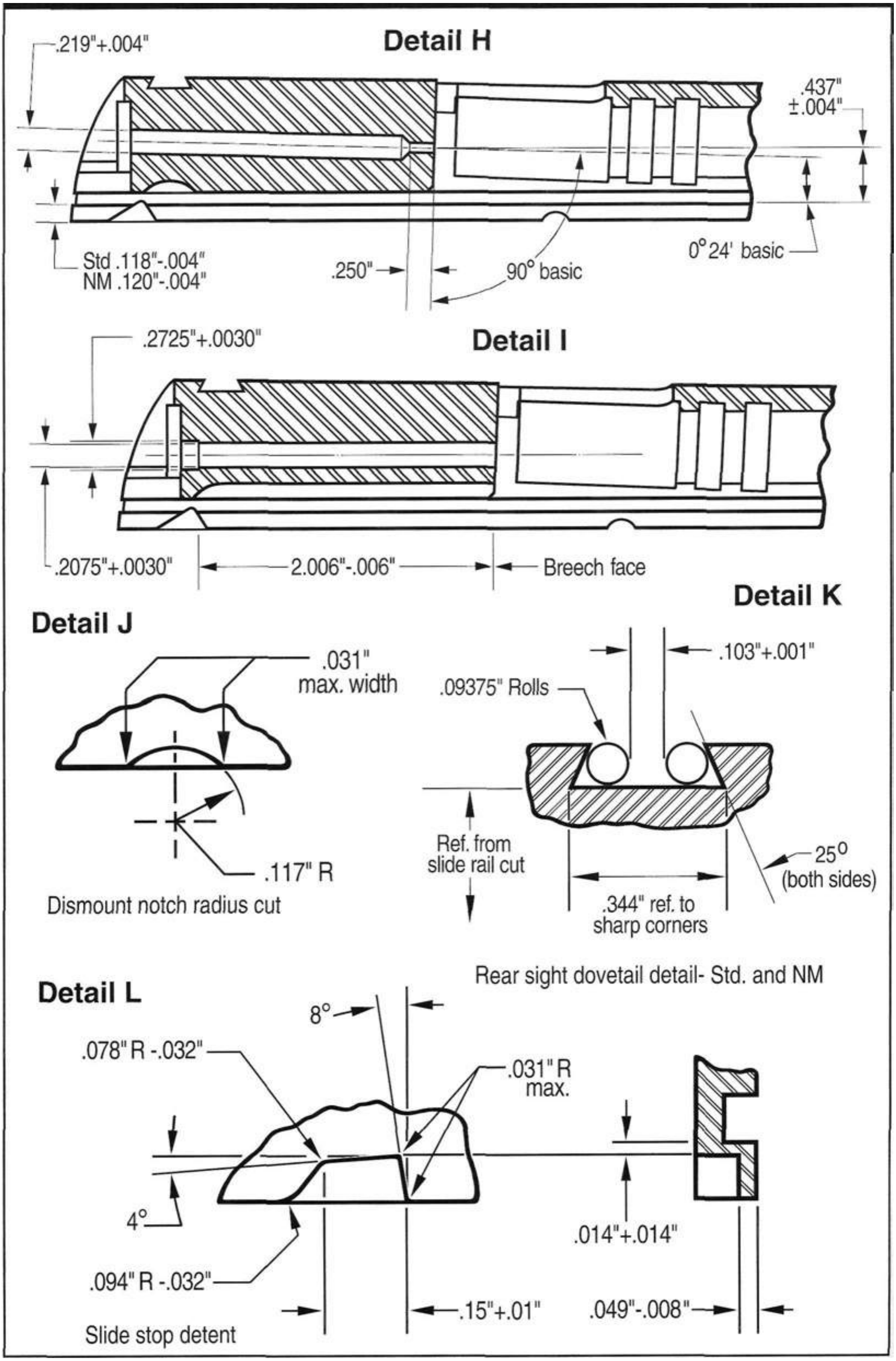


Figure 71- Ordnance style sectional and detail drawings by Heritage -VSP artist show critical Ml911, M1911A1, & M1911A1 NM slide interior and exterior operating surface dimensional inspection details.

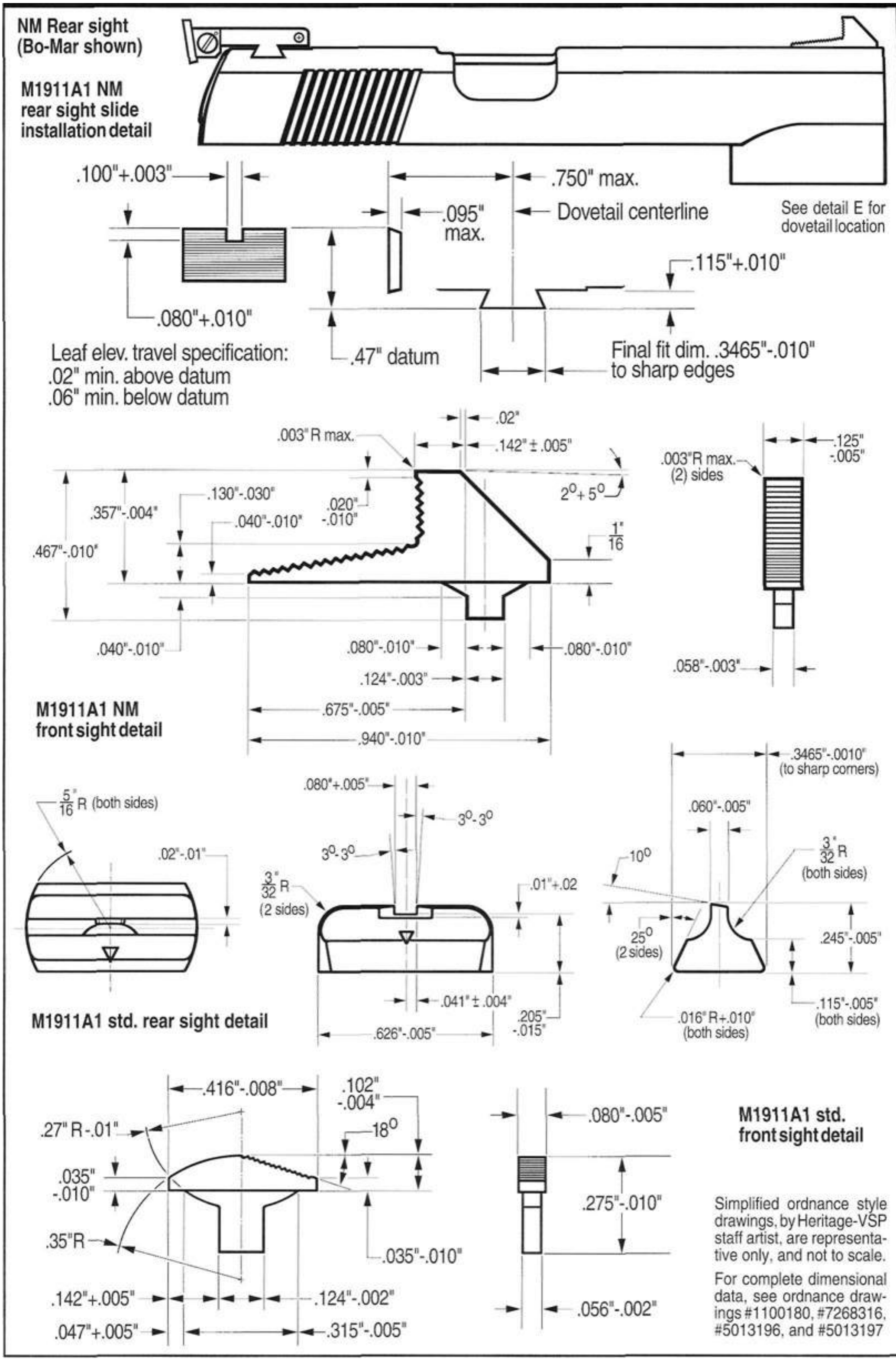
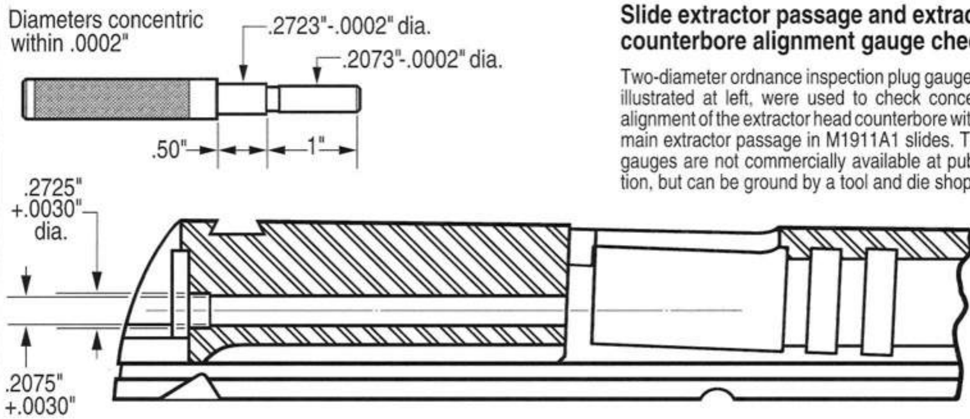
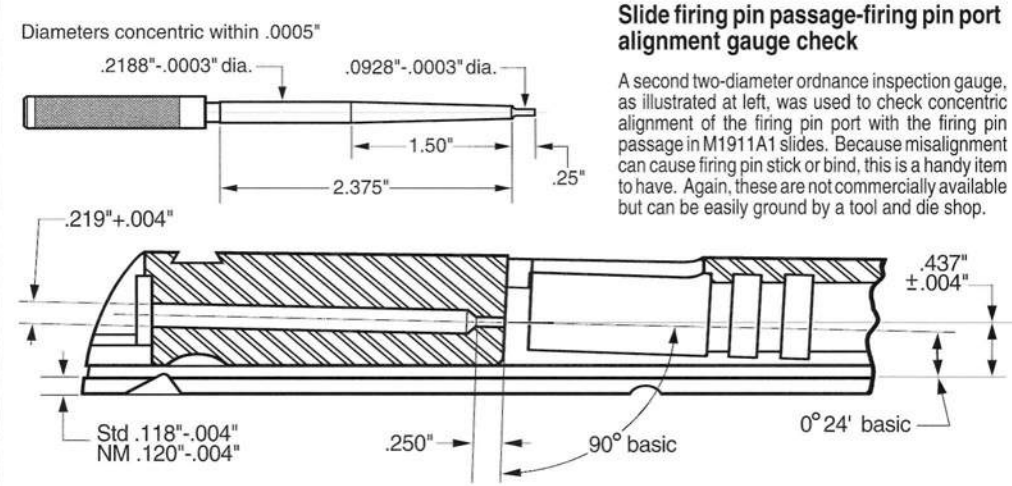


Figure 72- Ordnance style drawings by Heritage -VSP staff artist show M1911A1 NM and standard M1911A1 sight dimensional inspection details. The Bo-Mar rear sight illustrated on the NM slide, at top, is made in BMCS, BMCS-2, and BMGC (Colt Gold Cup) versions. Also see M15 sight data on page 137.



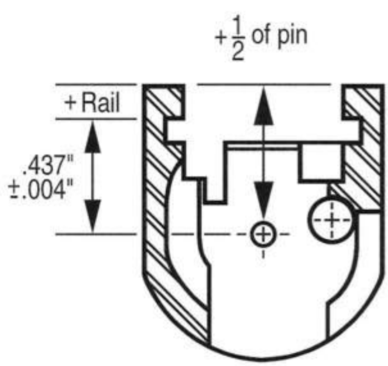
Slide extractor passage and extractor counterbore alignment gauge check

Two-diameter ordnance inspection plug gauges, as illustrated at left, were used to check concentric alignment of the extractor head counterbore with the main extractor passage in M1911A1 slides. These gauges are not commercially available at publication, but can be ground by a tool and die shop.



Slide firing pin passage-firing pin port alignment gauge check

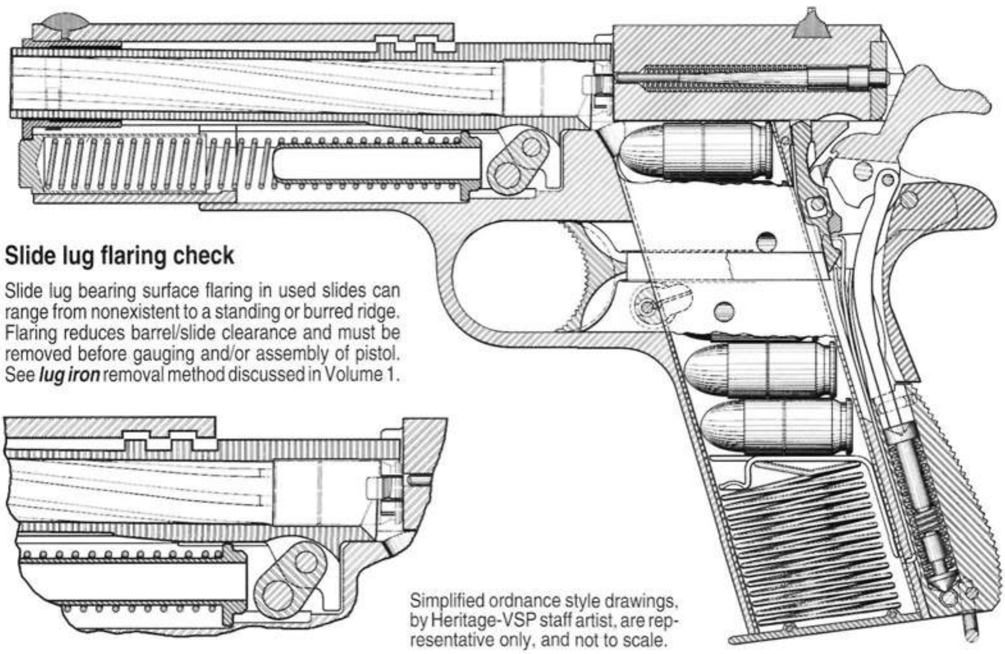
A second two-diameter ordnance inspection gauge, as illustrated at left, was used to check concentric alignment of the firing pin port with the firing pin passage in M1911A1 slides. Because misalignment can cause firing pin stick or bind, this is a handy item to have. Again, these are not commercially available but can be easily ground by a tool and die shop.



Firing pin port vertical location check

Firing pin ports are slightly to grossly mislocated in some commercially manufactured M1911 type slides. For this reason, firing pin ports in all slides should be checked. Measuring tools used to locate firing pin ports in ordnance spec. and commercial equivalent slides are: a groove/lands micrometer to measure slide rail thickness (see Starrett 260RZ groove micrometer on page 100); a straight, minimum clearance firing pin and a depth micrometer or a digital caliper with a depth measuring foot attachment. To determine port center location: (**1**) measure and note slide rail thickness; (**2**) measure and note firing pin tip diameter; (**3**) install the firing pin and hold the tip forward; (**4**) measure bottom of slide rail to firing pin O.D distance and note this figure; (**5**) then, add 1/2 of firing pin diameter and subract slide rail thickness from slide rail to firing pin distance measurement to determine firing pin port vertical center. Compare the resulting figure with ordnance specification of .437"+/-.004".

Figure 73- Ordnance style illustrations by Heritage - VSP staff artist, at top and center, show ordnance plug gauges used to check relative concentricity of the extractor passage/extractor counterbore and the firing pin passage/firing pin port in M1911Al slides. Commercial duplication of most ordnance gauges would be prohibitively expensive, hence the need for industrial substitutes. The gauges above and on pages 91 - 93 are simplifications of a few of the vast number of ordnance inspection gauges that were used in manufacturing and checking wear in M1911A1 Pistols and are shown because of historical significance and to also provide dimensional data for those inclined to use it. Gauges such as these are the only way to check certain critical passages at the bench. Original material and heat treat data: all gauges were made from tool grade steels and heat treated to RC63 min. For further data, see ordnance drawings #5075146 (extractor hole gauge) and #5075169 (firing pin hole gauge).



Slide lug flaring check

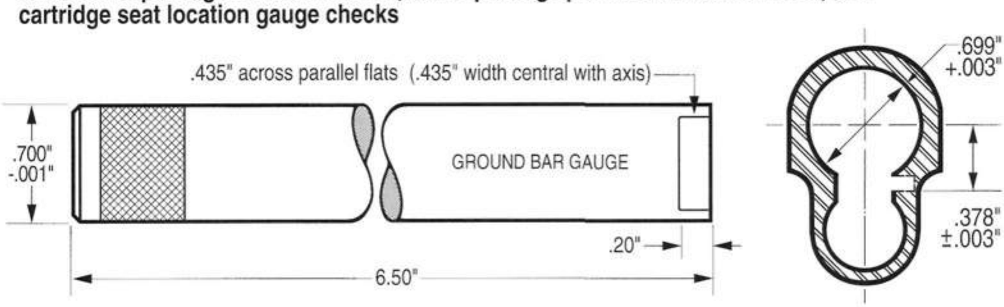
Slide lug bearing surface flaring in used slides can range from nonexistent to a standing or burred ridge. Flaring reduces barrel/slide clearance and must be removed before gauging and/or assembly of pistol. See ***lug iron*** removal method discussed in Volume 1.

Simplified ordnance style drawings, by Heritage-VSP staff artist, are representative only, and not to scale.

Slide lug flaring note:

The presence of light slide lug bearing surface flaring may indicate the beginning of lug battering in mid ordnance spec. (vertical dimensions) M1911/M1911A1 Pistols and commercial equivalents with std. barrel links, but usually does not. Causes of flaring are: (1) initial lug seating on proof test (see page 94); (2) insufficient barrel/slide lug clearance at linkdown (the slide lugs drag over too high barrel lugs); (3) insufficient or zero slide/barrel lug corner edge chamfer; (4) the slide is soft- (a) early/intermediate military slides were moderately soft, (b) some low quality commercial slides are also soft and have misdimensioned or mislocated lug surfaces.

Slide barrel passage vertical location, barrel passage parallelism with rail slots, and cartridge seat location gauge checks



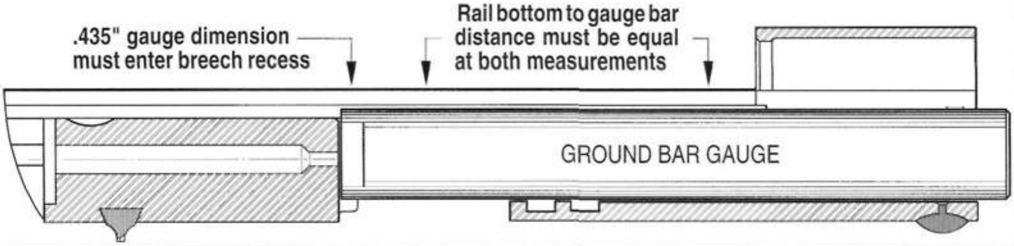


Figure 74- Sectional illustrations, at top, depict insufficient slide/barrel lug clearance at barrel link down. This condition is a known cause of major lug flaring and damage in M1911 pistols. Illustrations, below, show specified location of the slide barrel passage axis above the slide rail slot cuts (specified allowance for nonparallelism of the barrel passage relative to the rail cuts is zero); barrel passage bar gauge dimensional data; and a bar gauge installed in an M1911Al slide. The two flats on the bar must enter between the slide recoil surfaces (ordnance go gauge - .436"). Determine slide barrel passage parallelism by measuring slide rail bottom to bar gauge top distance at two points with a depth micrometer.

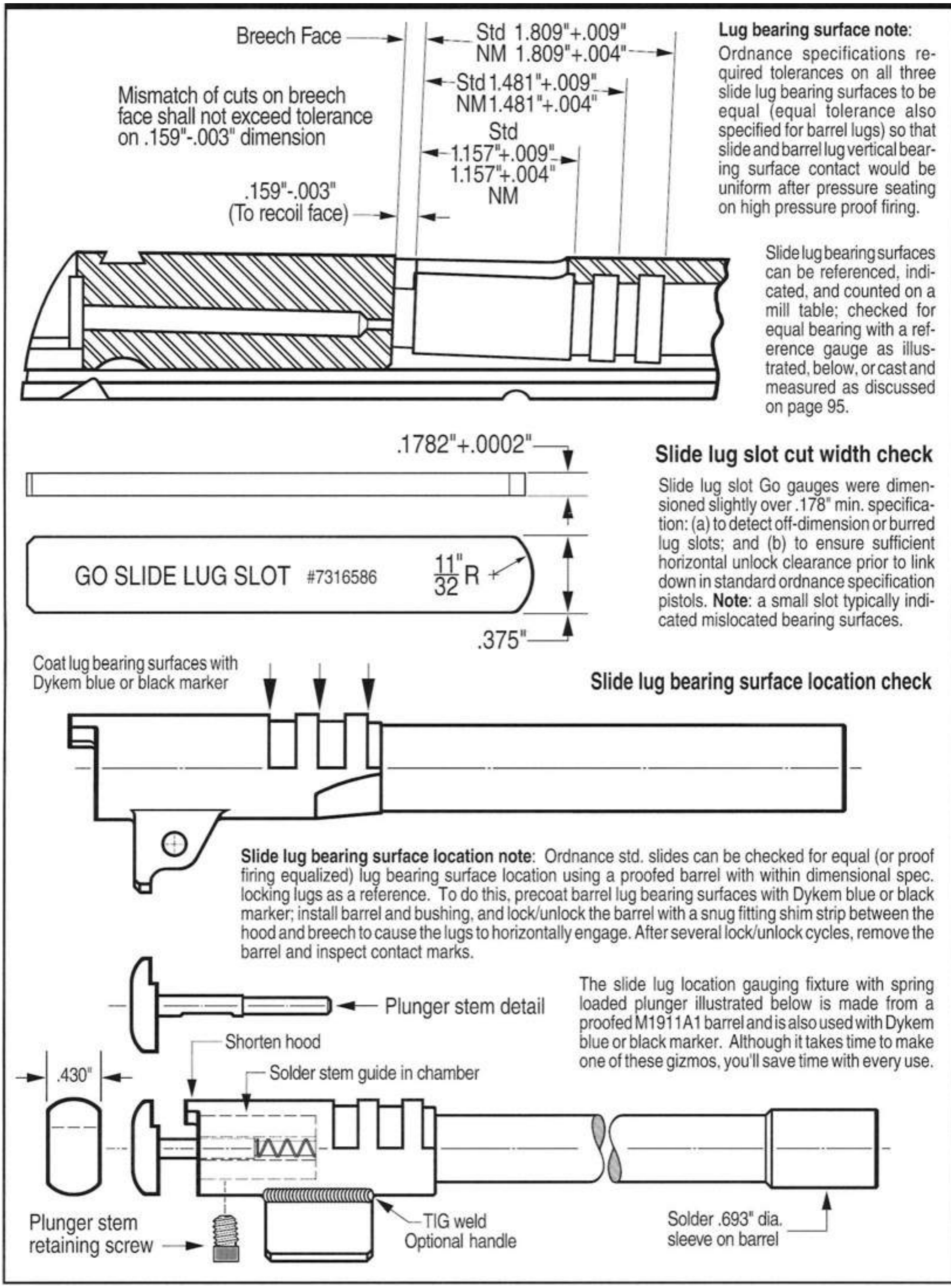


Figure 75- Ordnance style illustration by Heritage -VSP staff artist, at top, shows M1911A1 slide lug bearing surface locations relative to the slide recoil surface and breech face. **Lug bearing surface location note:** Ordnance specifications required all 3 M1911Al slide lug slots and bearing surfaces to be machined in one operation with an integral cutter. The logic was that the above 1.157", 1.481" & 1.809" dimensions would all be toleranced exactly the same relative to the slide's recoil surfaces. Commercial M1911 slides with individually cut lug slots may or may not have equally toleranced lug bearing surfaces. Fractionally unequal low/medium heat treat carbon steel slide and barrel lug bearing surfaces will eventually seat and in this way equalize. Unequal slide lugs have been known to stress crack and break medium plus heat treat barrel lugs, notably in high pressure/energy 9mm's. See examples in figure 172.

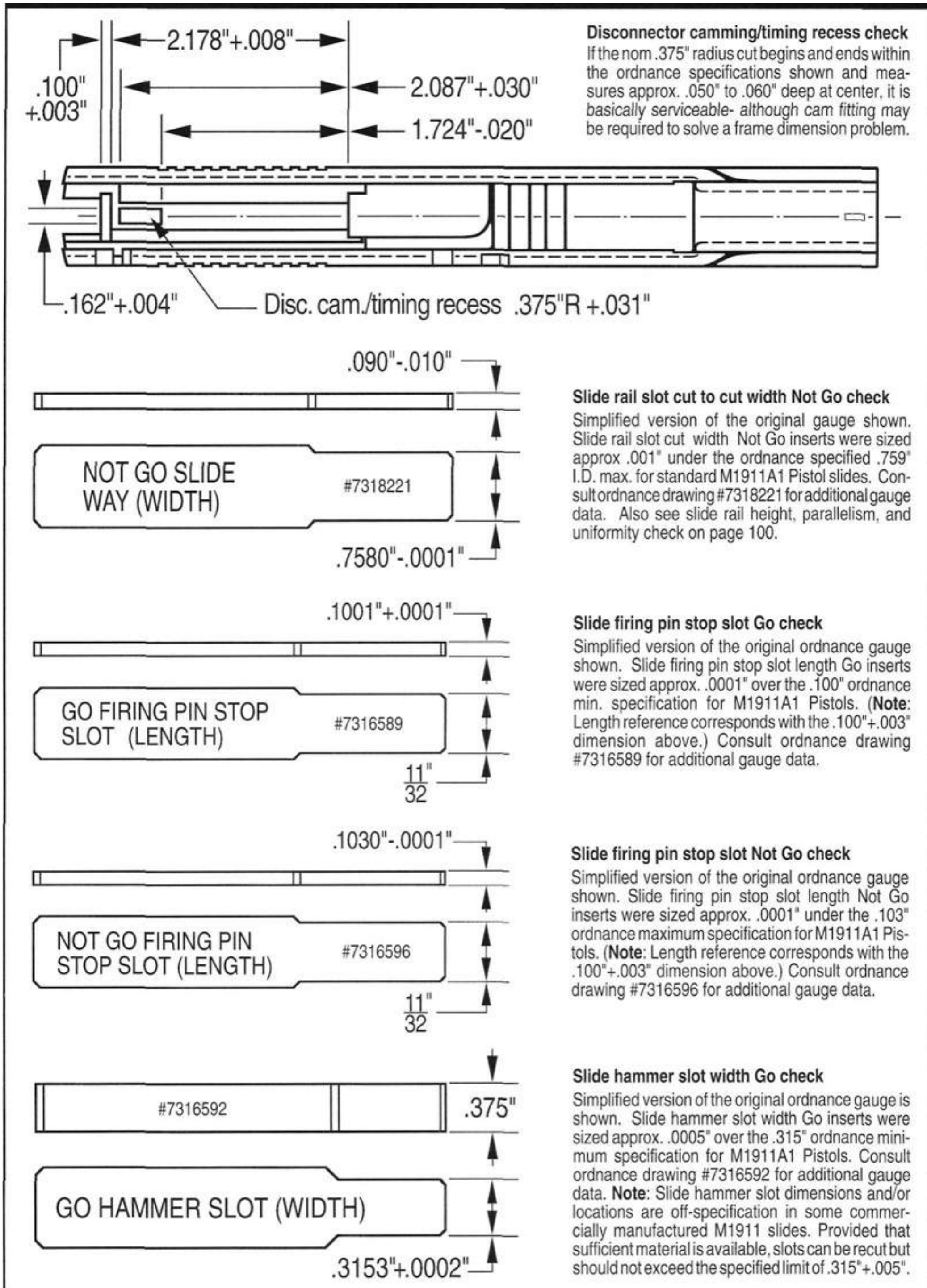


Figure 76- Ordnance style illustration by Heritage -VSP staff artist, at top, shows a bottom view of an M1911/M1911A1 slide, disconnector camming/timing recess location data, and firing pin stop slot length dimensional details. Simplified versions of several handy ordnance slide inspection gauges are illustrated below. Gauge data is shown because of historical significance and to provide dimensional data for those inclined to use it. Gauges such as these are the fastest way to check the referenced interior slide areas at the bench. Original material & heat treat data: all gauges made from tool grade steels, heat treated to RC 63 min. For further data, see ordnance drawings as numbered in each illustration.

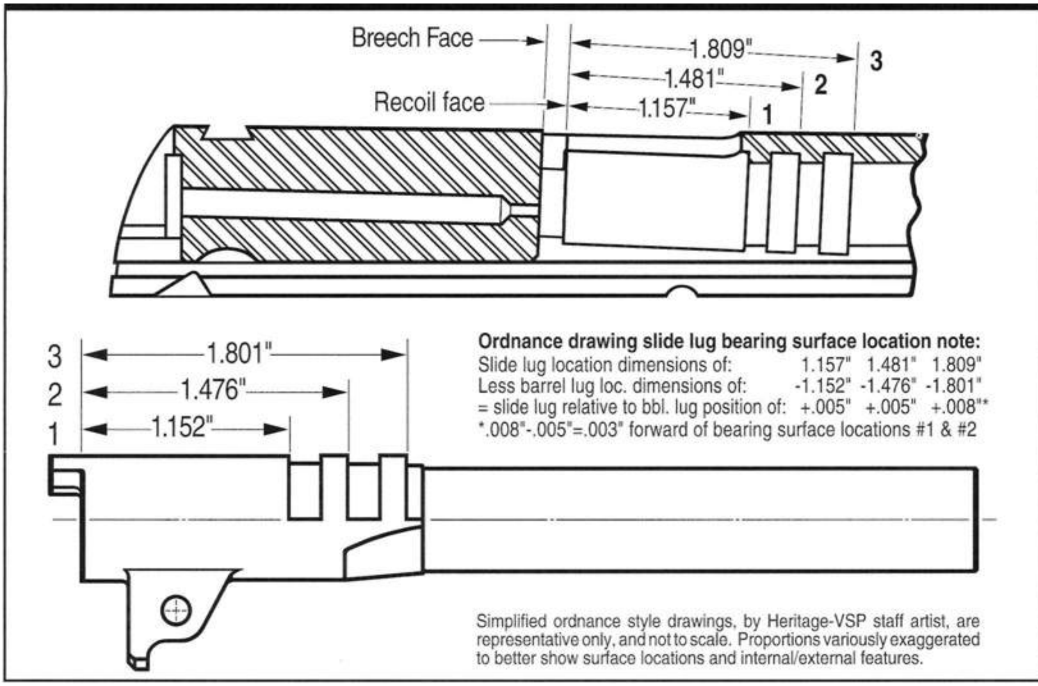


Figure 77- Ordnance style illustrations by Heritage -VSP staff artist show ordnance specified nominal print dimensions for interactive slide and barrel locking lug bearing surfaces l - 3 in M1911Al slides and barrels. The above illustration is provided for 3 reasons: (1) to call attention to the 1.809" print location of the front slide lug bearing surface; (2) to dispel myths associated with the fact that specification for this surface is .003" forward of the other two slide lug bearing surfaces before high pressure proof firing (see note); and (3) to suggest that carrying this ordnance design feature forward in medium plus heat treat commercial slides and barrels to be used with medium and high pressure cartridges is counterproductive. **Note:** After deducting the +.001" on the front barrel lug, actual (before proof) net difference is +.002".

Myth #1: The front (#3) slide/barrel lug surfaces were not intended to bear and are therefore unnecessary.

Myth #2* The front barrel lug is there only as a backup, as with the rear bolt lug in an M98 action.

The fact is that neither are remotely true. If you examine the lug wear and seating pattern in military M1911A1 Pistols, you'll find that all 3 locking lugs show bearing surface contact, wear, and/or seating and that all 3 slide lugs will show evidence of edge flaring (if not removed), to greater or lesser degree.

The above .002" net front lug clearance (before pressure proofing) dates back to early carbon steel slide & barrel low/medium heat treat specifications. The purpose was to pressure seat the two rear barrel lugs on high pressure proof cartridge firing (or on later firing, with replacement barrels) without distorting the front lug so that all three barrel lugs would then come to bear equally in the horizontal plane. Theory held that it was more logical to seat the two, more supported, rear lugs than excessively stress or distort the front. After proofing, barrels and slides were magnafluxed, proof marked, tops of the barrel lugs polished, and components finished. With respect to such details, an ordnance engineer at Springfield once aptly commented that a lot more has been forgotten about the M1911 design than will ever be remembered.

Slide lug dimension notes:

1. The above .003" slide (.002" net) seating clearance is unnecessary in commercial component slides because barrel and slide lugs are not seated (and thereby equalized & mated) by high pressure proof firing.

2. Seating clearance is unnecessary with medium plus heat treat slides and barrels because the harder lug surfaces are much less inclined to surface seat - and barrel lugs may crack/break rather than equalize.

3. Given the combination of higher than design pressure cartridges and medium and higher heat treat slides and barrels, even a small slide/barrel lug bearing surface inequality or mismatch is unacceptable because of the higher (and unequal) shear force exerted on one or more barrel lugs. Although stainless steel barrels have a somewhat lower shear factor than carbon steel- it's silly to unnecessarily tax the shear factor - better to correctly locate the slide lug bearing surfaces (or correspondingly adjust the lug bearing surfaces on barrels) for equal bearing. See barrel lug bearing surface adjustment in fig. 111.

***** Although elimination of the front barrel lug on the M15 Pistol tends to lend credence to myth #2, it was, nonetheless, a safe procedure- only because the M1911 ball cartridge is a low pressure round.

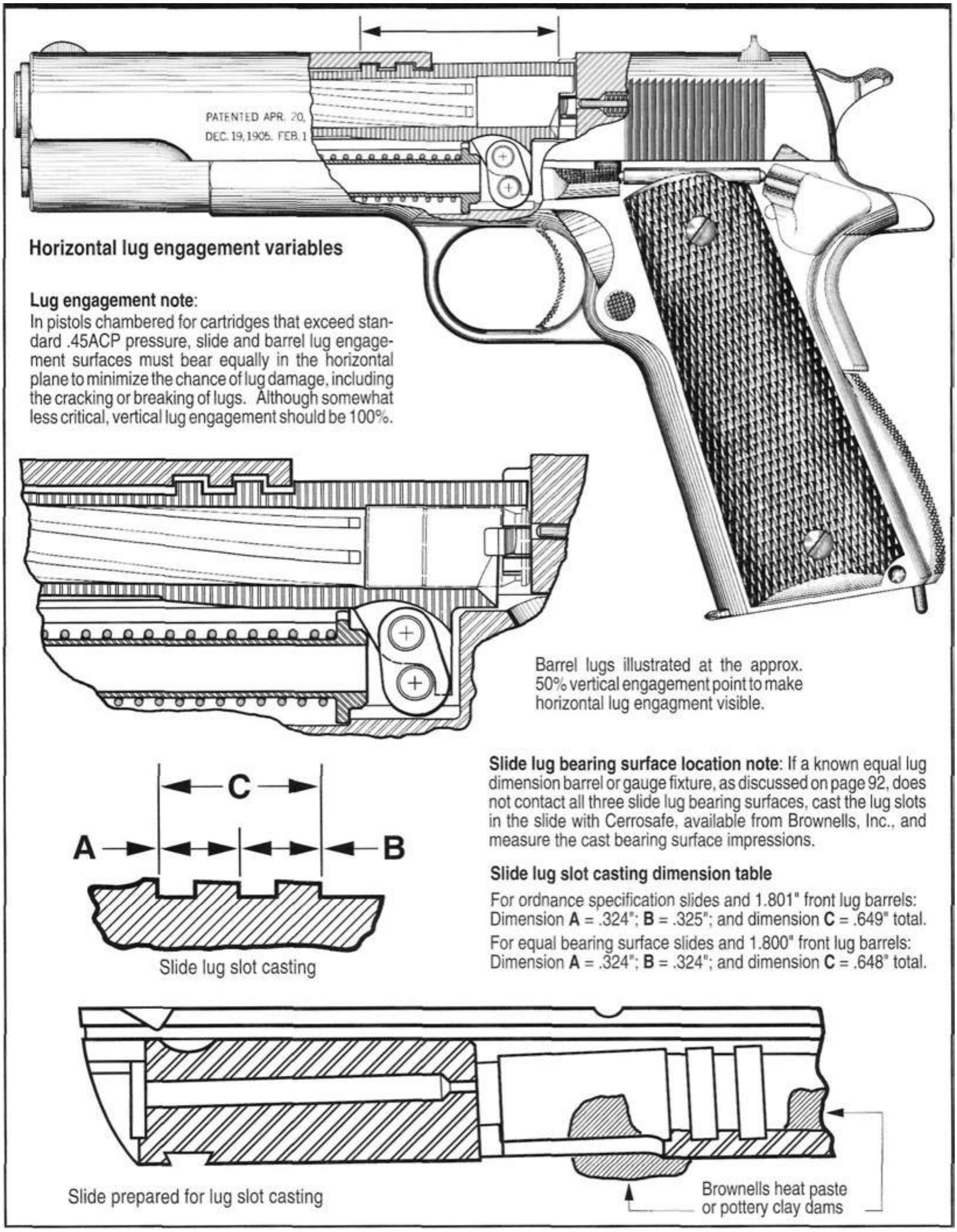


Figure 78- Ordnance style sectional illustrations by Heritage -VSP staff artist, at top, show relative positions of slide lug slots and barrel lugs in M1911Al Pistols. Sectional illustrations below show the casting method for determining relative positions of the lug slots and lug bearing surfaces in Ml911 type slides. See bearing surface relative location data in dimensional table above.

Equal slide/lug bearing surface note: As mentioned earlier, ordnance specifications and procedures ensured that slide and barrel lug bearing surfaces were equalized in production pistols and would also equalize in pistols after barrels were replaced. Keep in mind that this was based on ordnance specified carbon steels and specified heat treats. Although ordnance did not foresee M1911 type pistols being subjected to steady diets of 2X, 2.5X, and 3X design pressure cartridges, it is a credit to Browning's genius that present day shooters can get away with it- provided that lug engagement is horizontally uniform and vertically sufficient, and that slide and barrel metallurgy and fit are both optimum.

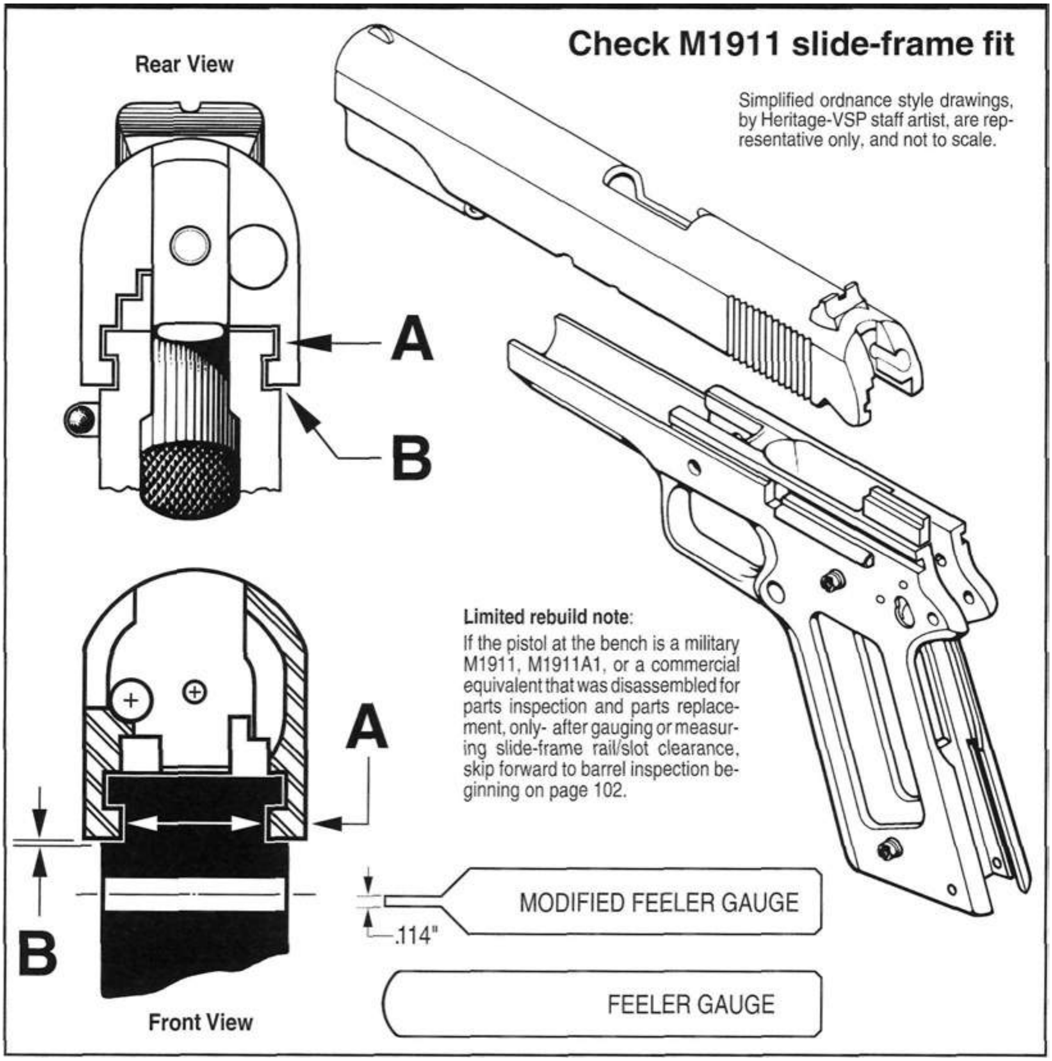


Figure 79- Ordnance style principle illustrations by Heritage -VSP staff artist, at left, show M1911/ M1911A1 slide-frame rail/slot clearance check points. Slide rail/frame rail slot horizontal clearance, at **A**, can be determined by comparative measurement as discussed on the following pages, or simply checked with modified feeler gauges. See modified feeler gauge illustration, above. Vertical rail/slot clearance, at **B**, can be determined by measurement or with standard feeler gauges.

A few words about slide/frame fit and rail/slot clearance in Ml911 Pistols-

We face, at this point, another of those instances in gunsmithing wherein one size (or, in this case, one clearance) does not fit all. There is no absolute slide-frame rail/slot clearance specification applicable to all categories of M1911 type pistols. Ordnance slide and frame specifications at mid component tolerance allowed .004" vertical and horizontal rail/slot clearance. This follows because mid spec, tolerances were based on actual component dimensions in preproduction pistols. We can deduce from this that ordnance engineers considered .004" rail/slot clearance to be optimum in military pistols.

What it comes down to is that, when assembling an Ml911, M1911A1, or commercial equivalent pistol, best or acceptable slide-frame rail/slot clearance depends on the type (collectible military pistol, etc.) or category of use the pistol is intended for. There are, relatedly, four clearance options:

1. U.S. Military pistols - .004" to .006" clearance is workable and, by now, better than average. **Note:** Almost all U.S. military pistols in unaltered, unrefinished, and functional condition with U.S.G.I. parts are collectible to greater or lesser degree. Rebuild work on these should be limited to inspection and parts replacement using U.S.G.I. parts of correct type and vintage. I would suggest checking rail/slot clearance in these pistols and preserving them as they are. Excessive clearance in mixed component

Slide/frame fit and rail/slot clearance in Ml911 Pistols, continued -
pistols can sometimes be reduced by selecting slide/frame combinations by measurement for lowest clearance fit. See max.-min. rail/slot data in figure 80. After selecting military pistol slides and frames for lowest rail/slot clearance, skip forward to barrel inspection on page 102.

2. Ordnance std. commercial Ml911 type pistols - As with military pistols, .004" to .006" clearance is workable and better than average. If the pistol at the bench is a general use Ml911 disassembled for parts inspection and replacement- measure or gauge check rail/slot clearance as discussed in figure 79 and skip forward to barrel inspection beginning on page 102. Rail/slot tightening is not suggested.

3. Ml911 type pistols to be *accurized* - .001" rail/slot clearance, or less, is suggested for bullseye pistols and .001 "-0015" for other competition categories. If building an accurized Ml911 from std. dimension components and frame/slide rail tightening is to be included- select a slide and frame combination that will require a minimum amount of adjustment. See dimensional data in figure 80.

4. Assembling an improved performance Ml911 carry pistol from zero clearance components - Fitting and lapping the slide-frame rail/slots to .0015"-.002" clearance is suggested.

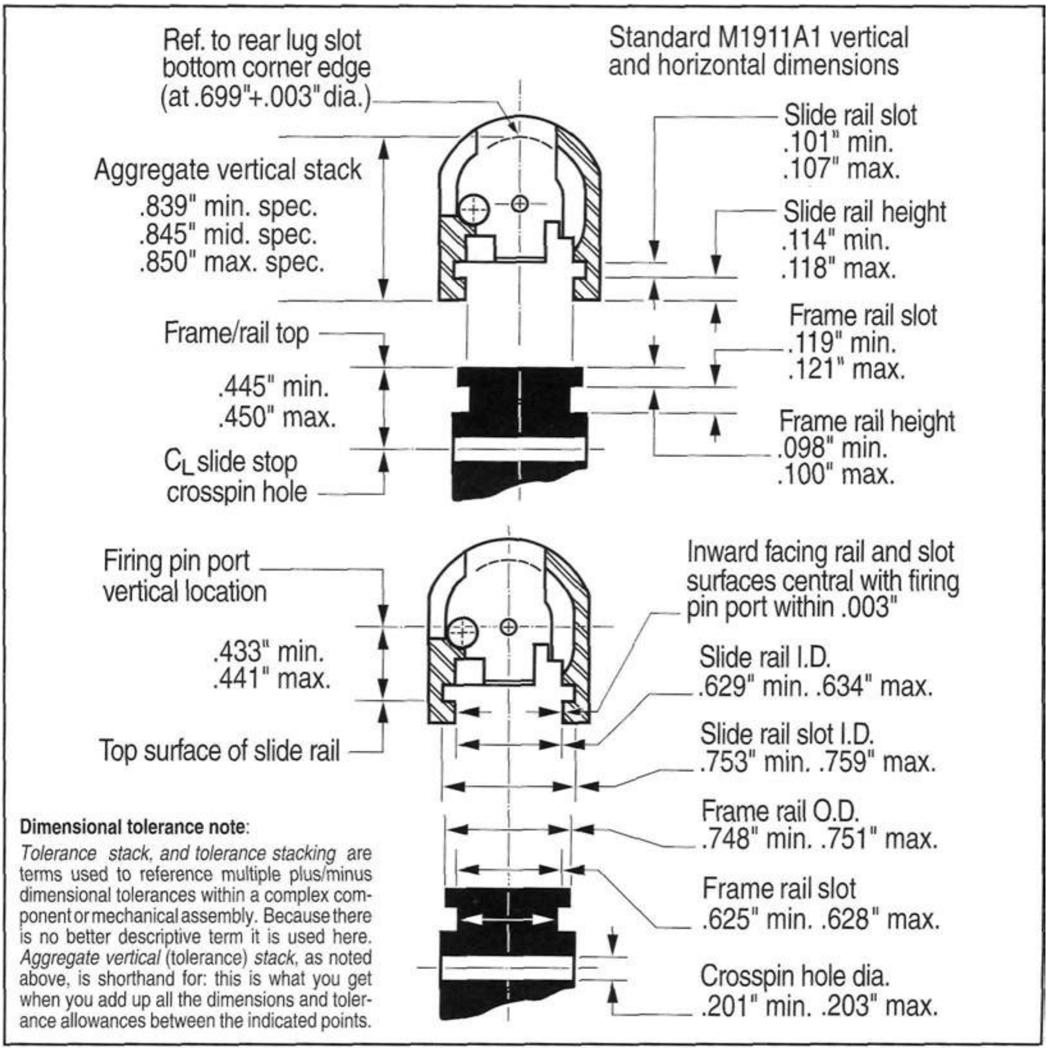


Figure 80- Detail illustrations by Heritage - VSP staff artist, show standard M1911A1 slide and frame rail/slot min./max. dimensions. NM dimensional data is shown on page 87. The drawings above group related slide and frame vertical and horizontal dimensions for easy reference when comparison measuring rails and slots. **Slide selection note:** Slides to be used in building accurized and improved performance carry, defense, and competition M1911 pistols also should be measured and selected for aggregate mid vertical tolerance stack height. See definition above and further discussion on page 98.

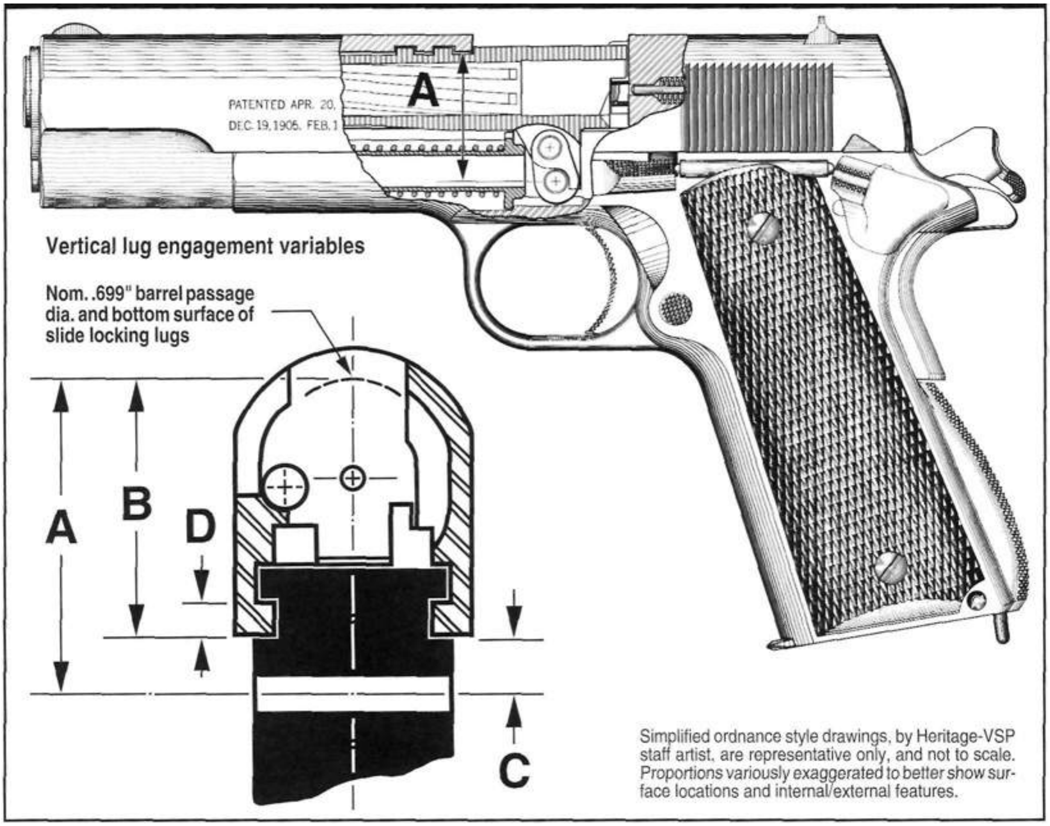


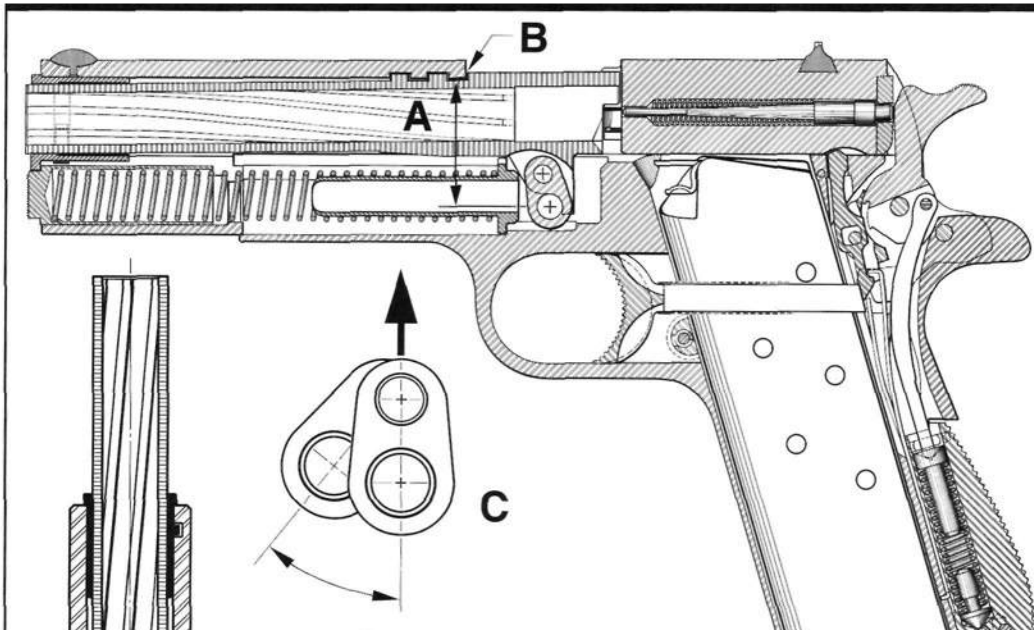
Figure 81- Ordnance style phantom and sectional illustrations, by Heritage - VSP staff artist, show internal operating surface locations in an M1911A1 Pistol referenced from the center of the slide stop crosspin hole in the frame and from the bottom of the slide rails. Critical vertical tolerance stack dimensions referenced above are listed and discussed below. Barrels link up higher on a given link radius in pistols with lower aggregate vertical tolerance stack dimensions. For this reason, frames and slides to be used in assembling improved performance and competition Ml911 pistols should be preselected by measurement (cherry picked) for closest to mid tolerance spec, dimensions.

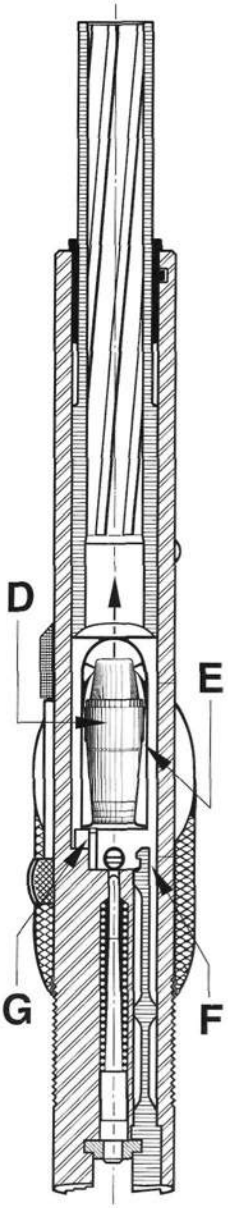
A. Aggregate slide/frame vertical tolerance stack - This is the overall vertical distance from the center of the slide stop crosspin hole in the frame to 12:00 position on the nom. .699" barrel passage dia. (also the bottom of the slide lugs) inside the slide. This net inside dimension determines the barrel link radius (link length) needed to link a given barrel up to the 100% vertically locked position, or any percentage thereof, depending on barrel and link dimensions. To minimize barrel link up/link down swing in competition pistols, this distance should not exceed approx. 1.075".

B. Aggregate slide only vertical tolerance stack - This is the vertical distance from the bottom of the slide rails to the nom. 699" dia. barrel passage (and the lug bottoms) inside the slide. Distance can be measured by indicating on a mill, or estimated with a digital dial caliper with a depth foot attachment. Suggested dimension in slides with not less than .114" min. specification rail heights is ordnance mid tolerance stack dimension of .845", or fractionally less. See rail height in #D, below.

C. Aggregate frame only vertical tolerance stack - This is the vertical distance from the center of the slide stop crosspin hole to the bottom of the slide rail slot(s) in the frame. Slides with a mid vertical tolerance stack dimension of .230" to .231" are suggested. See frame rail slot surface location specifications in Detail 8 on page 74.

D. Slide rail vertical height- Slide rail height should not be less than the ordnance minimum specification of .114" for standard M1911A1 slides. **Note:** This is important in pistols built on frames with peened-down or punch tightened rail slots because of the effect on central slide rail/ top frame clearance. Reduced clearance can cause a condition referred to as *hard over the disconnector* or *slide-disconnector bump* by early armorers. A second disconnector problem, failed reconnect, can be caused by a combination of reduced central slide rail/frame clearance and a minimum specification disconnector camming/timing radius cut.





Note: A mid specification overall vertical dimensional tolerance stack, as referenced at **A**, from the center of the frame's slide stop crosspin hole to the bottom surface of the slide's rear locking lug on the nom. .699" barrel passage dia. inside the slide (see arrow, at **B**) allows the barrel to link upward, as shown at **C**, and vertically lock fractionally earlier and on an intermediate, or shorter, radius barrel link.

Benefits of selecting mid specification vertical dimension M1911 slides and frames and reducing vertical and horizontal rail/slot clearances (or using equivalent commercial frames and slides with fittable zero clearance rails/slots)- and, for best results- installing a quality, gunsmith fit barrel and bushing:

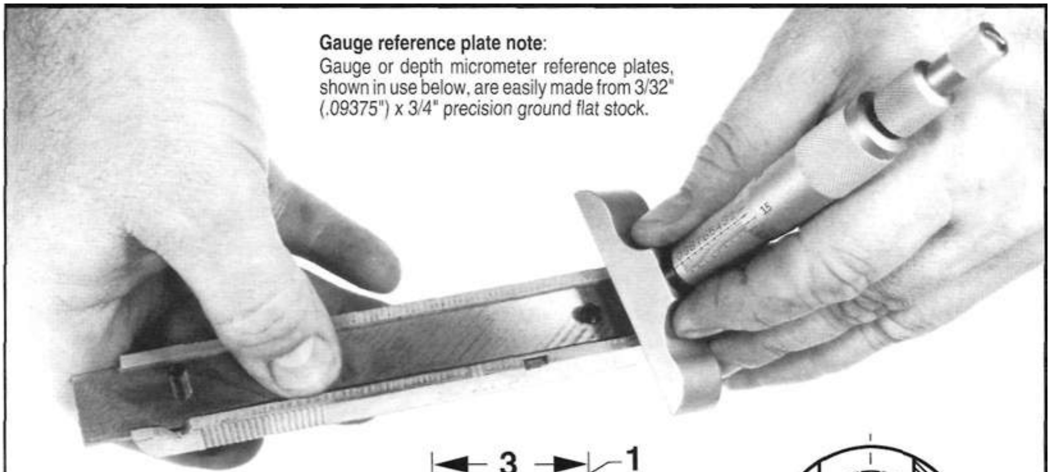
Vertical plane:

1. Shorter internal vertical height enables barrels to link up/down on an intermediate or shorter radius barrel link. **Note**: Shorter barrel links act to momentarily advance barrel linkdown timing (link down begins fractionally earlier relative to slide recoil position).
2. Barrels with optimum dimension lug slots link up to 100% slide lug engagement on intermediate or shorter radius barrel links. See Schuemann barrels on pages 112 &113.
3. An intermediate or shorter linkdown radius generally requires less adjustment of the rear barrel lug face and/or the front frame barrel linkdown stop surface.
4. Near zero vertical clearance stabilizes cartridge pick up, ramping, extractor pick up, and chambering by permitting the slide to address cartridges in within specification magazines at the same elevation with each firing cycle.
5. Consistent primer ignition- resulting from closer to vertically central, mechanically repeatable firing pin alignment with chambered cartridges. (Requires a central firing pin port and chamber.)

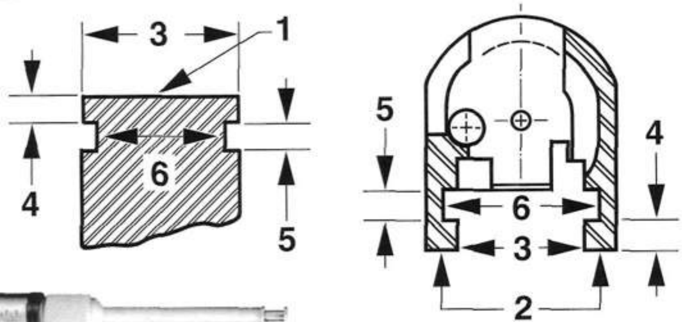
Horizontal plane:

1. Near zero horizontal clearance makes cartridge pickup from the magazine, magazine cartridge release, ramping, extractor/cartridge rim engagement, chambering, and even ejector case contact/ejection as referenced at **D**, **E**, **F**, and **G** in the illustration, at left, more uniform by permitting the slide to address cartridges in within-specification magazines on the same center with each firing cycle
2. More consistent primer ignition- resulting from horizontally central, mechanically repeatable firing pin alignment with chambered cartridges.

Figure 82- Arrows in ordnance style sectional illustrations by Heritage - VSP staff artist, show areas where selecting slides and frames for closest to mid tolerance specs, as discussed on pages 97 and 98 and reducing slide-frame rail/slot clearance, or similarly, selecting and fitting zero rail/slot clearance commercial slide/frames directly improves performance. Overall benefits are improved mechanical repeatability which, in turn, improves accuracy and reliability. Time spent in slide/frame selection saves a lot of time later and, with the addition of a high quality barrel, ensures a much better finished product.

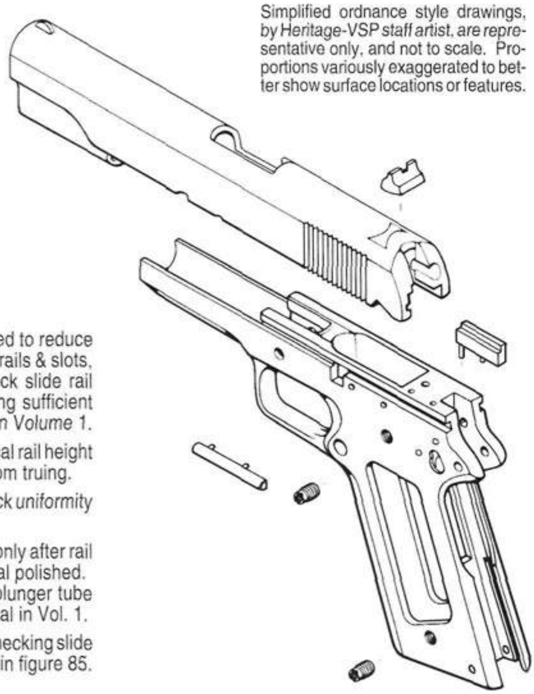


Gauge reference plate note:
Gauge or depth micrometer reference plates, shown in use below, are easily made from 3/32" (.09375") x 3/4" precision ground flat stock.



Groove micrometer note:
Although groove micrometers are primarily intended for specific point to point width measurement of grooves and slots, they also make handy full length reference gauges when moved laterally.

Simplified ordnance style drawings, by Heritage-VSP staff artist, are representative only, and not to scale. Proportions variously exaggerated to better show surface locations or features.



M1911 slide-frame rail/slot mating steps:

A. *Gunsmith fit slides and frames with zero or near* zero clearance rails and slots: comparison measure the slide and frame, check slide rail parallelism, and adjust oversize frame top and slide rail bottoms at **1** & **2** on a surface plate. Adjust inward/outward facing slide rail surfaces, at **3**, with an Eze-lap diamond hone until the slide begins to start on the frame. Then, lightly 45° break the sharp rail edges and lap to desired fit. See lapping in Volume 1 and figure 85. Also see rail edge chamfering in figure 85.

B. Slides and frames that are to have rails and slots adjusted to reduce rail/slot clearance: comparison measure the slide and frame rails & slots, at **4**, **5**, and **6** to determine fitting requirements. Then check slide rail parallelism and true the rail bottoms, at **2**. Then, presuming sufficient *material for fitting, adjust the slide and frame as discussed in Volume 1.*

Note 1: Select slides with sufficient rail thickness so that vertical rail height will not be less than ordnance min. spec. of .114" after bottom truing.

Note 2: *Always make measurements in several places to check uniformity* and note dimensions.

Note 3: (**a**) New frames- Install frame mounted components only after rail work is completed and the sides of the frame have been final polished. (**b**) Used frames- If components are installed, remove the plunger tube and ejector before rail adjustment. See plunger tube removal in Vol. 1.

Note 4: Lightly break sharp slide and frame rail edges before checking slide fit and lapping. See optional final rail edge break/clearance in figure 85.

Figure 83- Shows Ml911 slide rail parallelism check, at top, done as a basic inspection step and as a part of NM slide and oversize commercial slide bottom rail fitting. Rail parallelism is also checked and the bottom slide rails trued before adjusting the slide and frame rails to reduce rail/slot clearance. Measurement and fitting areas referenced above are discussed below. Measuring tools shown: ground reference plate, standard depth micrometer and Starrett 260RZ groove micrometer. Groove micrometers measure rail widths directly. Add .050" to internal and external surface groove micrometer readings.

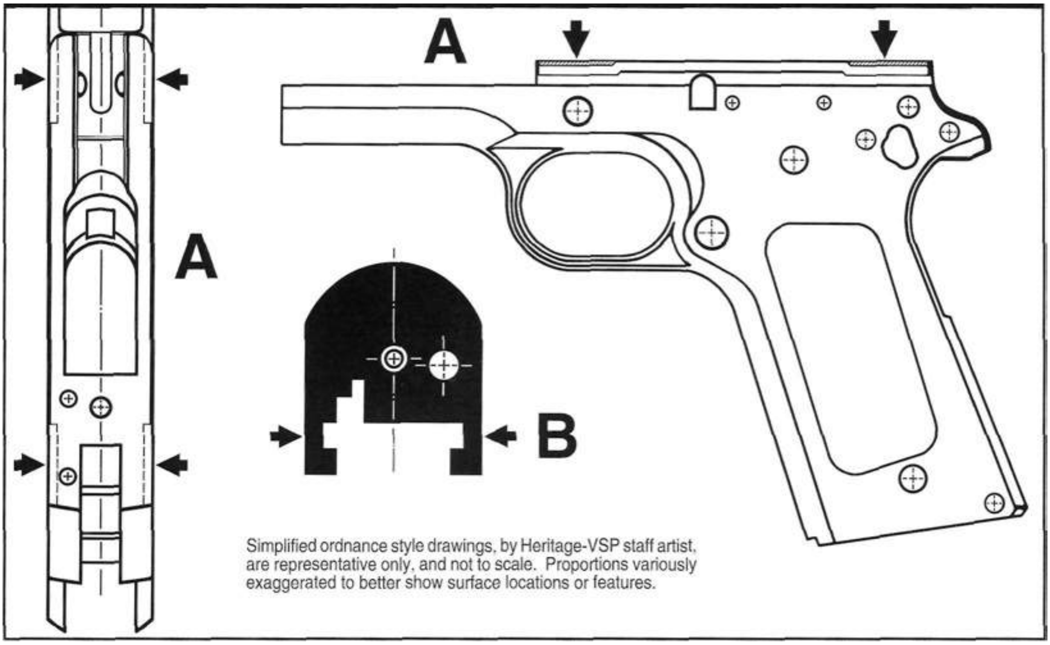


Figure 84- Arrows in illustrations by Heritage - VSP staff artist, at **A**, show areas where M1911 type frames are 4 point punch peened to reduce vertical frame rail slot/slide rail clearance. The illustration, at **B**, shows where Ml911 type slides are compressed to reduce horizontal slide rail/frame rail slot clearance. Frame rail punch peening, other frame rail tightening methods, slide bottom rail tightening, and related tooling and fixtures are discussed in detail in Volume 1.

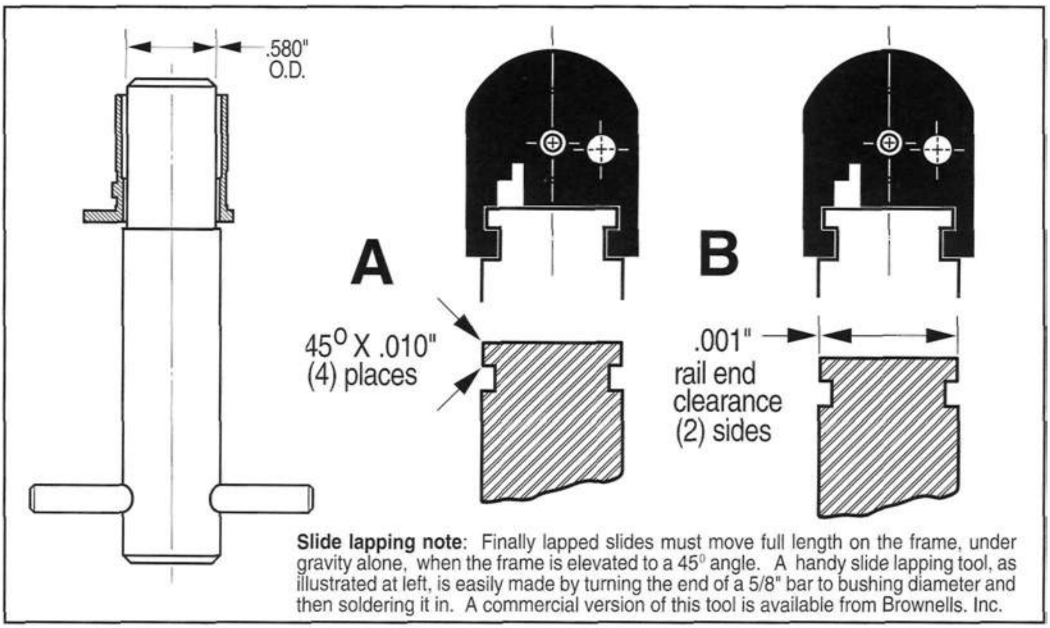


Figure 85- Illustrations, at right, show two different M1911/Ml911A1 frame rail edge clearancing methods. The 45° x 4 corner edge chamfer method, depicted at **A**, is done prior to final hand lapping of slide/frame rail surfaces to a near zero clearance fit. This method is preferable in M1911 type pistols with full strength recoil springs, built for design pressure/inertia range and greater, cartridges. The .001" x 2 side vertical (outside facing) rail face clearancing method, shown at **B**, was originally used by marksmanship unit armorers to reduce slide cycling friction in NM grade M1911A1 pistols built with lighter/shorter than standard recoil springs for reduced velocity (700-750 fps) match cartridges. This clearancing method is preferable in match (wadcutter) pistols and suggested as an option in duty/ carry pistols. The lapping tool, illustrated at left and discussed above, makes slide lapping easier.

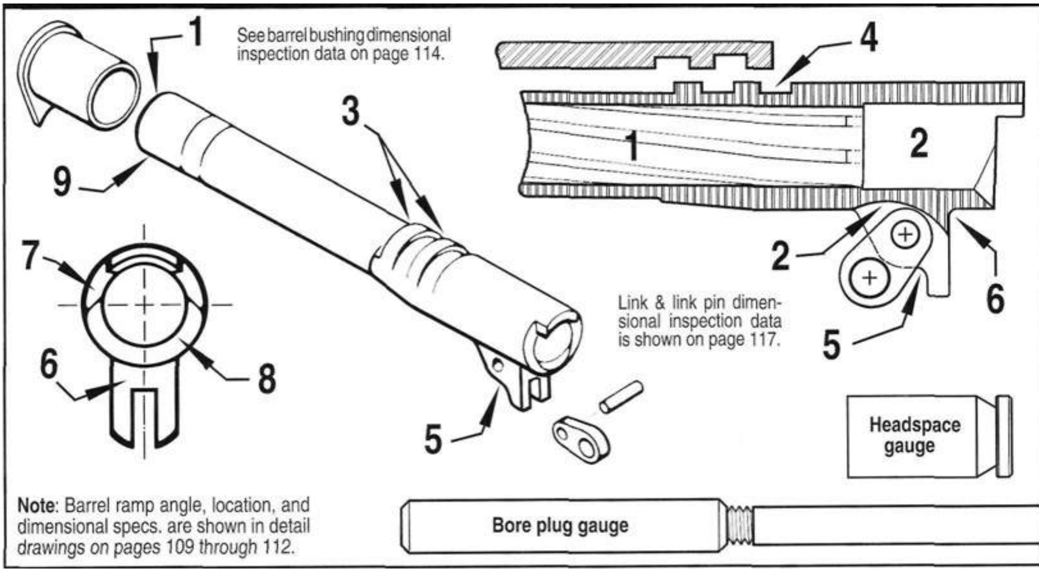


Figure 86- Arrows in sectional and exterior view illustrations by Heritage - VSP staff artist show M1911/M1911A1 barrel visual inspection points. Inspection points indicated above are listed and discussed below. M1911/M1911A1 and M1911A1 NM barrel dimensional inspection data and headspace dimension data is included in the detail drawings on the following pages. Additional M1911 barrel lug/slide lug slot dimensional data is included on pages 95, 122, and 124.

M1911/M1911A1 barrel visual and dimensional inspection points:

1. Bore and crown - Detail clean and visually inspect the bore and chamber. Remove fouling on the lands and plug gauge (range rod) reference check the bore. Suggested bore plug gauge head diameters are: .441", .442", .443" & .444" (.444" = maximum lands). Reject barrels with bores or chambers that are excessively worn, pitted, scarred, irregular, bulged, show evidence of beginning pressure/stress cracking, or are otherwise damaged. The muzzle crown must not be nicked, dented, or otherwise damaged. See examples of damaged, failed, and substandard barrels on pages 103 and 104. Barrel, bushing, link, and link pin dimensional inspection data is furnished in the various detail drawings on the following pages. **Military M1911/M1911A1 Pistol restoration note:** When rebuilding or restoring collectable military pistols, keep in mind that a certain amount of bore pitting was considered acceptable at the field maintenance level. Bore serviceability limits are listed in TM-9-2951-1, July, 1957.

2. Chamber - Clean and visually inspect the chamber as discussed above. If there is any question about chamber or bullet seat dimensions, cast the chamber and a portion of the bore with Cerrosafe and measure the casting. See chamber and bore dimensional inspection data on the following pages. Also visually inspect the bottom chamber wall for downward distortion, swell, or bulging at the thinnest wall section just above the link radius cut in the bottom lug. (Swelling is most often seen in soft, low end commercial barrels). Also, headspace check ordnance std. M1911/M1911A1 barrels and commercial equivalent component barrels as shown in figure 91 and barrel slide combinations as discussed in figure 92. Headspace in new gunsmith fit (long hood) commercial barrels is typically short. Chambers in these barrels are gauged and reamed to desired headspace after final rear barrel hood surface fitting. The difference between barrel chamber only headspace and actual slide/barrel headspace is shown on page 104. Cerrosafe casting metal is available from Brownells, Inc.

3. Barrel lugs (top) - Visually inspect the forward facing barrel locking lug surfaces. Closely inspect the vertical bearing faces, corner edges, and tops of the lugs for evidence of surface seating, alteration, battering, or other damage. Reject barrels with altered or damaged lug engagement surfaces or corners. Lug damage is discussed on page 82. Dimensional data is shown in the detail drawings on pgs. 109 & 110.

4. Barrel locking lug slots - Measure lug slot depth. Reject barrels with slots that have been machined or hand fit lower than the .285" min. spec, above bore axis for std. military barrels. See detail drawings on pages 109 and 110 for M1911/M1911A1 and M1911A1 NM lug slot dimensional inspection data.

5. Barrel lug (bottom) - Closely inspect all lug surfaces and the lug junction with the bottom of the barrel for possible cracks, surface seating, or battering. Inspect the rear underside of the barrel for evidence of link down impacts (the barrel should stop link down against the rear vertical lug face, not on the under side of the barrel). Previously used barrels: inspect the barrel link, link pin, and pin staking. Replace these

M1911/M1911A1 barrel visual and dimensional inspection points, (continued) -

components and restake as needed. See barrel link and link pin dimensional inspection data on page 117. New barrels and used barrels with link pins removed: ordnance specified bottom lug link pin hole dia. .154"+.001"(.154"min. & .155" max.). A #23 drill shank (.1540") can be used as a min. reference gauge.

6. Bottom barrel lug stop surface and lug corner radius - Inspect the rearward facing bottom barrel lug face (barrel link down stop surface) for evidence of misfitting (surface filed at an angle, too much material removed, etc.) and for possible surface slap seating or battering. Also inspect the lug/barrel junction just above the rear stop surface to make certain that the inside corner radius was not removed in previous barrel fitting. This small (1/32"R) radius is designed in to eliminate stress riser development. This helps prevent development of corner cracks that sooner or later occur without this critical radius.

7. Barrel recoil surfaces - Visually inspect surfaces for drag marking, seating, peening, or battering. **Note:** In ordnance std. M1911/M1911A1 pistols, these flat, vertical breech surfaces recoil against the corresponding vertical surfaces inside the slide. Barrel recoil surfaces are sometimes found seated or battered in off-dimension slide/barrel combinations and/or in some pistols with link down timing problems. Although less frequently seen, the extractor side may also batter (battering on this side also can be caused by an off-dimension extractor). Battering is shown in the photo example on page 53 in Volume 1. Unless toleranced long, commercial barrels with gunsmith fit hoods typically link down from horizontally engaged locking lug position and do not recoil against this surface. Suggested barrel/slide recoil surface clearance with gunsmith fit commercial barrels is .002".

8. Barrel cartridge ramp - Specifications call for a barrel cartridge ramp face angle of 35° relative to barrel vertical centerline. The ramp face must be smooth and the ramp face/chamber wall intersection (corner) edge radius (or edge break) should not exceed the .02"R max. NM specification. See dimensional inspection data in detail drawings on pages 109 through 111.

9. Barrel O.D. (at bushing contact area) - Barrel O.D. relative to bushing I.D. should, ideally, create a zero clearance fit with the barrel in locked position. See bushing dimensional data & fit on pgs. 114 - 115.

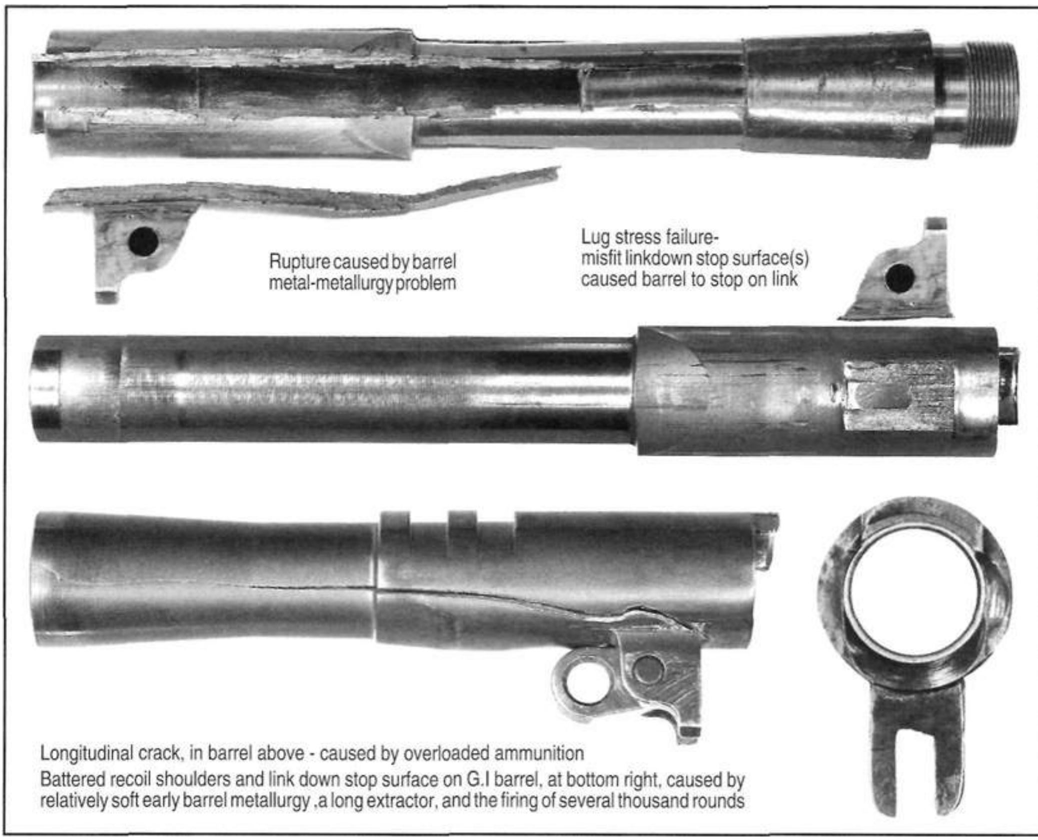


Figure 87- Shows views of defective/damaged commercial Ml911 type barrels at top, center, and bottom. An unserviceable early U.S.G.I. M1911 barrel (rear view) is shown at bottom right. Battering peened the recoil surface into the chamber on the right side of this barrel and prevented case extraction.

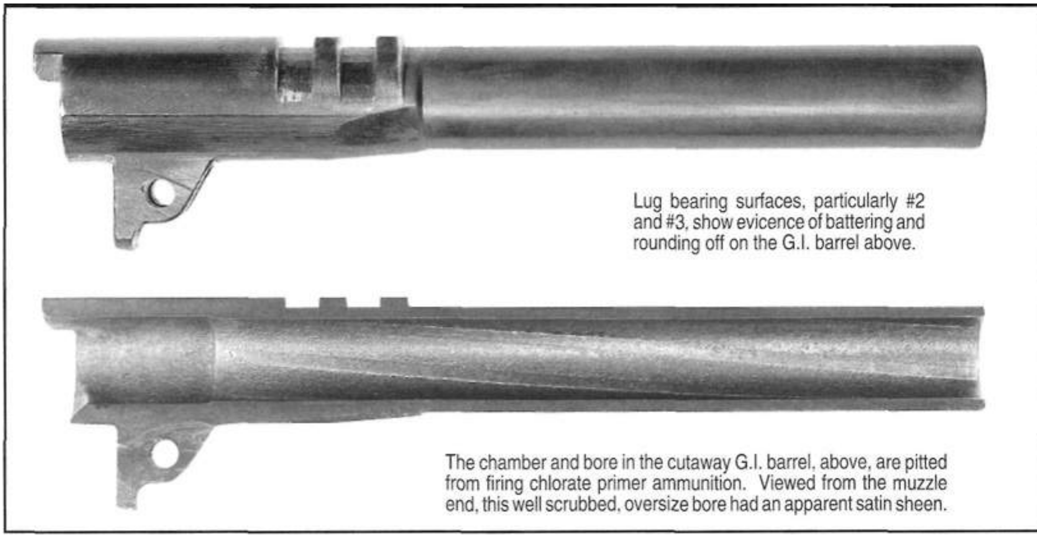
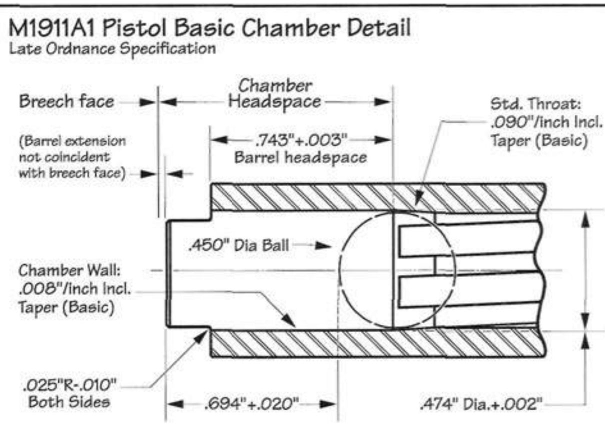
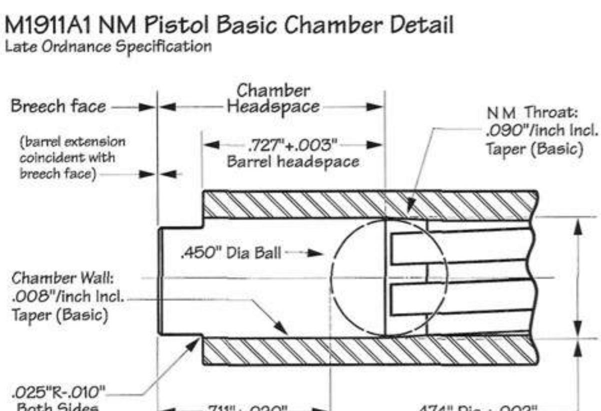


Figure 88- Shows additional views of unserviceable, defective, and/or damaged Ml911 type barrels.



M1911A1 chamber length note:

Mid spec. (barrel only) headspace is .896" (.7445" barrel + .1515" hood = .896"). Although .896" is .002" shorter than maximum cartridge headspace length (.898"), this scenario poses no problem in ordnance standardized dimension M1911 Pistols because of the .010"~.015"+ dwell (i.e., horizontal barrel/slide lug clearance) present in these pistols. In this case, the chambered cartridge simply pushes the barrel forward and fractionally closer to full horizontal lug engagement as the slide and barrel go into battery. See vertical and horizontal lug engagement in cycle of operation section on pages 39-46.



M1911A1 NM chamber length note:

Zeroing out the +/-.003" barrel chamber and hood tolerances, nom. NM chamber length + nom. NM barrel hood length (.727"+.181") = a (barrel only) chamber headspace of approx. .908". This follows because NM barrels were dimensioned for light hood fitting and to link down from the horizontally engaged locking lug position in NM slides.

Note: *Larger versions of illustrations, at left, are shown on page 23.*

Simplified ordnance style drawings, by Heritage-VSP staff artist, are representative only, and not to scale. Proportions variously exaggerated to better show surface locations and internal/external features.

Figure 89- Ordnance style illustrations by Heritage - VSP staff artist show std. M1911A1 and NM barrel chamber and bullet seat dimensional data and barrel (only) chamber length for the M1911 ball cartridge. Keep in mind that std. M1911A1 barrel chamber length is a barrel only headspace reference. Actual chamber headspace is defined as the distance from the chamber's cartridge heading shoulder to the breech face with the barrel in horizontally lug engaged position. In the NM barrel illustrated, the nom. .727" barrel headspace dimension + nom. .181" recoil shoulder to breech face distance would equal a barrel headspace of .908" (.898" NM cartridge length + .010"). Hood fitting would fractionally reduce this figure.

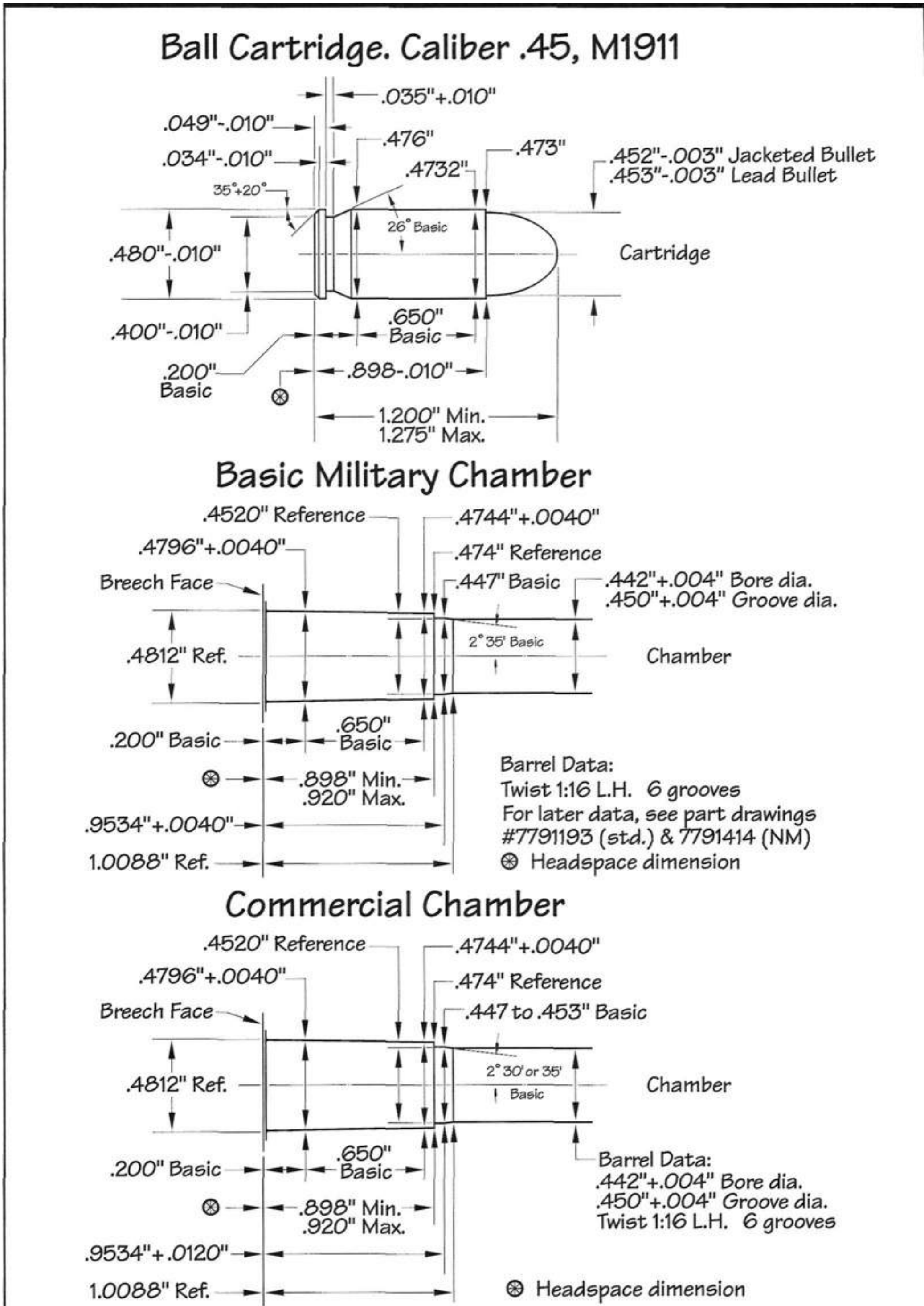


Figure 90- Illustrations by Heritage - VSP staff artist show M1911 ball cartridge, basic military Ml911 ball cartridge chamber, and commercial industry std. .45ACP chamber dimensions. Ordnance standardized .898" min. and .920" max. chamber headspace specs, carried forward into industry specifications. Although the above .022" min./max. headspace range is somewhat generous by current commercial standards (+.010" to .012" is a workable max. in commercial pistols), it did (and still does) permit clean or dirty pistol function and operation with virtually all possible pistol and ammunition combinations.

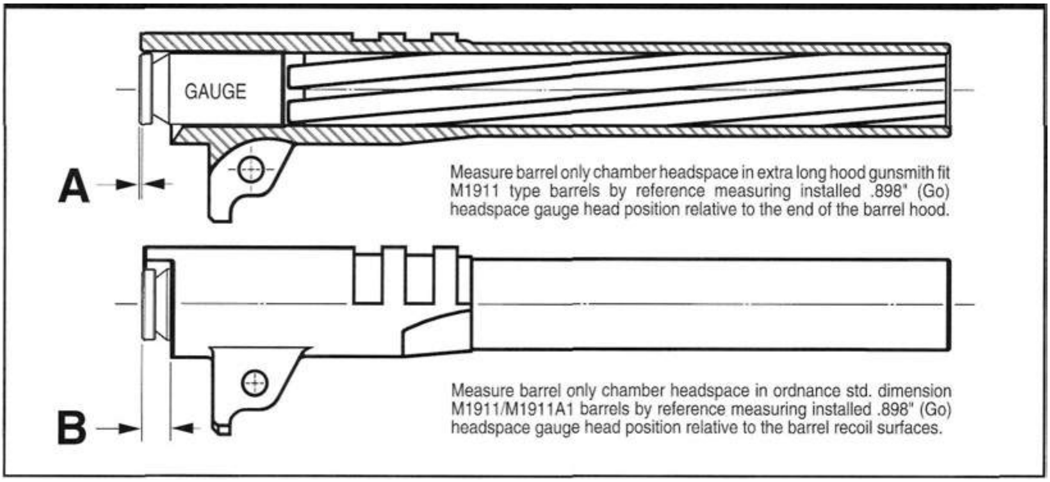


Figure 91- Illustrations by Heritage - VSP staff artist show barrel only chamber headspace checks in a long hood gunsmith fit M1911 type barrel at **A**, and in an ordnance standard (short hood) M1911A1 barrel, at **B**. See standard M1911/M1911A1 and NM barrel only chamber dimensional data in figure 89.

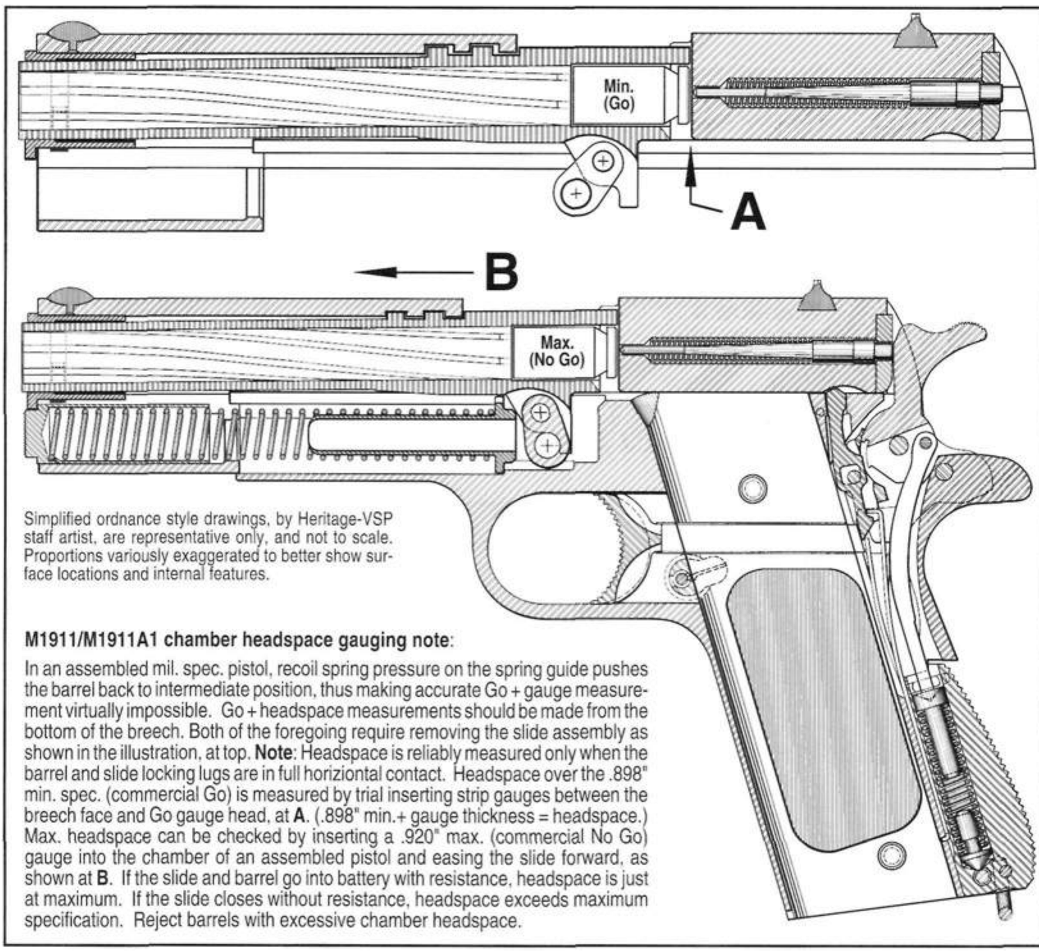


Figure 92- Ordnance style sectional illustration by Heritage - VSP staff artist, at top, shows a commercial minimum chamber (Go) headspace gauge installed in an M1911A1 slide assembly. The sectional illustration below depicts an M1911A1 pistol with excessive chamber headspace- as evidenced by the fact that, in this example, chamber length permitted the slide to close on a .920" maximum chamber (No Go) headspace gauge.

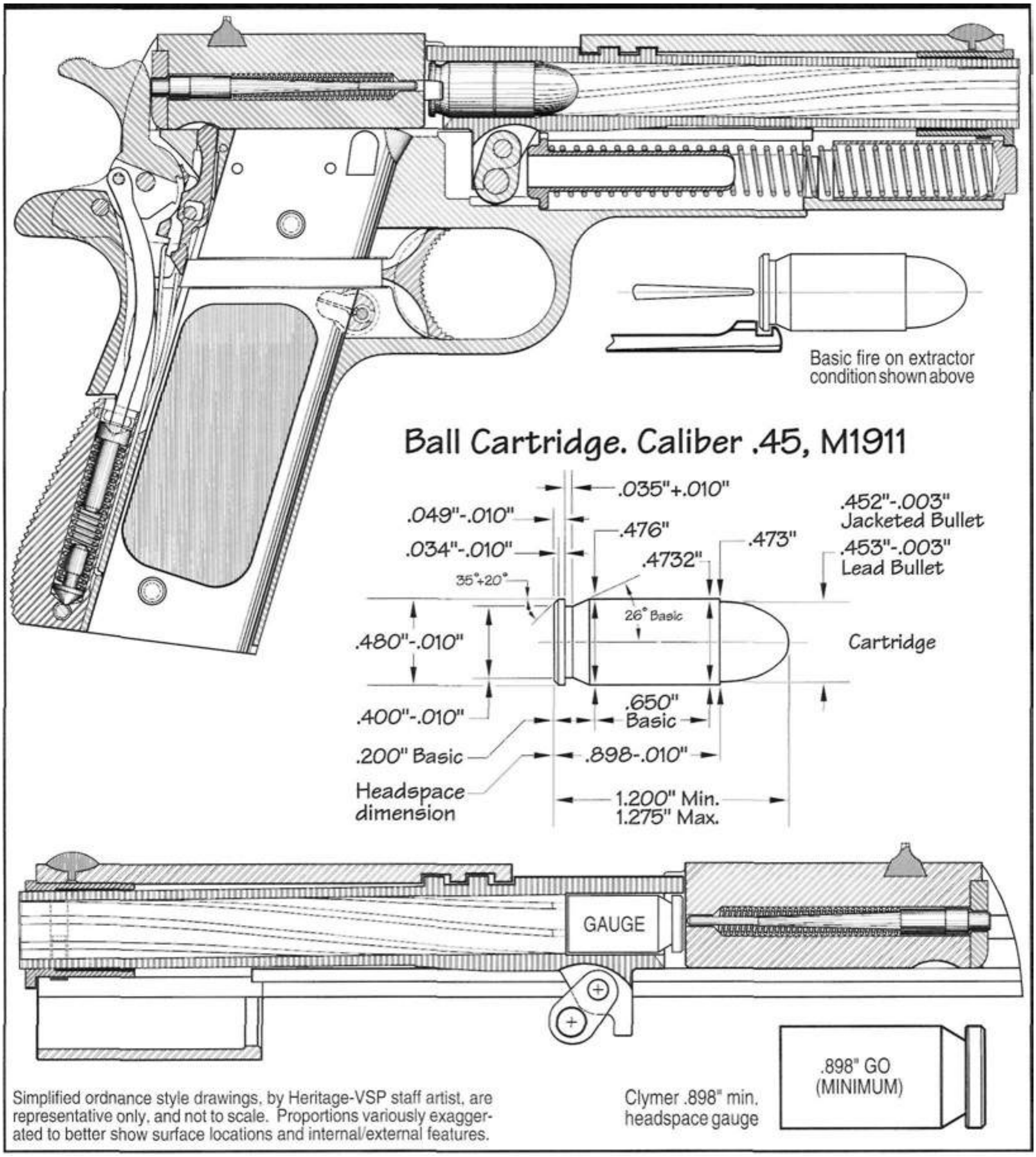


Figure 93- The ordnance style sectional illustration by VSP - Heritage staff artist, at top, depicts an Ml911 cartridge retained in proximity to the breech face by the extractor in an M1911Al Pistol. In this example, relative cartridge/chamber headspace and extractor hook engagement do not permit the cartridge case (mouth) to contact the chamber's heading seat. This condition (the cartridge being held in proximity to the breech face by the extractor hook) was humorously referred to by engineers and armorers at Springfield in the 1950's as *headspacing on the extractor*. *Firing on the extractor* was the term used to describe what came next. This condition was common in moderate to maximum chamber headspace M1911/M1911A1 Pistols, particularly when short/intermediate headspace length cartridges were fired. The ordnance requirement that M1911/M1911A1 Service Pistols should be able to fire any Ml911 (ball) cartridge under virtually any circumstance was the logic behind this seemingly strange headspace condition - which can't be argued with, because it worked well in combat in two world wars. **Note:** This feature is counterproductive in improved performance and competition M1911 Pistols because it adds a random longitudinal firing pin impact factor to the variable primer ignition problem discussed earlier. The sectional illustration, at bottom, shows a Clymer min. *(go)* headspace gauge installed in the chamber of a gunsmith fit long hood barrel. Ideal headspace in improved performance and competition pistols is based on cartridge case length plus a clearance factor for brass flow and firing residue. Suggested chamber headspace in improved performance .45 ACP Ml911 Pistols is max. cartridge length of .898"+.005". Measure headspace as discussed in figure 92.

Improving performance with gunsmith fit (long barrel hood/short chamber) commercial barrels-

With rimless, relatively straight case cartridges such as the Ml911 .45 Ball Cartridge/.45 ACP, chamber headspace is defined as the distance from the chamber's cartridge case heading seat (cartridge case shoulder) back to the breech face with the barrel lugs in the forward, horizontally locked position.

Actual headspace in ordnance std. M1911A1 Pistols and commercial equivalents with standard (short hood) barrels is made up of basic barrel chamber headspace (see page 104) plus the distance from the barrel recoil shoulder(s) rearward to the breech face with the barrel in horizontally locked position. But, because the recoil spring assembly in std. (short hood) Ml911 type pistols holds the barrel rearward of horizontal locking lug contact (to the rear of actual headspace position) - the barrel is always in an intermediate headspace position until the pistol is fired and the resulting pressure forces the locking lugs forward into full horizontal engagement. This design feature (see operating cycle on page 42) is workable only with low pressure cartridges such as the .45 ACP, which operates in the 17,000 plus psi range. The .22 L.R. cartridge, by comparison, generates approx. 24,000 psi. **Cautionary note:** Intermediate and higher pressure/velocity cartridges render this design feature unworkable due to the much higher energy slap seating force exerted on the slide and barrel lug bearing surfaces. For this reason, barrel hoods must be fit to horizontally engage the locking lugs (and thereby physically headspace the barrel) in barrels chambered for higher than ordnance standard pressure cartridges. See custom barrel/barrel hood fitting beginning on page 125.

General accuracy improvement notwithstanding, two problems (i.e., variable headspace and lug surface slap seating) are eliminated by physically headspacing the barrel. With long hood gunsmith fit barrels, this is done by adjusting the rear hood surface so that barrel hood/breech face contact causes the barrel and slide lugs to engage horizontally as the barrel links upward and the lugs engage vertically. Army marksmanship unit armorers used to aptly call this *headspacing on the barrel hood.* In this way barrels, chambers, and cartridges all actually headspace with reference to the breech face.

Headspace reaming note: At first glance, the .898"+.005" chamber headspace suggested for improved performance .45 ACP Ml911 Pistols discussed earlier may seem to be in conflict with ordnance .898" min. and .920" max. chamber headspace specs, but, in fact, is not. The suggested closer specification simply leans toward the precision side of the Ml911 design envelope. As far as the service pistol side is concerned, keep in mind that: (a) M1911 cartridge headspace was ordnance standardized at .888" minimum and .898" maximum and (b) that in ordnance std. pistols, slide-barrel hood horizontal clearance of .015" to .020"+ is taken up as the barrel is forced rearward by recoil spring pressure.

The following examples show combined effects of headspace related dimensional tolerances on cartridge chambering and breeching in within-specification ordnance std. M1911/M1911A1 Pistols:

Example 1 - In this example, presume a maximum rear barrel clearance and a minimum barrel chamber headspace condition. In this case, a max. headspace cartridge would contact the chamber's heading seat and push the barrel part way forward (against recoil spring pressure) toward horizontal lug engagement as the slide assembly went into battery. Although not a true *on-gauge* headspace condition, the cartridge case is nonetheless in contact with both the breech face and the chamber's heading seat when fired.

Example 2 - Presume in this opposite case example, a minimum rear barrel clearance and a maximum chamber headspace condition- and a less than maximum headspace cartridge. In this case, the chambered cartridge case would not contact the chamber's heading seat and would not push the barrel toward horizontal locking lug engagement. Here, the cartridge would be retained in proximity to the breech face by the extractor. Even if extractor hook location was off-tolerance (and cartridge position was somewhat forward of the breech face) inertial firing pin energy would still be more than sufficient to fire the cartridge *See. firing on the extractor* in figure 93.

As with intermediate vertical locking lug engagement discussed earlier, wide tolerance breeching was not an accidental feature of the ordnance standardized M1911 design. Both concepts, incorporated into a rough and tumble *drop it in the mud and it will still fire* service pistol, were proven workable in two world wars- but are the antithesis of precise mechanical repeatability. Because these military combat features mechanically limit higher accuracy and create variable primer ignition they are undesirable in improved performance and competition grade Ml911 pistols.

Causes of variable primer ignition:

1. Firing pin/primer misalignment (firing pin port/chamber/primer axis misalignment)
2. Excessive/variable headspace (firing on the extractor, cartridge deflection on firing pin contact, etc.)
3. Irregular primer seating depth
4. Changing/nonrepeatable left/right and/or up/down slide position
5. Changing/nonrepeatable locked barrel position (floating rear barrel position)

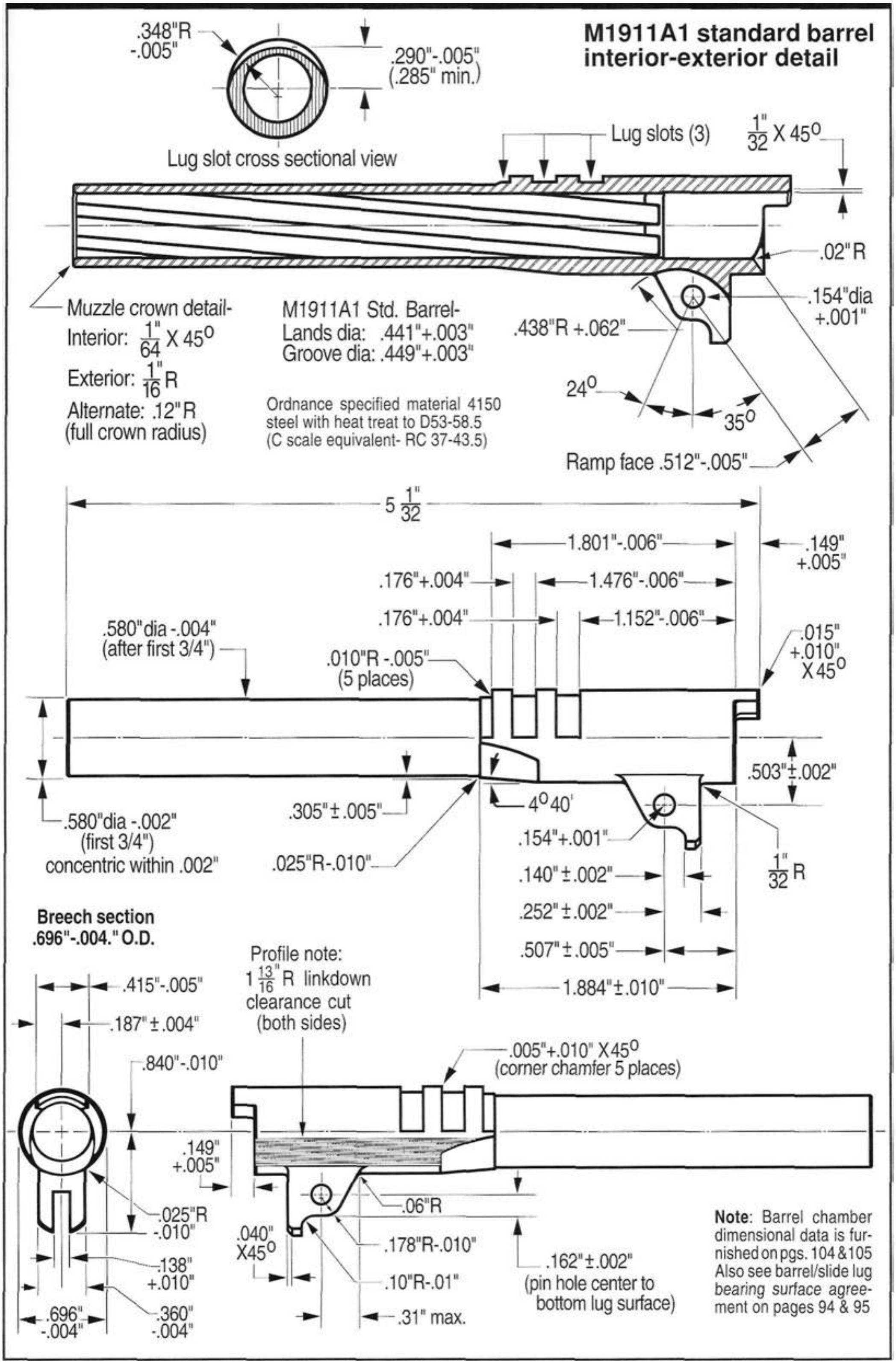


Figure 94- Ordnance style sectional and exterior view detail drawings by Heritage -VSP staff artist show M1911/M1911A1 barrel critical operating surface locations and dimensional inspection data.

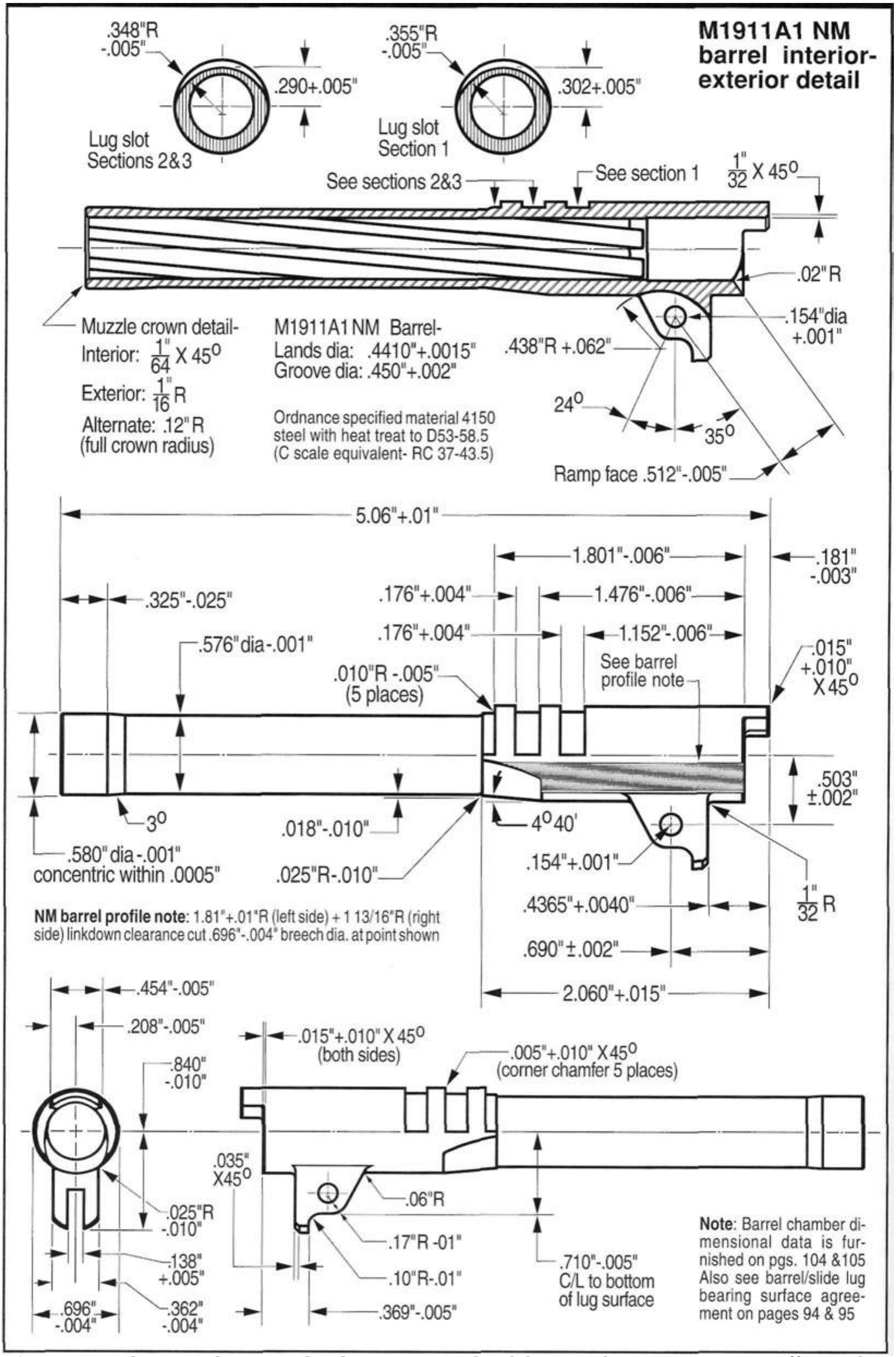


Figure 95- Ordnance style sectional and exterior view detail drawings by Heritage - VSP staff artist show M1911/M1911A1 NM barrel critical operating surface locations and dimensional inspection data.

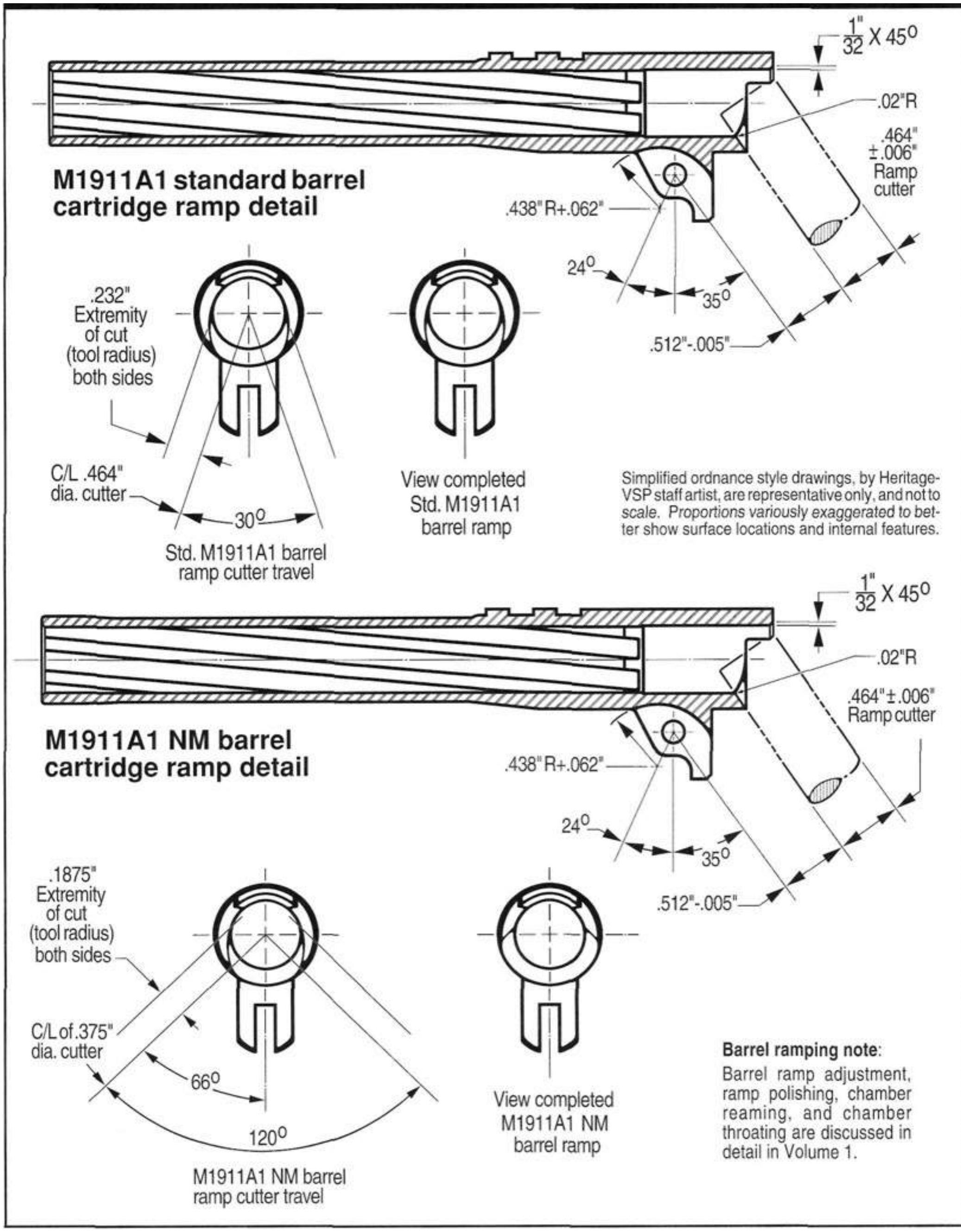


Figure 96- Ordnance style sectional and exterior view detail drawings by Heritage - VSP staff artist show M1911/M1911A1 NM barrel critical cartridge ramp surface locations and dimensional inspection data.

M1911A1/M1911A1 NM barrel inspection notes:

(1) Early/intermediate specifications called for 1035 and several other basically carbon steels. (2) Late ordnance specified material for both standard and NM barrels is 4150 steel. (3) Late hardness test specification is Rockwell D53-58.5 (C scale equivalent is RC37 to 43.5). (4) Ordnance specifications called for proof testing of M1911A1 and M1911A1 NM barrels by firing one high pressure test cartridge and then magnetic particle testing barrels for cracks, seams, and other potentially injurious defects- hence the proof firing stamp "P" and magnetic particle test stamp "M" on military barrel bottom lugs. For complete M1911A1 Pistol standard barrel dimensional data, consult ordnance drawing #7791193 and for 1911Al NM barrel dimensional data, see ordnance drawing #779414.

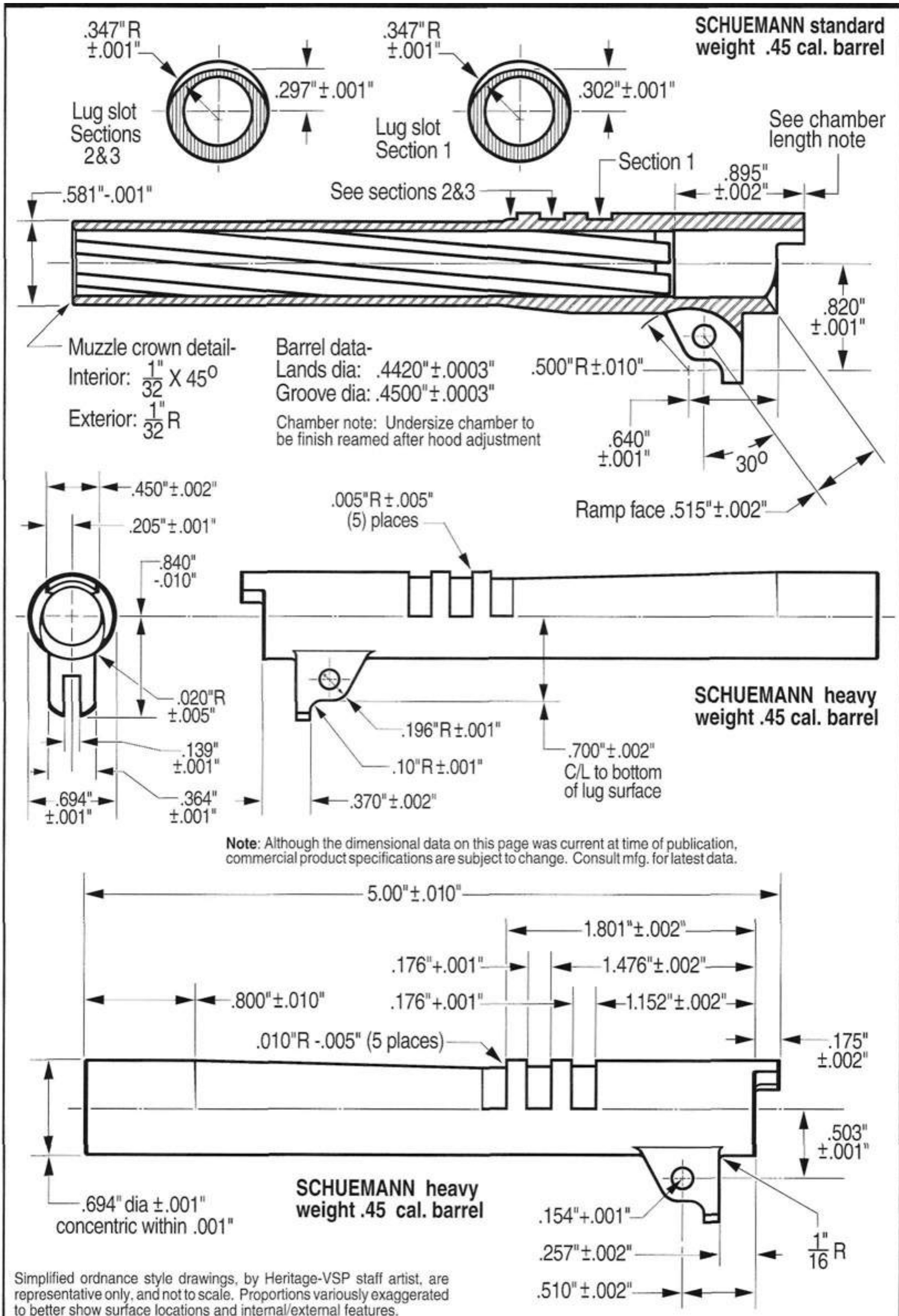


Figure 97- Ordnance style sectional and exterior drawings by Heritage - VSP staff artist show Schuemann Ml911 barrel dimensional data for comparison. Data, courtesy-Karl Schuemann. These superb quality barrels far exceed ordnance NM specifications and are, in fact, optimum performance standard barrels. See optimum performance Ml911 Pistol component section beginning on page 183.

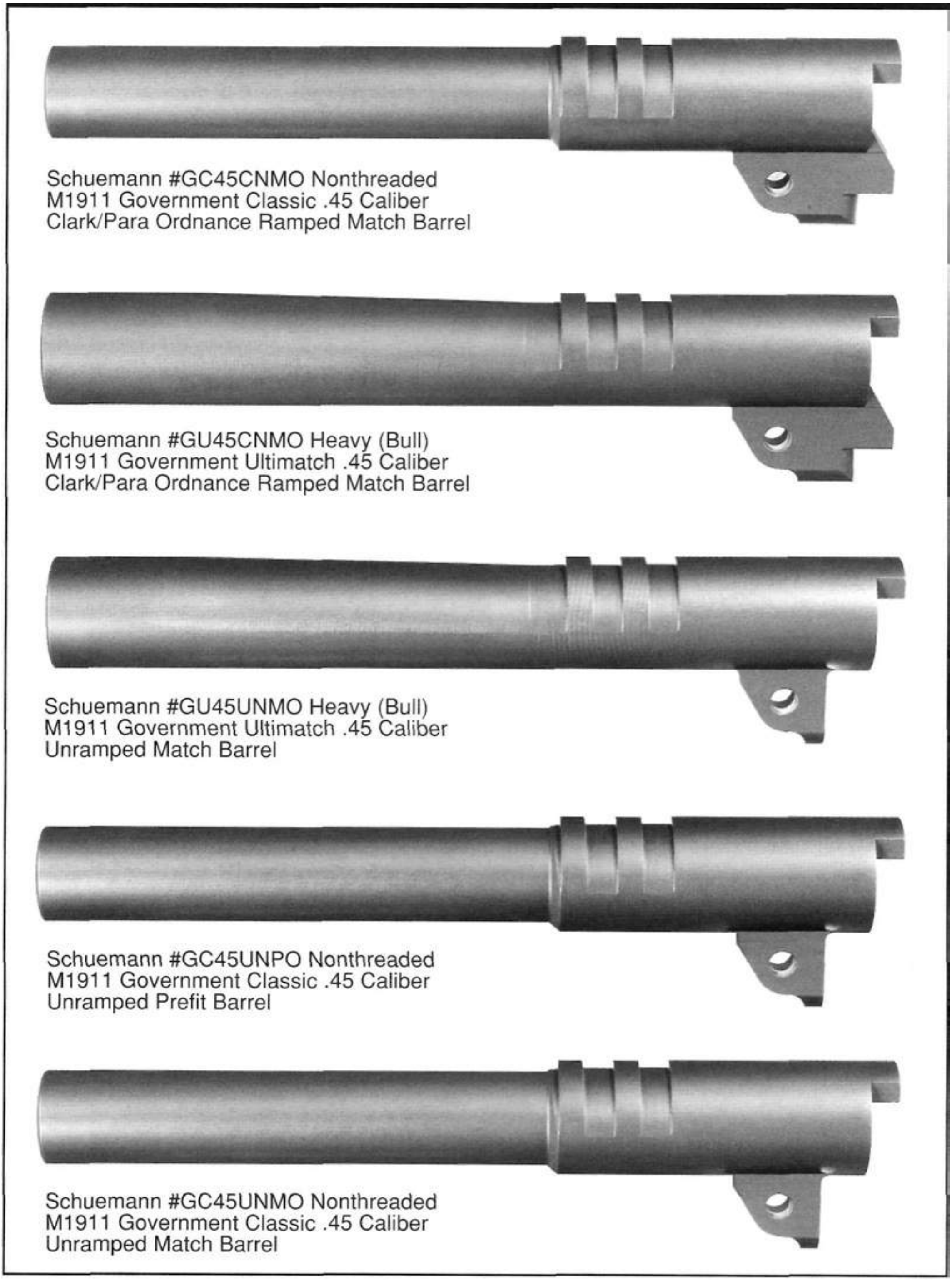


Figure 98- Shows examples of 5 of the 100 Schuemann M1911 Pistol barrel variations available at the time of publication. Schuemann M1911 barrels are machined from solid 416 stainless bar stock in an advanced 10-axis German mill/turn center in one continuously programmed machining sequence. On completion of the last machining operation, barrels exit the machine fully finished inside and out with only degreasing, hardening/tempering and deburring steps left to perform. With finished Schuemann barrels being virtually identical, type for type, the final hood adjustment needed to mate these barrels to slides is simpler and more consistent. Schuemann barrels are capable of sub 1" groups, from machine rest, at 50 yards. This level of accuracy was considered impossible in Ml911 Pistols by previous standards- even from a machine rest- and, needless to say, far exceeds human holding capability.

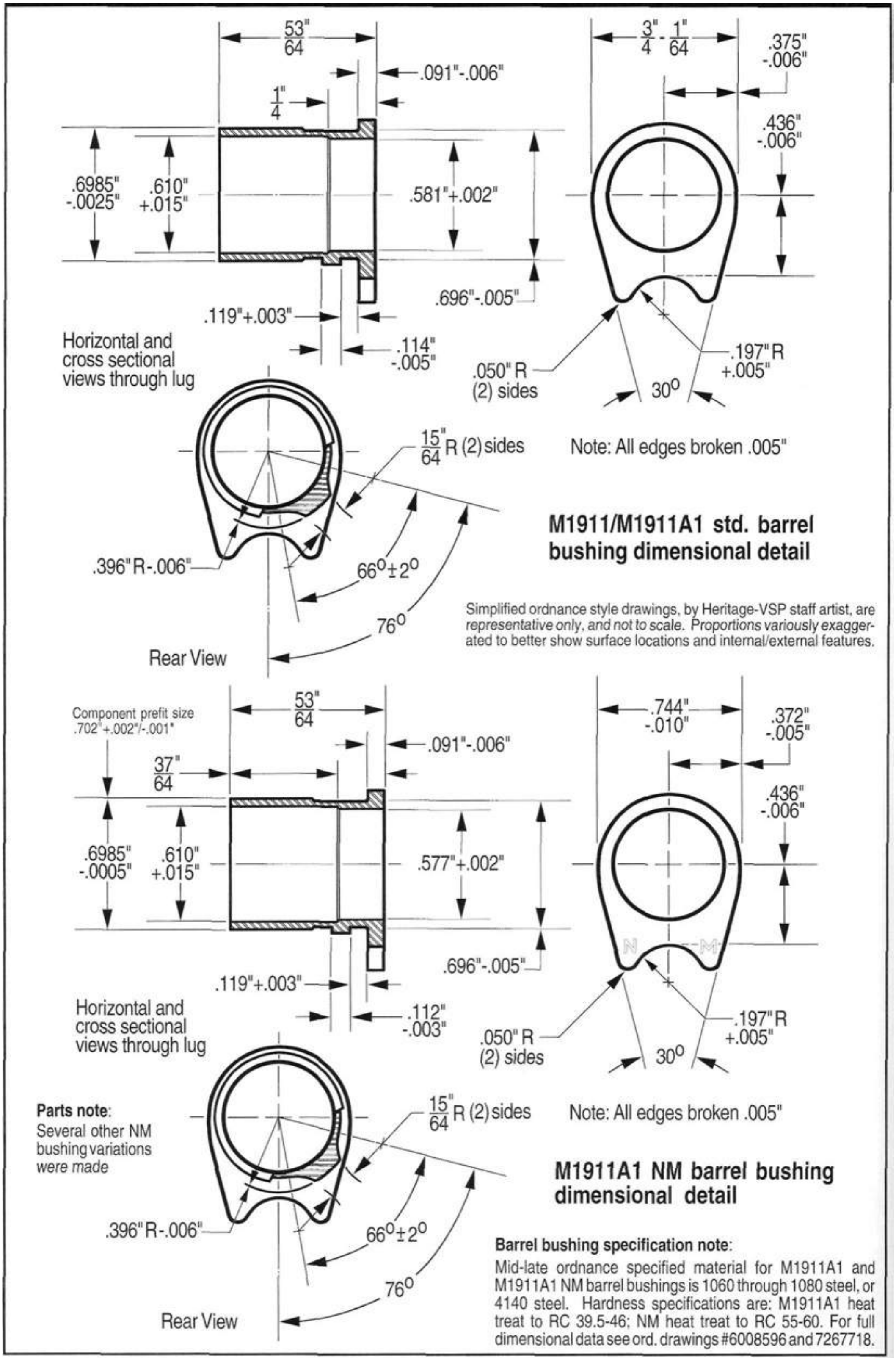


Figure 99- Ordnance style illustrations by Heritage1- VSP staff artist show M1911/M1911A1and M1911A1 NM barrel bushing dimensional inspection data. Visually inspect for alteration or damage.

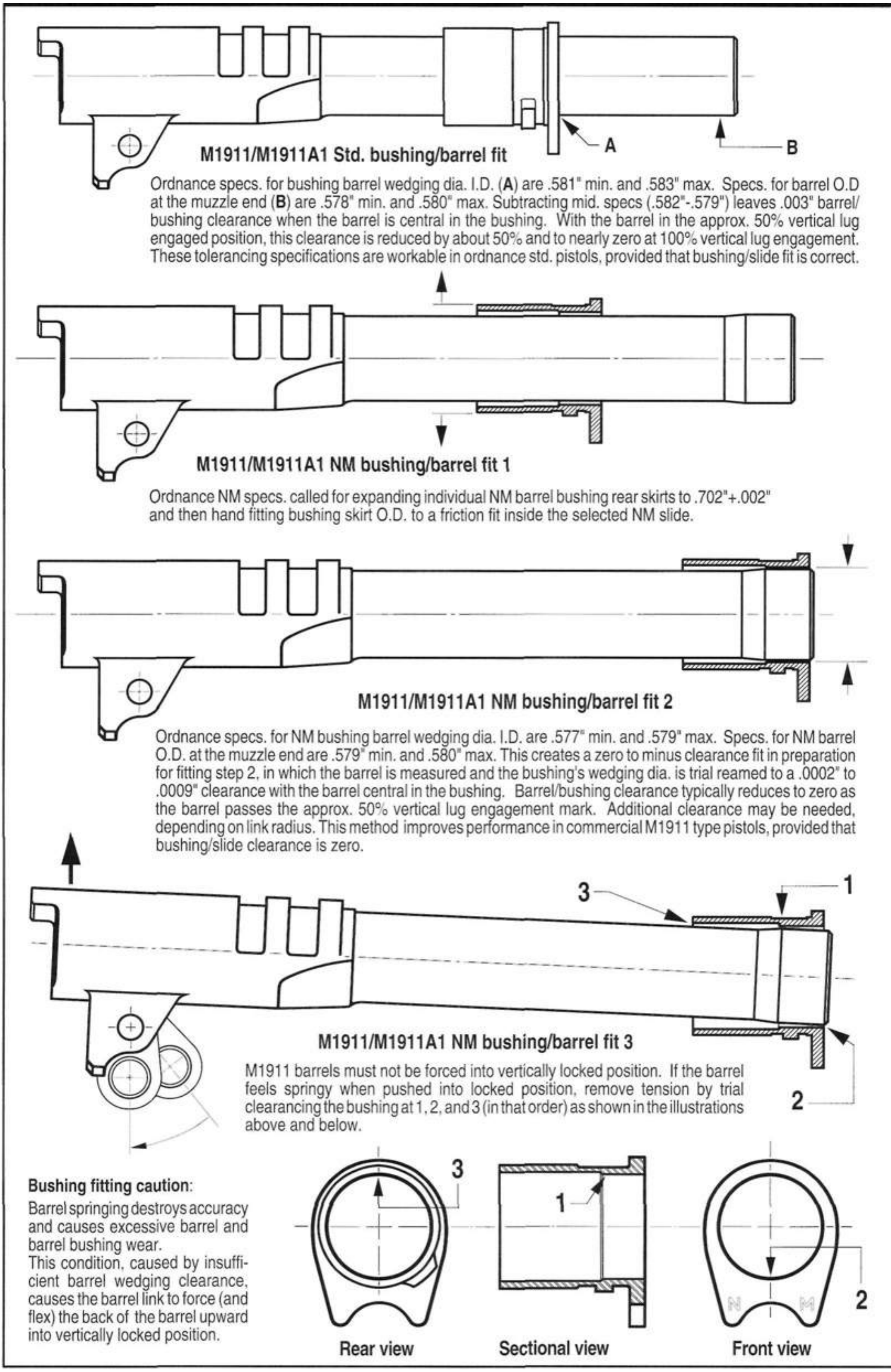


Figure 100- Ordnance style illustrations by Heritage - VSP staff artist show M1911/M1911A1 and NM barrel bushing fitting and clearance data- also applicable to commercial M1911's with similar bushings.

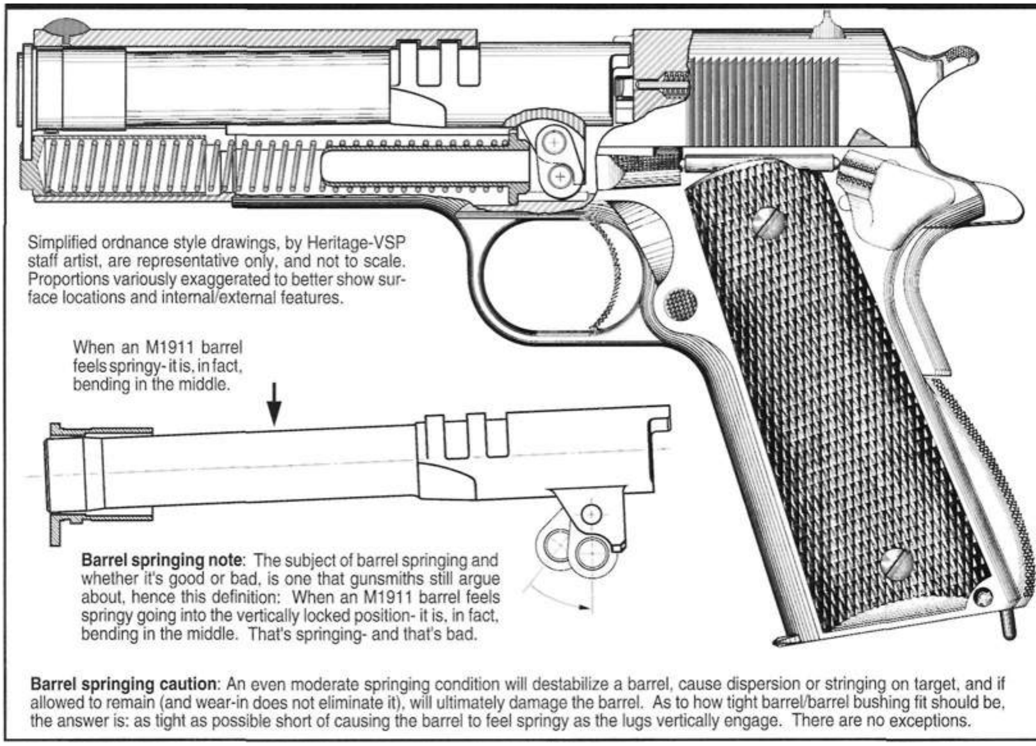


Figure 101- Ordnance style phantom sectional illustration by Heritage - VSP staff artist, at top, shows a barrel and gunsmith fit custom barrel bushing (oversize O.D. and undersize I.D.) installed, after fitting, in an M1911A1 Pistol. **Caution:** Always check for barrel springing and remedy before firing the pistol. Slightly tight bushings and/or bushings that wedge fractionally early can be lapped to optimum fit by applying a fine nonembedding lapping compound such as Brownells #800 aluminum oxide lapping paste and cycling the slide until clearance is correct and the barrel no longer springs.

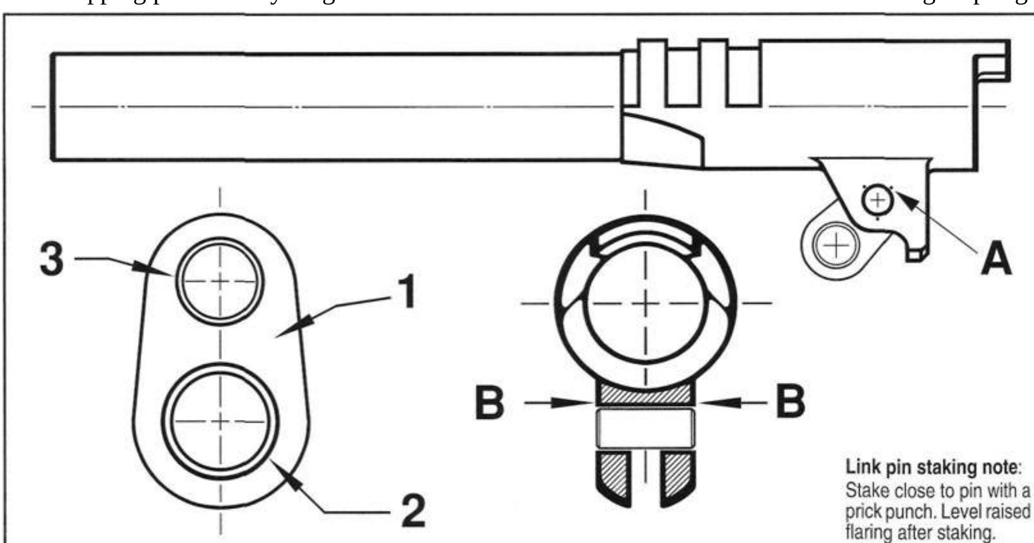
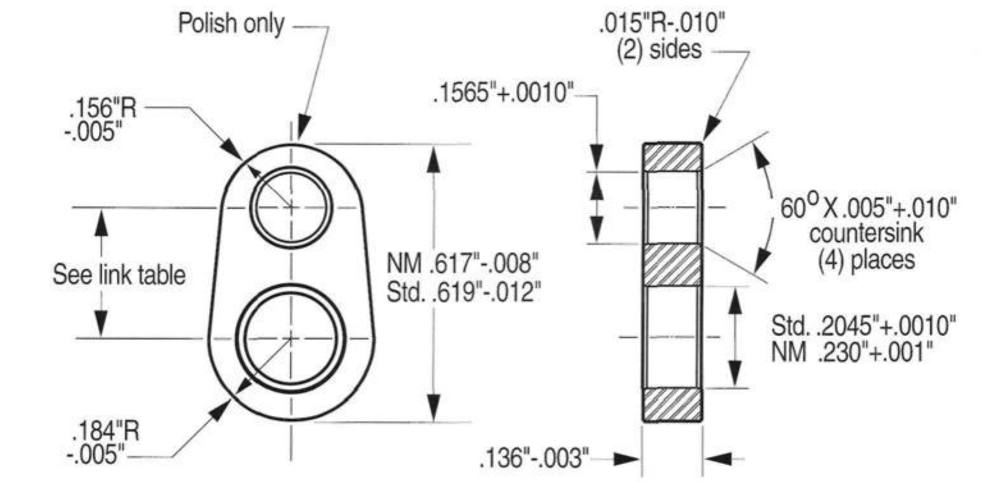


Figure 102- Ordnance style illustration by Heritage - VSP staff artist shows M1911/M1911A1 and M1911A1 NM barrel link visual inspection points and barrel link pin staking locations. Dimensional inspection data is shown in figures 103 and 104. Inspect the barrel link body, at **1**, for beginning cracks and check the pin holes, at **2** and **3**, for alteration and wear oversizing. Military 3 point, prick punch link pin staking, as shown at **A**, is suggested for military pistols with slightly loose link pin holes. Single point staking at the 12 O' clock position on both sides of the bottom barrel lug, as indicated at **B**, is suggested for tighter fitting barrel link pins. Level flaring after staking.

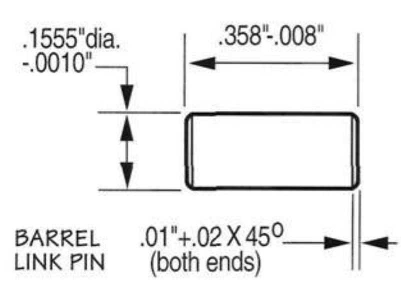


M1911/M1911A1 and M1911A1 NM barrel link detail

Standard range (nom. size .278")	**Std. minus range** (nom. size .278")	**Std. plus range** (nom. size .278")	**NM spec. range** (nom. size .291")	**NM spec. plus range** (nom. size .291")
.277"	-.001"= .277"	+.001"= .279"	NM .290"	NM +.001"= .292"
.278"	-.003"= .275"	+.003"= .281"	NM .291"	NM +.004"= .295"
.279"	-.005"= .273"	+.005"= .283"	NM .292"	NM +.008"= .299"
	-.006"= .272"	+.006"= .284"		
	-.009"= .269"	+.009"= .287"		
		+.010"= .288"		

Barrel link table

Figure 103- Ordnance style illustrations by Heritage - VSP staff artist show M1911, M1911A1, and M1911A1 NM barrel link dimensional data. Ordnance barrel link material/hardness specifications are: 1075 through 1085 steel heat treated to RC40-47. Barrel link dimensional notes: (1) Although nominal ordnance standard M1911/M1911A1 barrel link size is .278", actual standard radius length specification is .278" +/- .001"- this makes links with .277", .278", & .279" hole centers standard. (2) Ordnance specification for M1911A1 NM barrel links is .291"+/-.001" making .290", .291", & .292" links NM size. Commercial barrel links are available in ordnance specified sizes and in the above listed sizes.

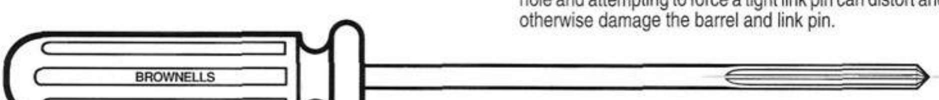


Barrel link pin diameter note:

The #5013199 barrel link pin illustrated, at left, was specified for use in all M1911A1, M1911A1 NM, and M15 pistols. Ordnance specified maximum pin diameter is .1555". Specified minimum link pin diameter is .1545".

In rounding these ordnance specifications up and down, commercial parts manufacturers have created defacto large (.156") and small (.154") barrel link pin sizes. Having two pin sizes to work with is helpful in fitting because of the variance found in barrel link pin hole diameters.

Caution: Before attempting to install a barrel link pin, reference check the link pin hole in the bottom barrel lug and then ream the link pin hole to the press fit diameter that matches the diameter of the selected link pin. Failure to ream the pin hole and attempting to force a tight link pin can distort and/or otherwise damage the barrel and link pin.



The Brownells link pin hole reamer, illustrated, has a slightly undersize pilot tip to help the reamer self align.

Figure 104- Ordnance style illustration by Heritage - VSP staff artist, at top, shows M1911/M1911A1 and M1911A1 NM barrel link pin dimensional inspection data. Ordnance link pin material/hardness specifications are: tool steel drill rod, heat treated to RC 43.5 to 50 before grinding to specified diameter. A Nowlin link pin hole reamer, available from Brownells, Inc., is shown, at bottom. Link pin reamers are available in nom. .154" and .156" diameter sizes.

M1911/M1911A1 slide-barrel-frame fit

1. Ordnance std. dimension Ml911, M1911A1, and commercial equivalent pistols:

Assembly note: If the pistol at the bench is a military Ml911, M1911A1, or commercial equivalent that was disassembled primarily for parts inspection and parts replacement, see basic firing pin port/ bore axis alignment and vertical lug engagement checks on pages 119 and 120 and skip forward to slide parts inspection, fitting, and installation beginning on page 140.

2. Improved performance, accurized, and competition grade Ml911 type pistols:

Assembly note: This section deals with precise slide-barrel-frame fit; vertical and horizontal component tolerance related variables that affect fit; and surface locations and adjustments that are important in assembling improved performance, accurized, and competition grade Ml911 type pistols. The fitting steps in this section depend largely on relative slide and barrel dimensions. For this reason, the checks, dimensional variables, fitting steps, and related page/figure references in the directory below are listed in typical and usual order, rather than in a fixed sequence.

1. Locating firing pin ports in commercial M1911 type slides as a necessary cherry picking step. See firing pin port locating methods on page 121. Also see port mislocation examples in figure 172.
2. Selecting barrels for top lug slot dimensions (lug slot depth relative to bore axis) for best bore axis alignment with the firing pin port when the installed barrel is in the 100% vertically locked position. See illustration and barrel lug slot data on page 122.
3. Vertical and horizontal lug engagement variables- This subject includes barrel and slide lug bearing surface agreement; checking and selecting slides for within specification lug bearing surface locations; and equalizing the top barrel lug bearing surfaces in the horizontal plane to agree with the slide. See discussion and lug bearing surface measurement and fitting on pages 123 and 124.

Horizontal lug engagement note 1: Equal lug bearing surface engagement (and, relatedly, equal lug pressure loading) is important in improved performance and competition M1911 pistols- and especially in pistols chambered for higher than ordnance std. design pressure cartridges. Equal lug bearing is all the more important in medium plus heat treat slides and barrels- and of particular importance in stainless steel slides and barrels, because of the somewhat lower shear factor associated with heat treated stainless steels. The point made is that, regardless of a given shear factor, it shouldn't be taxed.

Horizontal lug engagement note 2: (with reference to barrel fitting) Barrel lug bearing surfaces must be checked and fit to uniformly engage the corresponding slide lug bearing surfaces before barrel hood fitting. See page 124. Rear barrel hood fitting on gunsmith fit (long hood) custom barrels will then place the barrel in horizontally engaged lug position as the barrel is linked upward into the vertically engaged lug position. See barrel hood fitting on pages 125-127 and final hood fitting on page 134.

Vertical lug engagement note: Basic vertical barrel lug engagement is determined by slide and frame aggregate vertical dimensional tolerances (net vertical stack dimension from the center of the frame slide lock crosspin hole to 12 o'clock on the nom. .699" barrel passage dia. inside the slide). Bottom barrel lug cutting adjusts the barrel to this dimension less 1/2 of frame slide lock crosspin hole diameter.

4. Custom barrel fitting steps and the ***holy grail*** of Ml911 slide/barrel fitting. See discussion in fig. 112.
5. Useful barrel fitting tools, fixtures, and gauges. See illustration on page 128.
6. Top barrel lug slot adjustment- i.e., adjusting the bottoms of the top barrel lug slots to fractionally improve bore axis/firing pin port alignment after barrel hood fitting. See figure 118.
7. Bottom barrel lug cutting, final bottom lug camming surface fitting, barrel stability in the vertically locked position, and the all important rear barrel support triangle. See page 131.
8. Bottom lug cutting tools and related fixtures. See illustration on page 132.
9. Barrel link selection and final barrel hood fitting. See figure 121.
10. Barrel link down timing and slide/top barrel lug clearance. See discussion on pages 135, 191, and 194.

Top barrel lug-slide cycling clearance note: Frame and/or barrel link down stop surface adjustment is almost always necessary and provides top barrel lug/slide lug clearance (when the barrel is in linked down position) after the bottom barrel lug has been cut. **Note:** An apparent top barrel lug/slide static clearance at the bench may not actually exist under dynamic firing and slide cycling conditions.

11. Fitting Schuemann heavy profile *bull* barrels. See discussion in figure 123.

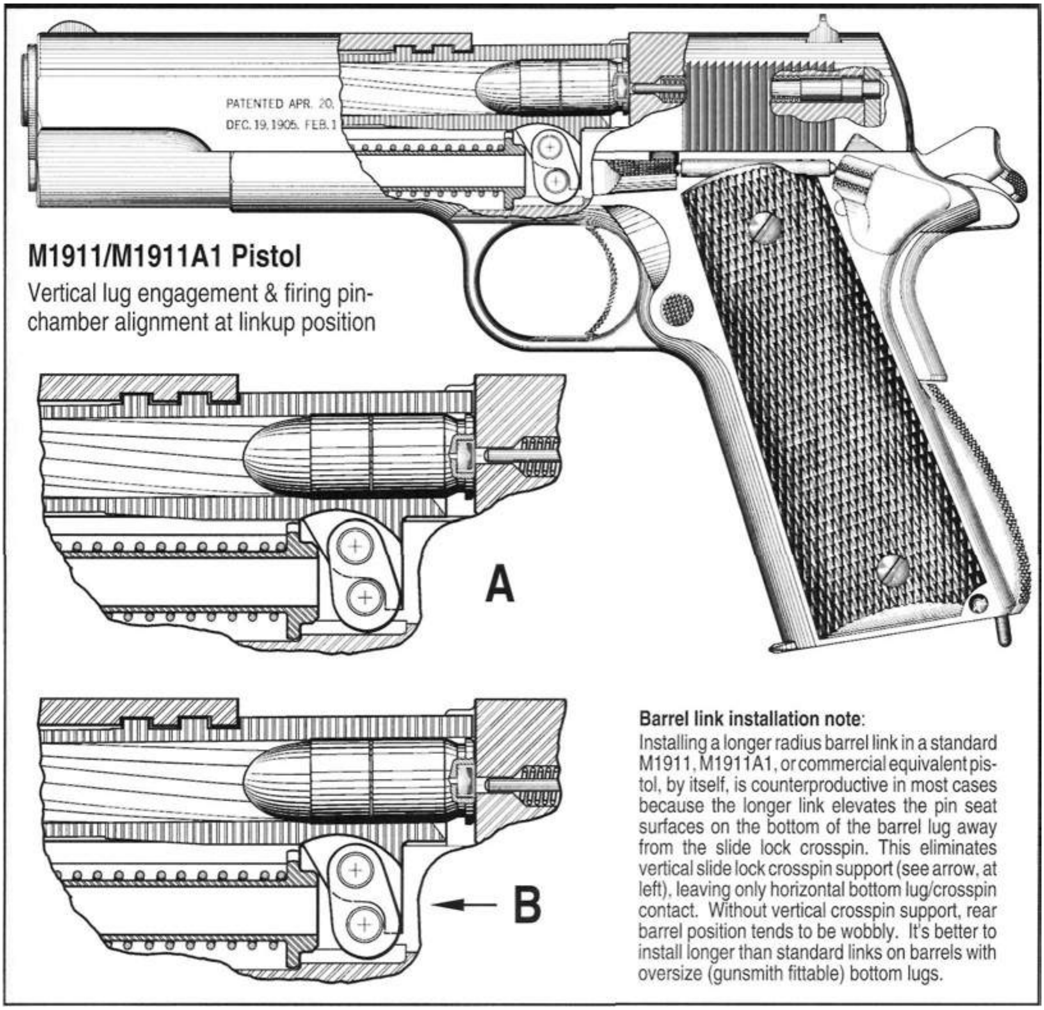


Figure 105- Ordnance style phantom sectional illustration by Heritage - VSP staff artist, at top, and enlarged sectional view at **A**, show firing pin port and chamber/primer axis in apparent alignment with a .305" rear lug slot custom barrel installed and linked to 100% vertically engaged position. **(Note:** .305" is approx, mid NM spec.) The illustration, at **B**, shows the effect of linking a standard barrel (std. lug slot spec. .290"-.005") to 100% vertical lug engagement in the same slide. In this example, barrel lug slot depth is .288" (approx, mid spec.) and the firing pin port is at nom. specification of .437". Subtracting the difference between the two lug slot bottom surfaces (.305"-.288"=.017"), and adding an .002" allowance for slope, brings the total to .019"- the actual firing pin primer mismatch in this example. This illustration makes the point that higher barrel link up in standard pistols is not suggested, by itself, because a longer radius link elevates the bottom lug crosspin seat away from the slide lock crosspin. This, in turn, makes barrels less stable *(wobbly on the crosspin)* and creates a greater firing pin primer mismatch than might have existed before. Longer than standard barrel links are best used with gunsmith fit (long hood + oversize bottom lug) barrels - and preferably barrels with NM spec, rear lug slots (.302"+.005").

Checking barrel firing pin port alignment in assembled Ml911 and M1911A1 Pistols-

M1911 and M1911A1 Pistols were dimensioned to link barrels upward to an intermediate (less than 100%) vertical locking lug engagement. For this reason, the ordnance decision to locate the firing pin port upward from a bottom reference point (.437"+/-.004" upward from the slide rail slot cuts) not only made sense but was the only logical way to do the job. In within spec, military pistols, this typically places locked barrel chamber axis reasonably close to firing pin port horizontal centerline. Firing pin port location can be referenced in most assembled and within specification military pistols by removing the extractor (to ensure gauge clearance); closing the slide; standing the pistol on the butt; sliding in a Brownells gauge as shown in figure 108, and carefully manipulating the slide and/or barrel hood to move the barrel fractionally up/down while very lightly pushing in on and manipulating the

Checking barrel firing pin port alignment in assembled M1911/M1911A1 Pistols, continued-

gauge rod to ease the gauge pin tip into the firing pin port.

Note: Some M1911 type pistols will not permit gauge pin entry into the firing pin port. There are several possible reasons for this other than the port is too high or low, which include: link length is longer than standard; the firing pin port is undersized or nicked; port location is left/right of vertical centerline and/or barrel fit displaces the barrel to the left/right of port centerline. To reference check firing pin port location in these pistols, remove the extractor; close the slide; place a thin coating of white paint on the end of the gauge pin; slide in the gauge and tap or spin the gauge pin on the breech face, and then remove the slide and visually check the location of the paint mark on the breech.

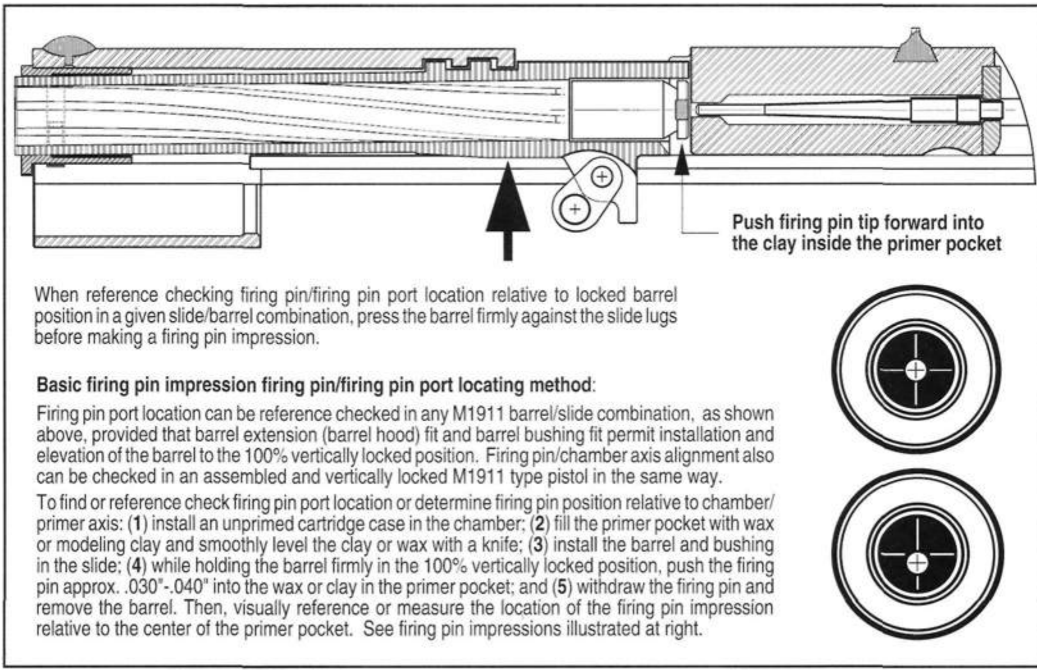


Figure 106- Ordnance style illustrations by Heritage - VSP staff artist show the basic clay firing pin impression method used to visually reference firing pin/port location relative to chamber and primer axis in Ml911 type pistols. Also see measurement and gauge location methods in figure 108.

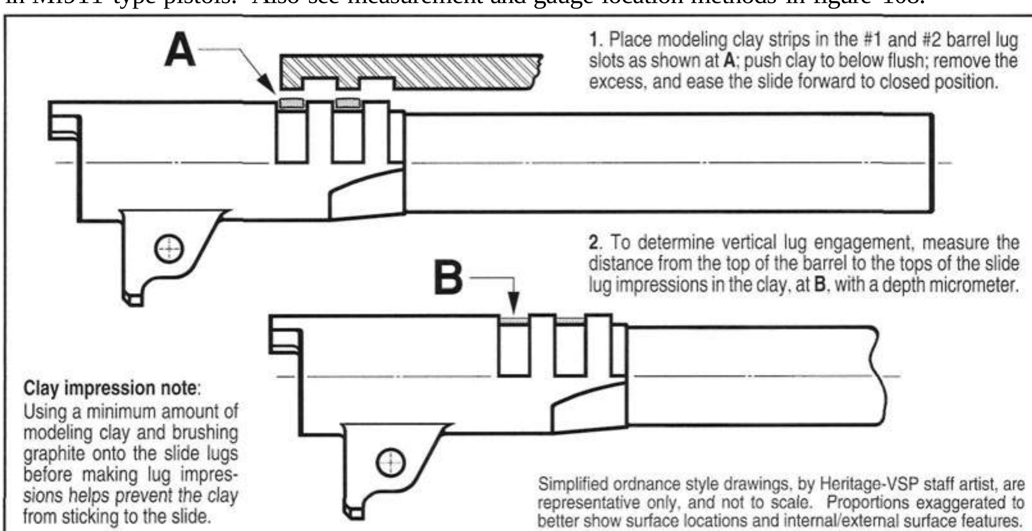
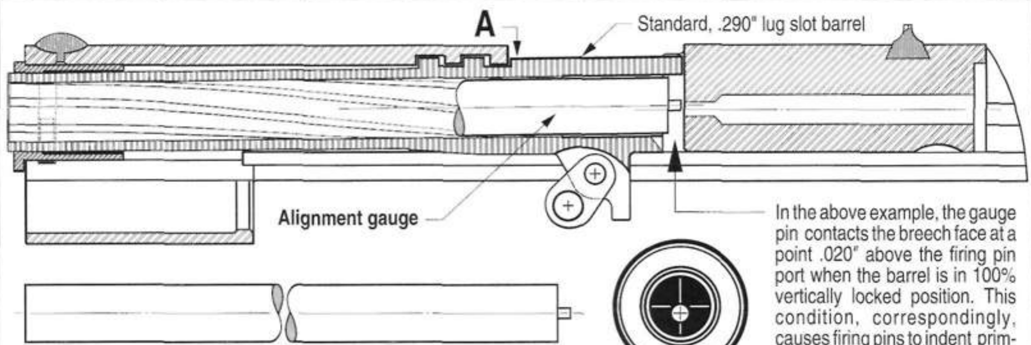


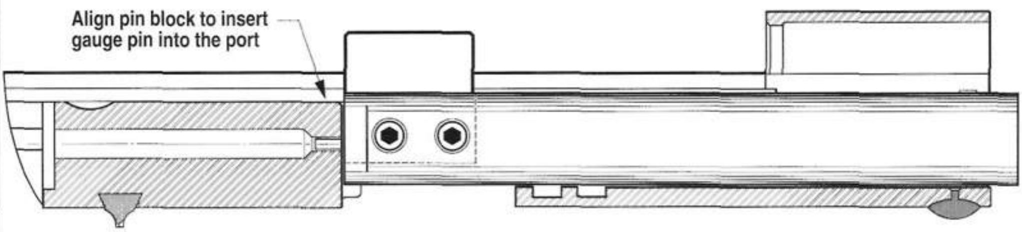
Figure 107- Ordnance style illustrations by Heritage - VSP staff artist show the basic clay strip lug impression method used to determine barrel locking lug vertical engagement in ordnance std. M1911, M1911A1, and commercial equivalent pistols. See clay impression note, above.

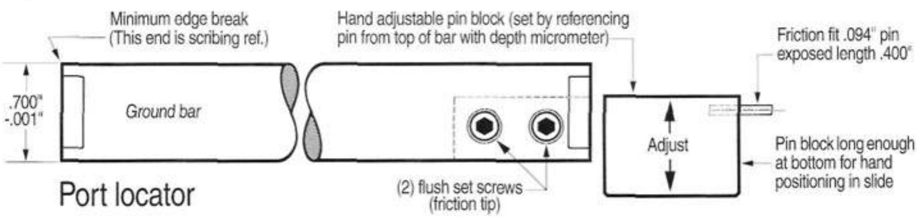


Brownells M1911 barrel - firing pin port alignment gauge

To find relative firing pin port location using a Brownells M1911 barrel/firing pin port gauge:

Relative firing pin port/bore axis alignment can be estimated using the above Brownells gauge and a depth micrometer or digital caliper with depth attachment as follows: (**1**) engage the gauge pin in the firing pin port and hold the barrel upward on the gauge pin; (**2**) with the barrel in this position, measure the distance downward from the top of the slide to the top of the barrel, at point **A**; (**3**) withdraw the gauge pin from the port and push the barrel upward until it stops against the slide lugs, as shown above; (**4**) then measure again at point **A**; and (**5**) find misalignment at full vertical lock in a given slide/barrel combination by subtracting the smaller measurement from the larger. **Note**: although this method is fairly accurate, practice is required in holding barrel position and keeping the depth micrometer vertical while measuring. This method can be used only with drop in and already fit barrels.

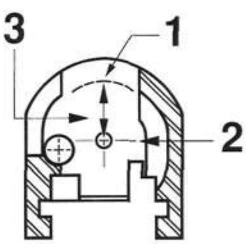




Port locator

To locate the firing pin port location relative to the nom. .699" dia. barrel passage (top down from the slide lugs):

(**1**) Snug the locator bar friction screws so that the pin block will move only with moderate finger pressure; (**2**) position the slide bottom up on the bench; (**3**) install the locator in the slide; (**4**) position pin block with fingers, as needed to slide the gauge pin into the firing pin port; (**5**) then carefully remove the locator; and (**6**) with a depth micrometer, find the distance downward from the top of the locator bar to the top of the gauge pin. **Note**: Subtract half of gauge pin dia. from measurement to find the distance to the center of the firing pin port.



To use the above port locator as a port location Go or No Go gauge: Preset the gauge *pin at the desired dimension and lock the pin block. Then insert locator bar in slide and* reference check port location.

Reference measurement port location method: (**1**) using the above port locator bar as a guide, scribe a nom. .700" dia. reference arc on the breech face; (**2**) install a firing pin (less spring) and wedge forward; (**3**) measure and note the distance from the top of the slide to the top of the firing pin; (**4**) measure the distance from the top of the slide to the apex of the scribed arc, splitting the mark as closely as possible; and (**5**) then subtract the second measurement from the first and add half of firing pin dia. (.045") to find the center of the port from the top down (i.e., location downward from 12 o'clock on barrel passage diameter).

Figure 108- Ordnance style illustrations by Heritage - VSP staff artist show 3 additional methods used to locate firing pin ports in M1911 slides. In these examples, firing pin ports are referenced downward from 12 o'clock on the .699" barrel passage dia. The top down reference method is best used to select (cherry pick) slides for firing pin port locations most agreeable with bore/chamber axis when barrels are linked to 100% vertically locked position. The Brownells gauge/reference method is shown at top; the firing pin port locator and Go-No Go method is shown, at center; and the reference measurement method is shown, at bottom. Adjustable port locators, as illustrated, are fairly easily made from bar stock.

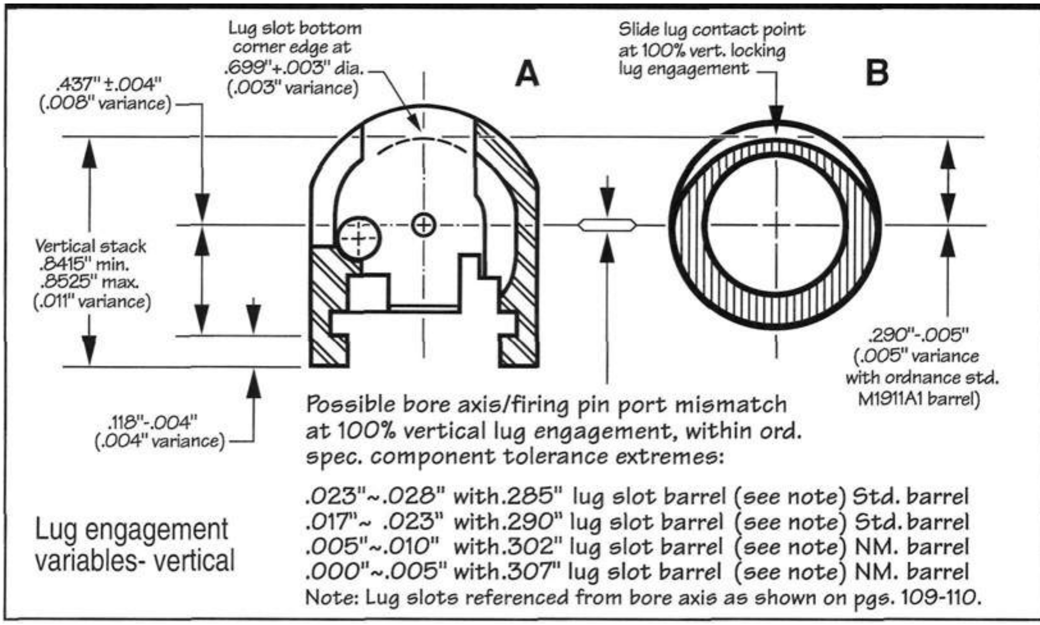
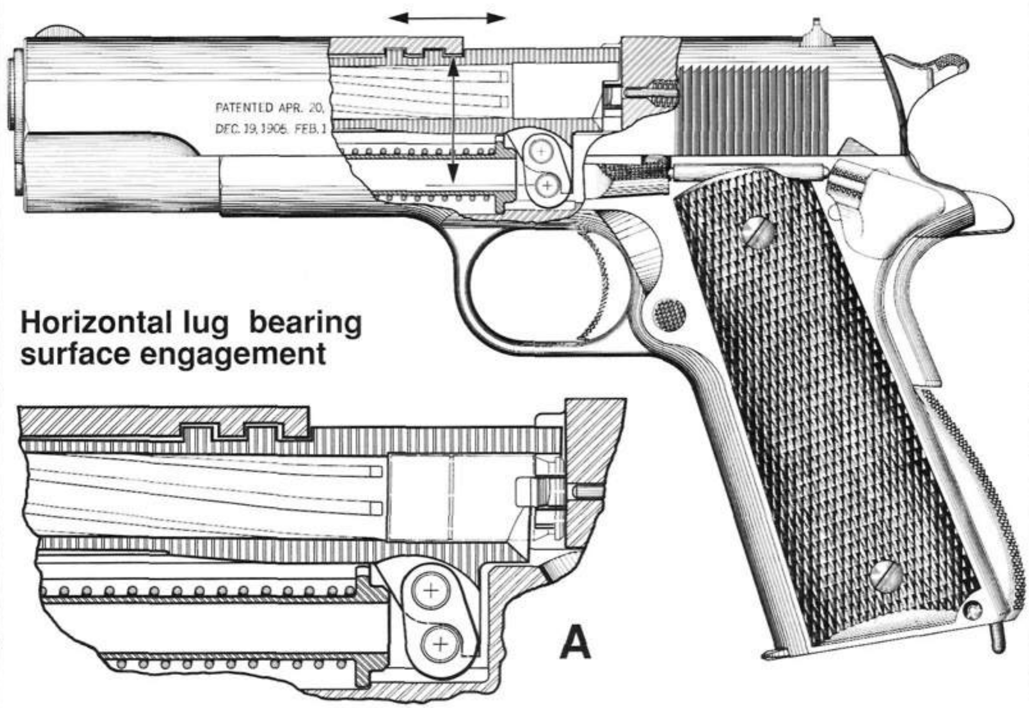


Figure 109- Ordnance style sectional illustration by Heritage - VSP staff artist shows the effect of interactive vertical tolerances in a within specification M1911A1 slide, at **A** and barrel, at **B**. This illustration is provided to point out that all combinations of the above tolerance variations are possible, including the extremes- and that all interact in one way or another to ultimately determine the physical location of the barrel/chamber axis relative to the slide's firing pin port and vice versa. Although this data is of limited interest in assembling or rebuilding standard military M1911/M1911A1 Pistols, close bore axis/ firing pin port alignment is an important consideration in assembling improved performance M1911 type pistols. Barrels in most std. Ml911 type pistols link up to an intermediate vertical lug engagement, as discussed earlier. Because of this, firing pin/chamber axis alignment is usually passably close in most standard pistols. **Note:** Actual vertical lug engagement in a given ordnance std. pistol is determined by combined parts tolerances and aggregate surface wear.

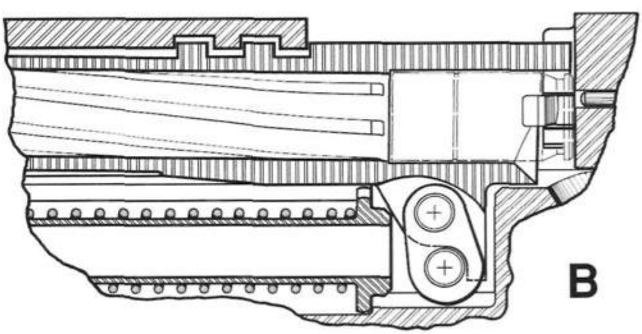
A few words about optimum performance dimension Ml911 slides and why they are needed- Slide dimensions are where the figurative rubber hits the road in M1911 type pistols. In assembling or building an M1911 pistol, the pistolsmith or armorer has two basic mechanical choices: (**1**) he can take the ordnance standard/mil. spec, route and assemble a practical, rough and tumble, general use M1911, or (**2**) he can take the improved performance road and build a closer toleranced M1911 with vastly improved mechanical repeatability and resultingly greater accuracy- given, of course, the availability of an optimum performance dimension M1911 barrel, which (thanks to Wil and Karl Schuemann) we already have. The key, and by now obvious, points made in this section are that: (a) commercial slide dimensional tolerances tend to only generally follow ordnance specifications (which makes cherry picking necessary); and (b) with the growing interest in higher performance Ml911 type pistols, it's long past time for an optimum performance dimension Ml911 slide. Although the concept may seem complicated on paper- in reality, it's simply a matter of creating a restandardized second version of the Ml911 slide with dimensions held closer to mid. ordnance specifications (like the original preproduction prototypes) and with the firing pin port located from the top down to coincide with the bore axis of a nom. .302" rear lug slot barrel in the 100% vertically locked position. The resultingly lower, correctly dimensioned, and rail parallel barrel passage plus the nom. .302" lug slot barrel would enable the pistols using such slides to link up and down on a closer to standard radius barrel link and would thus reduce or eliminate most long link related problems.

At risk of belaboring the point about firing pin port location, it must be said that firing pin port/chamber axis alignment is extremely important in improved and optimum performance pistols because firing pin/ primer axis mismatch causes variable primer ignition to greater/lesser extent. Due to diameter alone, the small pistol primers used in 9mm and .38 Super cartridges are less forgiving of mismatch than large pistol primers. The rule is: *the greater the mismatch, the greater the potential variation.* This condition, in turn, results in differences in powder burn and points of bullet impact on target. It's for this reason that this accuracy limiting mechanical problem (one that you wouldn't tolerate in a varmint or match rifle for one minute) should be addressed and solved. See optimum performance Ml911 Pistol section on page 183.

M1911/M1911A1 slide-barrel-frame fit
Vertical and horizontal lug engagement variables



Vertical lug engagement



Important reminder:

If building or assembling an M1911 type pistol to be chambered for a higher than ordnance std. .45 ACP pressure cartridge (.i.e., a higher than design pressure range cartridge)- be sure to see vertical and horizontal lug bearing surface engagement on pages 94, 118~120, and 124.

Horizontal slide/barrel lug bearing surface checks and barrel lug equalizing are discussed on page 124.

Simplified ordnance style drawings, by Heritage-VSP staff artist, are representative only, and not to scale. Proportions variously exaggerated to better show surface locations and internal/external features.

Figure 110- Ordnance style phantom sectional illustrations by Heritage - VSP staff artist show horizontal and vertical lug engagement in M1911A1 Pistols with equal lug bearing surfaces. In the example illustrated, at **A**, the 3 barrel lugs on the installed gunsmith fit barrel were fit to full slide lug bearing surface agreement as discussed in fig. 111. This barrel is in 100% vertically locked position. The example, at **B**, shows a standard (nom. .290" lug slot) military barrel with equalized lug bearing surfaces in an intermediate (less than 100%) vertically locked position. **Note:** in ordnance standard M1911Al Pistols, overall slide/frame vertical tolerance stack height, barrel link radius (link length), and barrel lug slot depth together determine the actual percentage that the barrel lugs will vertically engage. Vertically locked barrel position then determines the extent to which the bore/chamber axis and the center of the firing pin port will match or mismatch. These subjects and other horizontal and vertical dimension related fitting variables are discussed in detail on the following pages.

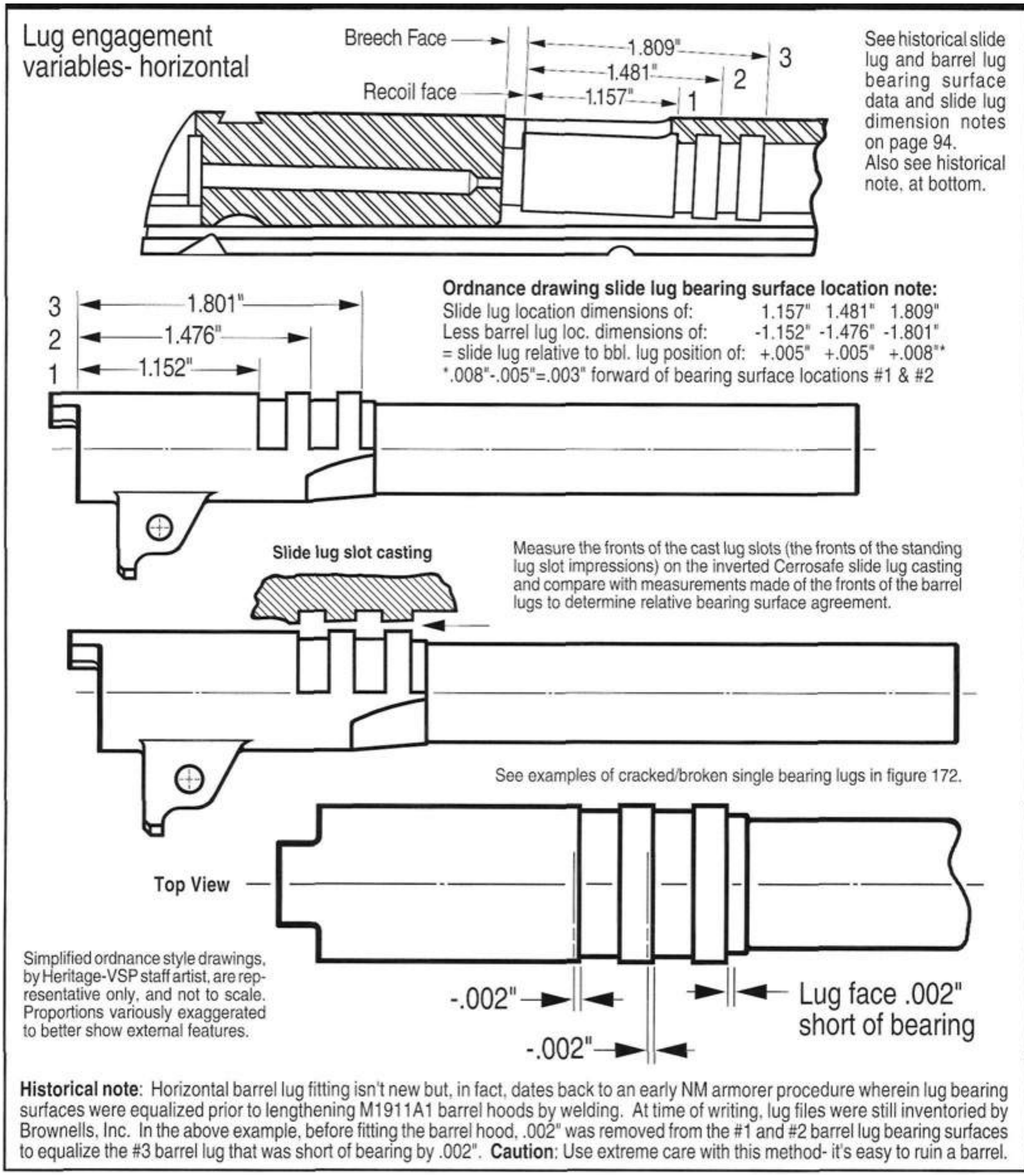


Figure 111- Illustrations and table, at top, show ordnance specified lug bearing surface locations. Also see historical discussion on page 94. Illustrations below show Cerrosafe casting reference method used to determine relative spacing of the slide lug bearing surfaces. Because lug bearing surfaces can be virtually anywhere in some commercial slides- (and surfaces may or may not be seated to equality in other slides) all 3 slide lug bearing surfaces should be located before attempting to install a gunsmith fit (long hood) barrel. The basic one slide lug (#1 slide lug, only) locating method is workable in standard and NM type pistols only if: (**a**) all slide and barrel lug bearing surfaces are within ordnance specifications; (**b**) the pistol at the bench is chambered for standard, or lower, pressure .45 ACP cartridges; and (**c**) slide/barrel lug bearing surfaces are pressure seatable as discussed on page 94. Otherwise, with higher than ordnance standard pressures and with medium plus heat treat slides and barrels, lug bearing surfaces should be located and barrel lugs equalized before fitting the barrel hood. Equal bearing is all the more important with stainless steel components because of the somewhat lower shear factor. After slide measurement (see lug casting method on page 95), there are two approaches: (**1**) trial select barrels and slides for closest lug bearing surface agreement; or (*2*) adjust the barrel lug bearing surfaces to horizontally agree with the corresponding slide lug surfaces. This is most accurately done by indicating and cutting the barrel lug bearing faces from top down to slot depth with a 5/32" carbide end mill. The remainder of the old lug face on either side can then be mill cut and fine adjusted with a lug file or diamond hone. See lug adjustment, above.

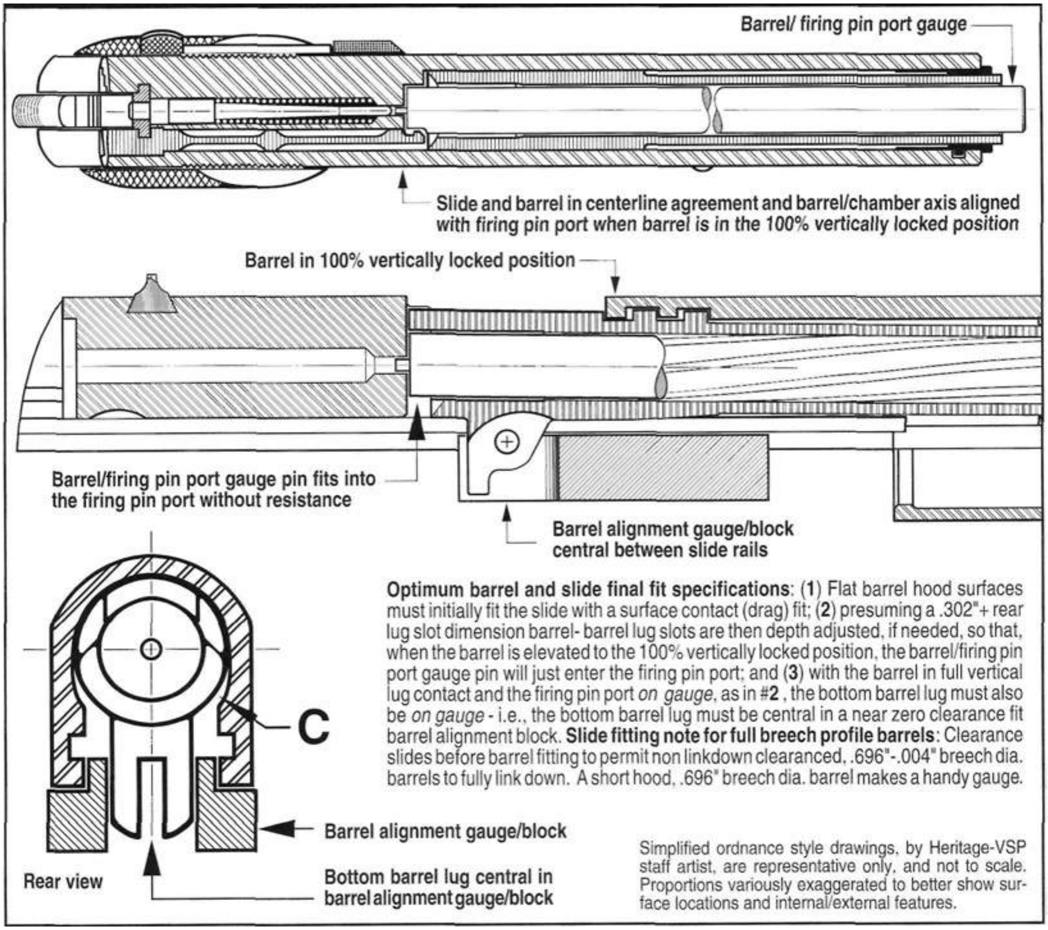


Figure 112- Ordnance style sectional drawings by Heritage - VSP staff artist illustrate the *holy grail* of Ml911 slide and barrel fitting. The three constituents of the *grail* are: (**1**) bore axis/firing pin port agreement (resulting in barrel/firing pin port gauge alignment and gauge pin entry into the firing pin port); (**2**) slide dimensions and barrel fit that, together, ensure slide/barrel vertical centerline agreement; and (**3**) the foregoing conditions exist with the barrel in the 100% vertical lug engagement position. The top sectional illustration shows an M1911 barrel and slide in centerline agreement and *on gauge* in the horizontal plane. The longitudinal sectional illustration, at center, shows an Ml911 barrel and slide in centerline agreement and *on gauge* in the vertical plane. The illustration at bottom shows the barrel and slide in centerline agreement in both planes and with sufficient slide clearance, at **C**, to permit the barrel to fully link down. **Note:** Gunsmith fit (long hood/bottom lug) barrels must be fit so that the bottom lug is central between the slide rails (i.e., the lug is not rotated left or right of center). This ensures that the bottom lug surfaces will be squarely cut when the slide/barrel assembly is mated to the selected frame. It must be said that it takes a lot of cherry picking to find commercial slides that meet the above requirements with a .302" + lug slot barrel installed. Wouldn't it be better to end the quest for the grail with off-the-shelf optimum performance dimension slides, as discussed on page 122 and 183 - 191, instead of having to find them the hard way? An optimum performance dimension slide is basically an M1911A1 slide held to mid ordnance tolerance specs, with the firing pin port located to accommodate a nom. .302" lug slot barrel. Custom barrel fitting steps for improved performance and competition grade Ml911 pistols (expanded to include additional barrel saving cautions) are listed and discussed below:

Gunsmith fit Ml911 custom barrel fitting steps (first see slide fitting note for full breech profile bbls.):

1. Measure slide dimension A (this applies to slides with equal or equalized lug bearing surfaces and slides mated to equal or equalized lug barrels) - Install a lug/breech face referencing fixture in the slide (see optional fixtures illustrated on page 128) and adjust the fixture to positive rear locking lug bearing surface/breech face contact. Then, lock and remove the fixture and measure the span with a digital caliper and note the measurement. Confirm this measurement (see dimensional illustration on page 127) by rezeroing the caliper and repeating the above measuring steps a second time.

Gunsmith fit Ml911 custom barrel fitting steps, continued-

2. Measure slide dimension B- Measure barrel hood slot width in the slide with a digital caliper (see illustration on page 127) and note the measurement. Then comparison measure barrel hood width and subtract slot width from barrel hood width to get an idea of the possible fitting range.

3. Precautionary step: Hood slots in some commercial Ml911 type slides are oversize and/or fractionally displaced left or right. Before attempting to fit a barrel to any slide, reference check as follows: (**a**) coat the flat barrel hood surfaces with Dykem blue or black marker; (**b**) install the barrel in the slide with a fractionally loose bushing; (**c**) install a barrel alignment block that has been prefit both to slide rail and bottom barrel lug widths. See gauge block data in fig. 114 and gauge block fit in fig. 112. With the barrel aligned and with the hood against the slide's recoil surfaces, visually reference check the positions of the two flat sides of the barrel hood relative to the corresponding slide hood slot walls to determine whether there is enough material on each side of the barrel hood for proper fitting to the slide.

4. Trial adjust barrel hood length- If all measurements indicate that the barrel can be fit to the slide: (**a**) lightly polish the nom. .699" dia. barrel passage in the slide lug area with a lug iron and #400 sandcloth (see lug iron use in Vol. 1.- an updated version of this tool is available from Brownells, Inc.); (**b**) deburr sharp slide and barrel lug edges by lightly breaking the corners (suggested max. .003" x 45°); (**c**) then, trial adjust barrel hood length to dimension **A** measurement from step **#1**, leaving a small additional amount of material for final fitting. Leave the hood rear corner edges sharp, recoat with Dykem or black marker and then repeat the visual reference check and contact mark step as in **#3.**

5. Trial adjust the sides of the hood- Place the barrel in a stoning fixture (see optional fixture illustrated on page 128); level barrel to align the flat hood surfaces; adjust stone height, and trial adjust the flat sides of the barrel hood in careful stages, repeating the above visual referencing/marking checks between fitting steps, until the barrel hood will start into the slide's hood slot with moderate finger pressure.

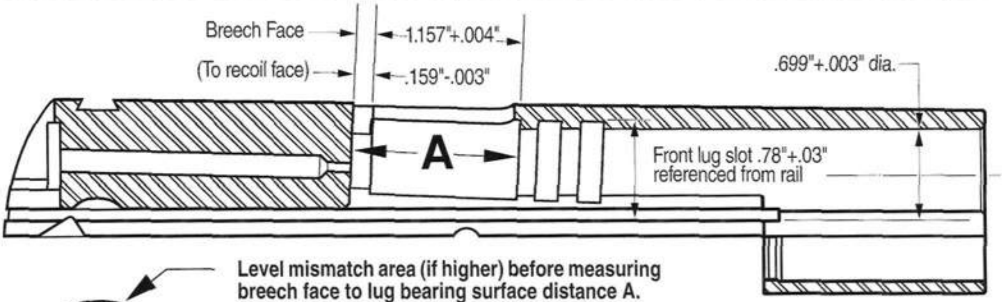
6. Fine hood adjustment- Taking extra care to maintain barrel hood/slide slot fit, bevel the barrel hood corners .010" x 45° and carefully fine adjust the 3 flat hood surfaces until the barrel can be pushed upward to the vertically locked position with the 3 flat hood surfaces evenly contacting the corresponding slide breech face/wall surfaces. The two sides of the hood are further adjusted later as a final clearance step.

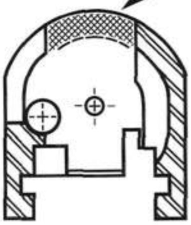
7. Firing pin port reference check- Then, with the barrel and slide lugs held in positive contact with thumb pressure and the barrel alignment block in place (the bottom barrel lug must be central in the block) place the barrel/firing pin port gauge in the barrel and visually reference check gauge pin location relative to the firing pin port. **Gauge note 1:** (for improved performance and competition pistols): If the gauge pin contacts the breech face fractionally lower than necessary to enter the firing pin port with a nom. .302" lug slot barrel, barrel lug slot final depth adjustment is the next fitting step. See figures 117 and 118. **Gauge note 2:** (for ordnance std. dimension slides and barrels): gauge pin contact will almost always be higher (the firing pin port will be lower than barrel/chamber axis with a std. lug slot barrel in 100% vertically locked position). A nom. .302" lug slot barrel will help remedy this problem.

8. Barrel lug slot fitting (depth) - Coat the barrel lug slots with Dykem blue or black marker pen and reinstall the barrel and bushing. Push the barrel upward to engage the lugs. Next, install the barrel alignment block and tap the bottom of the barrel with an aluminum drift to contact mark the bottoms of the barrel lug slot(s) and determine lug slot contact. Then, remove the barrel and carefully trial adjust the lug slots, as needed, so that when the barrel is in the 100% vertically locked position, the barrel/firing pin port gauge pin will enter the firing pin port without resistance. This final *on gauge* barrel position (i.e., *on both gauges* as shown in figure 112) is desirable in optimum performance Ml911 pistols.

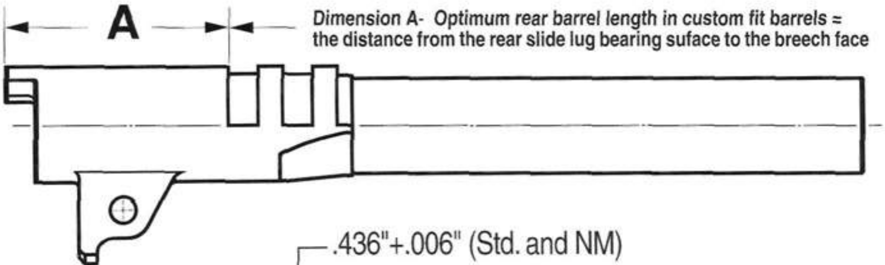
9. Barrel/slide lug bearing surface lap check (optional) - Although a little lapping with an extra fine compound doesn't hurt when barrel fit is tight, the intention is not to lap-in the barrel hood and/or barrel lugs, but to check the barrel hood and locking lugs for equal bearing surface contact. This step is suggested because the #2 & #3 locking lug bearing surfaces are inside the slide, which makes engagement invisible. This optional step is done, at this point, by hand moving the barrel in and out of locked position, or later by cycling the slide after bottom barrel lug fitting is complete. To lap check lug engagement- (**a**) lightly coat the 3 vertical lug bearing surfaces plus the flat barrel hood surface with Dykem blue or black marker; (**b**) apply a small amount of fine, nonembedding lapping compound to the lug bearing surfaces with a small art brush (Brownells #800 aluminum oxide paste is suggested) and lap the lug surfaces just enough to wear through the Dykem/marker pen coating to show a contact pattern on the lug bearing surfaces. **Lapping note:** use only the number of lock/unlock strokes needed to determine lug bearing surface contact. Then detail clean slide and barrel lug surfaces to fully remove all lapping compound.

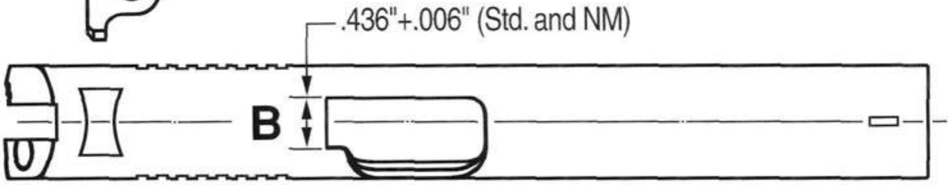
10. Adjust chamber headspace (short chamber barrels) - Carefully trial adjust headspace with an integral throat chambering reamer, rechecking headspace between steps. See suggested headspace on page 107.



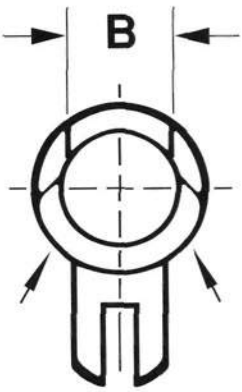


Measuring slides for custom barrel fitting (A): (**1**) visually and dimensionally inspect critical *slide surfaces/locations as discussed earlier and referenced above;* (**2**) *inspect the upper* breech face (see arrow in illustration, at left), level the upper face with a hard, fine cut stone, and deburr sharp edges before making dimension **A** measurements (**Note**: although ordnance specs. permitted an upper breech face cut mismatch within tolerance on the above .159"-.003" dimension, zero mismatch is desirable in slides to be fit with custom barrels); (**3**) then install a dimension **A** referencing fixture, extend to positive contact, and lock the set screw; (**4**) remove the fixture and measure the distance between the breech reference plate and lug pickup surface with a digital caliper and note the measurement. **Note**: measure a second time to confirm. (Old rule: measure twice, cut once.) Referencing fixtures are illustrated on page 128.





Measuring slides for custom barrel fitting (B): **Cautionary note**: The nom. .436" barrel hood slot I.D. varies from slide to slide (see tol. spec. above) and is sometimes found displaced left/right in others. This condition is problematical if excessive (typically *seen as not enough material on one side of the barrel hood for fitting.)* Although there are several involved ways to check slot location, the visual comparison method is easiest: (**1**) measure slide slot and barrel hood width, at **B**, to determine if there is enough material for fitting; (**2**) install the barrel and bushing and push the barrel part way in; (**3**) install the correct size barrel alignment block (see alignment block on pages 125 and 128) **Note**: the block must contact fit both the slide rails and the sides of the bottom barrel lug in order to accurately align the barrel in the slide; (**4**) move the barrel and alignment block rearward to the point that the rear corners of the barrel hood contact the slide at the barrel recoil surface/hood slot cut junction; (**5**) the following two visual inspection steps then determine barrel fittability- (**a**) hold the slide against a bright light source and view from the bottom of the slide to be sure that both rear corners of the barrel *hood contact the slide and that the barrel hood is wider than the slot (no daylight on either* side); if one side of the hood appears to be wider than the other, estimate and note the amount as a reference for stoning; (**b**) then, viewing against the light and from the top of the slide, slip in the barrel/firing pin port gauge and check gauge pin agreement with firing pin port vertical centerline. **Note**: if there is no daylight on either side of the barrel hood and the gauge pin appears to vertically align below the port, it's a go for fitting the barrel. If daylight is apparent on one side of the barrel hood and/or the gauge pin is apparently right or left of the firing pin port, do not attempt to fit the barrel. Instead, trial *substitute another barrel or another slide and repeat the above checks.*



See slide bbl. linkdown pre-*clearance note in fig. 112*

Figure 113- Sectional and exterior view illustrations by Heritage - VSP staff artist, show slide and barrel areas measured in preparation for custom barrel fitting. Measuring/gauging fixtures are shown on page 128. Barrel fitting steps are discussed on pages 125 and 126.

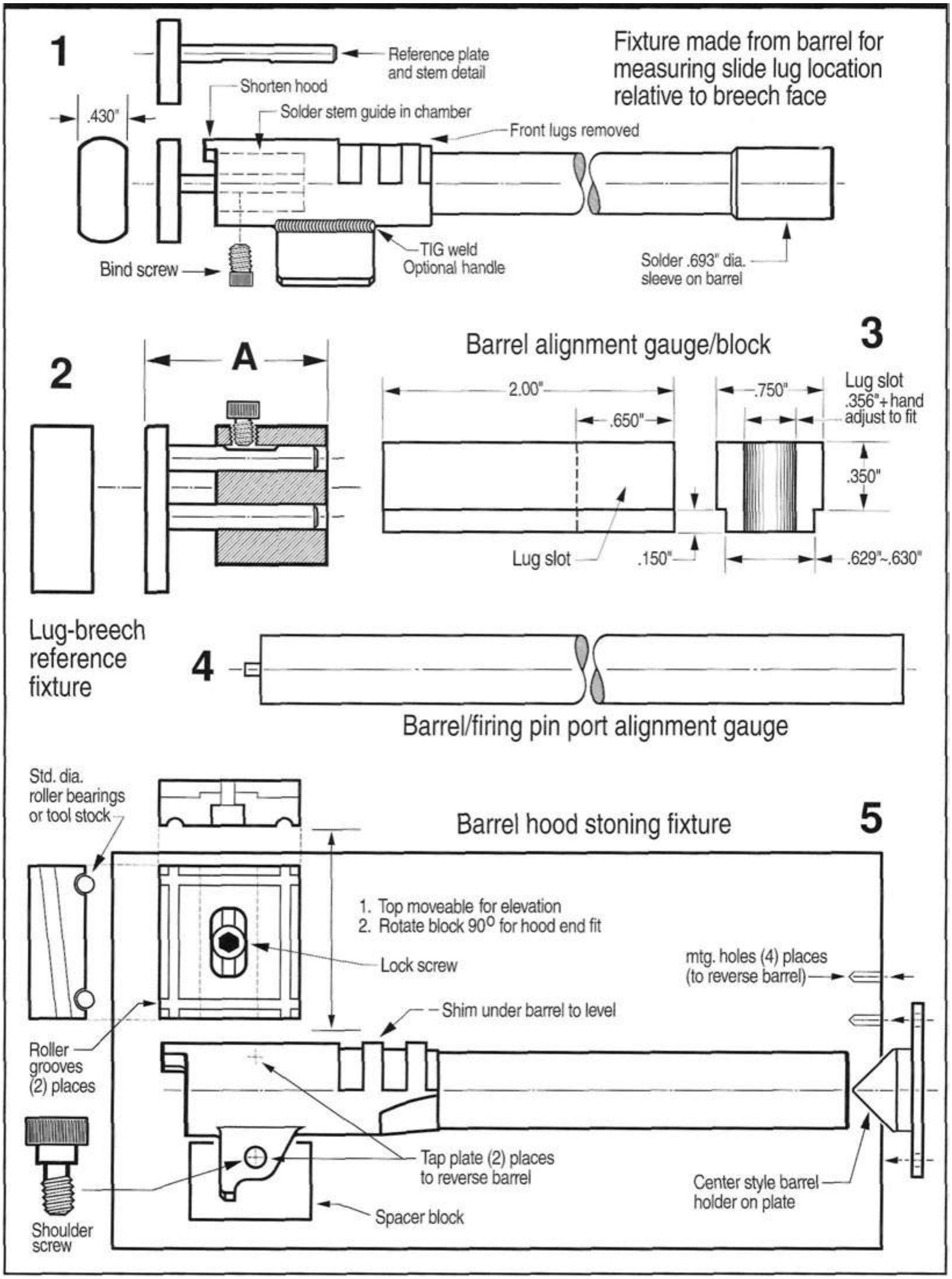


Figure 114- Illustrations show optional fixtures/gauges used to accurately fit custom M1911 barrels. The dimension **A** reference fixture, at **1**, is easily made from an old barrel with serviceable lugs. The reference fixture, at **2**, is a design variant by Badger Ordnance. Both are measured with a digital caliper after adjusting to #1 slide lug contact. The Cherry Corners barrel alignment block, illustrated at **3**, is available from Brownells, Inc. Barrel alignment blocks can be used as barrel hood fitting guides and also as barrel/slide alignment Go-No Go gauges. **Note:** Because of slide and barrel lug dimensional variations, blocks are needed in several adjusted sizes. The Brownells barrel/firing pin port gauge, at **4**, is a necessary inspection and final fitting reference as discussed earlier. The adjustable barrel hood stoning fixture, designed by author and illustrated at **5**, permits precise, flat, and level stoning of barrel hood fitting surfaces.

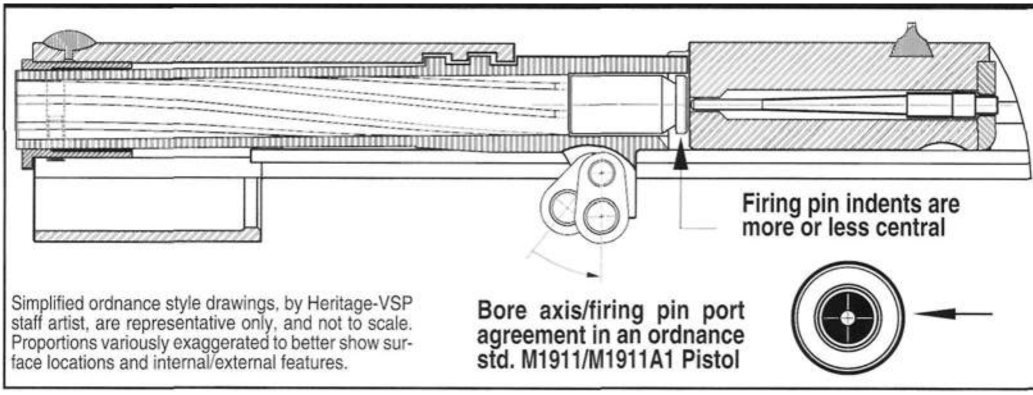


Figure 115- Ordnance style principle illustration by Heritage - VSP staff artist, depicts an M1911A1 barrel linked upward to 60% + vertical lug engagement and approx, firing pin/bore axis agreement at that rear barrel elevation in a within specification ordnance std. M1911A1 Pistol. The geometry shown is fairly common in within specification ordnance standard military M1911/M1911A1 Pistols and in commercial equivalents. Firing pin/primer indents are usually more or less central. Because barrel lug slot depth is not a major consideration in pistols that do not 100% vertically lock, firing pin/primer axis alignment is more general than specific and could be said to *float.* Firing pin/primer alignment can be adjusted somewhat in these pistols by installing a higher or lower barrel link. **Caution:** Vertical locking lug engagement must not be below 50-55% in ordnance std. military and commercial Ml911 Pistols.

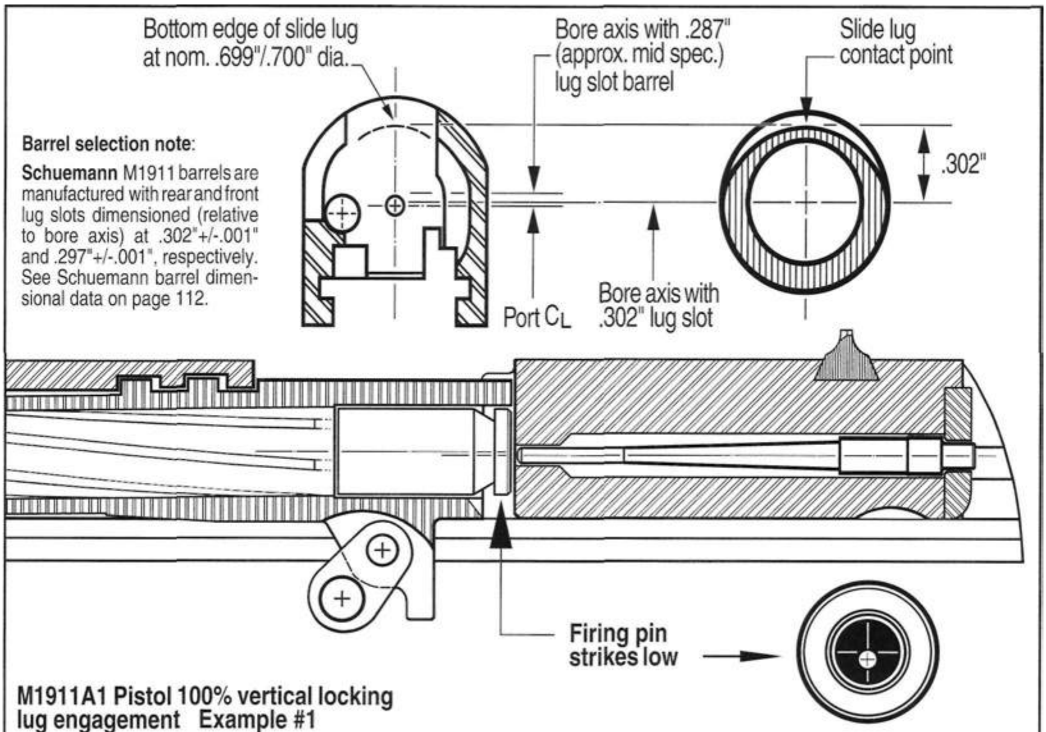


Figure 116- Sectional illustration by Heritage - VSP staff artist, at top, shows comparative bore/chamber axis alignment relative to slide firing pin port location with .287" (mid. std. specification) and .302" (min. NM specification) rear lug slot barrels linked upward to full vertical lug engagement. The sectional illustration, below, shows an M1911Al slide assembly with the same .287" lug slot barrel (as referenced in the illustration, at top, and shown in fig. 115) elevated to 100% vertical lug engagement. The point made in this example is that linking std. barrels up to attain 100% vertical lug engagement is basically counterproductive because the bore/chamber axis is typically elevated above firing pin port horizontal centerline. Increasing barrel link up, by itself, can also destabilize the rear of the barrel as discussed in figure 105. The right way to achieve 100% vertical lug engagement in this case and to maintain reasonable firing pin port/chamber alignment would be to fit and install a nom. .302" rear lug slot barrel.

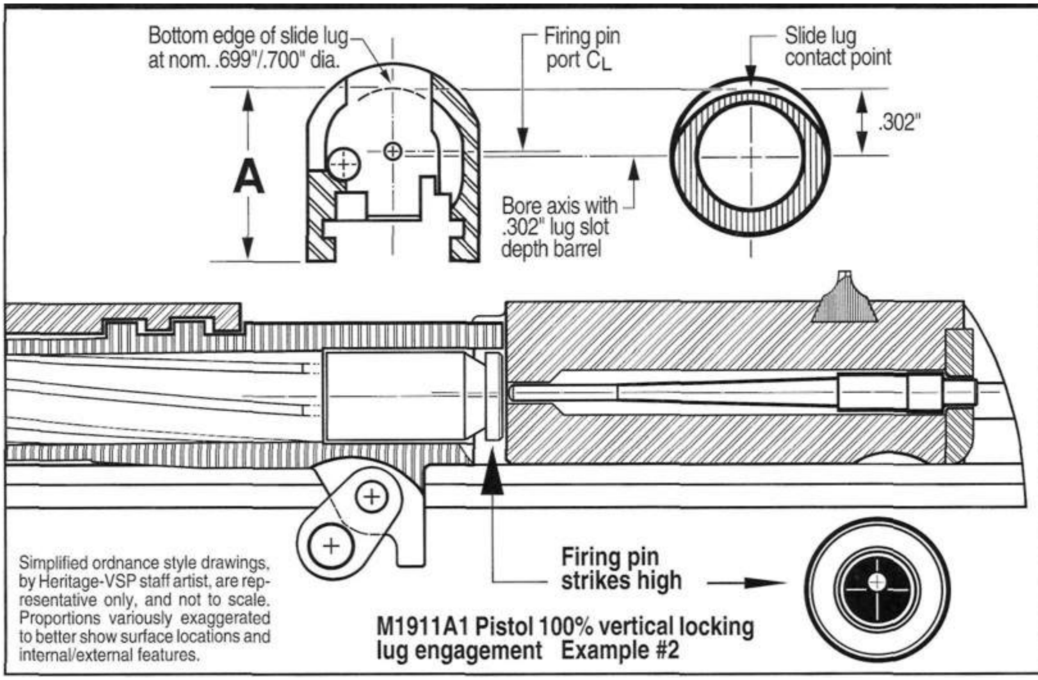


Figure 117- Sectional illustration by Heritage - VSP staff artist, at top, shows bore/chamber axis alignment relative to firing pin port location with a.302" (min. NM spec.) rear lug slot barrel in 100% vertical lug contact. The slide in this example has an aggregate min. spec, vertical stack dimension, at **A**, and a fractionally higher than maximum spec, firing pin port. The sectional illustration, below, shows a longitudinal view of the above geometry. In this example, the bore/chamber axis line is approx. .008" below firing pin port horizontal centerline. Given a .302" lug slot, as referenced above, this condition can be remedied (the bore/chamber axis can be moved upward into alignment with the firing pin port) by adjusting the depth of the #1 (rear) barrel lug slot (and the #2 slot, if needed) as discussed in fig. 118.

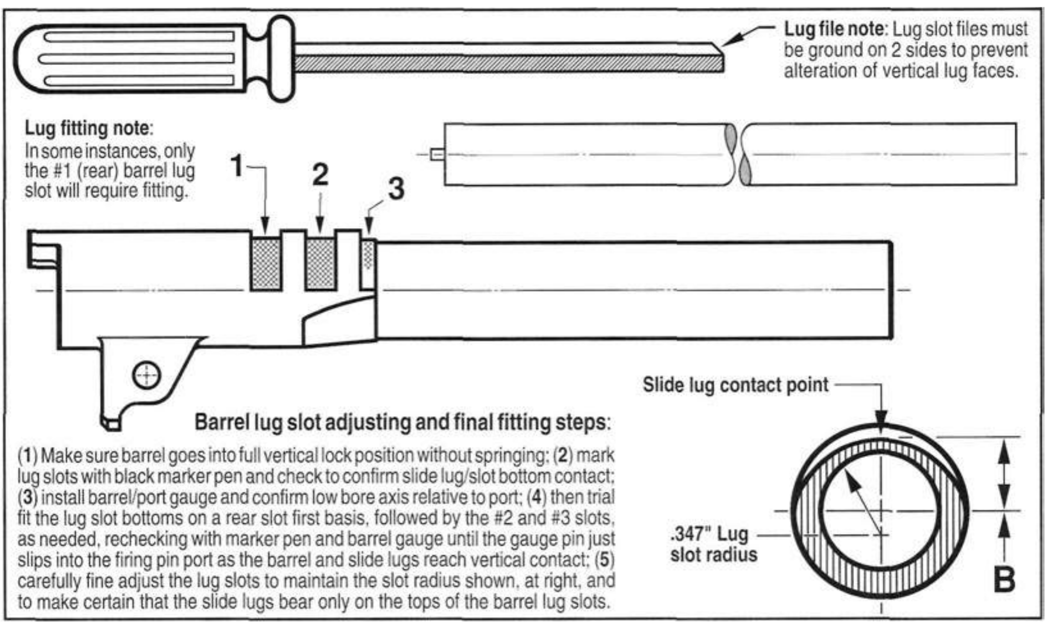


Figure 118- Illustrations show barrel lug slot adjustment points and tooling used. The fine cut locking lug file from Brownells, illustrated at top, is slightly narrower than lug slot width and ground smooth on the lug facing sides. The barrel/firing pin port gauge illustrated is also available from Brownells. **Warning:** Bottom slot/bore axis dimension **B** in the sectional drawing, at right, must not be cut deeper than the ordnance min. spec of .285". Barrel hood fitting must be completed before lug slot adjustment.

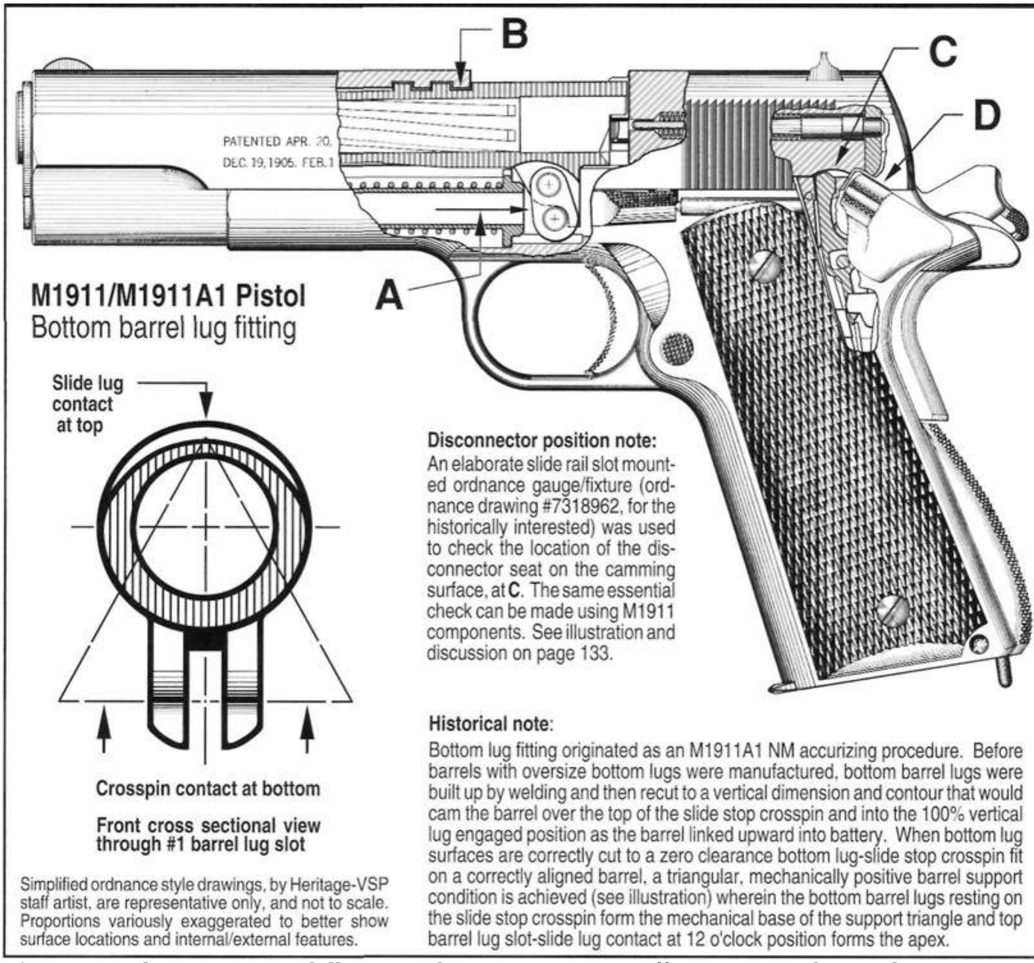


Figure 119- Phantom sectional illustration by Heritage - VSP staff artist, at top, shows relative positions of the top and bottom barrel lugs; the disconnector camming timing recess, and the disconnector, in ordnance specified *instant pickup* position when the slide is in battery in an M1911Al Pistol. Cutting the bottom barrel lug with a Wilson lug cutter at a vertical height corresponding with the top of an installed slide stop crosspin, at **A**, with the barrel retained in the 100% vertical lug engaged position, at **B**, reduces vertical barrel locking clearance to virtual zero when the assembled pistol is in locked position. Precise bottom barrel lug/crosspin fit enables the bottom lugs to cam upward over, and bear on the top of, the slide stop crosspin as the barrel is linked upward. This action creates the positive mechanical force, or support, triangle illustrated at lower left. The bottom lug surface bearing on the top of the slide stop crosspin acts to form the base of the triangle and the lug contact point, at the top, forms the apex. **Note:** Ordnance specifications require the disconnector to be in connected position and *on the cam* (i.e., the top in contact with the front curvature of the nom. .375" radius cut) as shown at **C**. Concurrent slide safety notch position, at **D**, must permit safety lever swing and slide notch entry.

Bottom barrel lug cutting steps:

1. Check slide/frame fit- Clearance the top of the front frame extension, if necessary (usually required when rails are lowered), and lightly polish the bottom of the central slide rail with a 1/2" fine cut stone.

2. Disconnector precheck- Temporarily install a serviceable disconnector, sear pin, sear spring, and mainspring housing (to retain the sear spring) and check disconnector rise to connected *on the cam* position and concurrent alignment of the slide safety notch with the safety lever. **Note:** components can be left in place using the optional bottom lug cutting method discussed on page 133.

3. Install barrel, bushing, and barrel holding fixture in slide- Prevent possible barrel misalignment and/or barrel position shift by: (**a**) temporarily installing the barrel alignment gauge/block used in fitting the barrel to align the bottom lug; and (**b**) making certain that the tensioning screw in the barrel holding fixture addresses the barrel on vertical centerline before tightening the holding fixture screw.

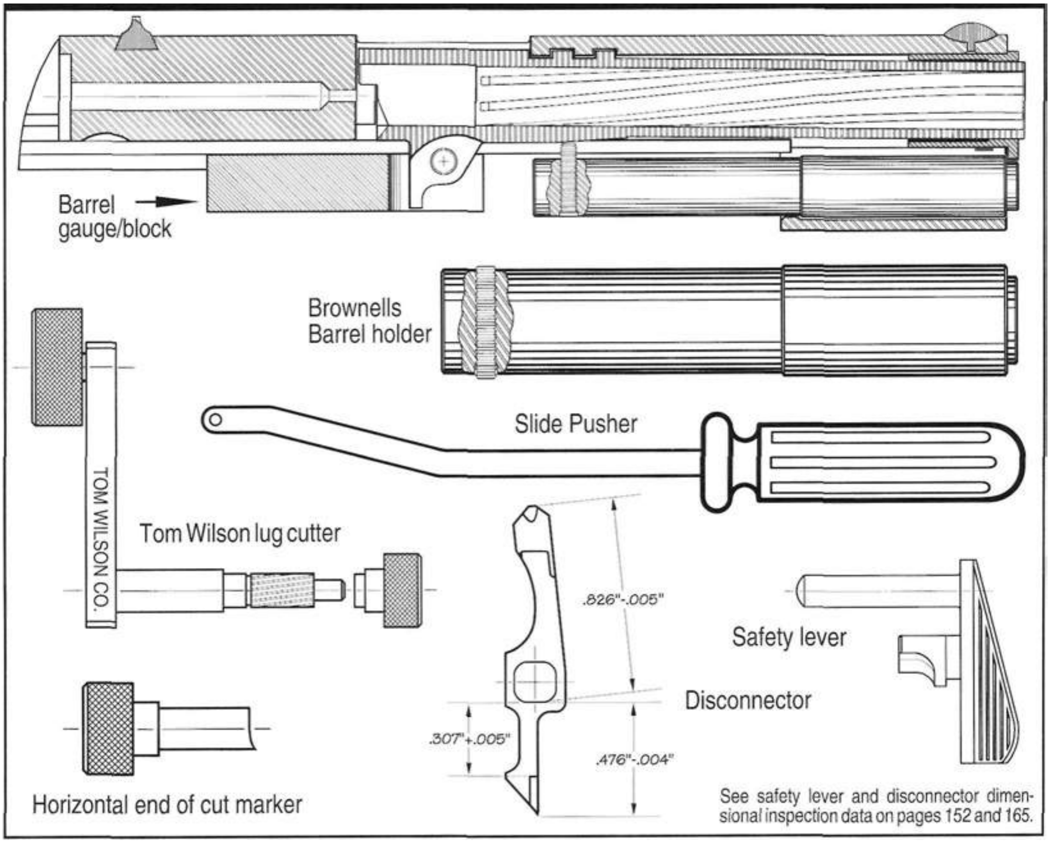


Figure 119- Sectional illustration by Heritage - VSP staff artist, at top, shows a Brownells barrel holder installed in an M1911Al slide in preparation for bottom barrel lug cutting. The barrel gauge block shown is temporarily installed to align the bottom lug before tightening the barrel holder. Tooling illustrated, except for the gunsmith made end of cut marker, is available from Brownells, Inc. A serviceable disconnector, safety lever, and sear spring are also useful fit check and fitting tools.

Bottom barrel lug cutting steps, continued-

4. Horizontal end of lug cut location precheck- This optional check is used to estimate whether or not sufficient forward lug stop surface material (see reference #3 in figure 120) will remain at the end of bottom lug cutting. An end of horizontal lug cut estimating tool is easily made by grinding a #7 drill shank (.201" dia.) on a shallow angle; pointing and sharpening the ground end, and using the end as a rotary scribe. To estimate max. lug cut, position the slide with retained barrel at the disconnector rise/safety lever swing point, and while retaining the slide in this position, scribe mark the bottom lug.

5. Setup for barrel lug cutting- Install the frame and slide in a lug cutting fixture or install a magazine well filler in the frame (magazine fillers available from Brownells, Inc.) and: (**a**) secure the frame between soft vise jaws; (**b**) install the slide assy.; safety lever with slide pusher, and the Tom Wilson lug cutter shown above. **Lug cutter lubrication note:** Coat the cutter and cutter shaft with thick assembly grease before installing it in the frame. The grease acts as a lubricant and traps cutting chips.

6. Cutting the bottom barrel lugs- Apply light pressure to the slide via the slide pusher and slowly turn the cutter in a clockwise direction. Cut the bottom barrel lugs on a careful trial and check basis until: (**a**) with a prechecked slide/frame (see discussion on page 133) the safety lever just swings into engagement in the slide's safety lever notch without drag; or (**b**) with disconnector installed as shown in figure 120, cut the lugs until the disconnector rises to the connected position and the safety lever concurrently swings into engagement in the slide's safety lever notch without drag. **Caution:** (**1**) too much pressure on the cutter affects the smoothness of the cut; (**2**) turning the cutter backwards will dull the cutter.

7. Adjust rear slide/frame surface mismatch- If, after correct lug cutting, a rear slide/frame surface mismatch condition exists, adjust and recontour the back of the slide to match the frame or the frame to match the slide. **Note:** This hand fitting job is best done by securing slide and frame between soft vise jaws with the safety lever in engaged position and adjusting/recontouring the surfaces by hand.

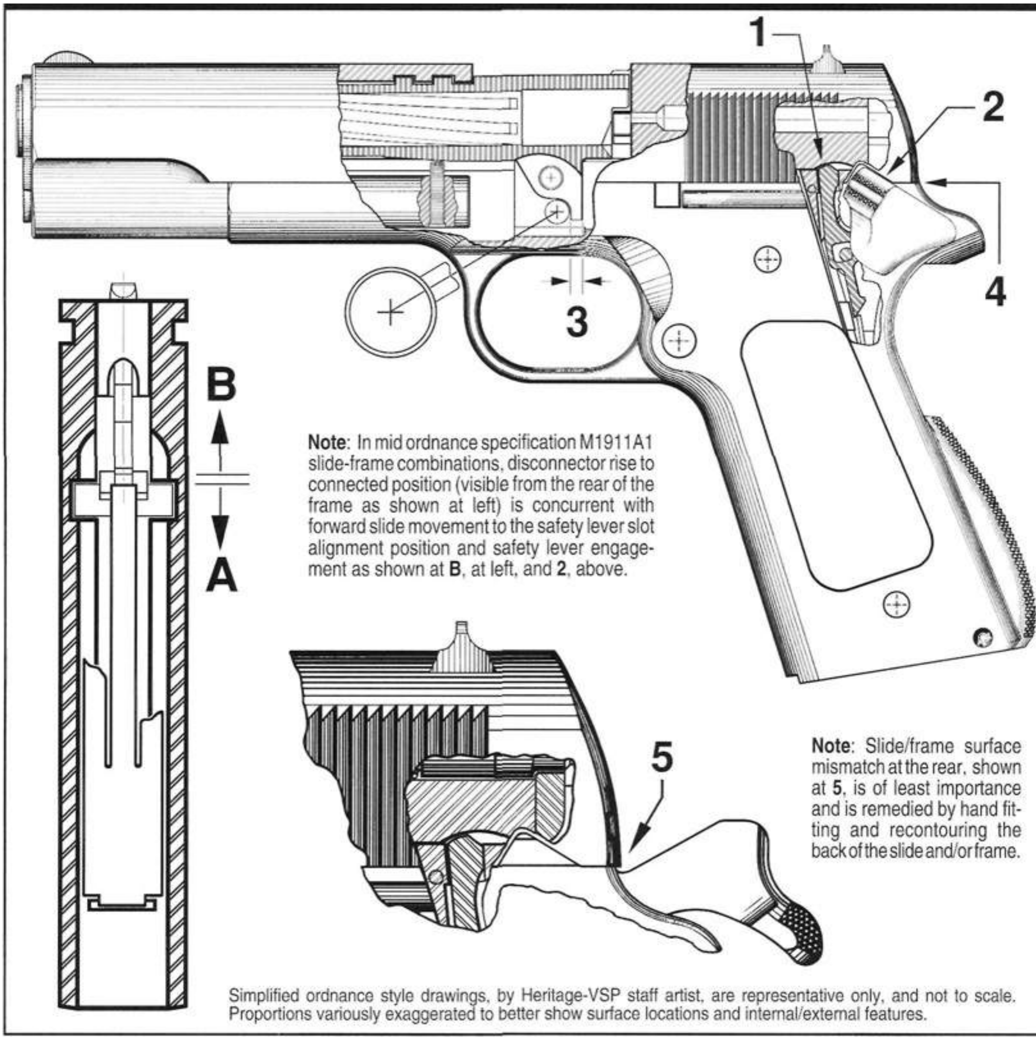


Figure 120- Ordnance style sectional illustration by Heritage - VSP staff artist, at top, shows a Brownells barrel holder and Wilson lug cutter installed in an M1911A1 slide/frame. In this example, the bottom barrel lug is cut with primary reference to disconnector rise to *instant pickup* position. Because of this, the disconnector, sear pin, trigger bow, sear spring, and mainspring housing (housing retains the sear spring), are also installed together with the safety lever and slide pusher. Bottom barrel lug cutting ends at disconnector rise, at **1**, which in this example is coincident with safety lever swing to engaged position, at **2**. With all components being within specifications- after lug cutting, the forward stop surface on the bottom barrel lug, at **3**, is within ordnance specified thickness of .112" +/ -.002" for std. M1911A1 Pistols and the rear slide/frame surfaces, at **4**, are relatively even. The vertical rear sectional illustration, at left, shows the disconnector elevated to connected position by the middle element of the sear spring. Arrows and reference lines at **A** & **B** show approx, disconnector travel range.

Lug cutting note: Cutting the bottom barrel lug until the safety lever just engages the safety lever notch in the slide (without reference to disconnector rise) is workable in slide/frame combinations with surface and hole locations that are at or near mid dimensional and locational specifications.

Caution: Because of the dimensional variables found in some slides and frames, I would suggest making it a practice to precheck slide/frame combinations for disconnector rise coincident with safety lever engagement well before attempting to cut a bottom barrel lug in a particular slide and frame. After completing this check, components can be optionally left in place as a precise lug cutting reference as discussed above in figure 120. Slides that do not pass this precheck because of disconnector camming/timing recess location or depth should be adjusted (if recess location permits and fitting material is available) and then rechecked before use. Frames that do not pass this check because of disconnector port diameter and/or port mislocation should not be used.

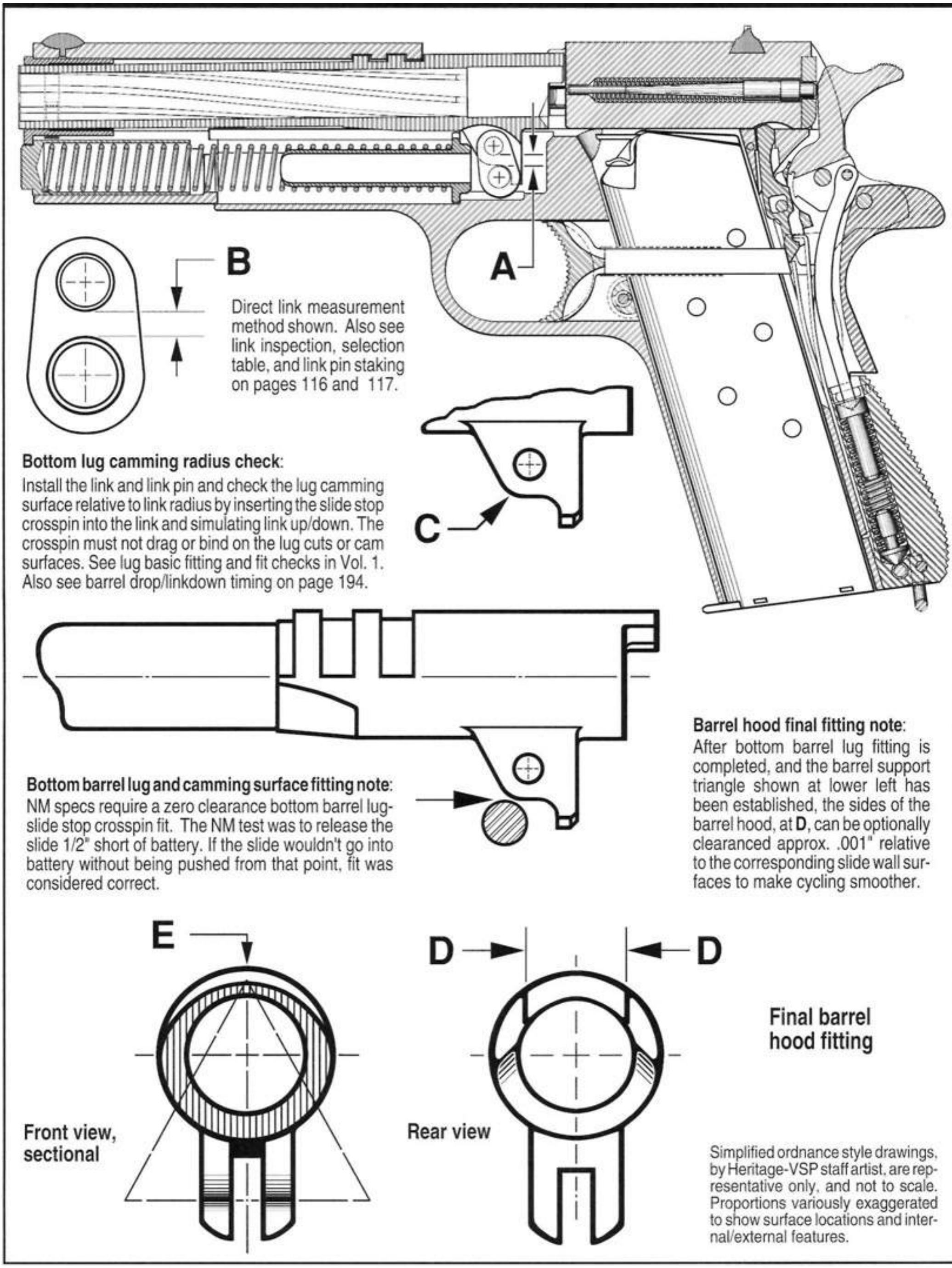


Figure 121- Arrows, at **A**, in the ordnance style sectional illustration, at top, indicate the vertical distance between the cut bottom barrel lug surface and the bottom of the barrel link pin hole. This critical distance, measured after removing the barrel, determines barrel link length. Specifically, the link selected must have the same pin bearing surface spacing, as referenced at **B**. Although identified by hole center location, barrel links should be selected with a digital caliper based on actual hole space measurement only. The illustration below shows the lug cam area, at **C**, radiused (best tool is an Eze-Lap diamond hone) to facilitate barrel link up/cam up and link down. Illustrations at bottom show the sides of the barrel hood, at **D**, that are final clearanced after the bottom lug is cut and the barrel is triangularly supported in locked position. If best link size is slightly tall, (vertical lock too tight) and the next shorter link size binds the slide stop crosspin, fine adjust the rear barrel lug slot bottom, at **E**, to fractionally raise vertical lug contact.

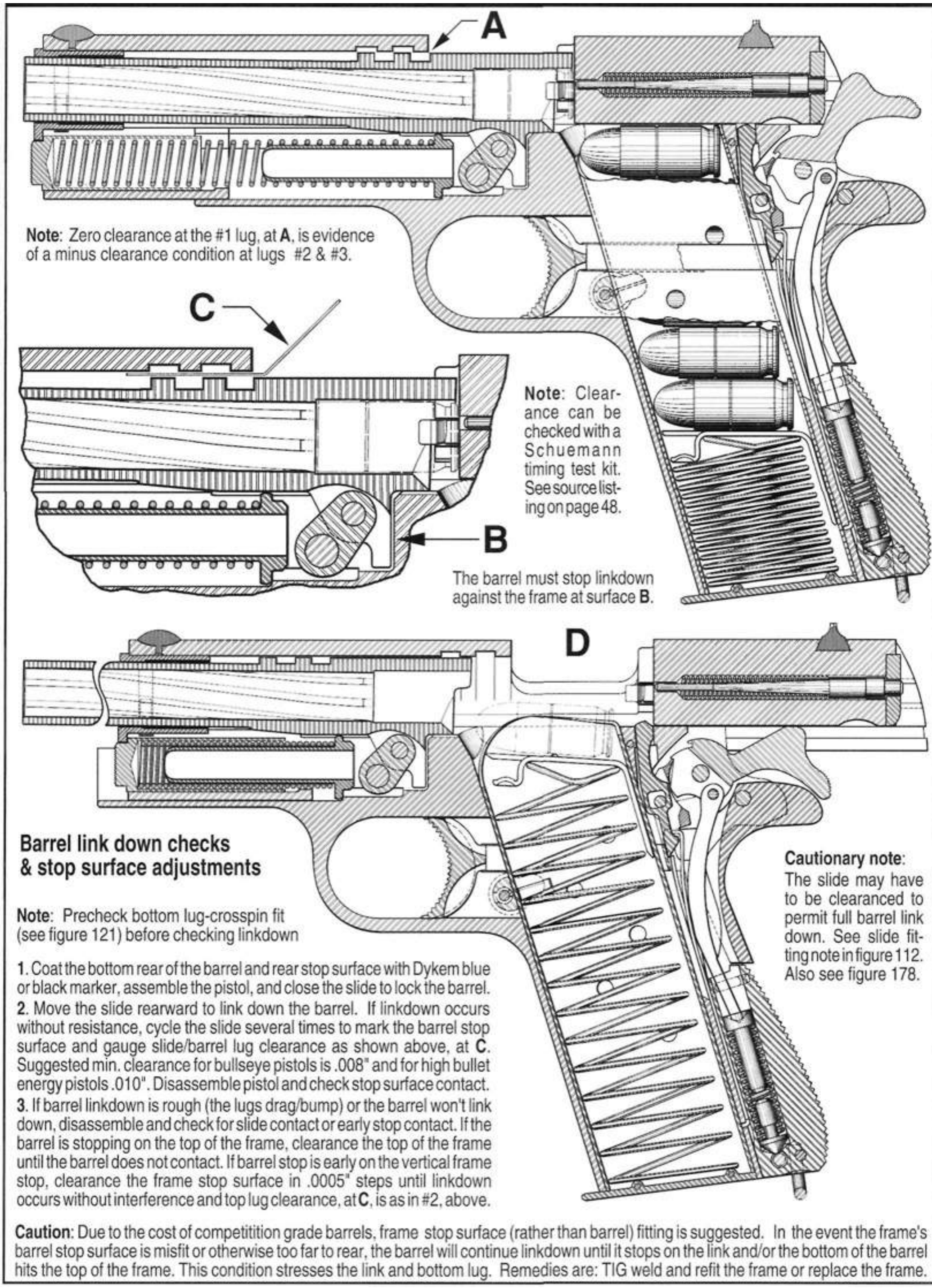


Figure 122- Ordnance style illustration by Heritage- VSP staff artist, at top, depicts a near zero slide/barrel lug clearance condition on barrel link down, at **A**. This static clearance may seem acceptable at the bench- but isn't dynamically when the pistol is fired. Higher bullet energies affect dynamics and require greater clearance. Illustrations below show an ideal barrel link down condition for comparison: (1) the vertical stop surface on the back of the bottom barrel lug contacts and stops the barrel against the vertical barrel stop surface inside the frame, at **B**; (2) with the barrel in this position an .010" gauge strip enters between the slide & barrel lugs without resistance, at **C**; and (3) with this clearance, the slide continues rearward movement without lug interference, at **D**. For further data, see optimum performance section on pages 183 - 197.

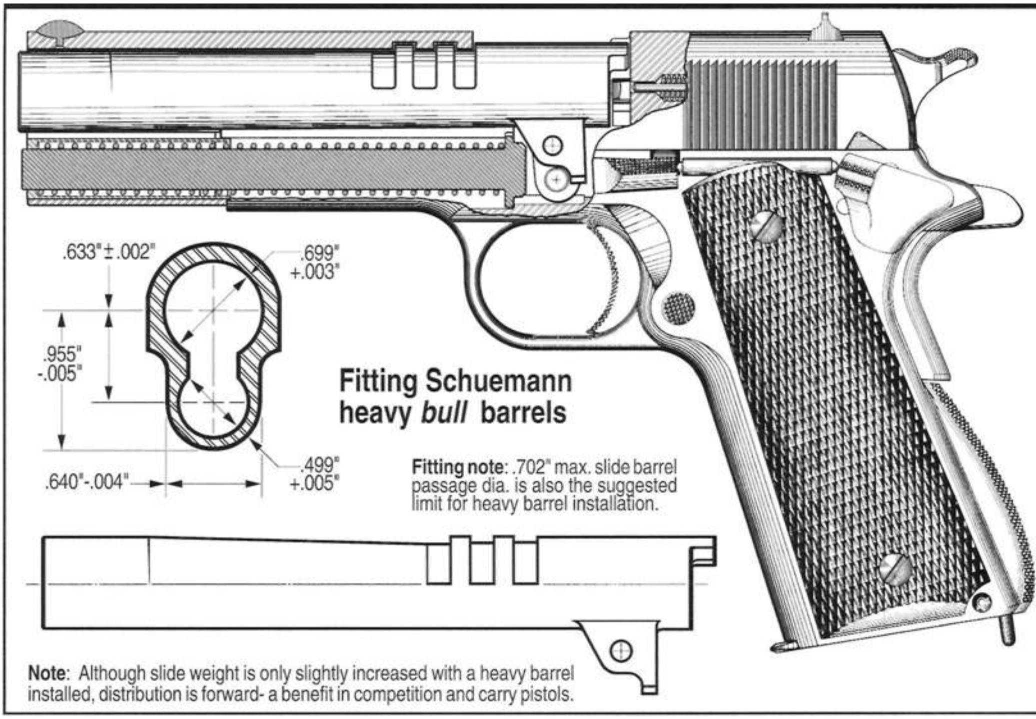


Figure 123- Ordnance style phantom sectional illustration by Heritage- VSP staff artist, at top, depicts a Schuemann heavy barrel installed in an M1911 type pistol. Except for elimination of the barrel bushing, fitting the barrel or slide to correct barrel wedging diameter relative to the barrel passage, and use of a reverse plug type recoil system, installation is essentially the same as with standard profile barrels.

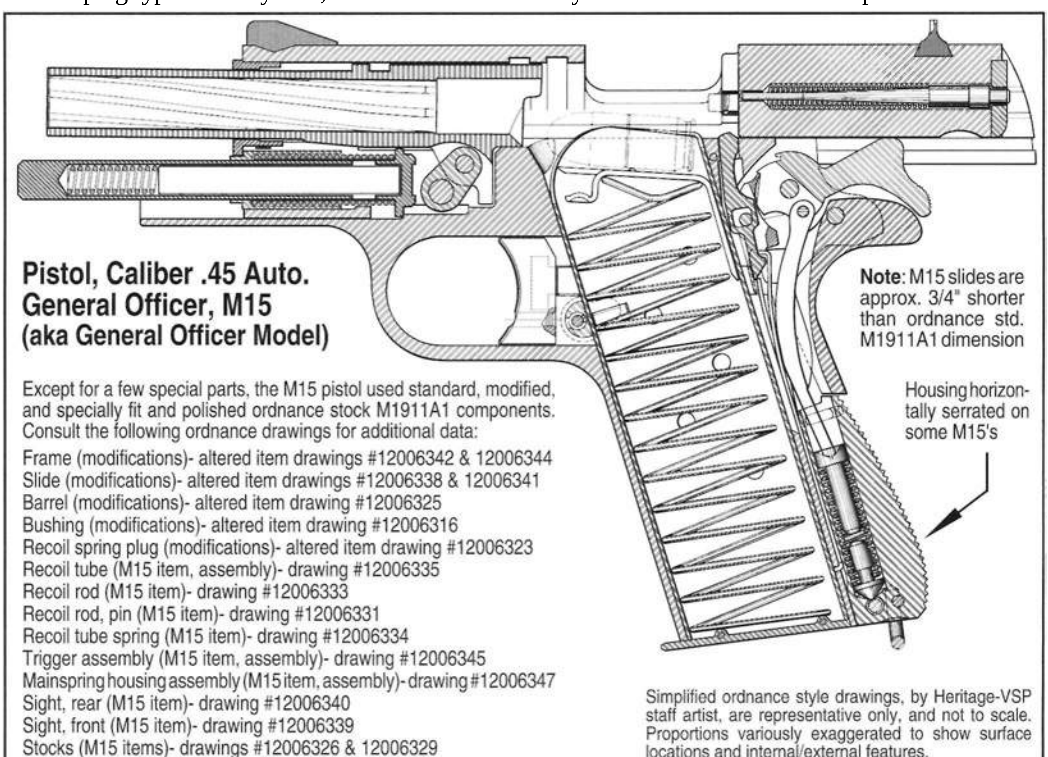


Figure 124- Ordnance style sectional illustration by Heritage - VSP staff artist shows an interior view of an M15 General Officer Pistol. M15 components are listed above. Major differences shown on page 137.

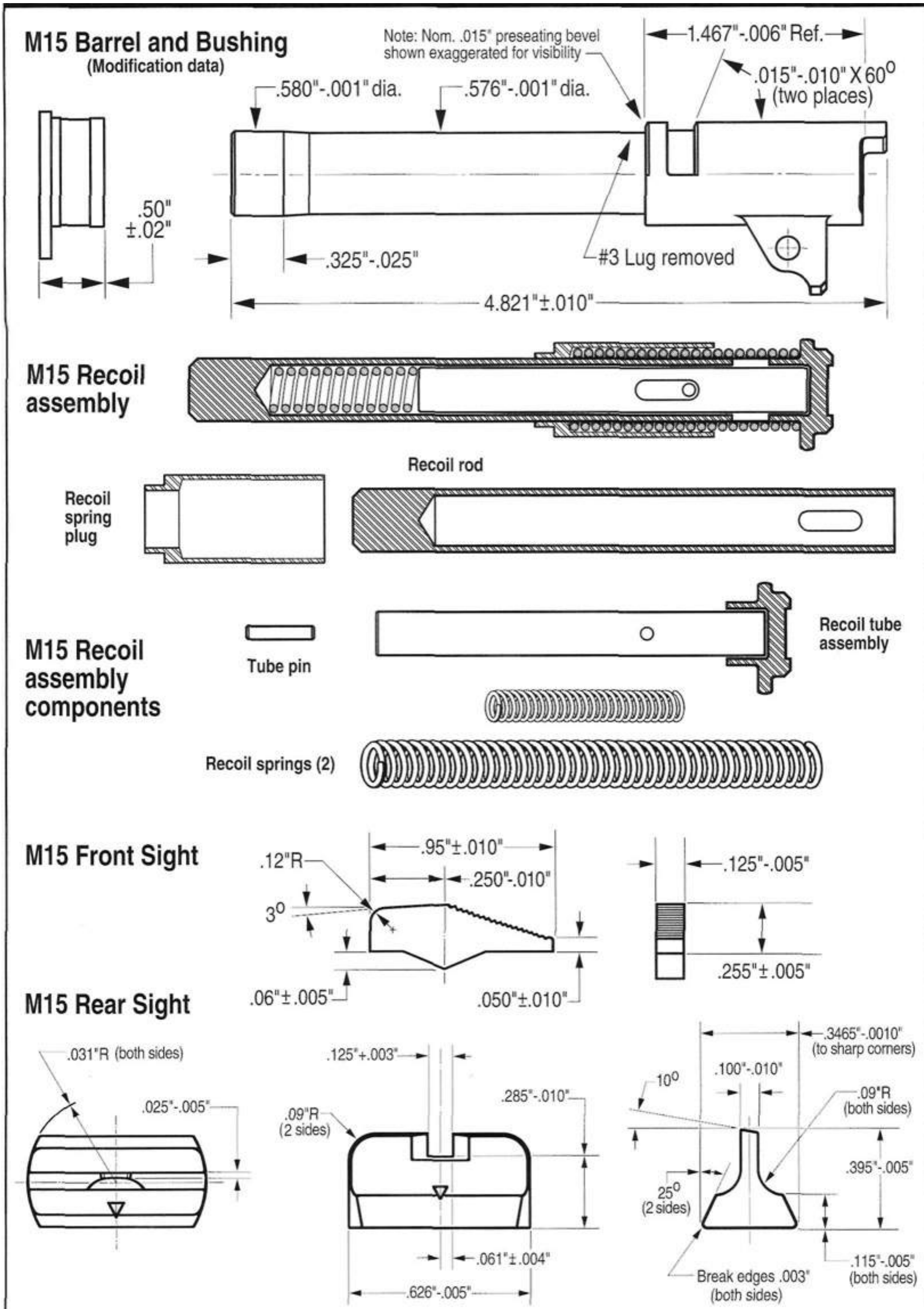
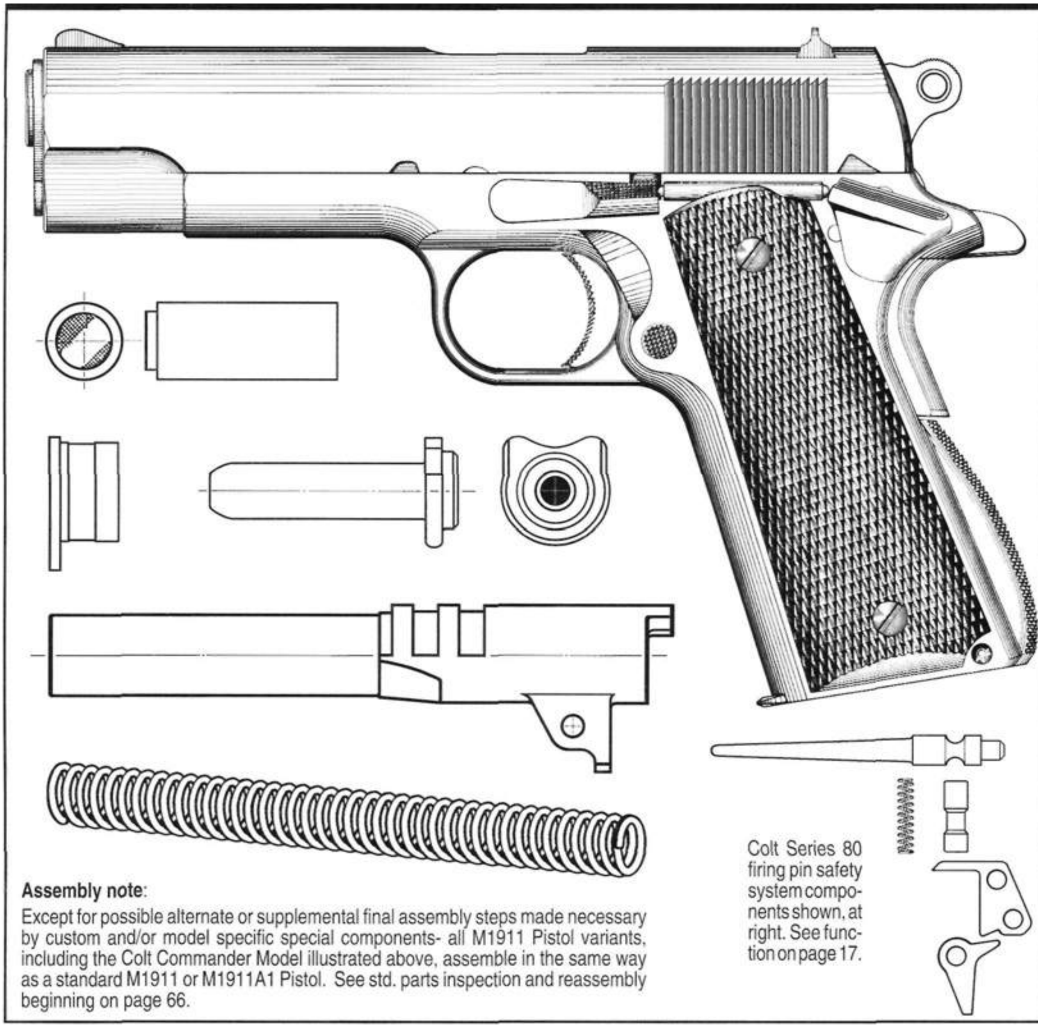


Figure 125- Ordnance style illustrations by Heritage - VSP staff artist, show M15 Pistol major component differences. The M15 was the ordnance issue replacement for the Colt .32 ACP M1903. Although few M15's were produced (just over 1000 were issued between 1972 and 1981), M15 data is furnished because of its historical significance and also to help pistolsmiths identify true M15 components (counterfeits began appearing in the mid 1970's). The M15 is a bonafide U.S. military pistol, and the last Ml911 variant to be produced beyond the experimental model stage by U.S. ordnance.



Assembly note:

Except for possible alternate or supplemental final assembly steps made necessary by custom and/or model specific special components- all M1911 Pistol variants, including the Colt Commander Model illustrated above, assemble in the same way as a standard M1911 or M1911A1 Pistol. See std. parts inspection and reassembly beginning on page 66.

Figure 126- Ordnance style illustrations by Heritage - VSP staff artist show Colt Commander Model component differences which include a 4 1/4" barrel; a short, otherwise standard barrel bushing; a shorter recoil spring (Commander springs typically have 24 coils); a shorter recoil spring guide and recoil spring plug; and a P-35 style hammer. The first Commander Model, an alloy frame version, was introduced in 1951. As with the M15 Pistol on pages 136 and 137, Commander slide length is also approx. 3/4" shorter than ordnance standard M1911 dimension. Commander slide length is the shortest suggested for pistols to be chambered for cartridges that are higher in pressure than industry standard .45 ACP pressure because of the angular locking lug bearing surface mismatch that correspondingly occurs with barrel angle increase as slide length is reduced below standard. In 3/4" shorter than std. length slides, only the top front corners of the barrel lugs initially bear on the slide lugs. **Note 1:** Lug face bearing area typically increases to approx. .015"-.020" on carbon steel barrels with normal lug seating. Unless barrel lug bearing surface angles are adjusted to agree with the slide in short slide M1911 type pistols chambered for medium plus pressure cartridges, this condition can cause sometimes graphic lug failures. Given the combination of high pressure cartridges, medium plus heat treat components, and angular + unequal lug bearing surface engagement, lug failures can occur in fairly short order. Unequal horizontal locking lug bearing surface engagement is discussed in detail on pages 94 and 124.

The above, by now almost forgotten, aspect of M1911 geometry, that of angular lug bearing surface mismatch (which increases with barrel angle) was the *thing* ordnance personnel were compensating for at Rock Island Arsenal by making the .015" x 60° barrel lug bearing surface edge cuts in fig. 125. This part of the process of converting M1911A1 barrels to M15's was specifically done to provide increased (more than corner only) lug bearing surface area prior to high pressure proof firing and lug pressure seating. **Note 2:** In commercial short slide .45 ACP M1911 type pistols, (that are not high pressure proofed) normal lug seating will usually seat the barrel lug bearing surfaces, in time, as discussed in note **1**, above.

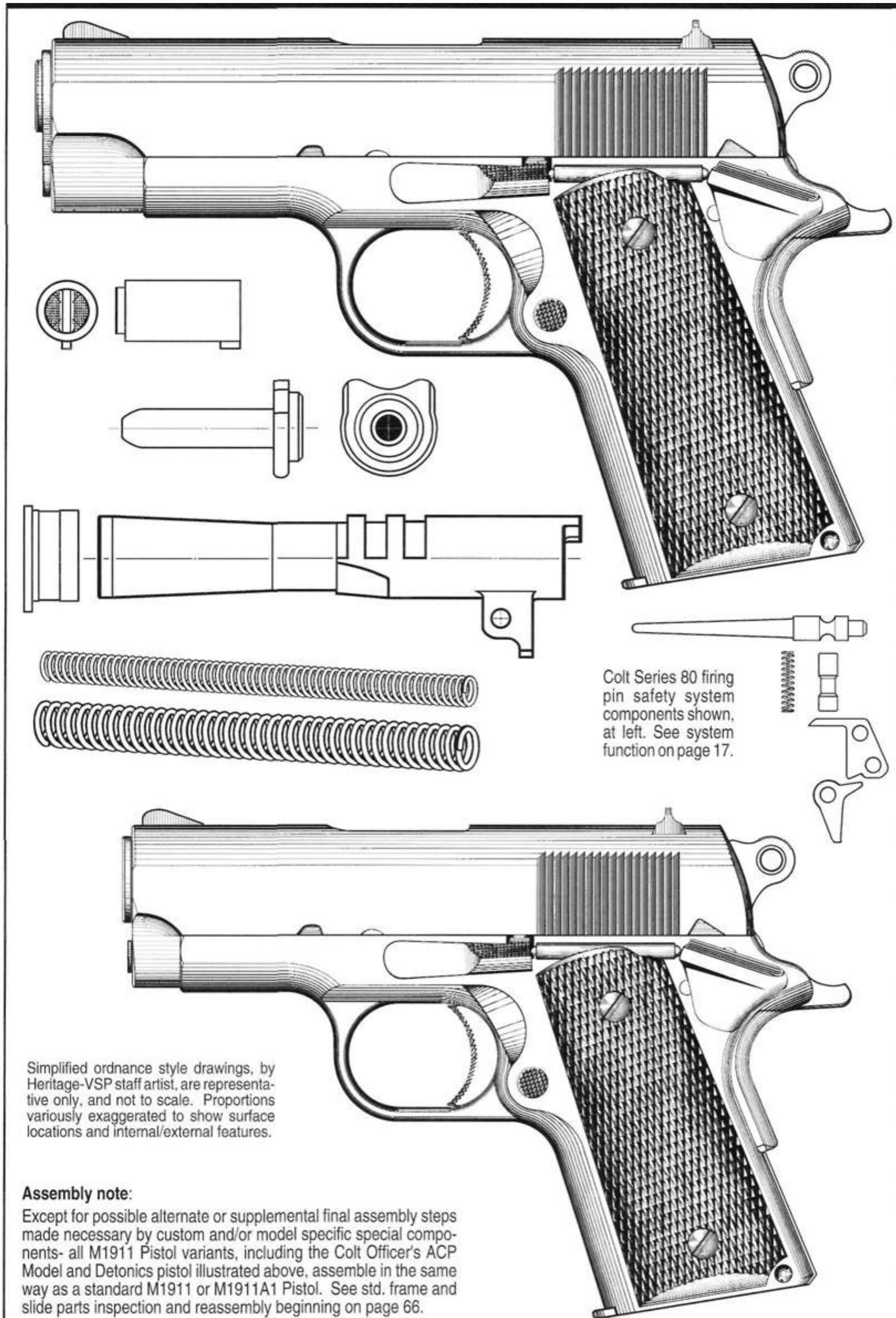


Figure 127- Ordnance style illustration by Heritage - VSP staff artist, at top, shows Colt Officer's ACP Model component differences which include an approx. 3 1/2" barrel; a short cone type barrel bushing; dual/concentric recoil springs; an extra short recoil spring guide, and a short recoil spring plug with slide locking tab. An ultra short early Detonics Ml911 variant is illustrated below for comparison.

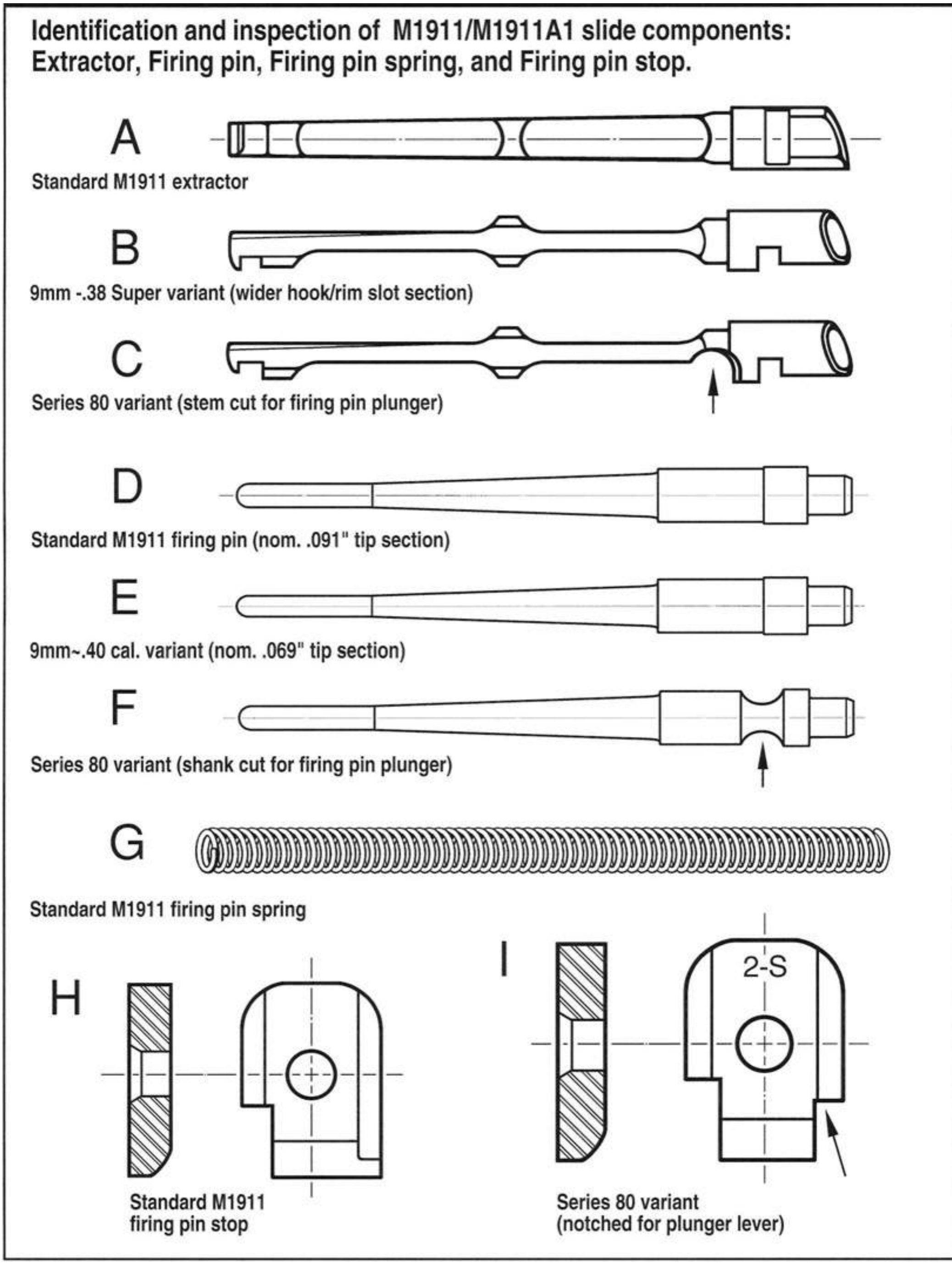


Figure 128- Ordnance style illustrations by Heritage - VSP staff artist, show views of a standard M1911/ M1911A1 extractor, firing pin, firing pin spring, and firing pin stop at **A, D, G** & **H**. Basic commercial variations are also shown for comparison and identification. Visual inspection steps: extractors (**A-C**) - closely inspect for excessive hook wear and evidence of misfitting or damage, including beginning stress cracks; firing pins (**D-F**) - tips must be spherical and the pin must be straight (runout should not exceed ordnance spec, of .003" TIR); firing pin springs (**G**) - coils must be round to prevent bind inside the firing pin passage, spring I.D. must friction fit on the nom. .153" O.D. taper at the rear of the pin and free length and tension must be within ordnance specs, to maintain the firing pin in rearward stop contact position and; firing pin stops (**H** & **I**) - inspect for excessive wear, hammer peening, and beginning cracks. See extractor and firing pin assy, dimensional inspection, fitting data, and slide assembly on pages 141-145.

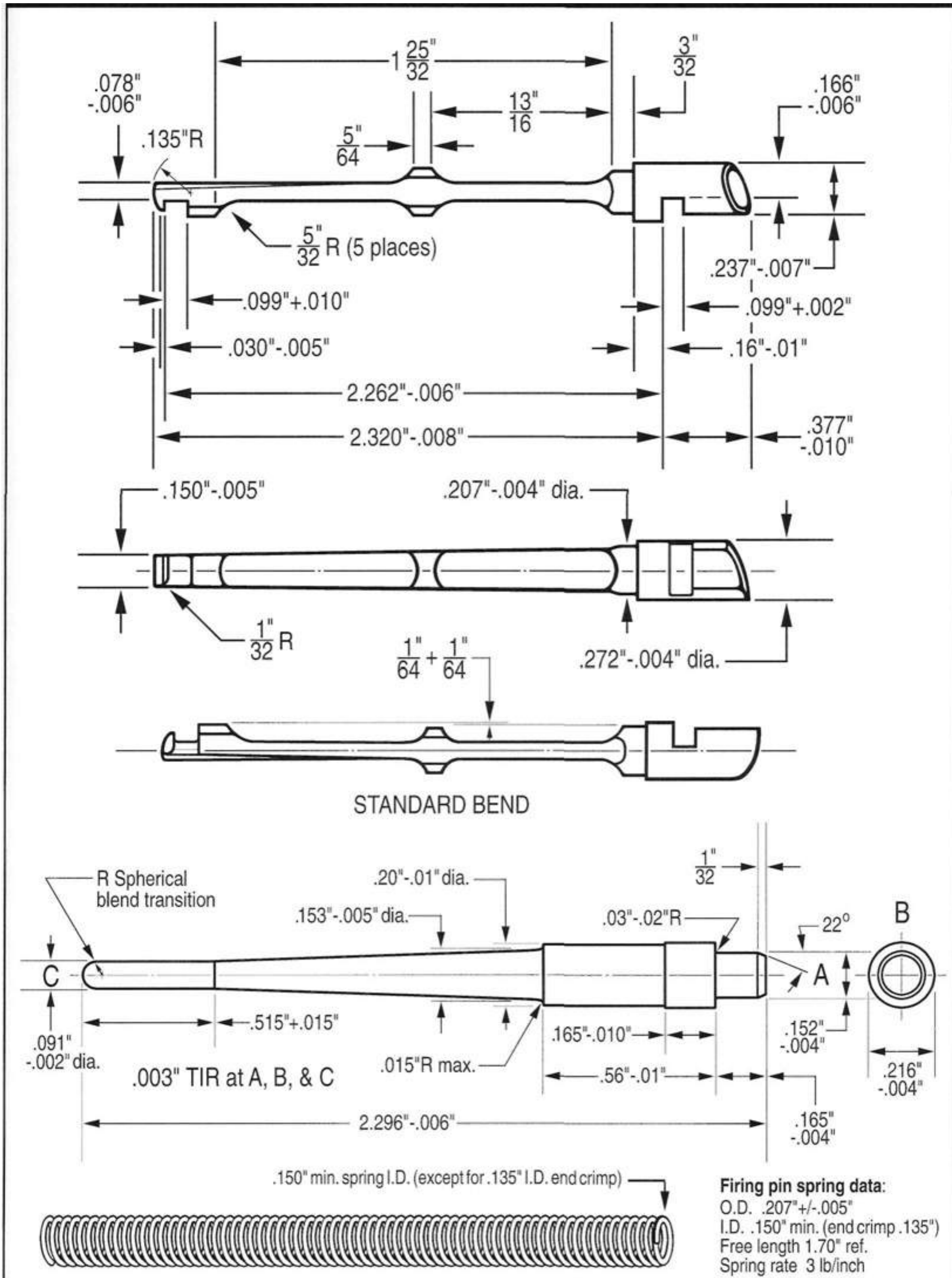


Figure 129- Ordnance style drawings by Heritage - VSP staff artist, show M1911/M1911A1 extractor, firing pin, and firing pin spring dimensional inspection details. Ordnance specified M1911A1 and M1911A1 NM extractor material and heat treat: material- 1060 to 1095 special steel, austenitic grain size 7 or finer; heat treat to RC 48-52. For further data, see ordnance drawing #6008595. Ordnance specified M1911A1 and M1911A1 NM firing pin material and heat treat: material- 1060, 1070, 1095 steel, austenitic grain size 7 or finer; heat treat to A70.5 to 73.5 (C scale equivalent RC 40 - 46). For further data, see ordnance drawing #6008599. **Extractor notes:** Ml911 extractors are basically springs. This being the case, best material is as specified. Regarding commercial products- I would suggest rejecting cast extractors and using well machined, well heat treated extractors made by quality manufacturers, only.

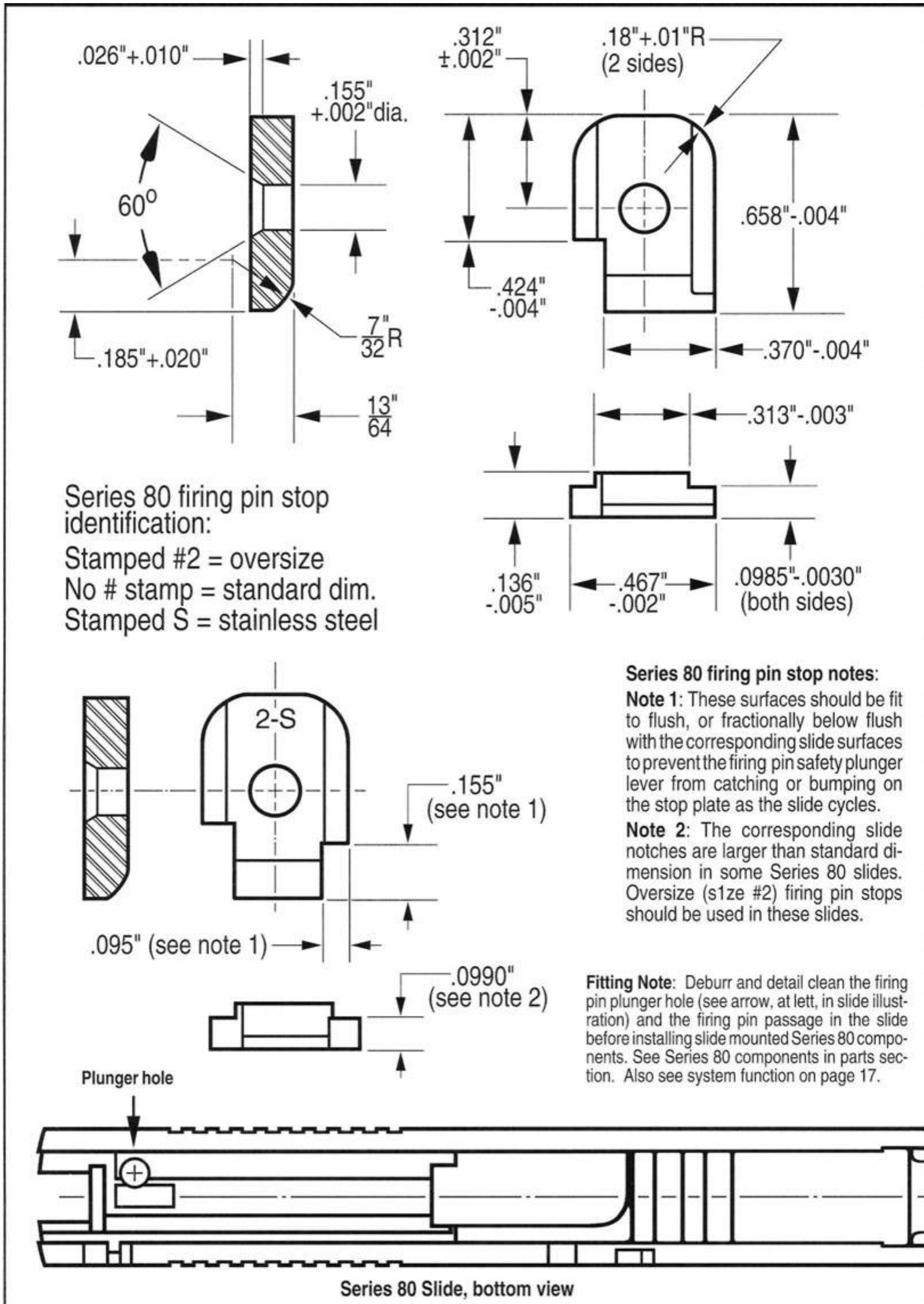


Figure 130- Ordnance style drawing by Heritage - VSP staff artist, at top, shows M1911/M1911A1 firing pin stop plate dimensional inspection details. Series 80 dimensional differences are shown and discussed below. Ordnance specified M1911A1 and M1911A1 NM firing pin stop material and heat treat: material- 4140 or 4150 steel, austenitic grain size 6 or smaller; heat treat to RC 43.5 to 50. For further data, see ord. drawing #5013205. Loose firing pin stop plate fit remedies: (**1**) trial fit and install an oversize plate, or (**2**) tighten fit by 3 point dimpling the outer edges of the plate with a prick punch.

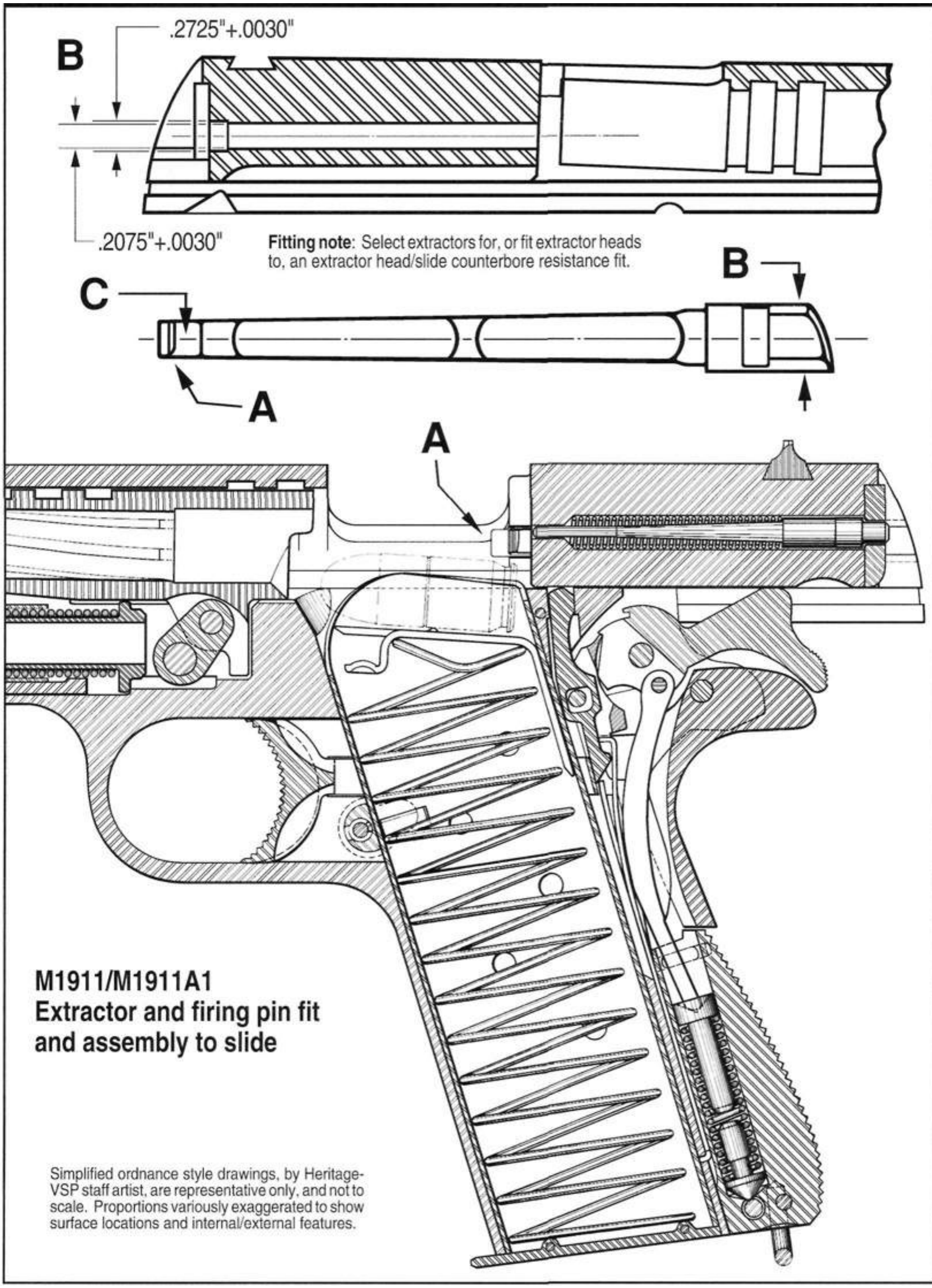


Figure 131- Ordnance style drawings by Heritage - VSP staff artist, show M1911/M1911A1 extractor fitting details **A** through **C**. Fitting details **D** and **E** are shown and discussed on pages 144 and 145. The five most important extractor fitting areas are:

1. Extractor hook-1/32" angled cartridge rim clearance radius, at **A**. (See cartridge angle, at A, in illust.)
2. Extractor head- head/slide counterbore resistance fit, at **B**.
3. Extractor slot-1/16" bottom cartridge rim pickup radius (or alternate bevel) and surface polish, at **C**.
4. Extractor tension- adjust bend to correct spring tension, at **D**. (See standard bend on page 144.)
5. Extractor clearance- clearance back of extractor, at **E**, (see page 145) to eliminate cartridge rim bind.

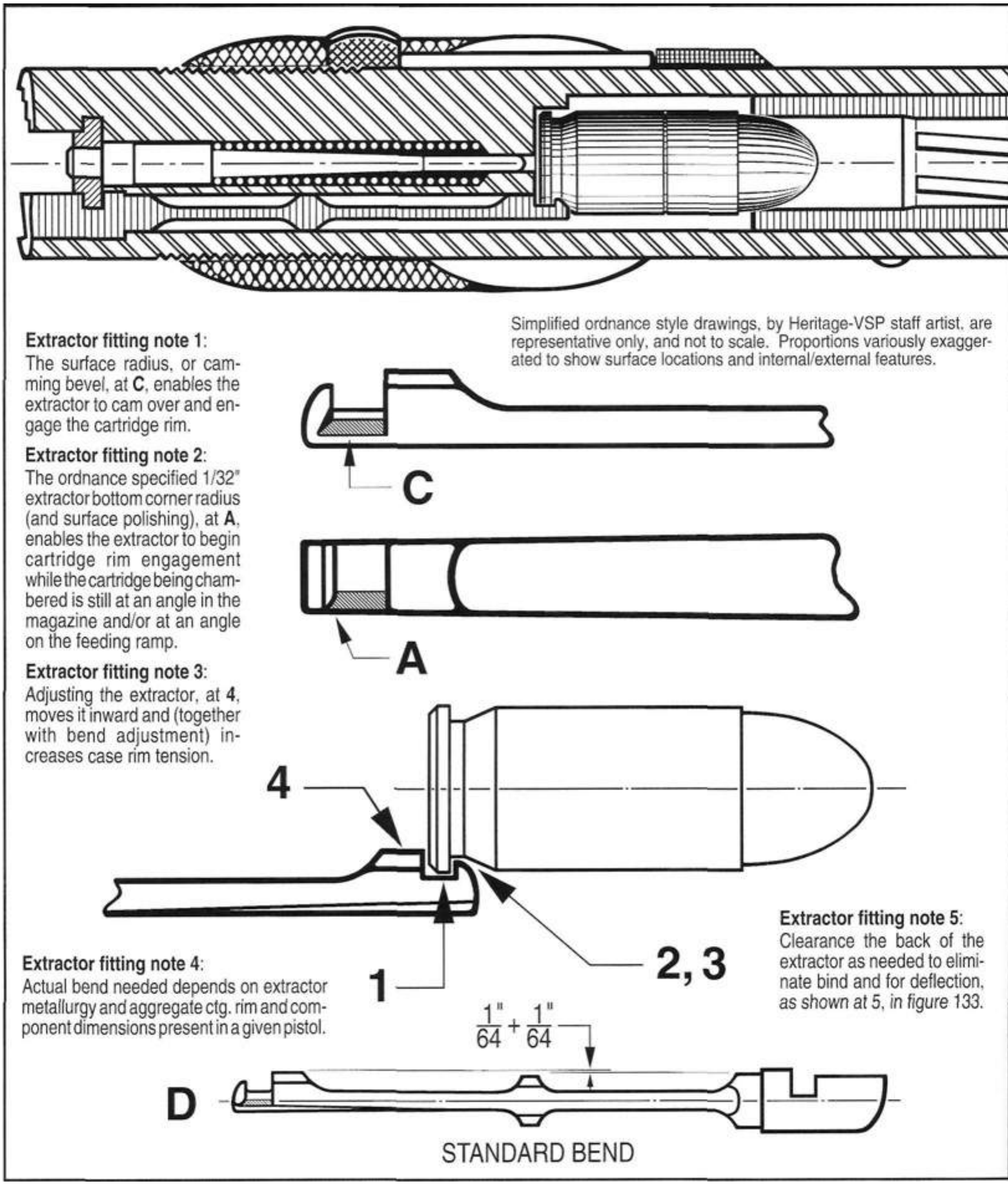


Figure 132- Ordnance style sectional illustration by Heritage - VSP staff artist, at top, shows an M1911 ball round just below the extractor at the moment immediately before the cartridge *breaks over* into horizontal alignment with the chamber and the cartridge rim is engaged by the extractor hook. To enable the extractor to do this without binding, the ordnance specified 1/32" angular (angled cartridge) clearance radius, at **A**, must be correctly cut and the surface and corner edges deburred and polished (see cartridge angle, at pickup, in the sectional illustration on page 143); the 1/16" cartridge rim pickup radius, at **C**, must be smoothly cut and the surface polished (the alternate 45° angle rim pickup cut surface shown in Volume 1 also must be polished). Extractor bend, at **D**, and resulting cartridge case rim pressure (at **E** on page 145) should not exceed the ordnance specification for ball cartridges of 4 1/2 lbs. **Note:** This specification was based on the pressure needed to push a flat gauge in, rather than pull it out. When correctly fit, the extractor should bear only on the outer diameter of the cartridge rim, at **1**, and not on the bottom of the rim recess cut or on the bevel at **2** & **3**. In the event that a correctly tensioned extractor does not make rim contact at 1, adjust the stop pad surface, at **4**, until the extractor just contacts the rim. If a test cartridge, or an extractor tension gauge, (see illustration in figure 133), drags, binds, or won't engage the extractor (the extractor will not deflect), check for back of extractor/ slide extractor passage contact and clearance the back of the extractor, as shown at **5**, on page 145.

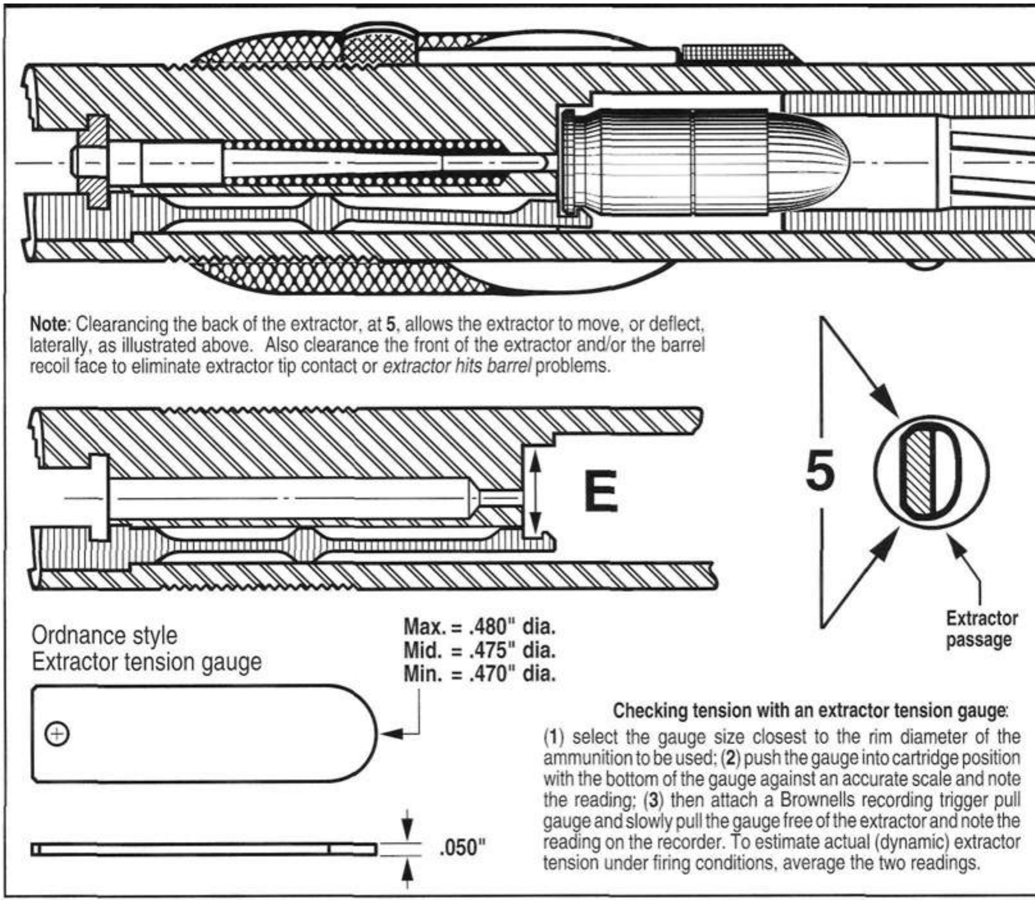


Figure 133- Ordnance style sectional illustration by Heritage - VSP staff artist, at top, shows a ball cartridge in *breakover* position (i.e., at the point the cartridge horizontally aligns with the chamber) and with the cartridge rim engaged by the extractor hook. In this example, the pressure needed to insert a mid specification (.475" cartridge rim dia.) extractor tension gauge, at **E**, was an excessive 7 lbs. Although bend tension is a factor, the remedy in this case was to clearance the back of the extractor, at 5; adjust extractor hook slot depth; adjust the 1/16" rim pickup radius, and polish the surfaces. Ordnance style extractor tension gauge(s), illustrated, are easily made from 3/64" ground flat stock or .050" gauge stock.

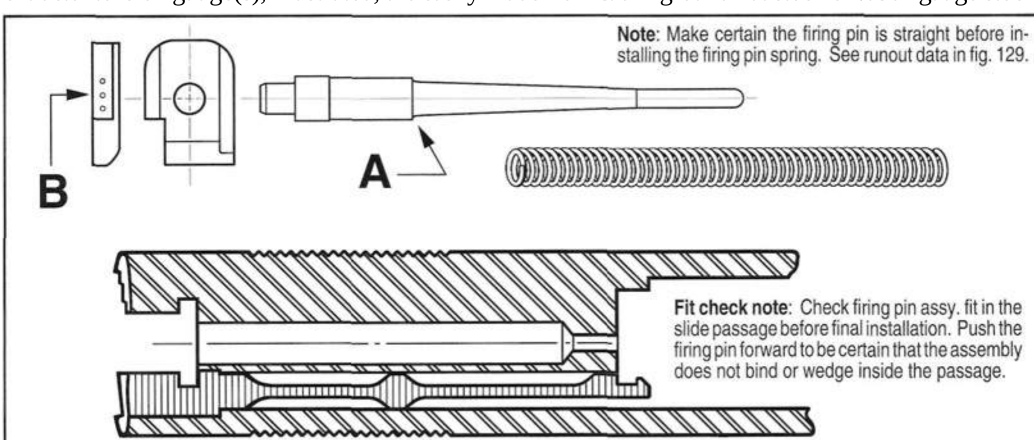


Figure 134- Ordnance style illustrations by Heritage - VSP staff artist, at top, show firing pin assembly components ready for installation after extractor fitting. Ml911 firing pins and springs were designed to function as an inertial unit. The spring, therefore, must be captive on the pin taper, at **A**. See end crimp in figure 129. Slightly loose stop plates can be tightened by lightly dimpling with a prick punch, at **B**.

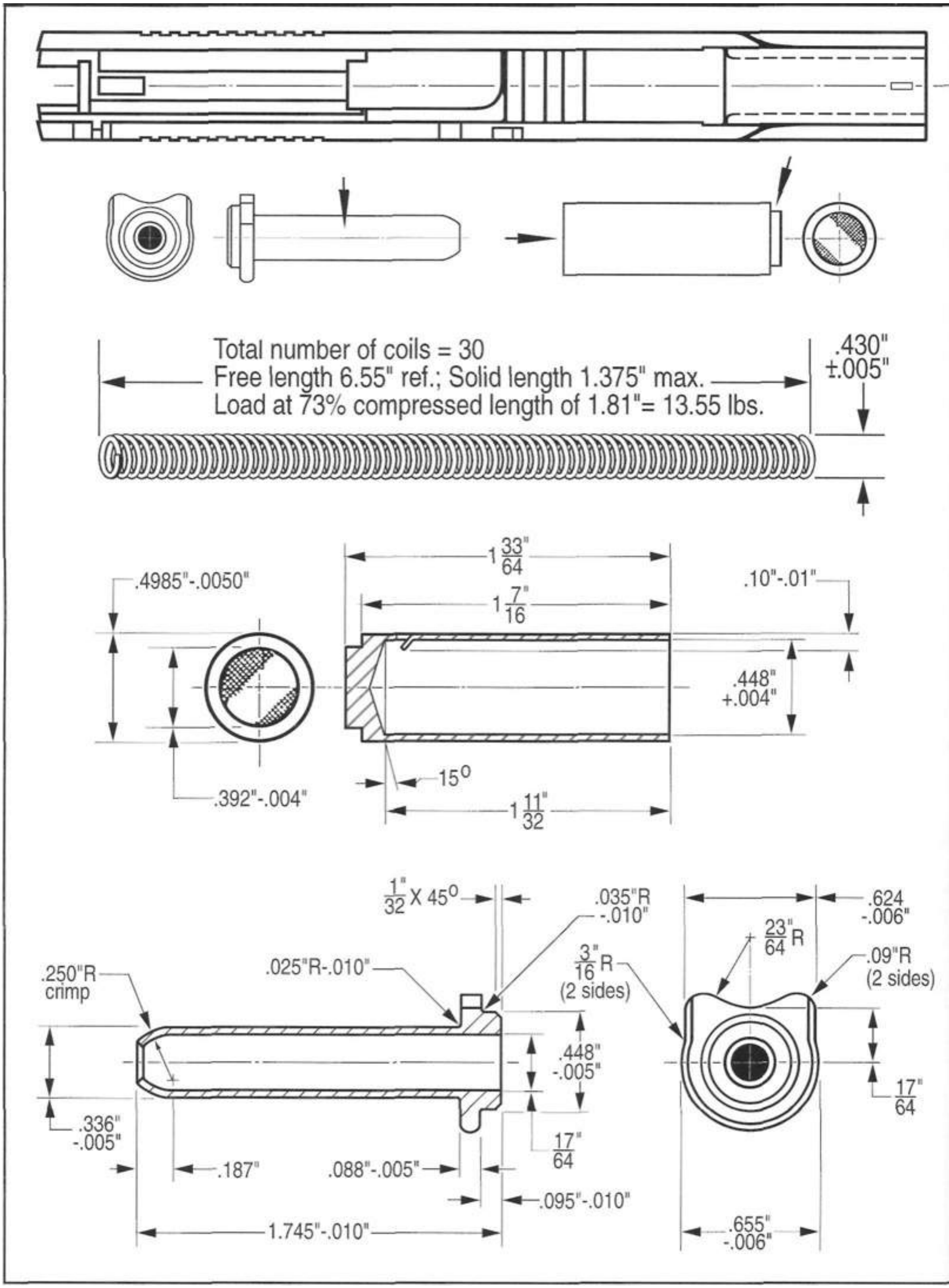


Figure 135- Ordnance style drawings by Heritage - VSP staff artist, show M1911/M1911Al slide group components, that are installed after the slide is mounted to the frame. Recoil spring, recoil spring plug, and spring follower visual inspection points are indicated at arrows above. Inspect components for out of roundness, beginning cracks, and other evidence of damage. Dimensional inspection data is shown below. Specified spring plug material and heat treat: material - 1020 to 1025 steel; heat treat sufficient for machining. For further data, see ordnance drawing #5013201. Specified follower material and heat treat: material - 1045,1050, or 1137 steel, heat treat to RC 35-40. For further data, see ordnance drawing #6008597. Spring data: ordnance std. recoil springs have 30 coils. Fully compressed spring tension is 17.36 lbs. Although tension is progressive, this equals an average spring rate of approx. 2.65 lbs/inch.

Identification, inspection, fitting and installation of M1911/M1911A1 frame parts group components:

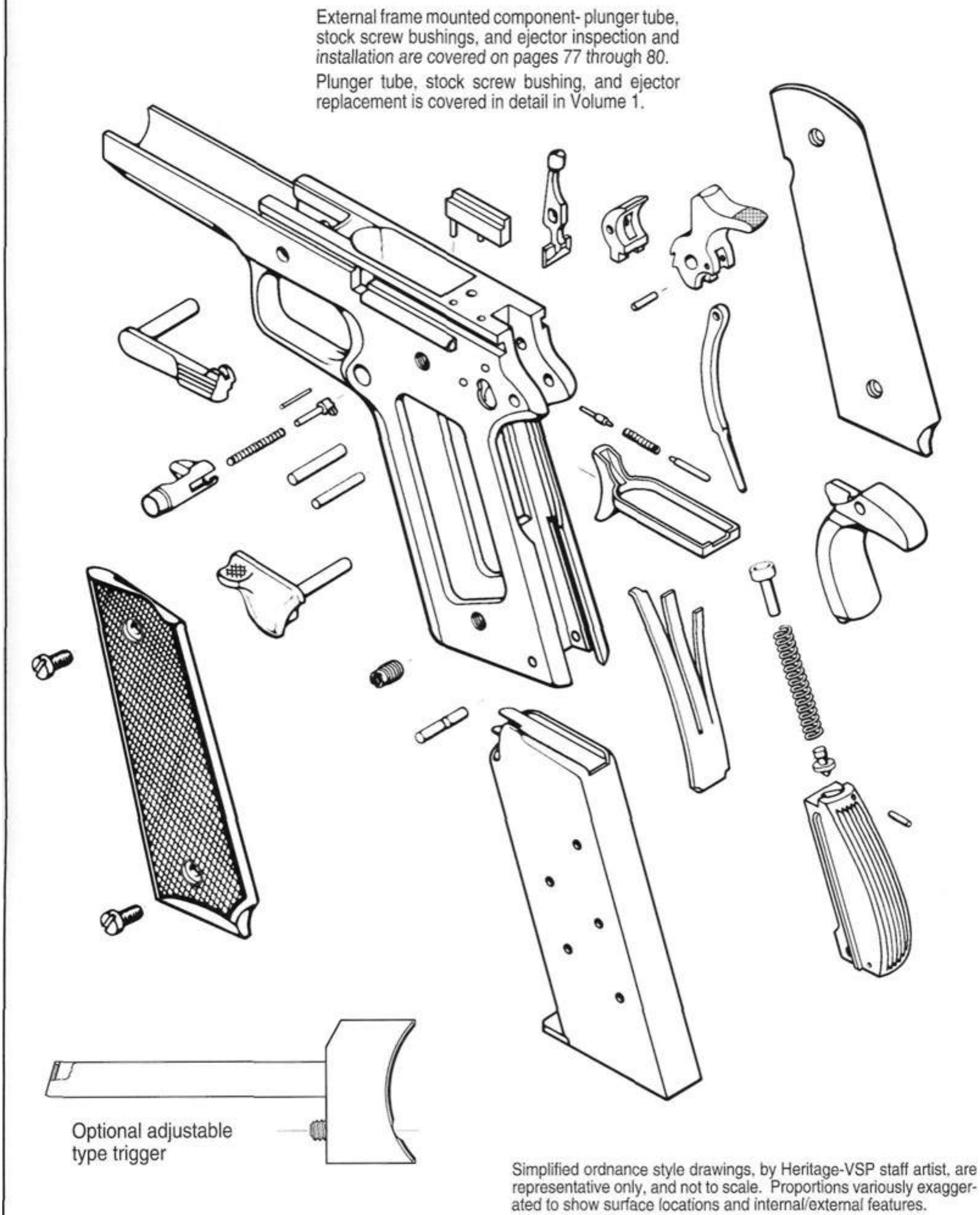


Figure 136- Ordnance style illustration by Heritage - VSP staff artist, shows an exploded view of M1911/M1911A1 frame group parts. These components are visually and dimensionally inspected, fit checked, and installed in this section. The installation sequence shown on the following pages groups components based on primary interactivity of the parts and relative location. To illustrate: the slide stop, safety lever, and slide stop/safety lever spring/plunger assy, are inspected, fit checked, and then installed together. Critical interactions of parts installed later in the sequence with earlier installed parts is discussed with the later part. For example: the final aspect of thumb safety fitting is sear stop surface adjustment which can be accurately done only after hammer and sear fitting has been completed.

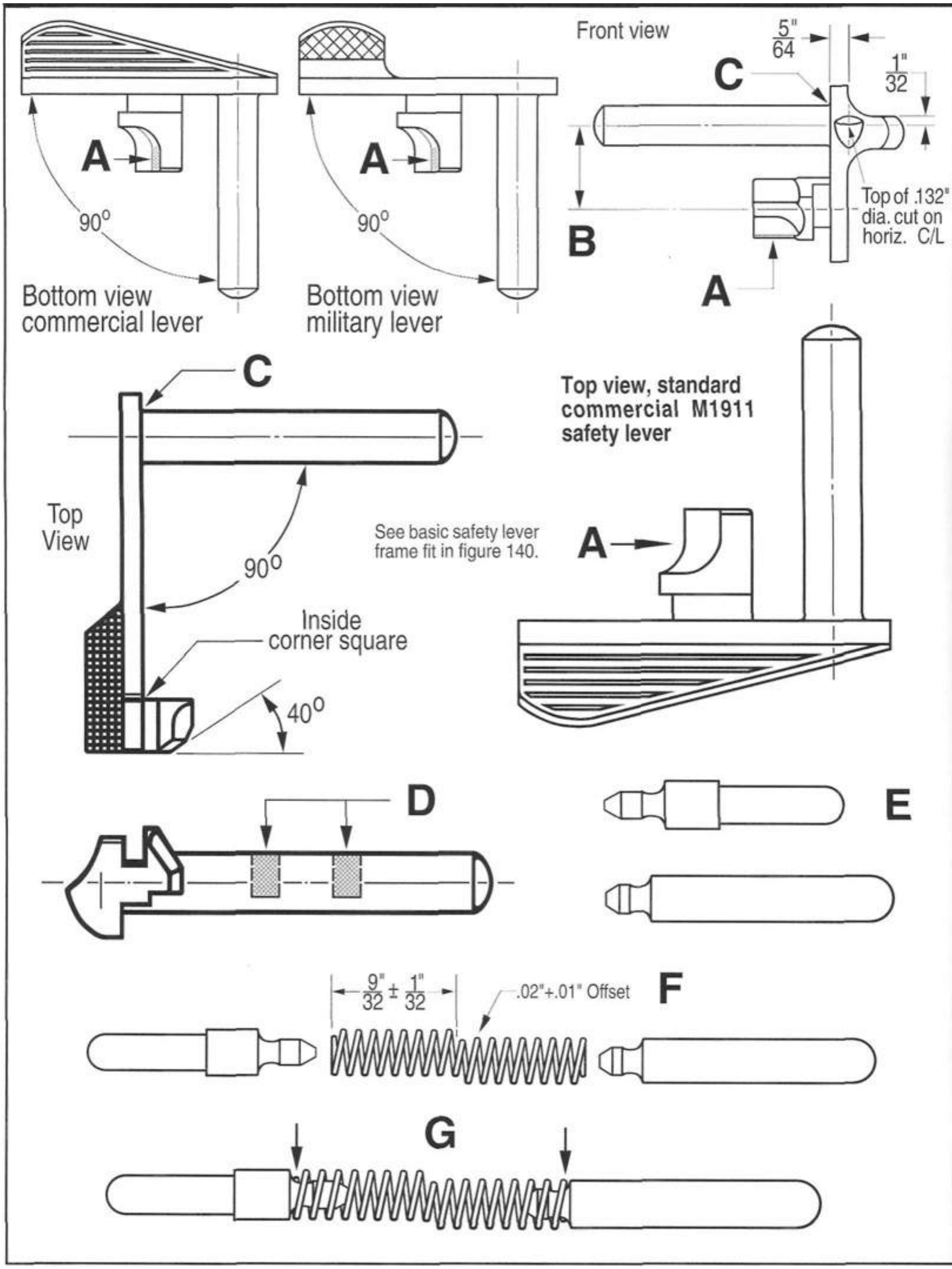


Figure 137- Ordnance style illustrations by Heritage - VSP staff artist show M1911/M1911A1 safety lever, slide stop (slide lock), and safety/slide stop spring and plunger assembly visual inspection points. Critical points are: (**1**) the safety lever sear stop (sear blocking) surface, at **A**, must be within ordnance specifications, or long enough to positively block the sear in the pistol the safety is installed in (see sear stop surface fitting on page 169); (**2**) safety pivot shaft and stop stud axes, at **B**, must be parallel to minimize angular bind; (**3**) the inside pin shaft/lever corner radius, at **C**, must be present on both the safety and the slide stop to minimize stress crack potential; (**4**) the slide stop crosspin must be checked for lug peening, at **D**, (shiny lug contact marks should show, only- surface upset indicates the stop is too soft); (**5**) both plungers, at **E**, must have smooth spherical ends and serviceable spring inserts; (**6**) spring offset, at **F**, must be as shown and spring end crimp(s), at **G**, must capture both plunger stem spring inserts.

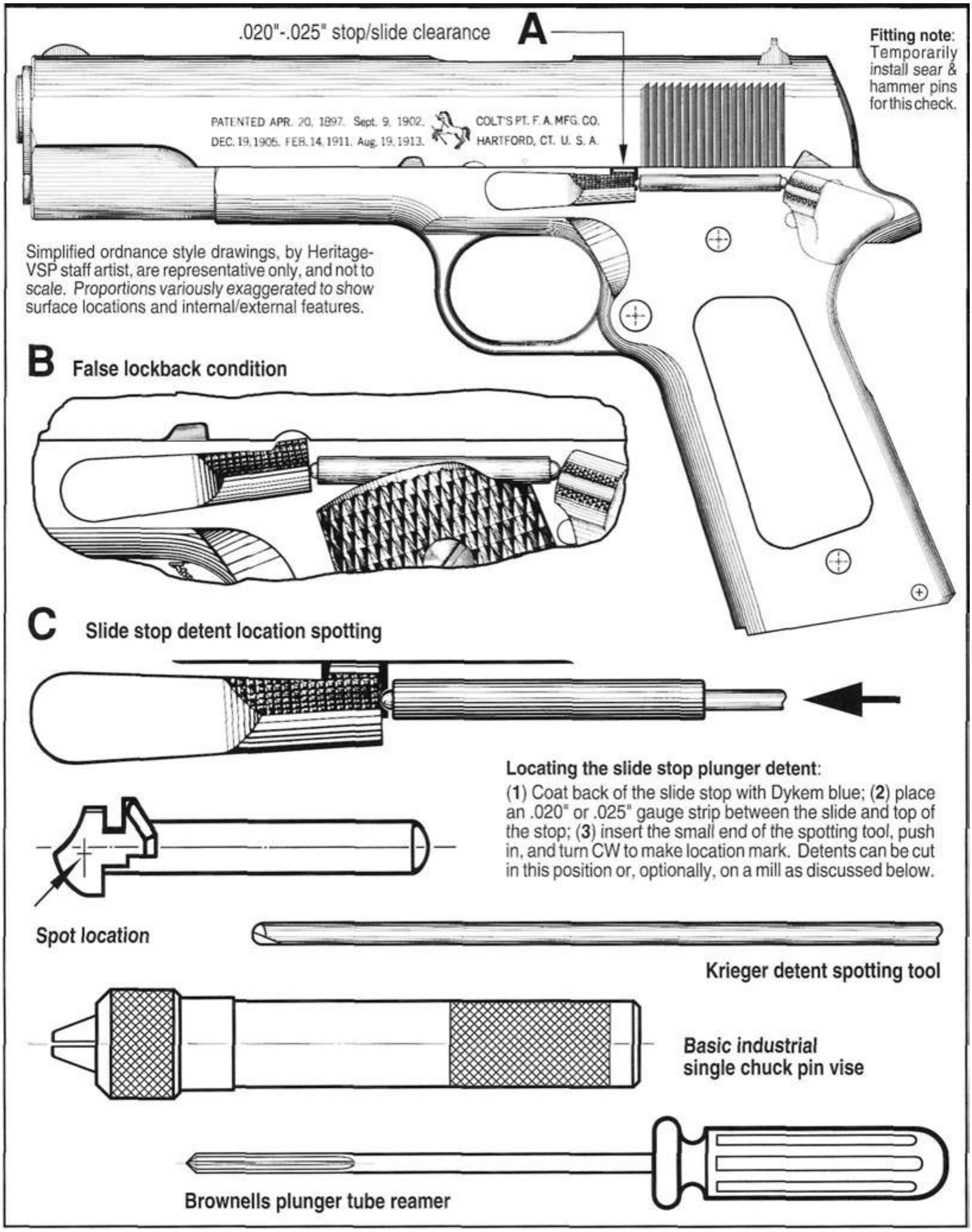


Figure 138- Ordnance style illustration by Heritage - VSP staff artist, at top, shows the slide assembly temporarily installed on an M1911Al frame for frame mounted component fit checks. The safety lever, slide stop, and safety/slide stop spring and plunger assembly are trial installed to check pivot function and clearance. The safety lever should ride on the tops of fractionally above flush hammer and sear pin heads rather than bearing directly on the frame. The flat surface on the top of the slide stop (see arrow at **A**) should clear the bottom of the slide approx. .020" to .025" when in installed position. Insufficient clearance and/ or incorrect magazine follower bend can cause the false lockback condition shown at **B**. Correct stop clearance plus the addition of a slide stop plunger detent controls slide stop position and eliminates false lockback. Detent location spotting and the tools used are illustrated, at **C**. Tooling, including plunger tube reamers (2 diameters made), available from Brownells, Inc. Best detent cutting method is to locate the spot, as shown above, secure the stop in a mill vise, and cut the detent dimple with a 1/8" carbide ball end mill. Trial cut carefully. A too deep detent will prevent slide auto lock open on an empty magazine.

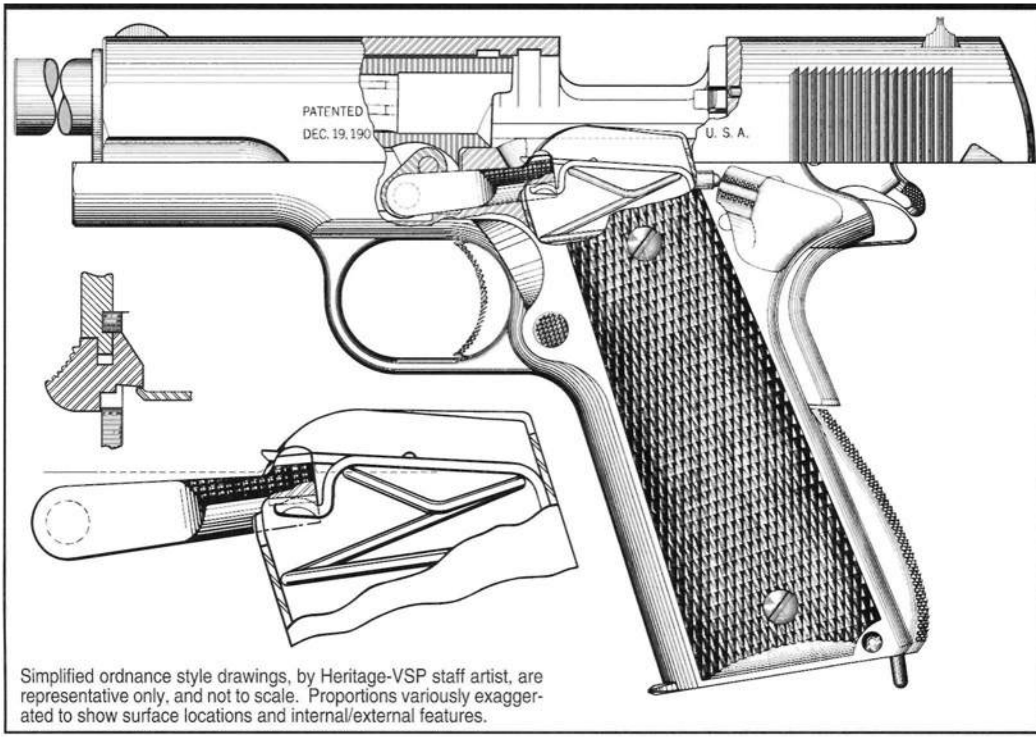


Figure 139- Ordnance style phantom illustration by Heritage - VSP staff artist shows an M1911A1 slide in auto lock back position on an empty magazine in a fully assembled pistol. The sectional illustrations below show relative magazine follower and slide stop positions. Although lockback can be checked with a serviceable magazine at any point after slide stop fitting, slide stop and slide stop detent cut reliability are easiest checked before installing the mag. catch assembly by slowly sliding a known serviceable magazine into the magazine well and observing when a slide stop (without detent cut) begins to move or when a slide stop with detent breaks detent. The stop should begin to move when the bottom of the magazine is approx. 5/16" short of frame contact. Detent break should occur approx. 1/8" beyond.

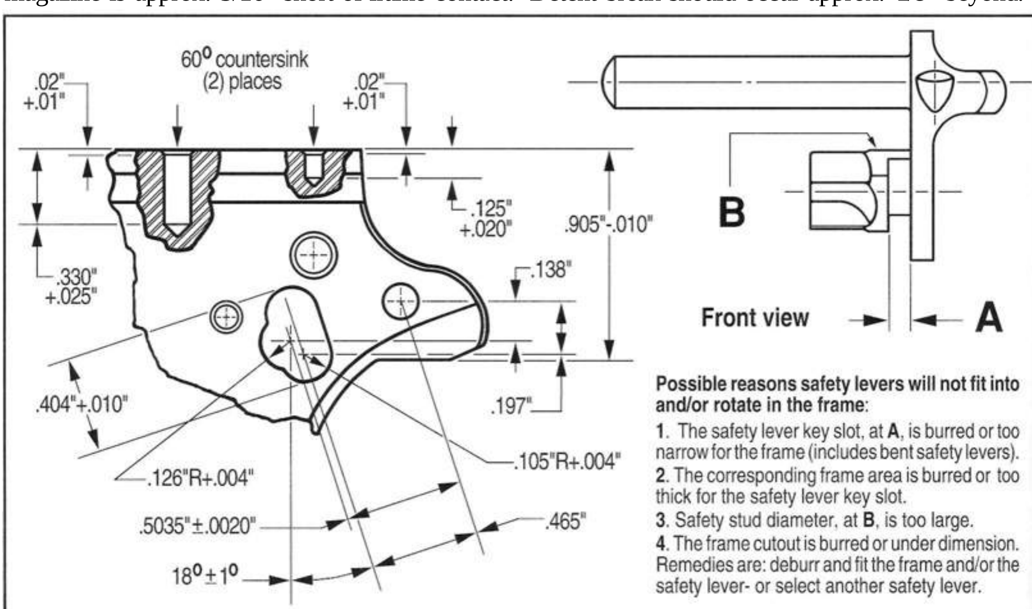


Figure 140- Ordnance style illustration by Heritage - VSP staff artist, at left, shows M1911A1 frame safety lever cutout dimensional details. Basic safety lever/frame cutout fit check and fit adjustment points are shown and discussed, at right. Safety lever dimensional inspection data is shown on page 152.

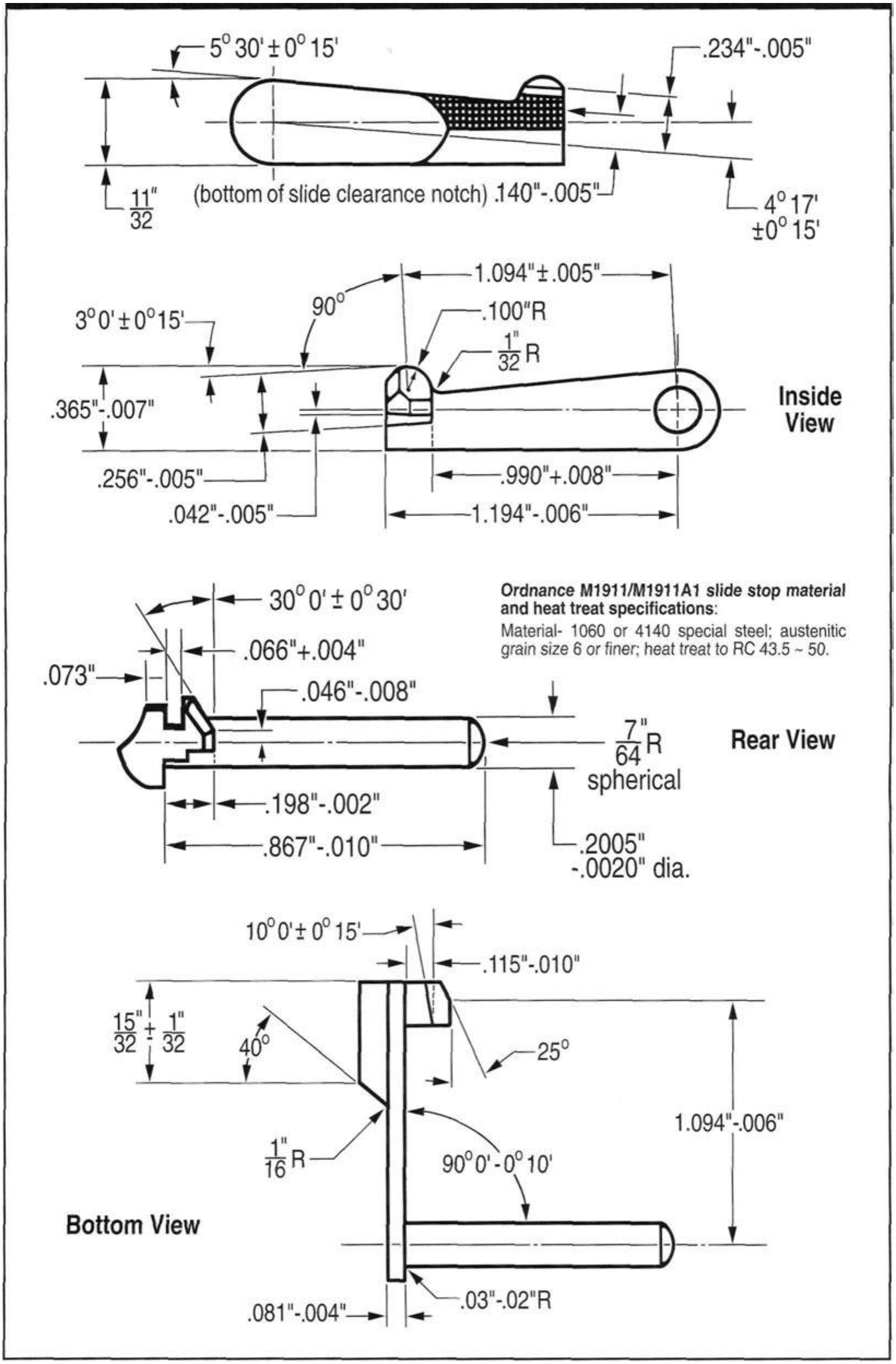


Figure 141- Ordnance style illustrations by Heritage - VSP staff artist show M1911Al slide stop dimensional inspection details. For further data, consult ordnance drawing #6008595.

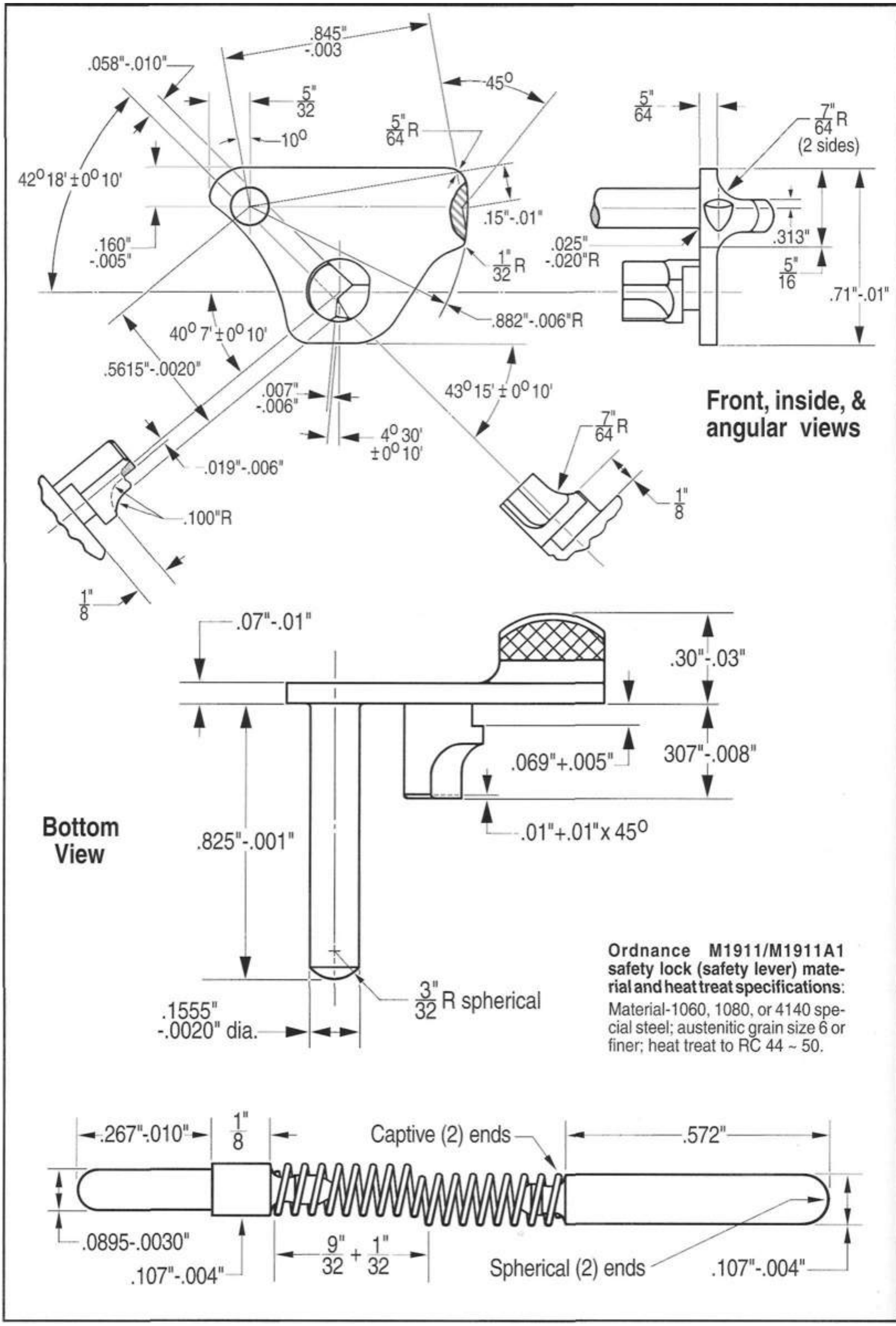


Figure 142- Ordnance style illustrations by Heritage - VSP staff artist show M1911A1 safety lock (aka thumb safety lever) and slide stop-safety lever spring/plunger assembly dimensional inspection details. For further data, consult ordnance drawings: #5503840 (safety lock) #5013194 (slide stop/ safety plunger spring); #5013193 (slide stop plunger); and #5013195 (safety lock plunger).

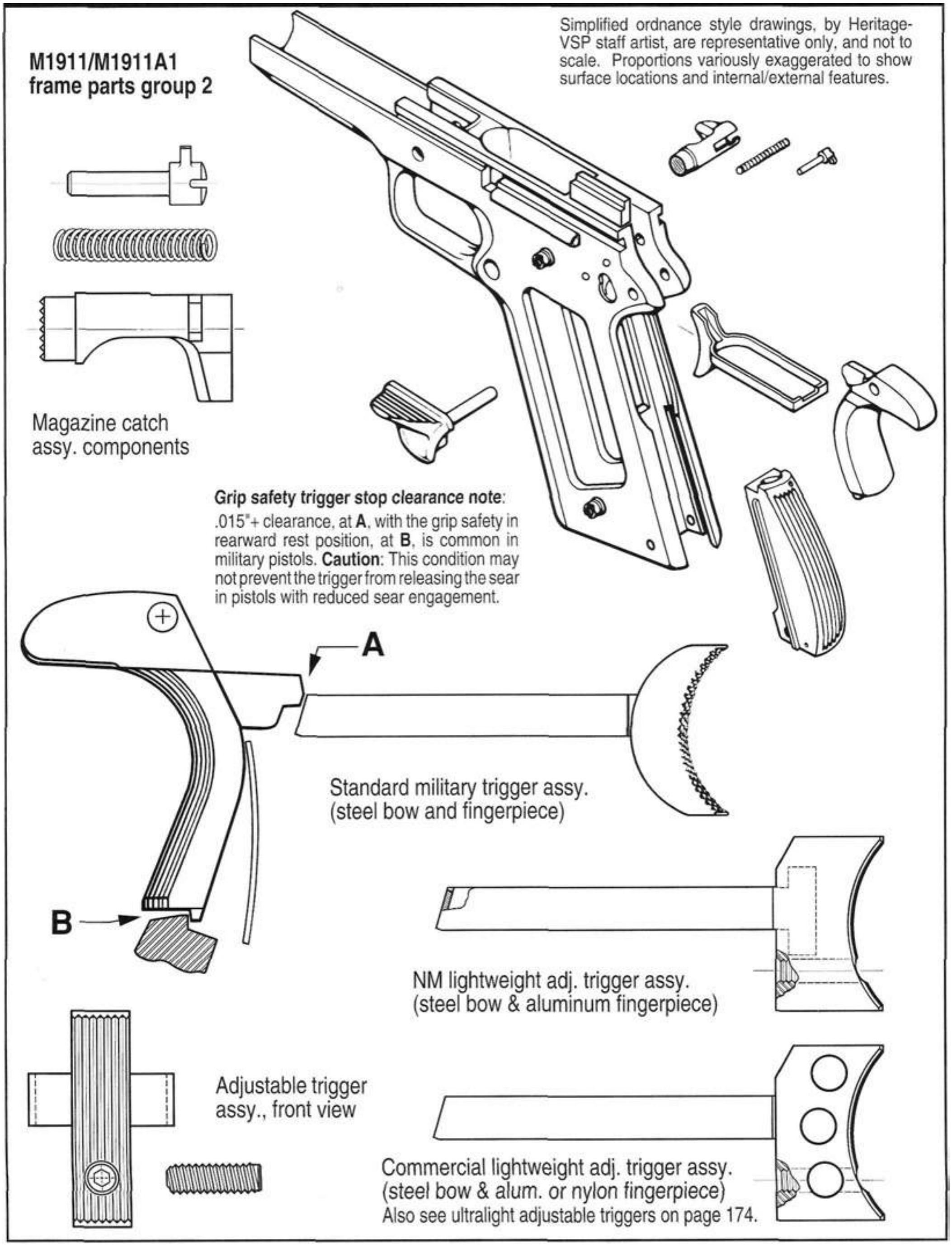


Figure 143- Ordnance style illustrations by Heritage - VSP staff artist show M1911A1 frame installed components that are inspected and fit checked next. This second interactive parts group includes the trigger and magazine catch assemblies and the grip safety. The thumb safety lever and mainspring housing are temporarily installed to check basic grip safety function and grip safety trigger stop-trigger clearance. Ordnance M1911 Pistol assembly specifications required the grip safety (in the undepressed position) to stop rearward trigger movement before the trigger bow could cause the disconnector to apply pressure to the sear hooks and begin to move the sear. This is all the more important in tuned pistols with reduced sear/hammer engagement. Excessive clearance remedies are: (**a**) trial replacement of the grip safety; and (**b**) peen stretching and refitting the end of the trigger stop extension to desired clearance. Component fit and dimensional inspection data is covered on pages 154 -158.

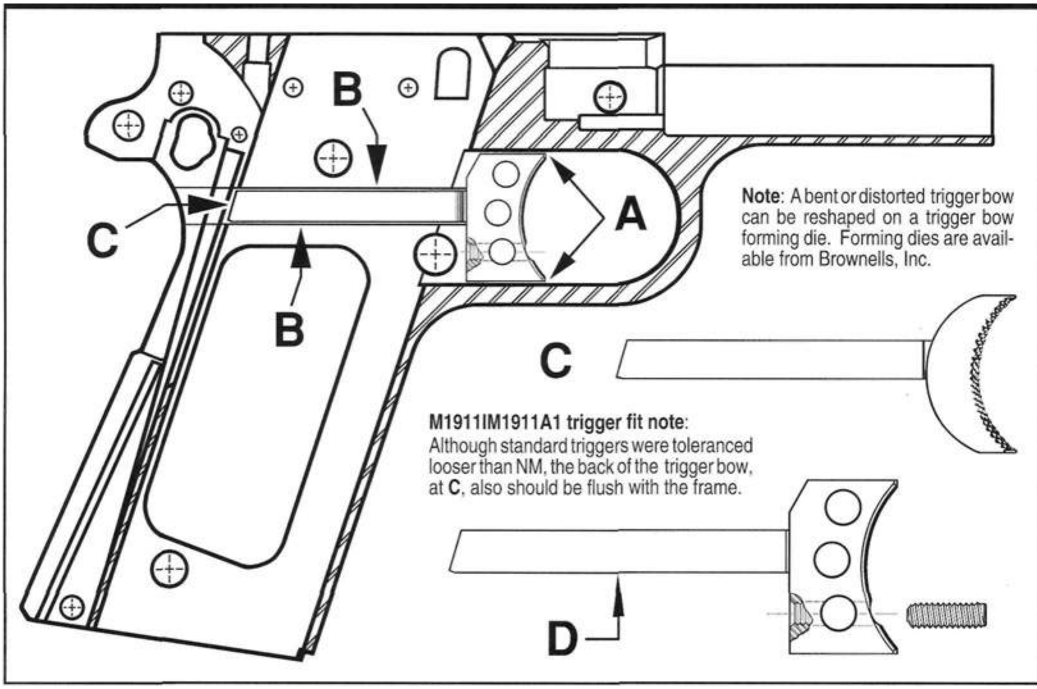


Figure 144- Ordnance style sectional illustration by Heritage - VSP staff artist, at top, shows a light weight NM type trigger installed in an M1911A1 frame. Trigger fitting and fit check points are: (**1**) the fingerpiece and trigger bow should fit the frame, at **A** and **B**, with minimum vertical and horizontal clearance but must also move without drag; (**2**) with the trigger in full forward position, the angled back of the trigger bow, at **C**, should be flush with the frame; and (**3**) with these fitting points established, clearance and polish the inward facing trigger bow surfaces, at **D**, to eliminate trigger/magazine drag.

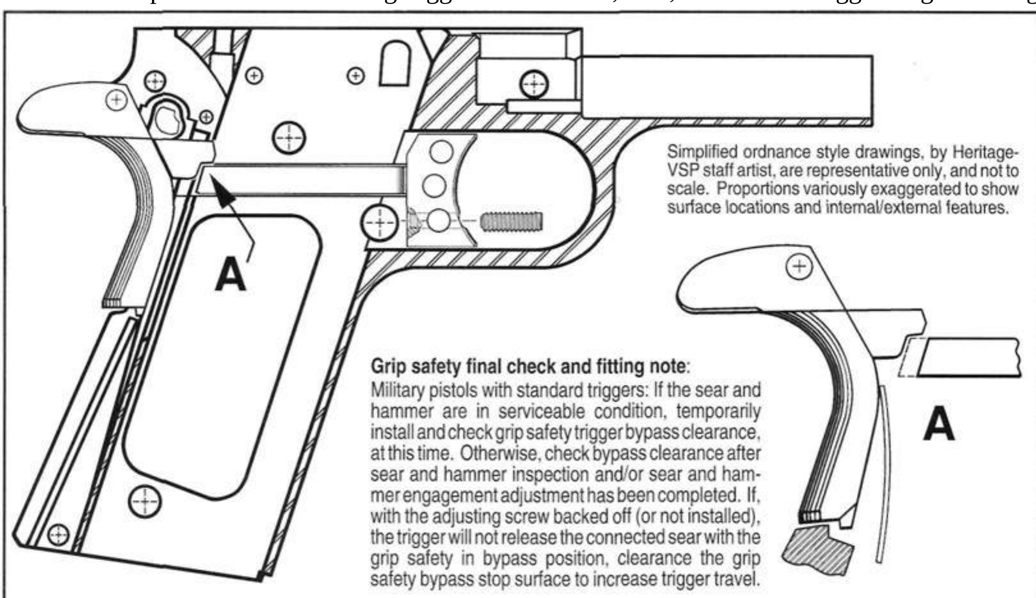


Figure 145- Ordnance style illustrations by Heritage - VSP staff artist show a lightweight NM trigger installed in an M1911A1 frame after fitting as discussed in figure 144. The grip safety selected for use is shown temporarily installed to: (**1**) check grip safety trigger stop/bow clearance and adjustment as discussed on page 153; and (**2**) to check trigger bypass clearance. To paraphrase another ordnance specification: when the grip safety and trigger are squeezed to fire the pistol, the grip safety trigger bypass cut, at A, must allow sufficient rearward trigger movement to enable the disconnector, in the connected position, to engage the sear hooks and rotate the sear far enough to release the hammer.

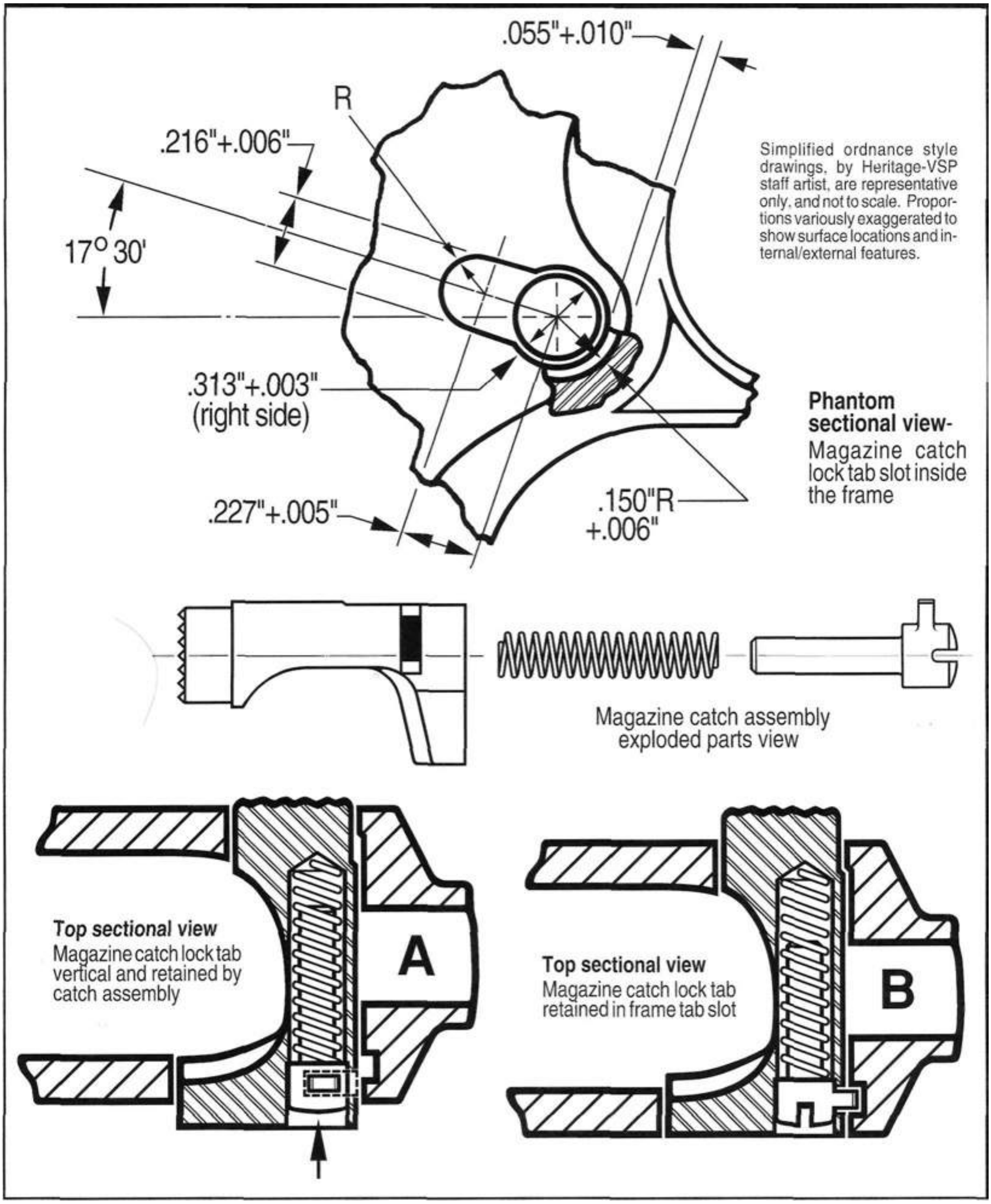


Figure 146- Ordnance style sectional and phantom sectional illustrations by Heritage - VSP staff artist, show M1911/M1911A1 frame magazine catch mounting passage dimensional inspection details and assembly. Install Ml911 type magazine catches as follows: (**1**) new frames- always deburr and lightly break inside magazine catch passage corner edges; (**2**) preassemble the magazine catch assembly to capture the spring and lock, making sure that the lock tab points straight up, and slide the assembly into the frame as shown in the top sectional illustration, at **A**; (**3**) hold the flat right side of the catch body approx, flush with the frame and push the lock inward with a Magnetip or ground screwdriver compressing the spring; (**4**) when the lock tab and frame tab slot are aligned (this is done by feel), turn the lock CW to engage the lock tab in the frame slot, as shown at **B**, and remove the screwdriver. After installing the catch, check function by depressing and releasing the catch button (the catch must not stick in the frame). Then, final check catch function by installing and releasing a serviceable magazine. Magazine dimensional inspection data is shown on pages 176 - 182. **Magazine catch/frame component assembly note:** The installed magazine catch assembly retains the trigger in the frame and also provides a bearing surface for the trigger adjusting screw.

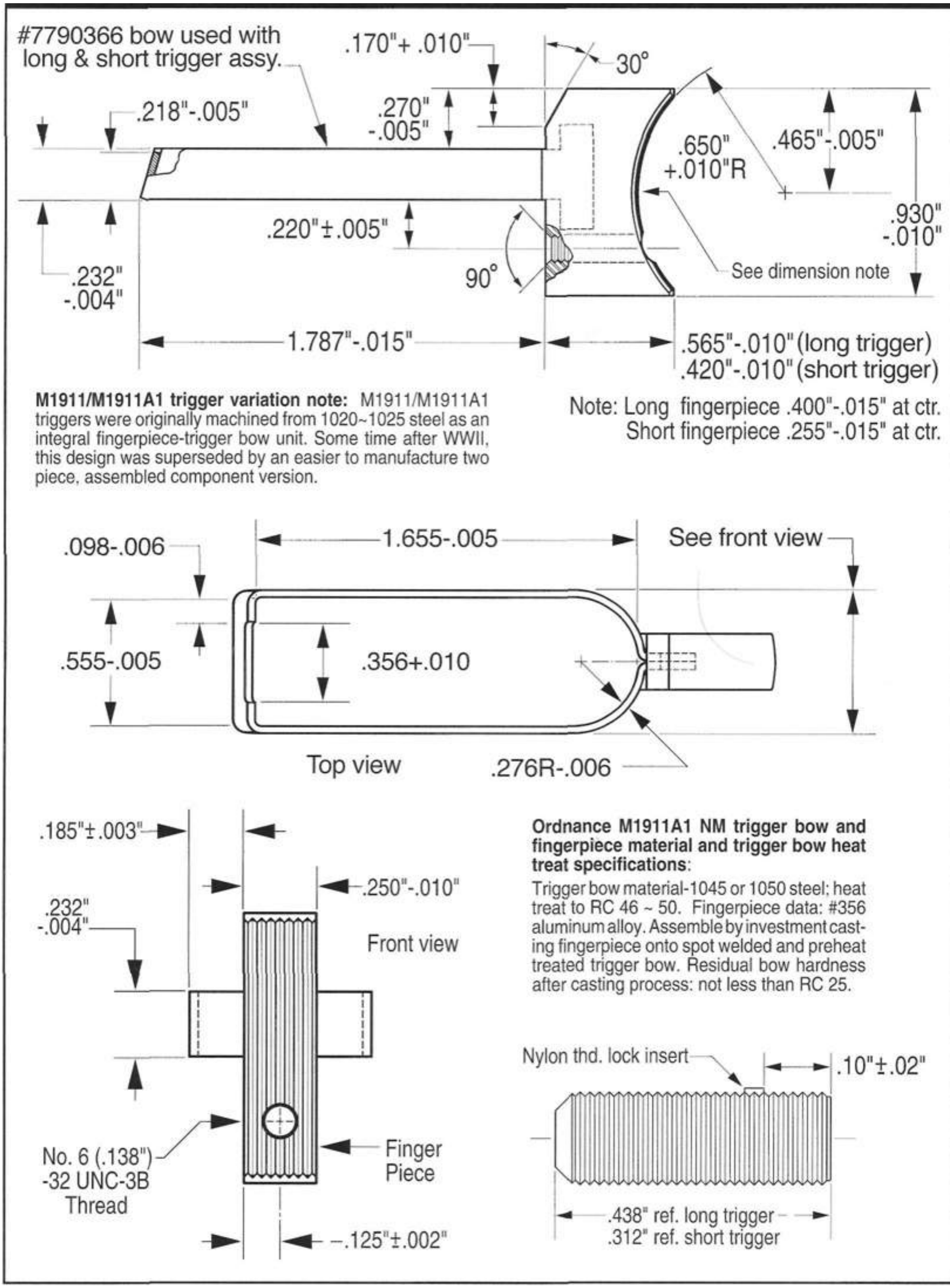


Figure 147- Ordnance style illustrations by Heritage - VSP staff artist show M1911A1 NM basic trigger assembly (fingerpiece and trigger bow) views and dimensional inspection details. Trigger adjusting screw dimensional data is shown separately, at bottom. Ordnance specifications called for investment casting of the aluminum fingerpiece onto the steel trigger bow. For further trigger data, consult ordnance drawings: #6147780 (ordnance standard military trigger assembly); #7791063 (NM trigger assembly, short, basic); #7790351 (NM trigger assembly, short, with adjusting screw); #7791067 (NM trigger assembly, long, basic); #7790348 (NM trigger assembly, long, with adjusting screw); #7790366 (basic trigger bow, only); #7791070 - (trigger adjusting screw, short); and #7791069 (trigger adjusting screw, long). Trigger screw adjustment is discussed on page 174.

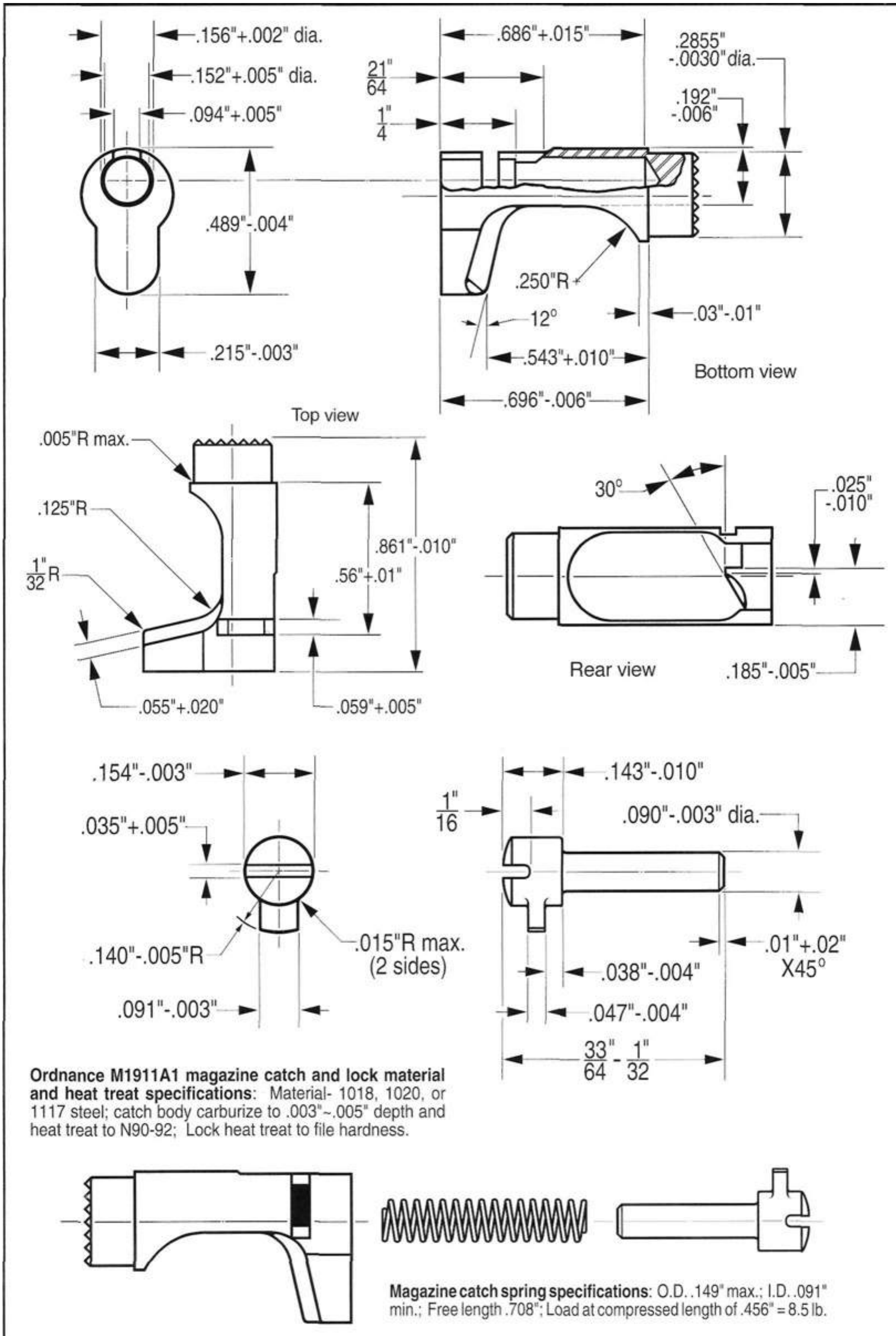
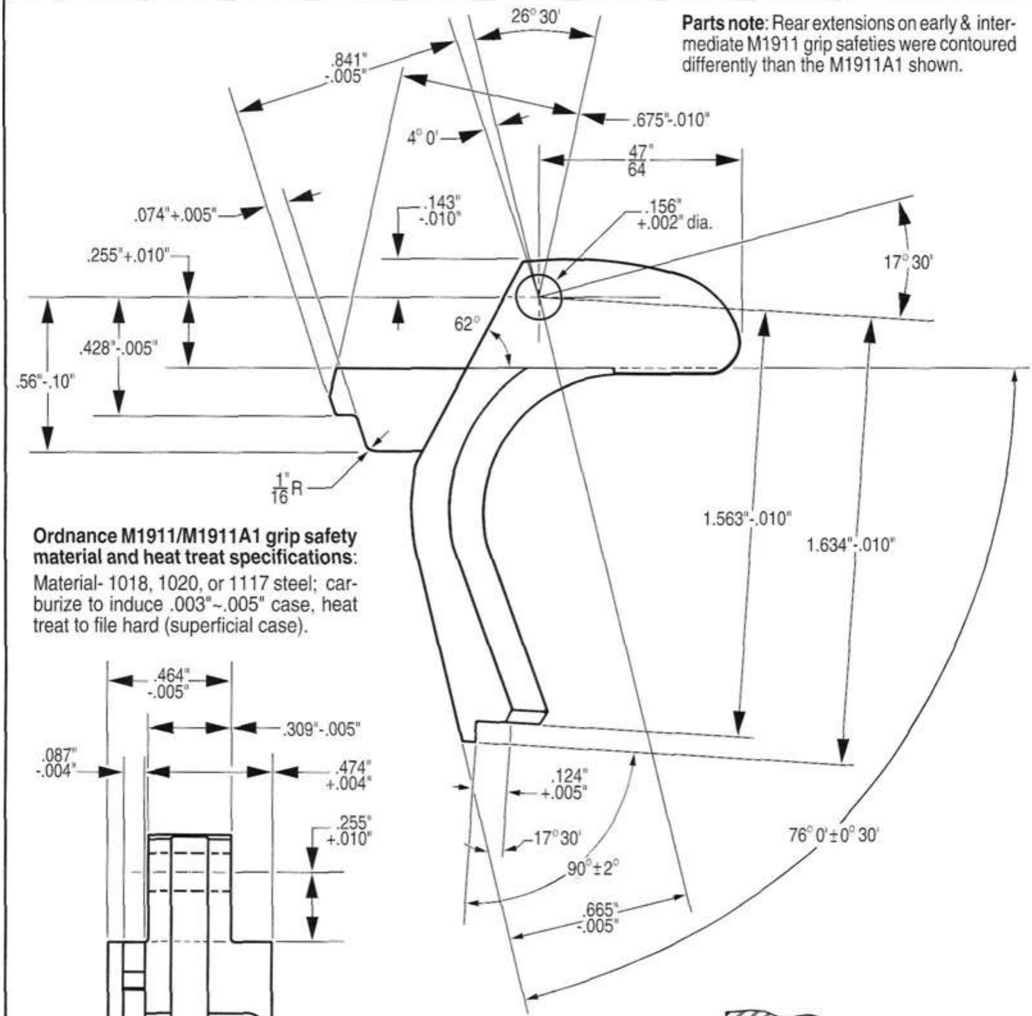
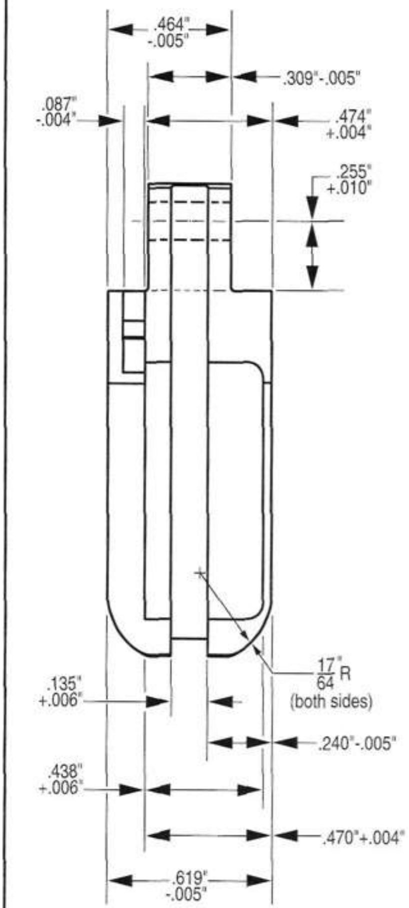


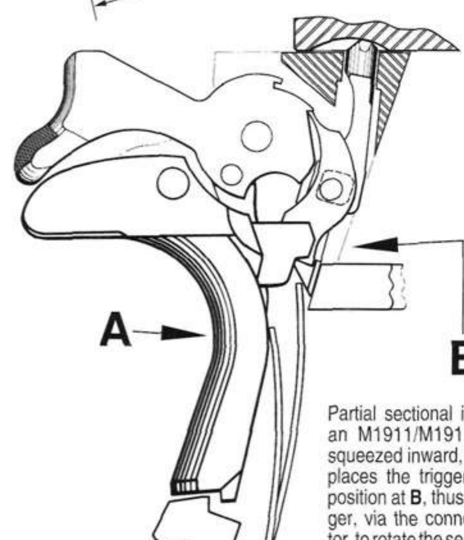
Figure 148- Ordnance style illustrations by Heritage - VSP staff artist show M1911/M1911Al magazine catch assembly component views and dimensional inspection details. For further data, see ordnance drawing #6008609 (mag. catch body); #5013218 (mag. catch lock) and #5013217 (mag. catch spring).

Parts note: Rear extensions on early & intermediate M1911 grip safeties were contoured differently than the M1911A1 shown.



Ordnance M1911/M1911A1 grip safety material and heat treat specifications:
Material- 1018, 1020, or 1117 steel; carburize to induce .003"~.005" case, heat treat to file hard (superficial case).





Partial sectional illustration shows an M1911/M1911A1 grip safety squeezed inward, at **A**. This action places the trigger stop in bypass position at **B**, thus enabling the trigger, via the connected disconnector, to rotate the sear and release the hammer when the trigger is pulled.

Figure 149- Ordnance style detail illustrations by Heritage - VSP staff artist show M1911A1 grip safety dimensional inspection details and function. For further component data, see ordnance drawing #6501828.

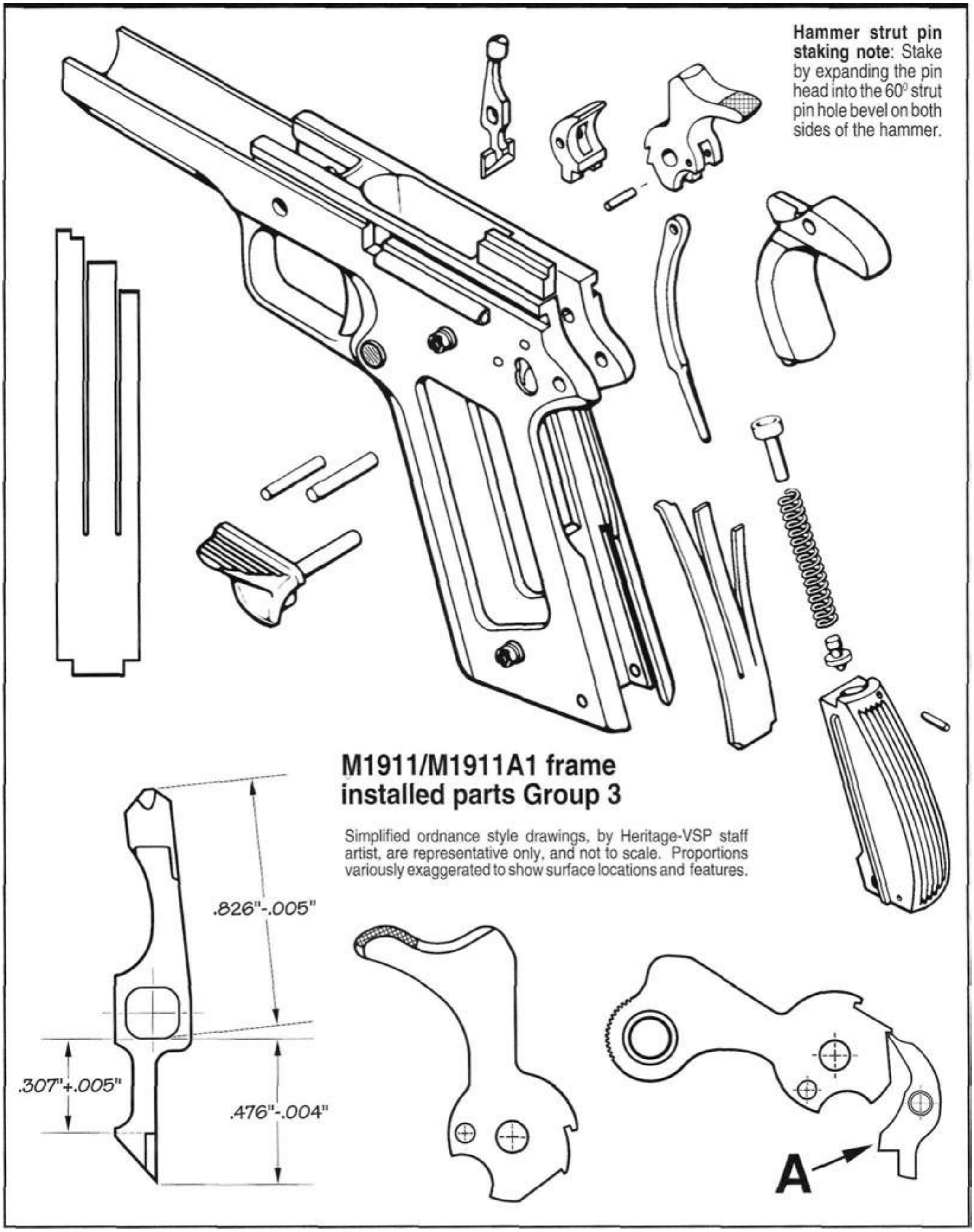


Figure 150- Ordnance style illustrations by Heritage -VSP staff artist show M1911/M1911A1 frame installed components that are visually and dimensionally inspected and fit checked next. This third interactive frame parts group includes the hammer and strut assembly; the sear and disconnector; the sear spring; the hammer and sear pins, and the mainspring housing subassembly. Closely inspect all Group 3 components for evidence of surface wear (including uneven surface wear) misfitting, alteration, galling (galling typically indicates off-specification metallurgy), battering, and possible other damage. Beyond this, parts dimensional inspection is all important. Individual Group 3 component dimensional inspection data is included on the following pages.

Parts fitting note: It's a given that hammer/sear geometry and sear fitting together determine engaged sear rotation (and actual sear stop shoulder location, at **A**) when the hammer is in full cocked position. Because of this, safety lever sear stop surface fit checks and final safety lever sear stop surface fitting can be reliably done only after sear and hammer engagement surface fitting has been completed.

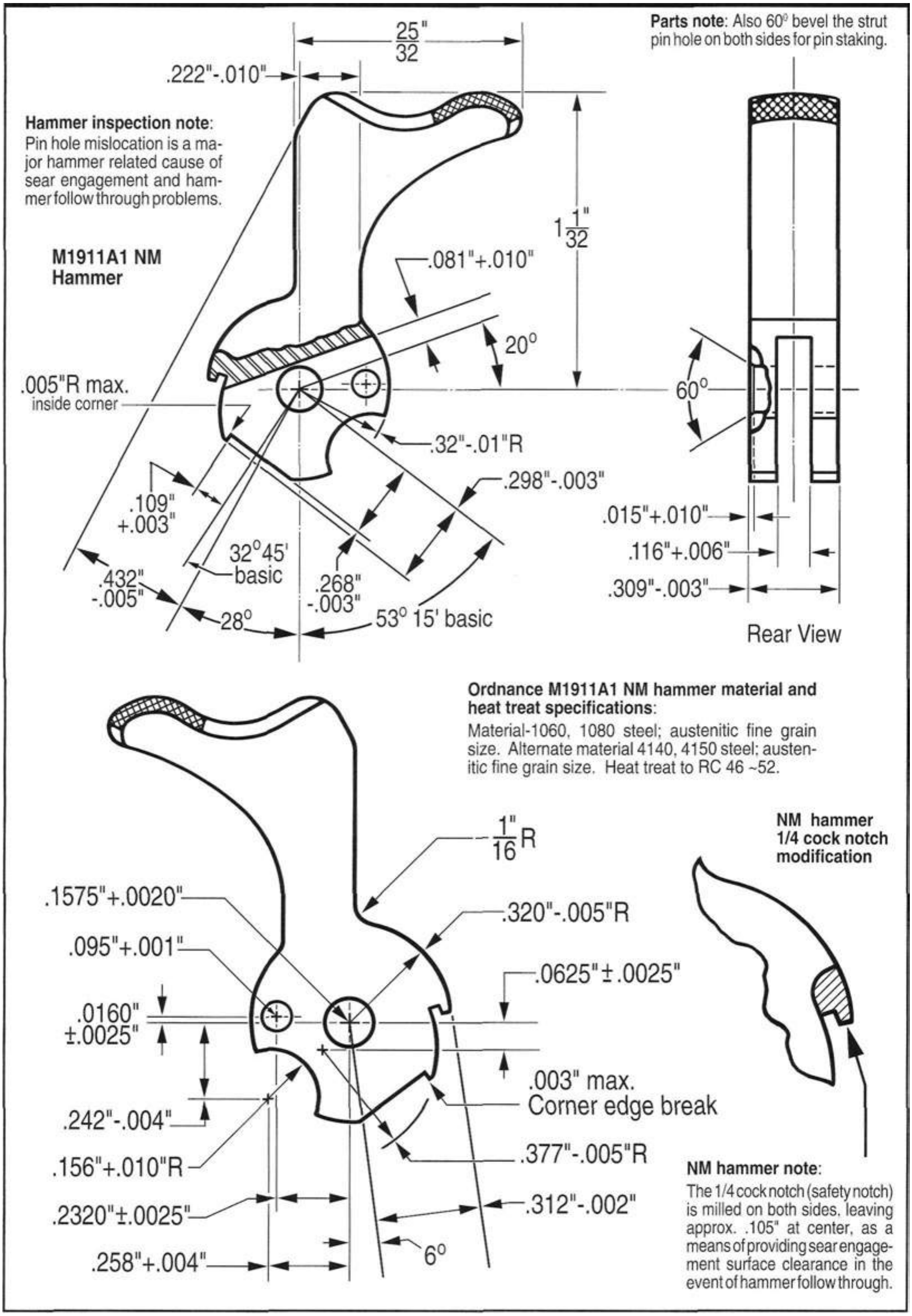


Figure 151- Ordnance style illustrations by Heritage - VSP staff artist show M1911A1 NM hammer dimensional inspection details. 1/4 cock mod. shown at lower right. **Note 1:** The non pinch variation of the 7/16" wide spur Ml 911 hammer was still specified as an acceptable production alternative at time of publication. **Note 2:** Both 45° diamond cut (std.) and straight crosscut (alt.) hammer spur knurling patterns are still specified. For further data see ord. drawings #7790803 (NM hammer) and #5503839 (std. hammer).

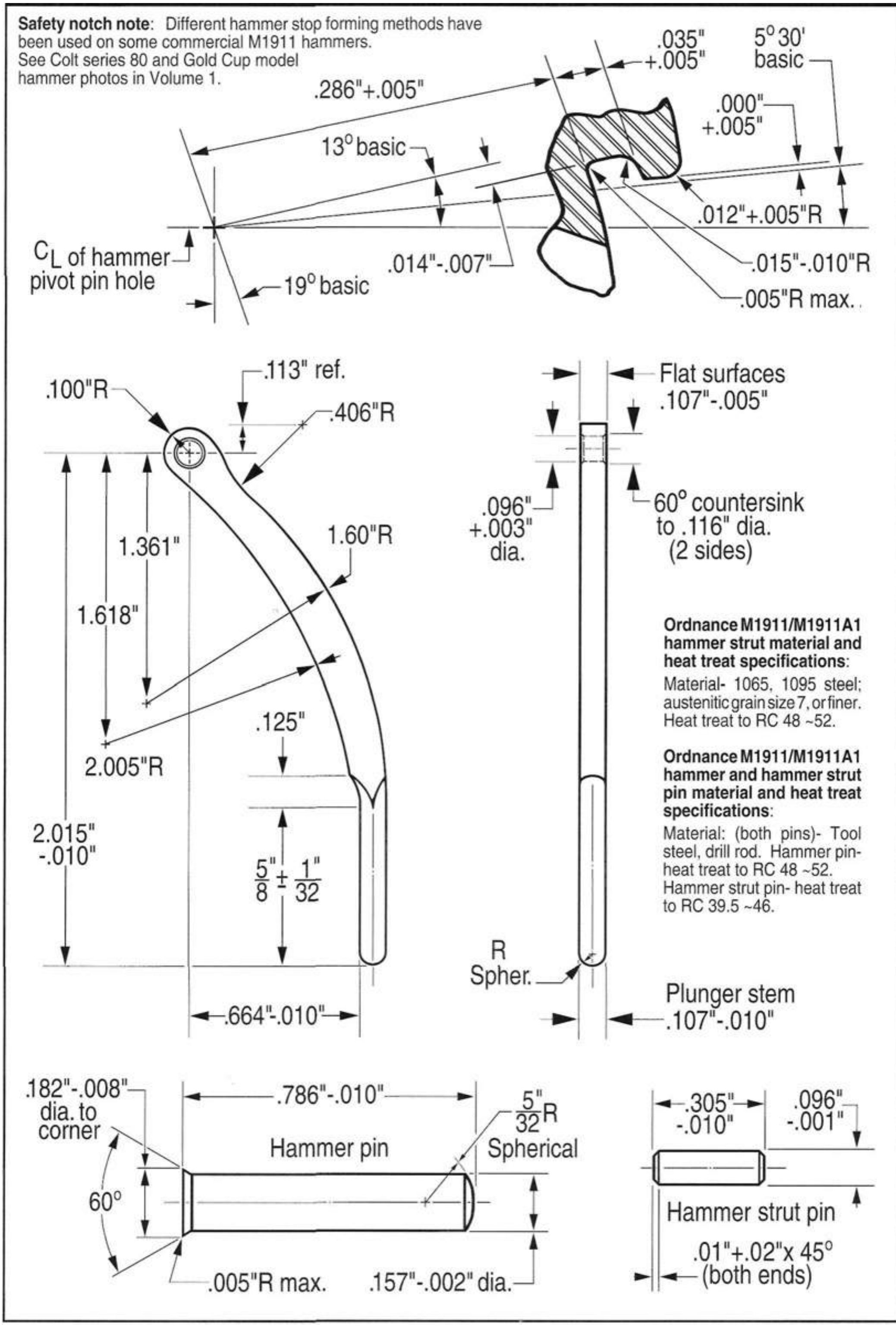


Figure 152- Ordnance style detail illustrations by Heritage - VSP staff artist show M1911/M1911A1 hammer safety notch, hammer strut, hammer strut pin, and hammer pin (pivot pin) dimensional inspection data. For further data see ordnance drawings #7790803 (NM hammer); #5503839 (std. hammer); #6008600 (hammer strut); #5013206 (hammer pin); and #5013207 (hammer strut pin).

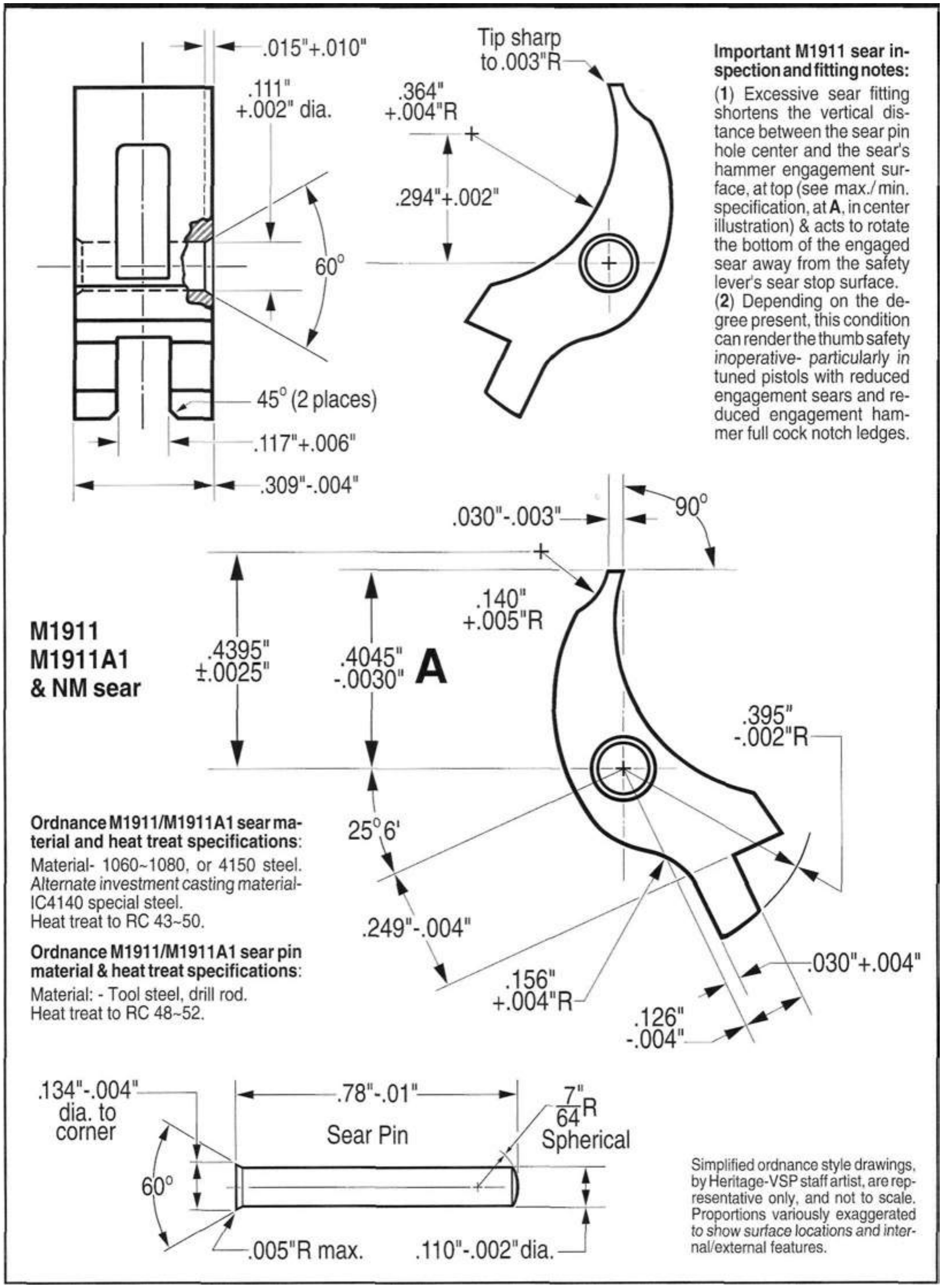


Figure 153- Ordnance style illustrations by Heritage - VSP staff artist show M1911Al sear and sear pin dimensional inspection data. For further data see ordnance drawing #7268068 (M1911A1 & NM sear) and #5013211 (sear pin). **Note:** A slightly shorter than .4015" min. specification sear (see height spec, at **A**) usually won't render a serviceable thumb safety inoperative in a within specification ordnance std. pistol because of the .025"+ sear/hammer engagement typically present. With the above sear engagement, an .010"-.015" clearance between the sear and the thumb safety sear stop surface would not allow sufficient trigger movement to release the sear. This safety margin doesn't exist in a pistol with minimum sear/hammer engagement- hence the need to reduce sear/safety lever stop clearance to zero.

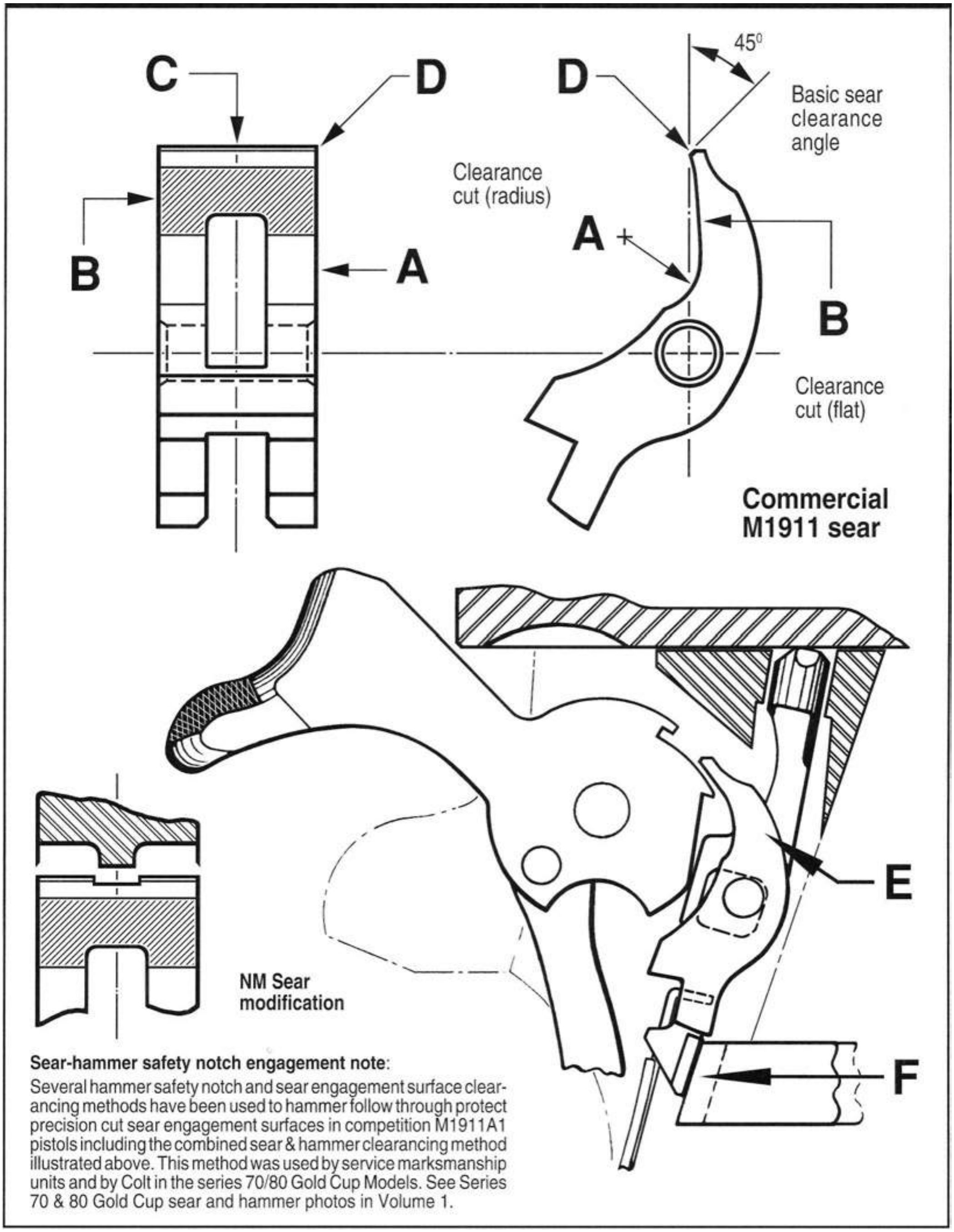
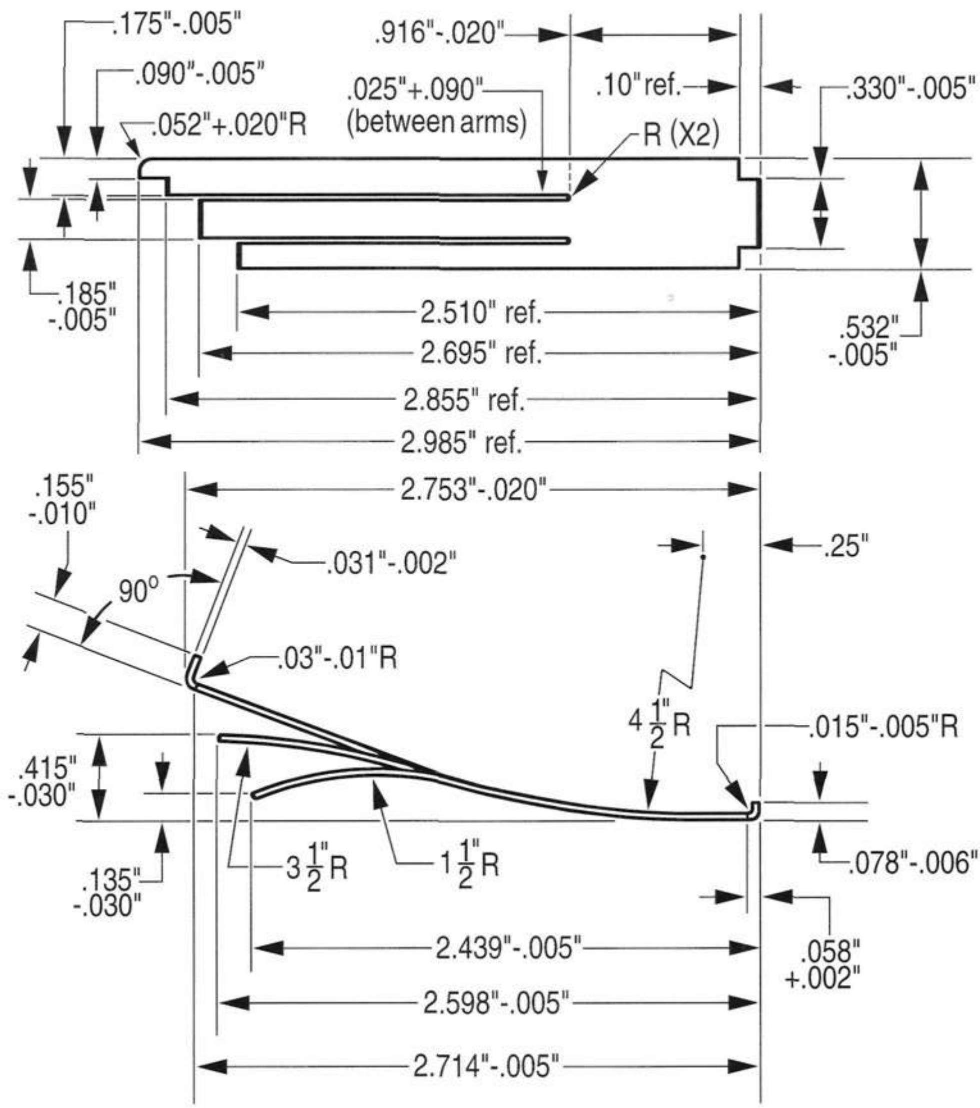
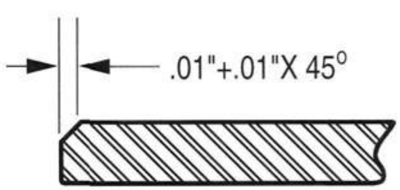


Figure 154- Ordnance style illustrations by Heritage - VSP staff artist, at top, show supplemental surface details typically found on many commercial Ml911 type sears: The hammer clearance radius cut, at **A**, and the flat secondary clearance cut, at **B**, together virtually eliminate hammer contact and interference, as shown at **E**, when the disconnector is in the trigger rearward disconnect position, as shown at **F**, until the hammer has rotated sufficiently to engage the sear in the hammer's full cock notch. With both ordnance std. and commercial Ml911 sears, the top hammer engagement surface, at **C**, should be checked for parallelism with the sear pin hole axis and squared, within height and angle specifications, as shown in figure 153. The secondary, or breakaway clearance angle, at **D**, is precut on some commercial sears and not on others. Although this angle is preferential, the basic 45° remains workable. Both the primary and secondary sear surfaces can be checked on commercial sear fixtures available from Brownells, Inc. and/ or basic fixtures as shown in Volume 1. **Caution:** Sear breakaway clearance reduces net sear engagement.





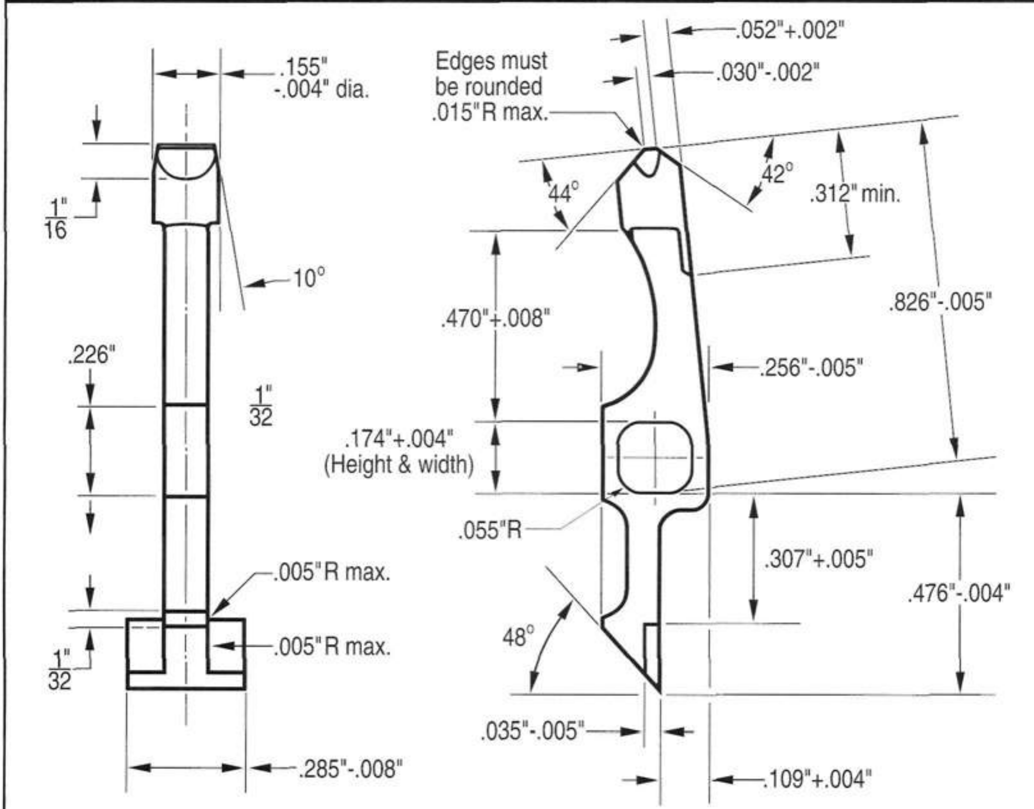
Disconnector & grip safety arm contact surface detail

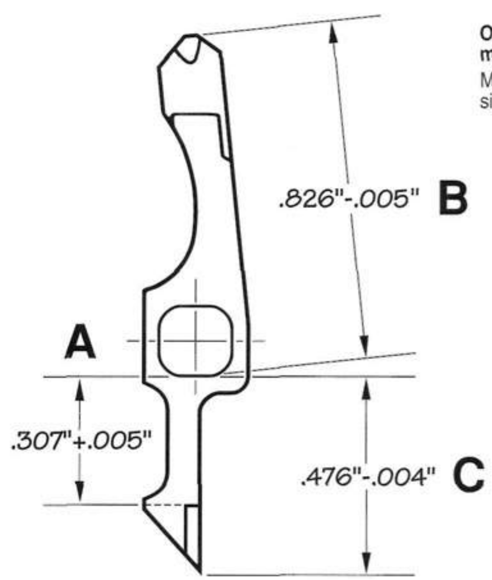
Ordnance M1911/M1911A1 sear spring material and heat treat specifications:

Material- 1055~1075 steel. Heat treat to A72 ~75.

Sear spring tension note: The above specified steel, spring arm bend and final heat treat together determine basic sear spring tension. Match armorers routinely adjusted sear spring bend to decrease or increase individual arm tension. The disconnector and grip safety arms are bevelled (see specification, at left) and polished to reduce parts friction and to make disconnector cycling and trigger pull smoother. Disconnector spring arm (middle arm) pressure can, by itself, account for the first 1 to 1 1/2 lbs. of trigger pull.

Figure 155- Ordnance style illustrations by Heritage-VSP staff artist show M1911/M1911Al sear spring dimensional inspection data. For further data see ordnance drawing #6008602 (Ml911, M1911A1, and M1911Al NM sear spring). Several commercial versions of the Ml911 sear spring are offered including a Clark variant with a split central arm, available from Jim Clark and Brownells, Inc. This spring is designed to apply pressure on the trigger bow in order to minimize inertial trigger bounce and related hammer follow through problems in M1911 type pistols with reduced pull triggers.





Ordnance M1911/M1911A1 disconnector material and heat treat specifications:
Material- 1060~1074 steel. Austenitic grain size 6, or finer. Heat treat to RC 43.5 ~50.

M1911, M1911A1, & M1911 NM disconnector fitting note:
Ordnance specified new component disconnector fitting steps are limited to: breaking all sharp edges to generally minimize operating friction; lightly polishing the top of the disconnector (to remove transverse machine lines) to minimize slide friction, and polishing the 48° sear spring contact bevel on the bottom of the disconnector (together with the flat rear trigger bow contact surface) to minimize disconnector cycling friction. Also see disconnector clearance and pivot head disconnector on page 175.

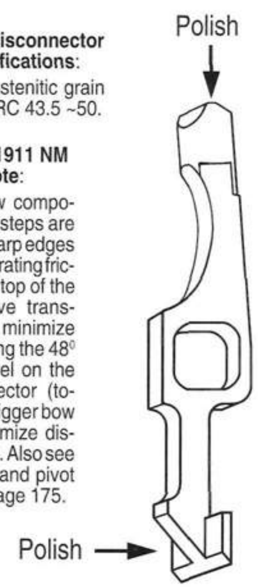


Figure 156- Ordnance style illustrations by Heritage - VSP staff artist show basic M1911/M1911A1 disconnector dimensional inspection data. For further data, see ordnance drawing #6008603 (disconnector). Not too many years ago, virtually all M1911/M1911A1 disconnectors sold met ordnance specs. (Those that didn't gauge were rejected.) After visual inspection, it was then sufficient to simply measure overall height. If a disconnector appeared to be serviceable and measured within 1.293" min. and 1.302" max. OAL, it was considered serviceable. Now, even with benefit of modern CNC equipment, some manufacturers fail to hold tolerances. For this reason, and because safety is involved, all Ml911 disconnectors should be dimensionally checked, at least at **A**, **B**, and **C** above, before use.

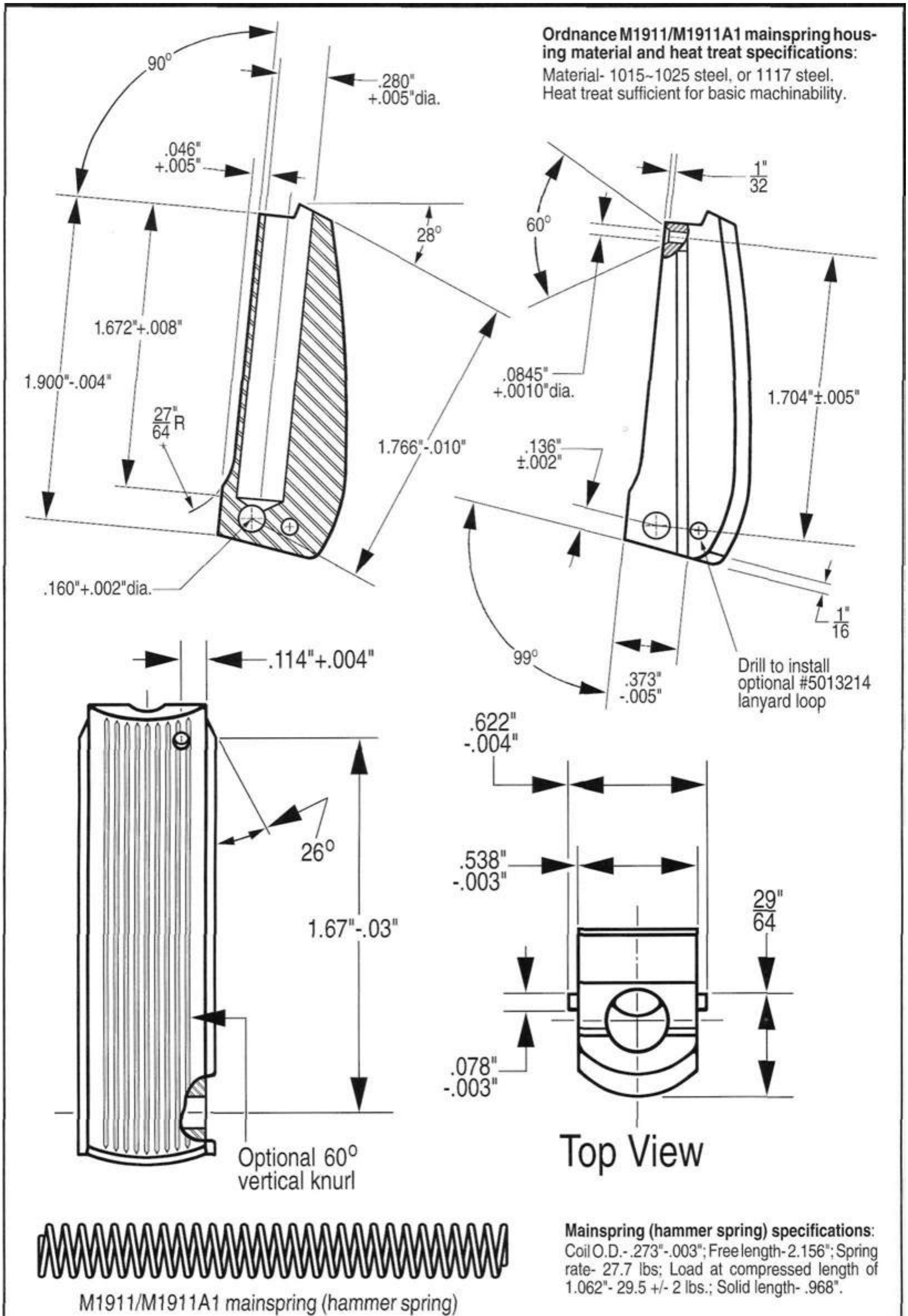
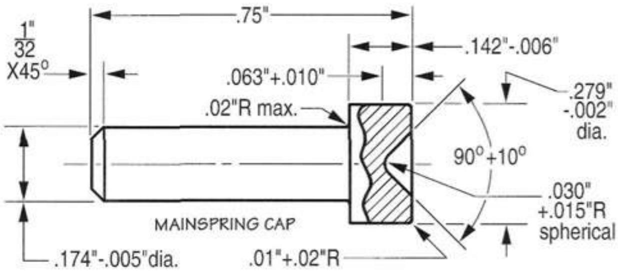


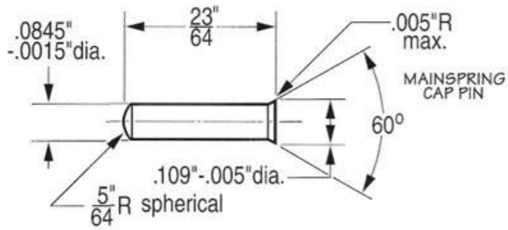
Figure 157- Ordnance style illustrations by Heritage - VSP staff artist show basic M1911A1 mainspring housing dimensional inspection data. For further data, see ordnance drawing #5503841 (mainspring housing); #5013208 (mainspring, or hammer spring); #5013214 (optional lanyard loop); and #5013215 (lanyard loop pin). Optional component dimensional inspection data is shown in figure 158.



M1911/M1911A1 Mainspring cap-

Ordnance specified material: 1018 through 1020 steel, or 1117 steel.

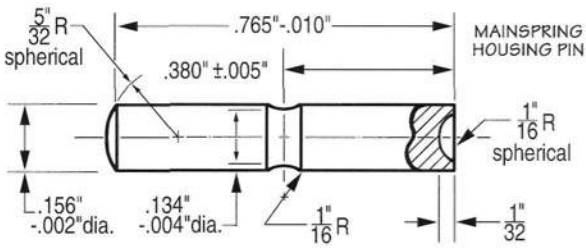
Heat treat: Impart .003"~.005" case and heat treat to file hardness (superficial). For further component data see ordnance drawing #5013209.



M1911/M1911A1 Mainspring cap pin-

Ordnance specified material: 1017 through 1020 steel, or 1117 steel.

Heat treat: impart .003"~.005" case and heat treat to file hardness (superficial). For further component data see ordnance drawing #5013210.

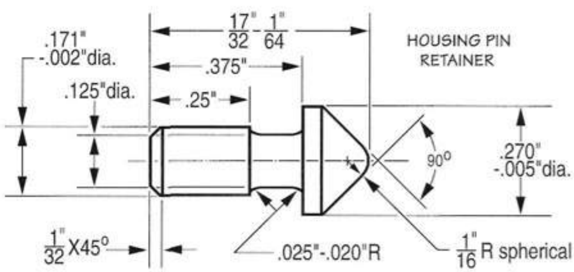


M1911/M1911A1 Mainspring housing pin-

Ordnance specified material: tool steel, drill rod. Spec. QQ-T-580

Heat treat to RC 43.5~50. For further component data see ordnance drawing #5013212.

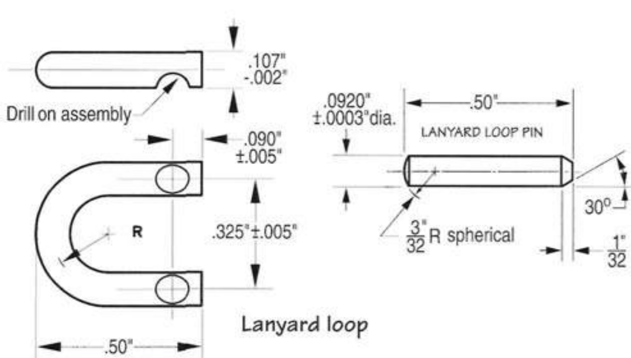
Simplified ordnance style drawings, by Heritage-VSP staff artist, are representative only, and not to scale. Proportions variously exaggerated to show surface locations and internal/external features.



M1911/M1911A1 Mainspring housing pin retainer (lock plunger)-

Ordnance specified material: 1020 steel or 1117 steel.

Heat treat: Impart .002"~.005" case and heat treat to file hard (superficial). For further component data see ordnance drawing #5013213.



M1911/M1911A1 Lanyard loop (optional component)-

Ordnance specified material: 1010~1020 steel, or 1117 steel.

Heat treat: sufficient for forming only. For further component data see ordnance drawing #5013214.

M1911/M1911A1 Lanyard loop pin (optional component)-

Ordnance material tool steel, drill rod. Spec. QQ-T-580

Heat treat to RC 43.5 ~ 50. For further component data see ordnance drawing #5013215.

Figure 158- Ordnance style illustrations by Heritage - VSP staff artist show basic M1911/M1911A1 mainspring housing subassembly component dimensional inspection data. For further component data, see the above listed ordnance drawing numbers. Mainspring (hammer spring) dimensional inspection data and compression test data is shown in figure 157.

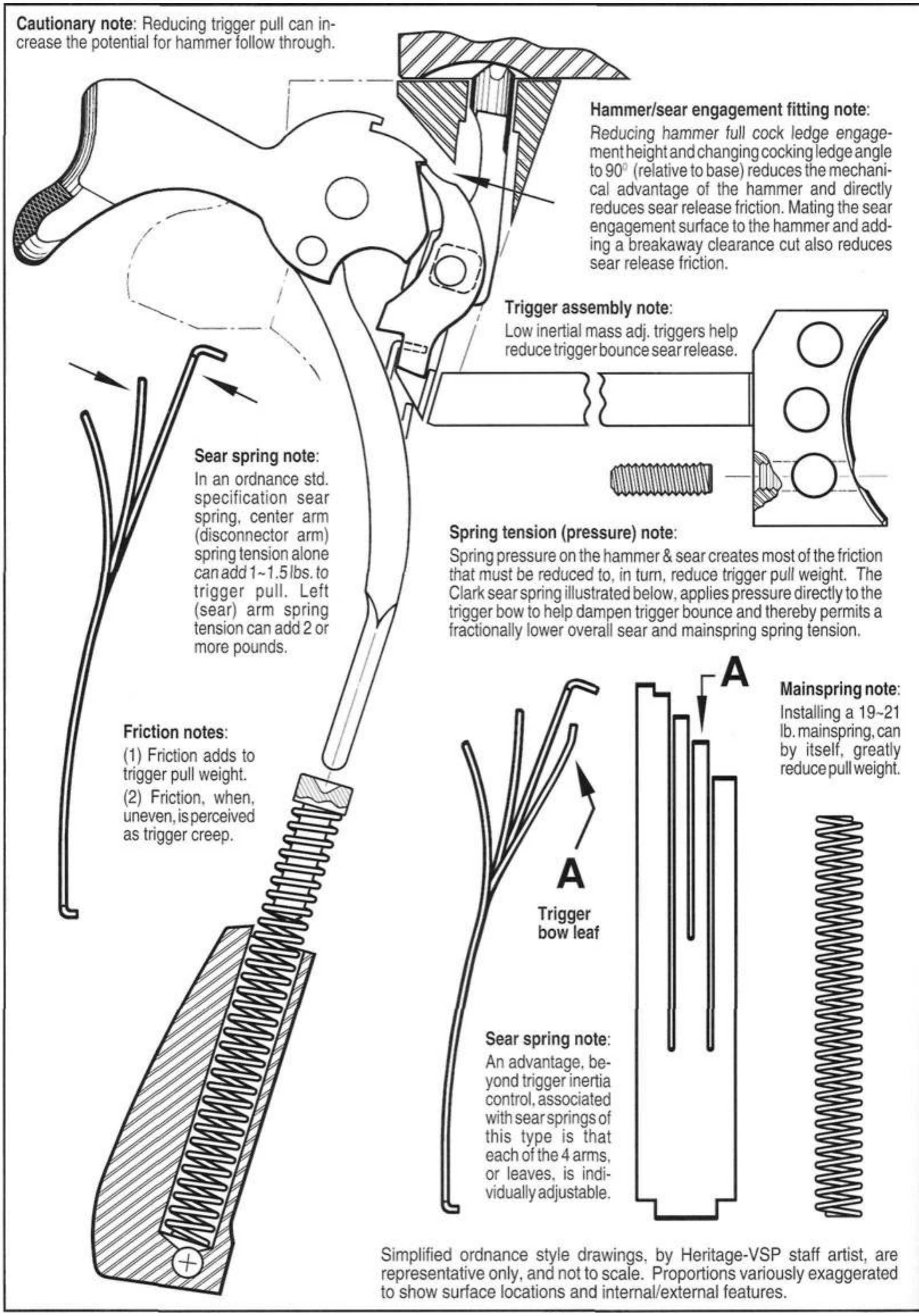


Figure 158- Ordnance style principle illustration by Heritage - VSP staff artist shows interactive M1911 trigger group components. The *trigger bow leaf*, at **A**, on the split center arm of the Clark sear spring illustrated at bottom, helps control inertial trigger jump and resulting *disconnector slap* sear releases as the slide is released and/or cycles. Trigger work, including friction reduction, spring rate data, sear and hammer fitting and sear hammer full cock engagement checks, are discussed on pages 169 - 171. The causes of, and remedies for, hammer follow through are discussed in detail on pages 172 and 173.

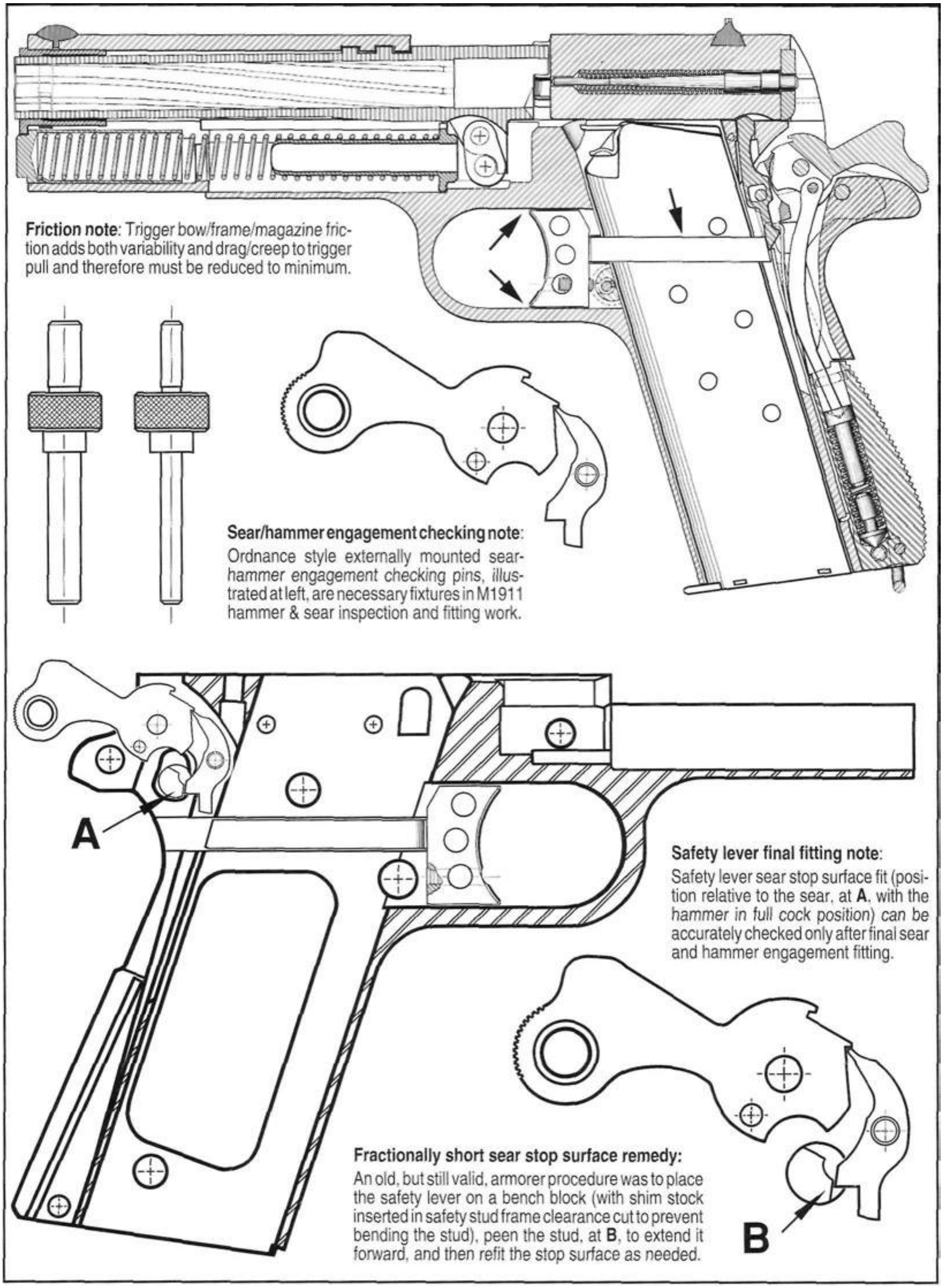


Figure 159- Ordnance style illustration by Heritage - VSP staff artist, at top, shows trigger assembly and magazine drag/friction areas that should be checked and minimized before attempting to reduce trigger pull in an M1911 type pistol. It's counter productive not to do this first because of the negative effect on pull and false scale indications created by the drag/creep present. The illustration, at bottom, shows ideal zero clearance safety lever sear stop/sear shoulder fit after sear and hammer full cock engagement fitting work is completed There are several ways to check for zero clearance, but the following method is most positive: (**1**) the safety lever must rotate to full upward/engaged position - if not, trial fit the stop shoulder until it does; (**2**) once the safety is in the engaged position, the trigger must not be able to move the sear.

Adjusting and reducing trigger pull weight in Ml911 type pistols-
There are 6 basic steps involved in adjusting or setting trigger pull weight in M1911 Pistols. Reducing trigger pull weight and eliminating creep in M1911 Pistols has popularly been called *trigger work* and the final product referred to as a *trigger job*. Both names have stuck but are, in a way, misnomers, because most of the work involved is done with components other than the trigger. This point is made apparent by the following fitting/adjusting steps:

1. Component selection- The first step in M1911 trigger work is selecting the trigger, sear, hammer, and other trigger group components that are to be used in the pistol at the bench. This includes selecting a quality custom hammer, sear, disconnector, and custom springs (with spring rates optimum for the intended job) and deciding whether to use a standard trigger assembly, or a light weight or ultra light weight adjustable trigger assembly (see lightweight trigger notes, below). Components must be selected with the end use category in mind- for example, the best type and style hammer, sear, and spring set for a basic carry or defense pistol would, in most cases, be different than for a match or other competition pistol. If using drop-in trigger group components to improve trigger pull, see #3B on page 171.

Lightweight trigger notes: The benefits of lighter weight, adjustable M1911 triggers are: (**a**) lower mass minimizes trigger assembly inertia and thereby the effect of inertial trigger jump or bounce- i.e., trigger bow slap against the disconnector and sear (the *slap effect* becomes a serious negative as sear and hammer spring pressure is decreased and as sear/hammer mechanical engagement is reduced); (**b**) regarding trigger adjustment- reducing trigger travel not only reduces trigger take up on squeeze, but also minimizes total inertial trigger travel, or bounce, as discussed above; (**c**) lowering trigger assembly inertial mass becomes a more important consideration as pull weight is reduced, especially when pull is reduced below 4 1/2 lbs. It's important to note that conservative pistolsmiths tend not to use full weight (all steel) trigger assemblies in M1911 type pistols with trigger pull weights below 5 lbs. A wide selection of *high tech* lightweight and ultra lightweight Ml911 trigger assemblies were available at time of publication (including some with total weights of less than 1/4 ounce made with titanium bows and magnesium, carbon fiber filled nylon, and other plastic, finger pieces). Lightweight and ultra light Ml911 triggers are available from Brownells, Inc.

2. Minimizing component friction- It's counterproductive not to minimize friction before other trigger group parts fitting, because component/frame drag and friction add weight to trigger pull. Irregular drag/friction is aggregately perceived as trigger creep. This work, necessarily done before sear and hammer engagement adjustment and/or spring adjustment, includes trigger bow/frame and fingerpiece/frame clearancing; trigger bow/magazine clearancing (magazines should be preselected); minimizing disconnector body friction, disconnector/sear spring drag/friction, disconnector sear hook finger drag/friction, mainspring/mainspring cap/mainspring housing friction, and, finally, hammer/sear/frame friction. The best tools for this job are: small, carbide tip deburring tools, fine needle files, medium diamond hones, and Craytex rods (Craytex rods are great for leveling machining ridges inside steel mainspring housings).

3. Sear/hammer engagement surface adjustment-

A. If stoning the sear and hammer engagement surfaces on a fixture: (1) first polish the hammer's full cock engagement ledge (sear bearing surface); (**2**) if the hammer is to be used in a bullseye competition pistol- informal service marksmanship unit NM specs were: adjust hammer full cock ledge angle to 90° (relative to notch base) and then adjust ledge height to .016"~.018" (also relative to base). **Hammer fitting notes:** An .018" to 020" min. ledge height is suggested for general competition use and an .025" min. ledge height for carry/defense pistols (with correctly fit sears installed). Although considered conservative by some, I would suggest maintaining the full cock ledge angle on carry/defense pistol hammers within ordnance NM specifications (see ordnance NM hammer specs, in figure 151). **Sear fitting notes:** When hammer work is done- (**1**) true the sear's hammer ledge engagement surface, staying within ordnance vertical height and angle specifications (see ordnance specifications in illustration on page 162); (**2**) then make the initial 45° sear breakaway clearance cut (see breakaway clearance angle relative to sear vertical centerline in the illustration on page 163). Informal service marksmanship unit net NM sear engagement specification was .006" to .008" (top sear hammer ledge bearing surface width remaining after breakaway clearance cut) for sears that were to be used with .016" to .018" full cock engagement ledge NM hammers. A more conservative .010" net minimum sear engagement width is suggested in general competition use pistols. An .010" to .015" net minimum sear engagement width is suggested for carry/defense pistols with .025" full cock ledge hammers.

Additional sear breakaway clearance angle cutting note: I would suggest stoning the sear breakaway clearance cut on a trial, incremental cut, basis and then increasing the clearance cut and correspondingly reducing the sear's hammer bearing surface area, as needed after spring work and as determined by trigger pull test results.

Adjusting and reducing trigger pull weight in Ml911 type pistols, continued:

B. If using drop-in components to improve or reduce trigger pull- Those reluctant to invest in sear/ hammer stoning fixtures make a valid point when they say that it's hard to amortize fixture cost when tuning triggers in only one or two pistols. In such case, I would suggest selecting high quality, brand name drop-in hammers with preadjusted full cock engagement surfaces; sears with precut engagements and breakaway clearances, and reduced tension hammer and sear springs that are best for the category of use. An alternate choice would be to buy a complete drop-in "trigger job" kit. These kits are furnished with reduced tension hammer and sear springs. Several M1911 drop-in trigger job kit variations were available from Brownells, Inc., at time of publication. If you don't have a current copy of Brownell's excellent catalog- by all means, order one. See source listing on page 48.

4. Mainspring (hammer spring) and sear spring adjustments- Mainsprings: it's always better to use a reduced power commercial mainspring (hammer spring) with an overall length closest to ordnance specified 2.15" mainspring free length, than it is to shorten an ordnance standard mainspring. Suggested minimum mainspring tension rating for bullseye competition pistols is 19 lbs.
Sear spring adjustments: (**a**) central (disconnector) spring arm- tension should not be adjusted to less than 1/2" lb.: (**b**) left sear spring arm tension (this arm bears on the left sear finger) should not be adjusted to less than **1 lb**.
Sear spring notes (from ordnance specifications): (**1**) Central spring arm tension must never be less than that needed to positively reset/elevate the disconnector to the connected position. (**2**) Left sear spring arm tension must be sufficient to positively maintain sear/hammer engagement.

5. Initial trigger pull adjustment- Initially adjust aggregate pull (with all component fitting and spring tension related factors considered) to approx. 1/4 lb. higher than desired final trigger pull as an allowance for a possible fractional drop in pull due to wear-in and/or initial spring set.

Trigger pull checking note: Pulls of 5 lbs. and higher can be optionally checked using a Brownells recording trigger pull gauge or a std. ordnance/NRA weight type measuring system. Pulls of 4 1/2 lbs. and less should be checked with an ordnance or NRA type trigger pull weight system, only.

6. Final adjust trigger pull as needed after wear-in- Recheck trigger pull after allowing the trigger mechanism to work-in and/or wear-in for a period of time (typically, the time needed to fire 100 to 200 rounds). Fine adjust sear breakaway clearance and adjust sear spring tension at this point, as needed. If hammer and sear full cock engagement surfaces are within the normal dimension and angle range, but pull is lower than expected, increase sear spring bend and/or trial replace the mainspring. As an alternate remedy, trial replace the mainspring with the next highest pound rating. If mechanical engagement is minimal (for example, breakaway clearance is somewhat excessive and is the cause of a too light pull), freshen the sear engagement bearing surface (staying within ordnance sear height and angle specifications) to fractionally widen and increase the sear's hammer ledge bearing surface area.

Hammer and sear stoning fixture and final fitting notes: (**1**) Any number of fixtures can be used to hold and position a sear and hammer for engagement surface stoning. Choices range from using a tool maker's vise or a mill vise to the basic Tom Wilson fixtures shown in Volume 1 - to some of the more sophisticated stoning fixtures that are now available. See current Brownells, Inc. catalog for fixture availability. (**2**) Regardless of the precision the stoning fixture used is capable of, it's necessary to precheck and fine adjust sear/hammer engagement fit before final installation of components. The simplest and best way to do this is to install ordnance style frame mounted sear/hammer fitting pins (fitting pins are illustrated in figure 159); coat the sear and hammer full cock engagement surfaces with Dykem blue or black marker, and hand engage/disengage the hammer and sear and check contact surfaces for (**a**) evenness of bearing and (**b**) the actual extent of bearing surface contact. External, frame mounted M1911 sear/hammer fitting pins are also available from Brownells, Inc.

Cautionary notes regarding stoning fixtures, fixture setup, & hammer/sear surface adjustments: (**1**) Make sure the stoning fixture used aligns and securely holds the part; (**2**) make certain that stone alignment relative to the work is such that finished transverse hammer and sear surface cuts are square (parallel with sear/hammer pivot pin hole centerline), and that cuts in the opposite plane (90° to sear/hammer pivot pin hole centerline) are also square and are made at the desired angles.

Installed trigger group caution: The hammer's full cock engagement ledge height and angle, and the sear's hammer engagement bearing surface area and breakaway clearance cut depth or angle, together with the selected springs and/or spring adjustments made, must not permit inadvertent hammer release or hammer follow through. See causes of, and remedies for, hammer follow through beginning on page 172; lightweight trigger notes on page 170; and trigger (trigger screw) adjustment in figure 161.

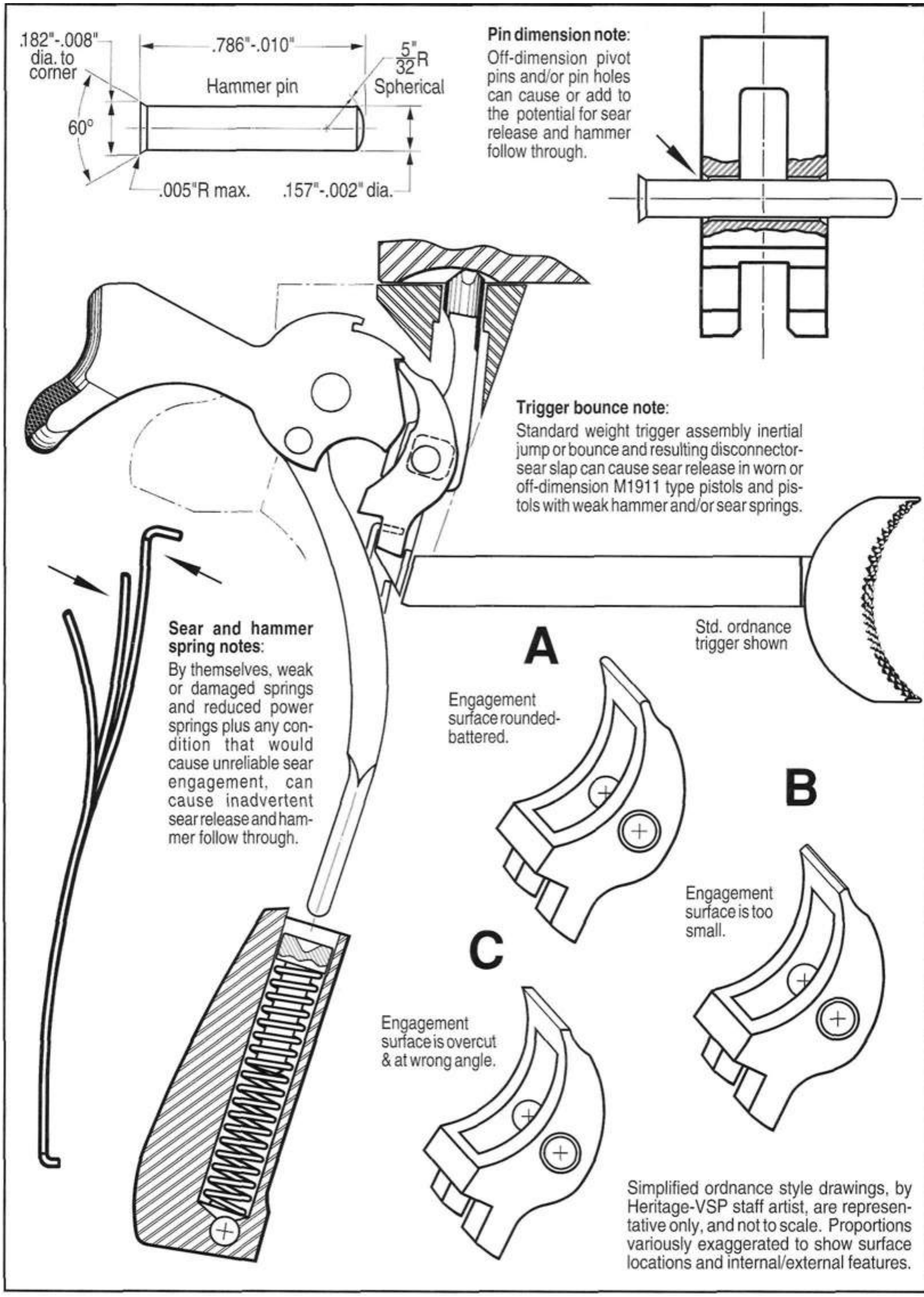


Figure 160- Ordnance style principle illustration by Heritage - VSP staff artist shows factors that can cause and/or contribute to inadvertent sear release and hammer follow through in Ml911, M1911A1, and commercial Ml911 type pistols. Sear engagement surface conditions that are major causes of, or that predispose, hammer follow through are illustrated above. The sear, at **A**, has a battered/rounded off engagement; the sear, at **B**, has a miscut breakaway clearance (almost zero bearing surface area remains); the sear, at **C**, has a full engagement surface-but, in this example, this surface was cut too short and is nonparallel with sear pin hole axis. See detailed list of interactive causes & potential causes on page 173.

Causes of, and remedies for, hammer follow through in Ml911 type pistols-

Editors Note: Over the past 10 years, more questions have been asked about hammer follow through in M1911 Pistols than on any other topic. Regarding these queries, it was interesting to note that nearly all of the pistols referenced were older M1911's, M1911Al's, and Government Models in heavily used to worn out condition- hence the following basic checklist treatment of the subject:

Basic causes of inadvertent sear release and hammer follow through:

Set, weak, altered, and/or damaged spring related:

1. Insufficient sear spring tension- left sear arm weak, set, or misbent (low direct sear pressure)
2. Insufficient sear spring tension- central sear arm weak, set, or misbent (low disconnector/trigger pressure)
3. Insufficient mainspring tension- mainspring coils weak, set, or damaged (low hammer/sear pressure)
4. Insufficient mainspring tension- wrong or altered mainspring installed (low hammer/sear pressure)

Mechanical- sear/hammer engagement related (A):

1. Insufficient sear engagement- sear battered/or rounded-off (full cock bearing surface is too narrow)
2. Insufficient sear engagement- sear breakaway clearance excessive (full cock bearing surface is too narrow)
3. Insufficient sear engagement- sear misfit, altered (full cock bearing surface is on wrong angle)
4. Insufficient sear engagement-hammer cocking ledge battered (full cock bearing surface is too narrow)
5. Insufficient sear engagement-hammer cocking ledge altered (full cock bearing surface is cut too narrow)
6. Insufficient sear engagement-hammer cocking ledge altered (full cock bearing surface angle is wrong)

Mechanical- sear/hammer engagement related (B):

1. Unreliable sear engagement- loose sear, under dia. sear pin (permits variable sear position)
2. Unreliable sear engagement- loose sear, over dia. pin hole in sear (permits variable sear position)
3. Unreliable sear engagement- loose sear, over dia. sear pin hole(s) in frame (permits variable sear position)
4. Unreliable sear engagement- angled sear, sear pin hole in sear not at 90° (permits variable sear position)
5. Unreliable sear engagement- angled sear, sear pin hole in frame not at 90° (permits variable sear position)
6. Unreliable sear engagement- loose hammer, under dia. hammer pin (permits variable sear position)
7. Unreliable sear engagement- loose hammer, over dia. hammer pin hole in hammer (permits variable sear position)
8. Unreliable sear engagement- loose hammer, over dia. hammer pin hole(s) in frame (permits variable sear position)
9. Unreliable sear engagement-angled hammer, hammerpin hole in hammeron angle (permits variablesear position)
10. Unreliable sear engagement- angled hammer, hammer pin hole(s) in frame on angle (permits variable sear position)
11. Unreliable sear engagement- sear eccentric, sear pin hole in sear mislocated (permits variable sear position)
12. Unreliable sear engagement- sear eccentric, sear pin hole(s) in frame mislocated (permits variable sear position)
13. Unreliable sear engagement- hammer eccentric, pin hole in hammer mislocated (permits variable sear position)
14. Unreliable sear engagement- hammer eccentric, hammer pin hole(s) in frame mislocated (permits variable sear position)
15. Unreliable sear engagement- sear Shammereccentric, both pin hole(s) in frame mislocated (variable sear position)

Additive factors: The inertial jump or trigger bounce associated with high and medium mass trigger assemblies can exceed sear/hammer full cock engagement friction in Ml911 type pistols with weak, altered, damaged, or wrong springs and/or with worn, loose, battered, altered, or eccentrically mis-located sear/hammer full cock engagement surfaces. Depending on the degree present, this condition can permit or cause sear disengagement and resulting hammer follow through as the slide is initially released from the locked position or at a later point in the firing cycle.

Any of the above listed items, or any combination that would act to reduce the mechanical positivity of sear/hammer full cock notch engagement can cause, or permit, the sear to bounce, wobble, or slip out of full cock engagement sufficient to permit hammer release and follow through to the safety stop ledge or 1/4 cock notch position. In his wisdom, Browning saw the Ml911 safety or 1/4 cock notch as a necessary design feature. History has indeed confirmed his insight.

Hammer follow through remedies: Every item on the above cause and effect checklist essentially embodies its own remedy- i.e., remove a particular cause, or causes, on the list- replace the part or parts, etc.- and the problem is eliminated. If the problem is not eliminated or is only lessened, something was missed- repeat the checklist and replace or refit the item (as applicable) that was missed. Causes of hammer follow through in M1911 type pistols with reduced trigger pull weight are the same (there are only the above listed causes) but easier to solve because most hand assembled pistols are within ordnance specification except for reduced sear hammer engagement and spring tension.

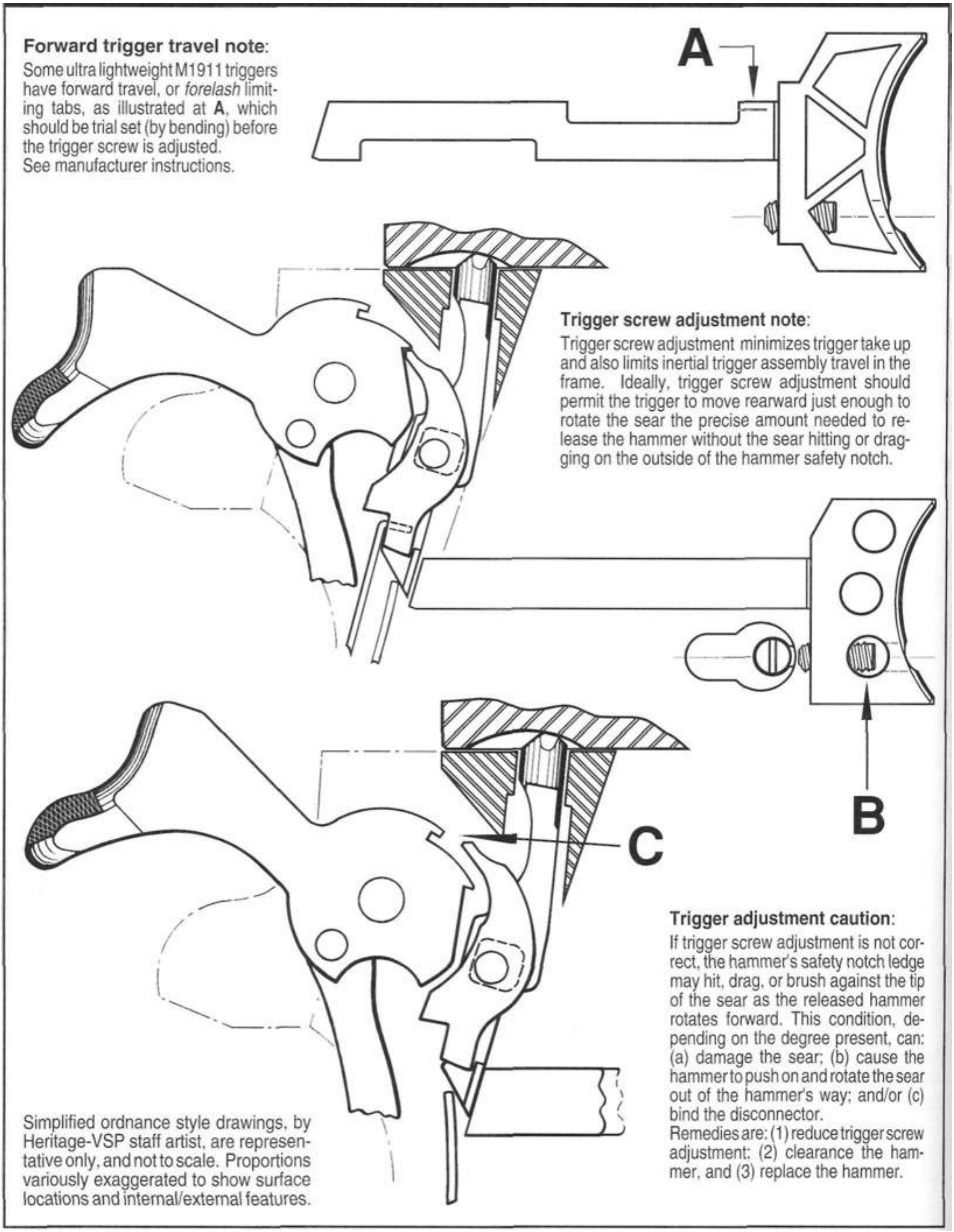


Figure 161- Ordnance style principle illustrations by Heritage - VSP staff artist, at top and center, show Ml911 adjustable trigger screw and travel tab adjustments. *Forelash* tab(s), shown at **A**, (not furnished on all triggers) should be trial set to position the rear of the trigger bow at flush with the interior of the frame. **Note:** If the trigger bow is further rearward, it may drag/bind the disconnector. The trigger screw, at **B**, is then adjusted to permit just enough rearward trigger travel to rotate the sear free of the hammer's full cock engagement ledge and release the hammer. Check correct adjustment by retaining and swinging the hammer forward and aft to make certain that, with the adjusted trigger held in rearward position, the top of the sear does not hit or drag on the hammer's safety notch ledge, at **C**. If the sear lightly brushes the outer surface of the hammer, at or above the safety notch, adjust the trigger screw to permit fractionally greater sear rotation. If contact is greater, remove the hammer and clearance the outer front surface above the safety notch with a medium Eze-lap diamond hone. Then reinstall the hammer, readjust, and recheck.

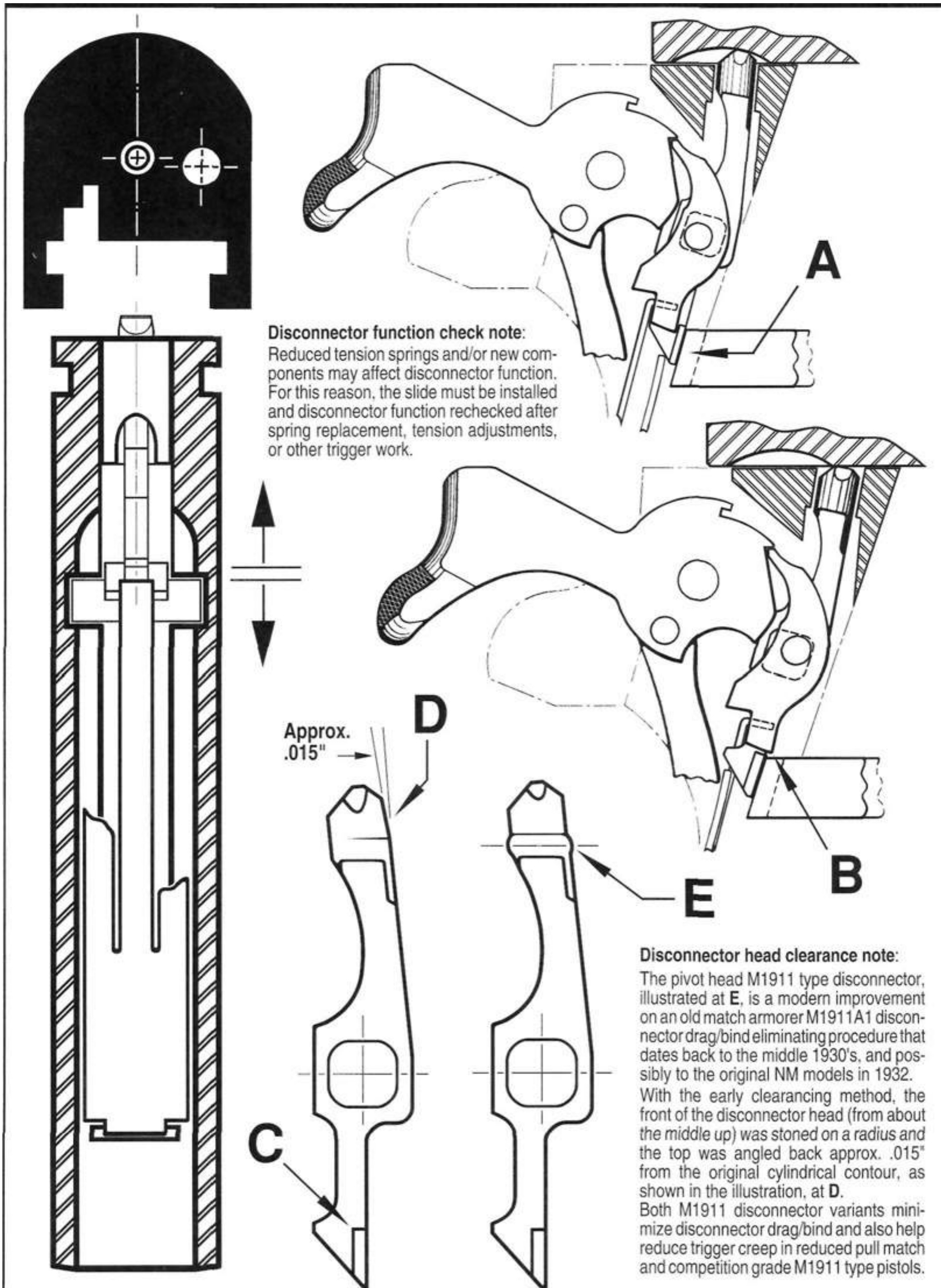


Figure 162- Ordnance style rear sectional illustration by Heritage - VSP staff artist, at left, depicts M1911Al trigger group components installed in the frame for a final disconnector function check with the slide after completion of trigger work. Disconnector function checks (and rechecks) are particularly important when reduced tension and/or tuned springs are installed. Illustrations, at upper right, show an M1911Al disconnector in the trigger forward/connected and trigger rearward/disconnected positions. Steps that help eliminate disconnector drag/bind, indicated at arrows above are: (**1**) polish the backs of the disconnector and trigger bow, at **A**; (**2**) lightly edge break or radius the sear hooks and disconnector blade corners (up to a max. of .003") at **B** and **C**; and (**3**) disconnector head clearance. See note, above.

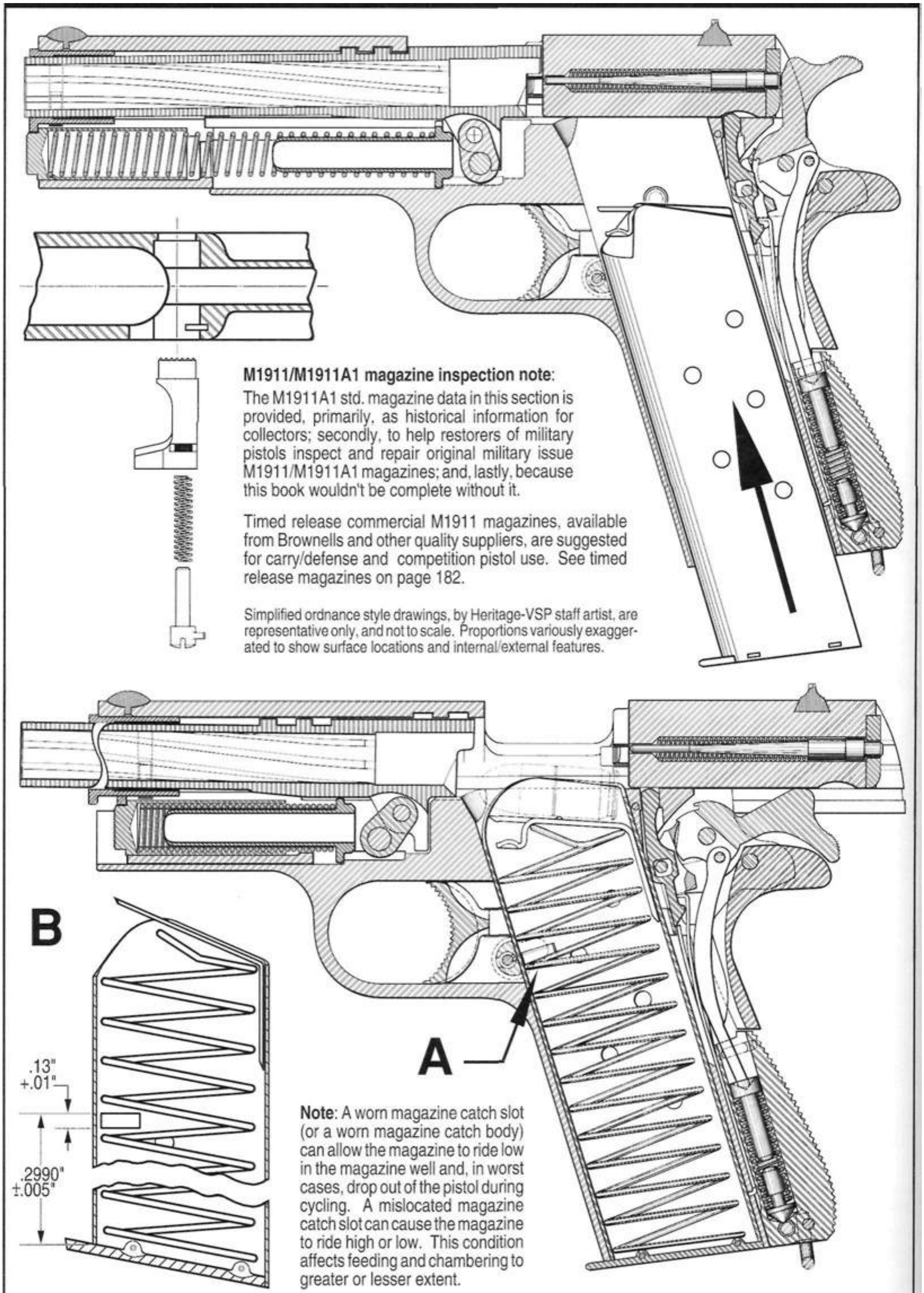


Figure 163- Ordnance style sectional illustration by Heritage - VSP staff artist, at top, shows an M1911/M1911A1 magazine being installed to check tube (body) fit in the magazine well, and also to check for positive magazine catch engagement. The sectional illustrations, below, show the magazine catch engaged in a serviceable magazine, at **A**. Ordnance specified M1911A1 magazine catch slot vertical location is shown, at **B**. The above checks, plus test firing, usually determine magazine serviceability. M1911A1 magazine component dimensional inspection data is shown on the following pages.

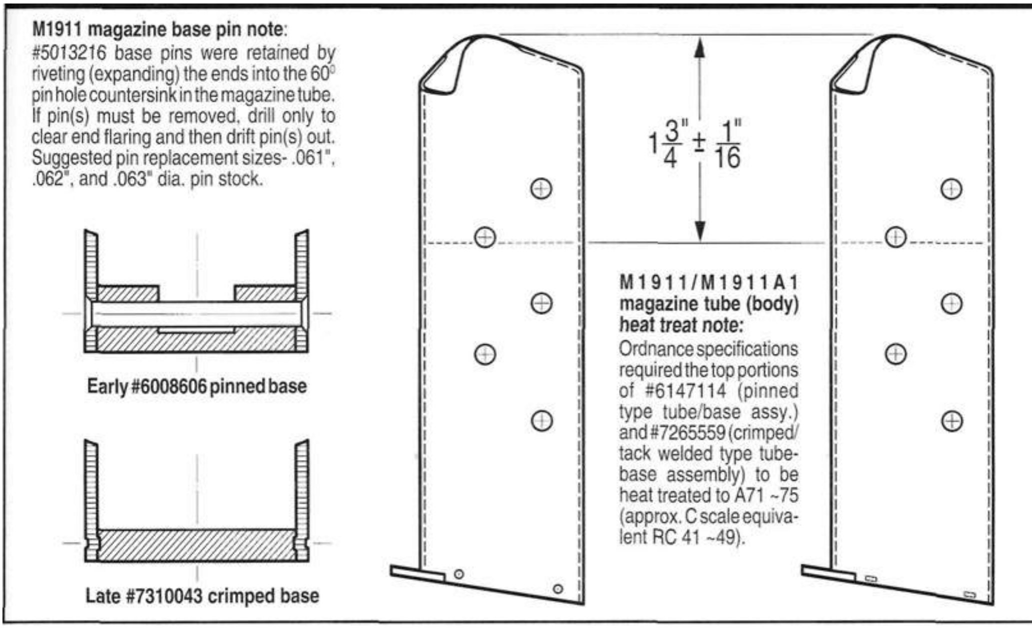


Figure 164- Ordnance style illustrations by Heritage - VSP staff artist show early and late style M1911 / M1911A1 magazine tube/base subassemblies. Although the assembly drawing (#6147114) for the pinned base type magazine still existed at time of publication, this magazine is technically obsolete. Earliest M1911 magazines had lanyard loops (not shown). Per magazine assembly drawing #5508694, there is one part number (#5508694) for complete M1911A1 magazines, assembled with either of the above tube/base subassemblies. Component dimensional inspection data is shown on pages 178 - 181.

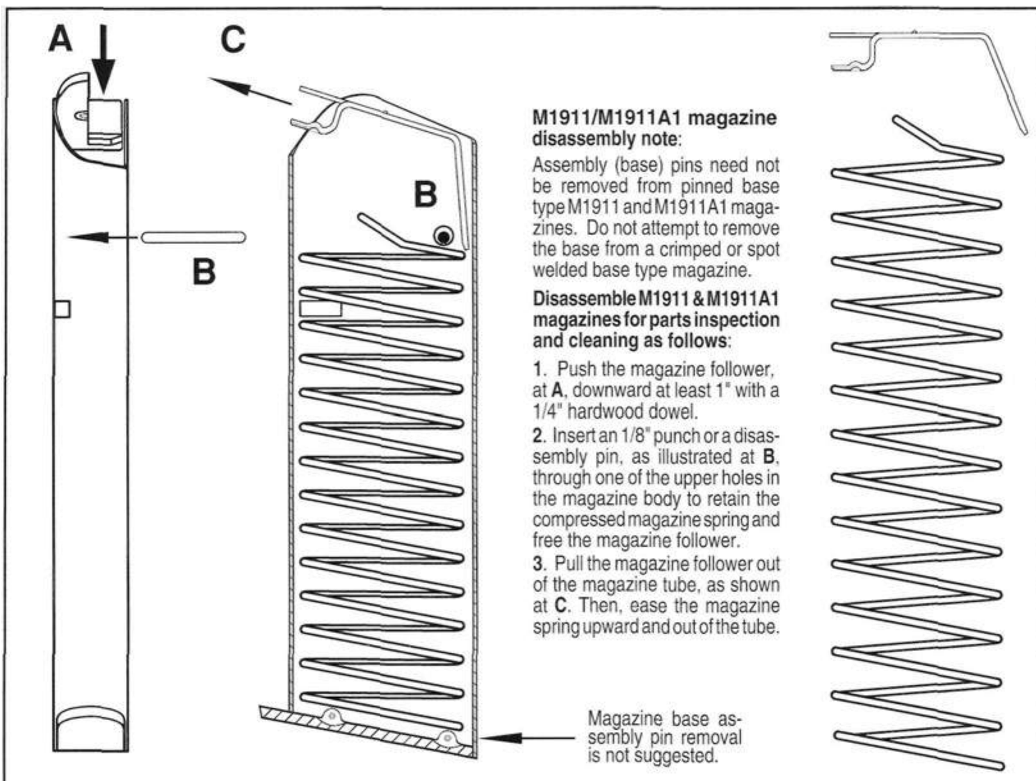


Figure 165- Ordnance style principle, sectional, and parts illustrations by Heritage - VSP staff artist show Ml911/M1911A1 magazine component disassembly steps. See base pin removal note, above.

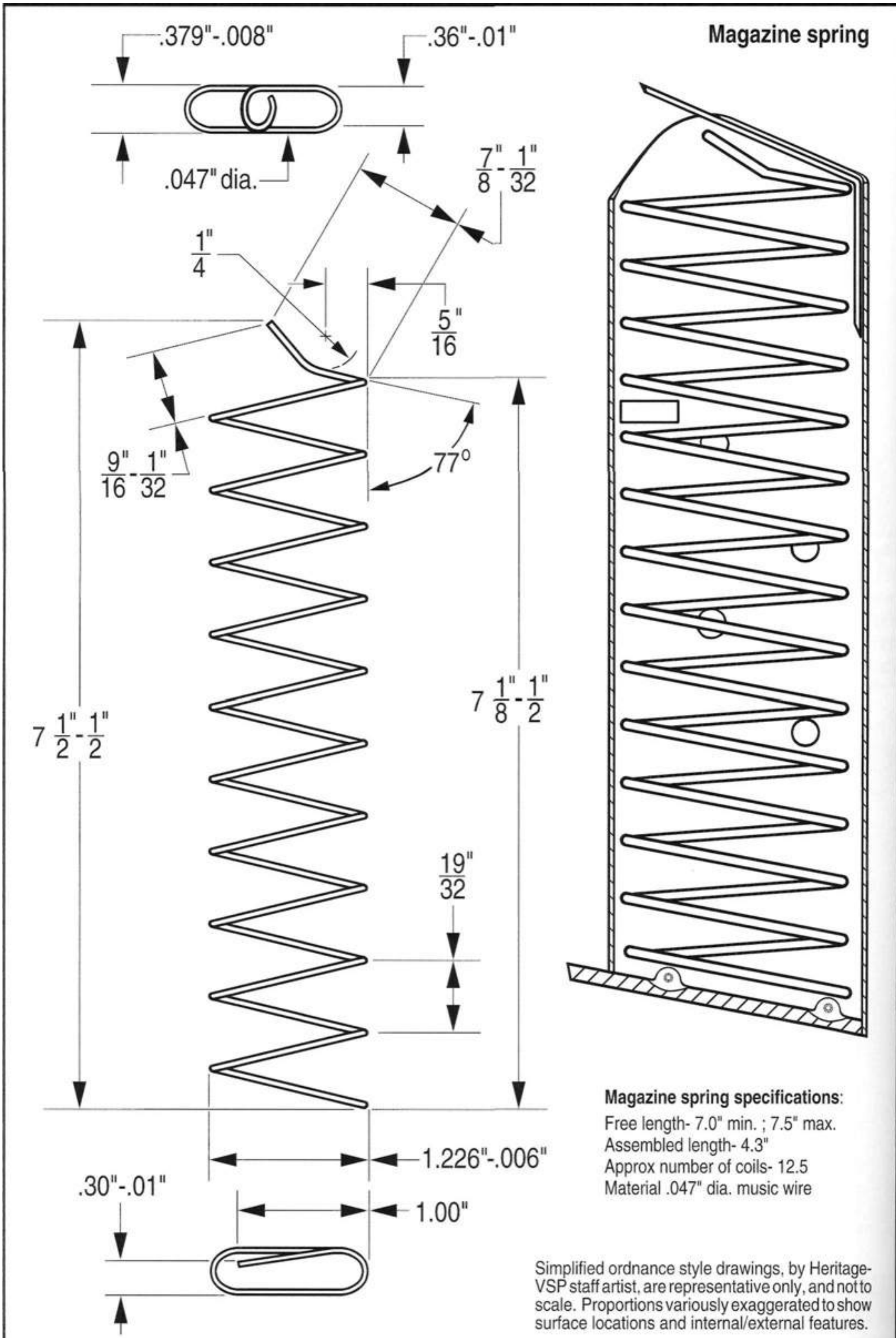
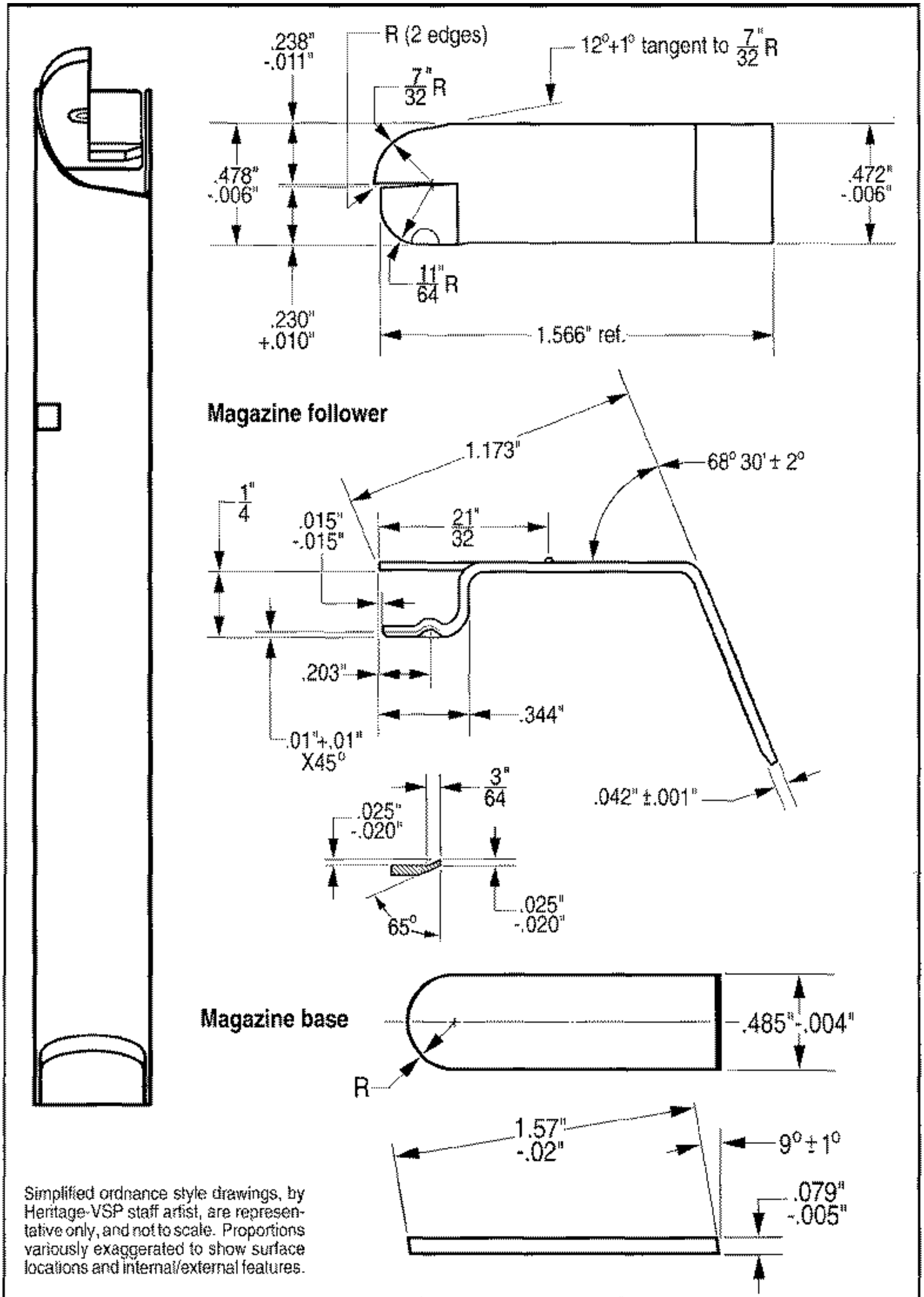


Figure 166- Ordnance style illustrations by Heritage - VSP staff artist show M1911/M1911A1 magazine spring dimensional inspection data. For further data, consult ordnance drawing #6008607 (spring, magazine). **Parts note:** Weak magazine springs cause feeding malfunctions.



Simplified ordnance style drawings, by Heritage-VSP staff artist, are representative only, and not to scale. Proportions variously exaggerated to show surface locations and internal/external features.

Figure 167- Ordnance style illustrations by Heritage - VSP staff artist show M1911/M1911A1 magazine spring follower and late style (crimp or tack welded) magazine base dimensional inspection data. Early style pinned magazine bases are shown on page 175. For further component data, consult ordnance drawing #6008608 (follower, magazine) and #7310043 (base, magazine). Ordnance material and heat treat specifications - magazine follower: 1015 or 1020 steel with heat treat sufficient for forming, only, magazine base: 1015 or 1025 steel with heat treat sufficient for shearing/stamping.

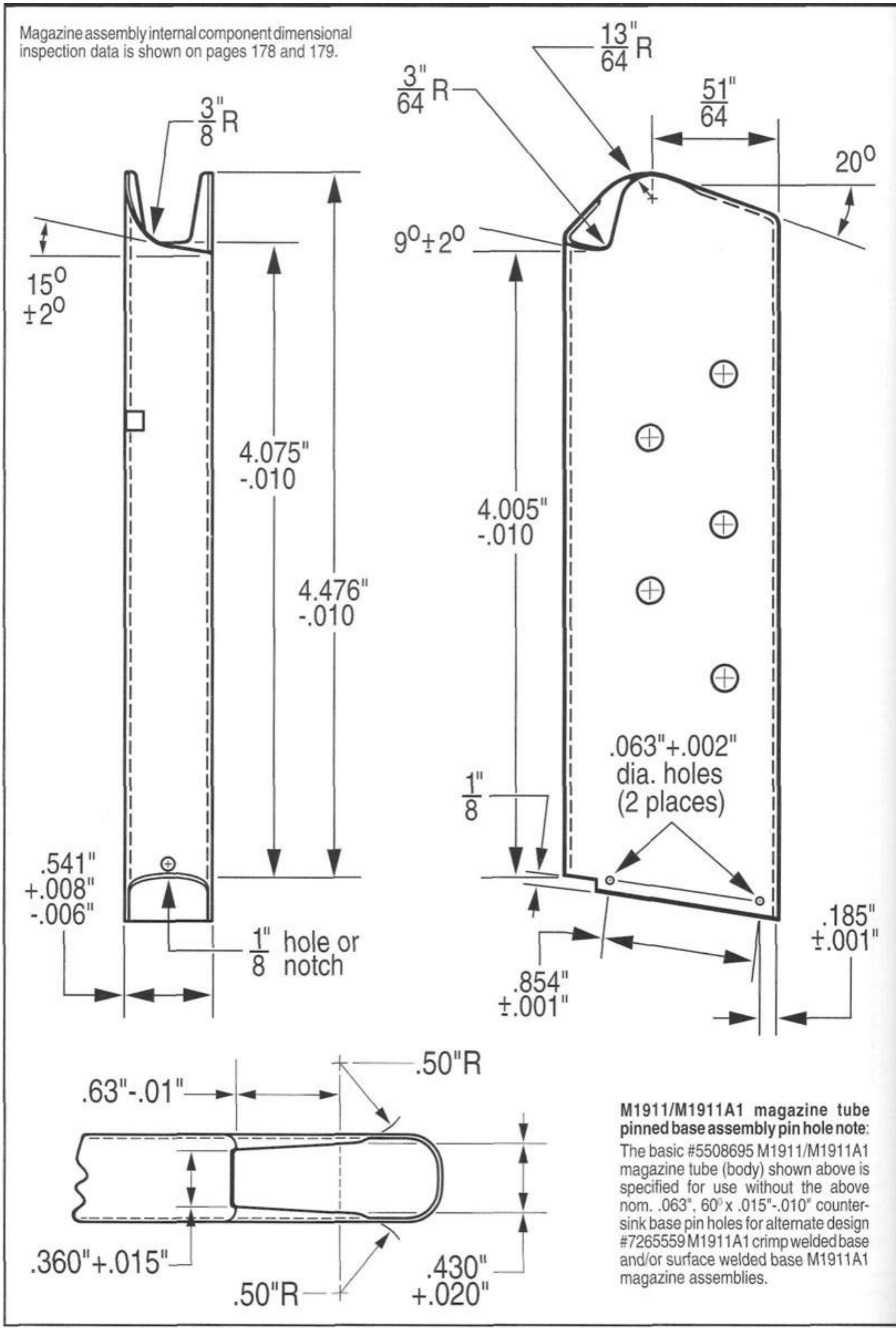
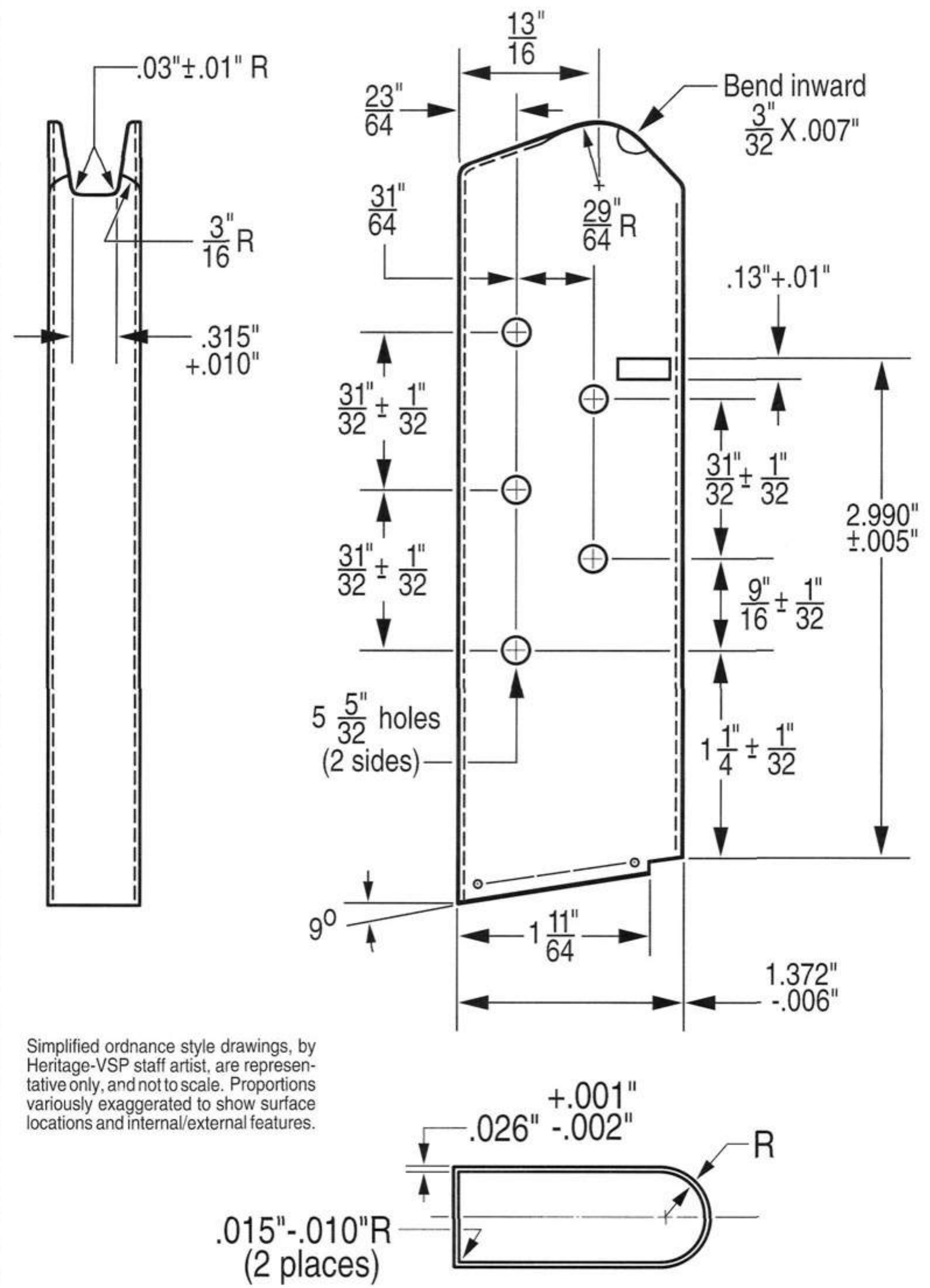


Figure 168- Ordnance style front, left, and top (3/4 top view) illustrations by Heritage - VSP staff artist show M1911/M1911A1 magazine tube (body) dimensional inspection data. **Note:** Ordnance specifications required M1911/M1911A1 magazines to release a .480" max. diameter gauge cartridge (ball type) within a distance of .820" max., as measured along the top surface of the magazine tube from the rear face.



Simplified ordnance style drawings, by Heritage-VSP staff artist, are representative only, and not to scale. Proportions variously exaggerated to show surface locations and internal/external features.

Figure 169- Ordnance style rear, right side, and cross sectional illustrations by Heritage - VSP staff artist show M1911/M1911A1 magazine tube (body) dimensional inspection data. For further data, consult ordnance drawing #5508695 (tube, magazine); #5508694 (magazine assembly); #6147114 (tube, magazine subassembly, pinned base); and #7265559 (tube, magazine subassembly, crimp welded or tack welded base). Ordnance specified magazine tube material- 1045 or 1050 steel. Heat treat top nom. 1.75" portion of tube, only, to A71-75 (C scale equivalent is RC 41-49).

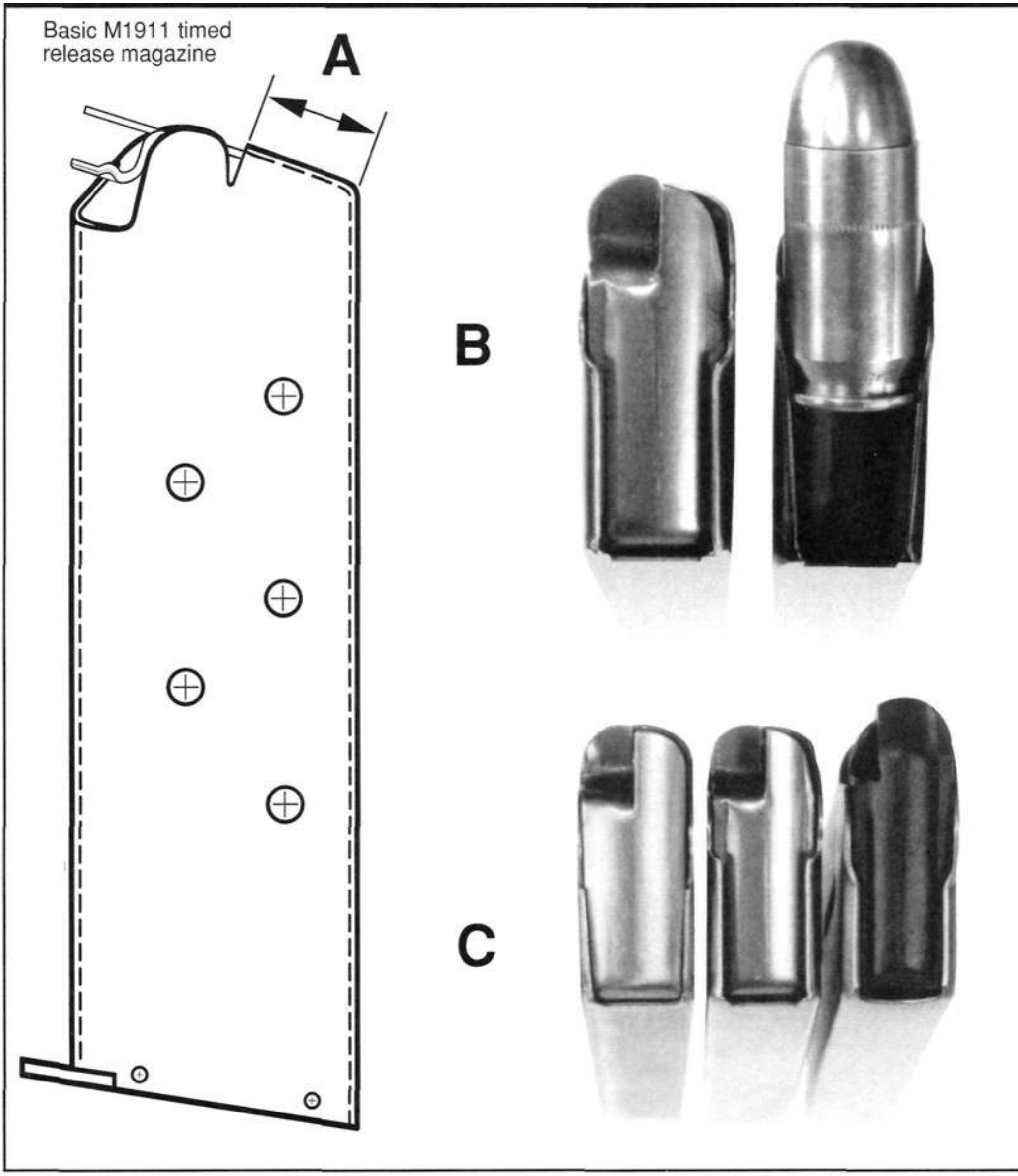


Figure 170- Ordnance style illustration by Heritage - VSP staff artist shows one of several magazine feed lip modifications historically employed to control and time cartridge release in Ml911 type magazines. Although several variations exist, dimension **A**, in most magazines modified as illustrated in the above example, typically measures between .55" and .60". Cartridge release in ordnance std. dimension M1911Al magazines depends primarily on feed lip width and cartridge rim diameter. The photo, at **B**, shows top views of a timed release and standard magazine for comparison. The max. rim diameter cartridge in the standard magazine releases when pushed forward to a point approx, even with the release slots in the timed release magazine next to it. A minimum rim diameter cartridge in the same magazine, however, releases fractionally earlier, i.e., forward of the cartridge position shown. Top views of several commercial timed release M1911 magazines are shown below, at **C**, for comparison. Considering the quality of currently available name brand timed release Ml911 magazines, it's no longer worthwhile to invest time in modifying and tuning ordnance standard magazines. Timed release magazines are less cartridge rim diameter and rim condition sensitive, and as the name implies, mechanically time release and thereby control cartridge horizontal breakover and chamber alignment. **Historical note:** The first timed release Ml911 magazines were ordnance std. dimension magazines modified by service marksmanship unit armorers to improve ramping and chambering of match cartridges (notably wadcutter type) in NM pistols. Magazines were then custom fit for best function in specific pistols.

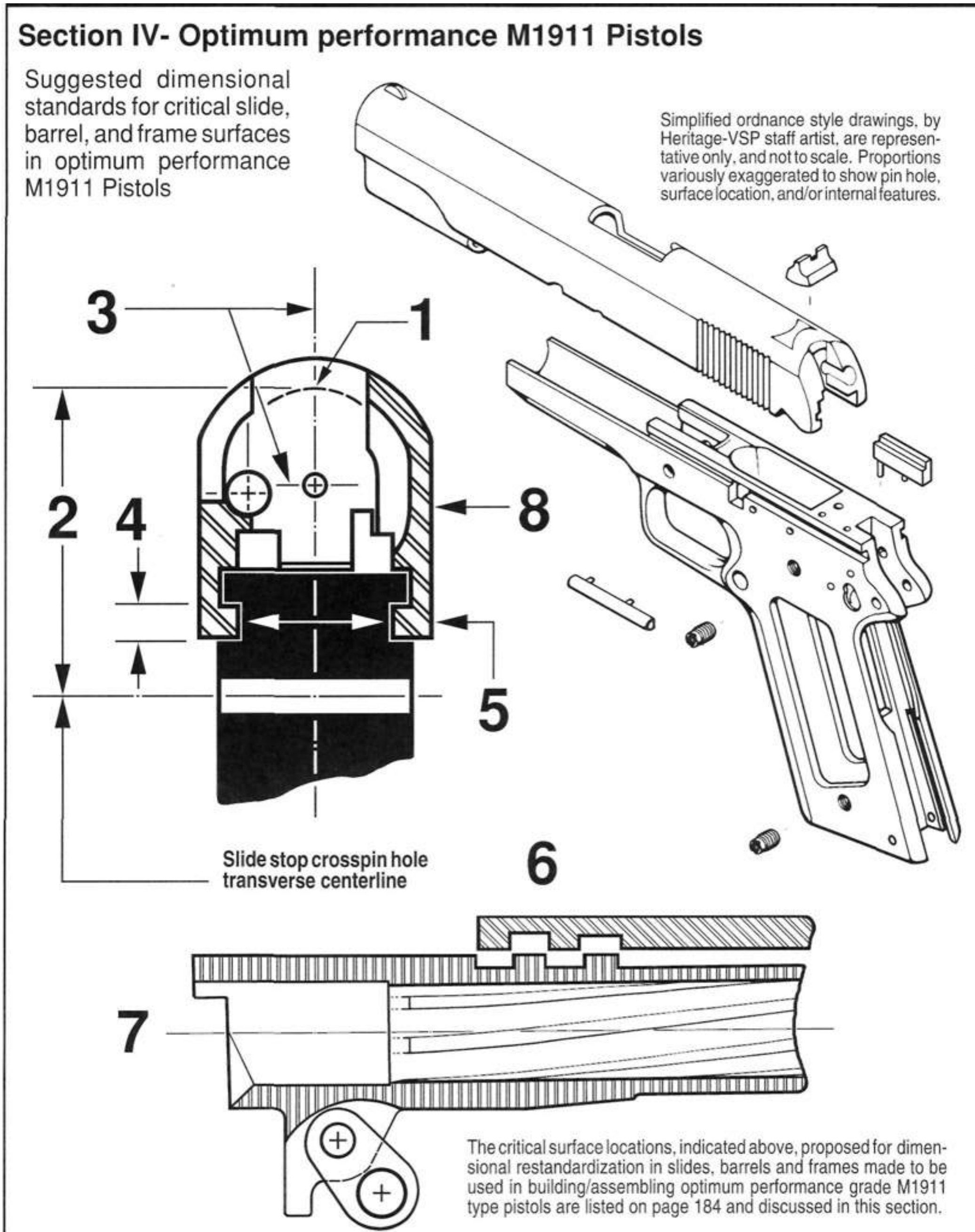


Figure 171- Ordnance style illustrations by Heritage - VSP staff artist show slide, barrel, and frame surface locations that are critical in competition grade M1911 Pistols and that should be precisely located in an optimum performance M1911 Pistol. M1911 detractors tend to consider use of the word *optimum* in describing an M1911 type pistol as gilding the lily. It does, nonetheless, apply. Funk and Wagnall's definition is: (**1**) the condition or degree producing the best result- and others: the **very best, most advantageous,** or **most favorable** condition. And that's exactly what we're after in this section: the very best, most accurate, and most favorable overall performance M1911 Pistol possible- and one that will hold together and keep its competitive advantage for umpteen thousands of rounds. If you're a competition shooter- that's *favorable* and that's *advantageous*. Critical surface locations, as referenced in the illustration above, that should be dimensionally restandardized (for this class or grade of Ml911, only) are listed on page 184 and discussed on pages 186-196. Examples of problems and component failures that can occur in the absence of the suggested standards are shown in figure 172.

Critical surface, slot, passage, port, & bearing surface locations in optimum performance Ml911 Pistols-

1. Barrel passage diameter, location, and parallelism in the slide- This is the originally ordnance specified .699"+.003" I.D. central passage in the slide. Barrel passage diameter, vertical mislocation, and nonparallelism problems are found in many commercial slides. Passage diameter and vertical height together define the slide locking lug vertical bearing surfaces. Passage diameter and location above the rail slot cuts in the slide, are two of several slide related factors (three, when vertical plane nonparallelism is factored in) that determine how far a given barrel must be linked upward in order to 100% vertically engage the locking lugs. Passage nonparallelism affects locked barrel angle (in both the vertical and horizontal planes) and also affects vertical link up distance. Suggested M1911 optimum performance slide barrel passage dimensional/locational specs, are discussed on pages 186 and 187.

2. Total vertical stack dimension (see vertical stack definition in figure 80) - This (the total stack) is the distance from the center of the slide stop crosspin hole in the frame to 12 o'clock position on the barrel passage inside the slide with the slide mounted on the frame. The total is made up of aggregate slide vertical stack plus aggregate frame vertical stack dimensions. This dimension, minus the distance from the center of the barrel's link pin hole to the bottom of the #1 (rear) lug slot, determines barrel link radius length. Approx, mid ordnance specification turns out to be optimum. When the total vertical distance is greater, correspondingly longer radius barrel links are needed to 100% vertically lock barrels. Longer radius barrel links then add to, or create, bore axis/firing pin port misalignment and link down timing and related barrel/slide clearance problems on barrel link down. Suggested M1911 optimum performance total vertical stack and related slide/frame dimensional specs, are shown on page 187.

3. Firing pin port location relative to bore/chamber axis- Firing pin port (and, relatedly, firing pin) location should agree with bore/chamber axis. Firing pin/primer axis mismatch creates variable primer ignition, which (depending on the degree present) has an effect on point of impact on target. In improved and optimum performance M1911 slides, barrels are linked to 100% vertically locked lug position rather than intermediate position as in ordnance std. pistols. For this reason, slide firing pin port location should be vertically referenced from the top down (i.e., downward from a point or arc on the breech face described by extending slide passage diameter rearward). Breech face and firing pin port location in the horizontal plane must be centered on a vertical line described by the barrel passage axis. Suggested Ml911 optimum performance slide firing pin port location specs, are shown on pages 186 and 187.

4. Side rail/frame rail slot height- This slide dimension should be standardized to vertically agree with the rail slot cuts in an optimum performance dimension frame + .002" material at the bottoms of the slide rails for final truing and fitting. It's a matter of picking some dimension and holding it. The .114" min. ordnance spec, figure used was most favored by early armorers because of beneficial effect on barrel link length. With this dimension held, frame rail slot dimensions should be correspondingly held to vertically locate the slide and minimize fitting, Proposed M1911 optimum performance slide and frame rail vertical dimensional specs, are shown on pages 186 and 187.

5. Slide rail/frame rail slot width- This slide dimension should be standardized to horizontally agree with the rail slot cuts in an optimum performance dimension frame + .001" material on the inside rail faces (.002" total) for final truing and fitting. Again, it's a matter of picking some dimension and holding it. Then, with this dimension held, correspondingly hold frame slide rail slot and frame rail dimensions to horizontally locate the slide on the frame and minimize fitting. Suggested M1911 optimum performance slide and frame rail horizontal dimensional specs, are shown on page 187.

6. Slide/barrel locking lug bearing surface agreement- Although barrel locking angle varies the percentage of face contact from lug to lug, all three slide and barrel locking lug surfaces must contact and bear equally in the horizontal plane as the barrel is linked upward to the vertically locked position. This is important with medium and higher heat treat slides and barrels and in pistols chambered for std. pressure .45 ACP cartridges- and doubly important in pistols in which high pressure cartridges are fired. See failed barrel lug examples in figure 172. For background on this subject see bearing surface data on page 94. Suggested optimum performance slide and barrel lug dimensional location specs, are shown on page 189.

7. Bore and chamber axis/firing pin port agreement (with barrel in 100% vertically locked position- Agreement is aggregately determined by barrel passage and firing pin port location in the slide, barrel length, and barrel lug slot depth relative to bore axis, as discussed above and in earlier sections. Discussion in this section is optimum performance dimension M1911 barrel and primarily nom. .302" lug slot barrel related. See rear lug slot historical/dimensional data on page 188.

8. Slide reinforcement (suggested for pistols chambered for high pressure cartridges)- This includes thickening the slide walls, widening the link down clearance area to eliminate barrel hits, radius cutting critical inside corners (in stress crack prone areas) and thickening the recoil face, etc. See page 190.

Figure 172- Shows examples of abused custom Ml911 components. The barrel, at top, was subjected to an extreme overload. The next three barrels have broken/cracked middle lugs. This damage occurred for two reasons: (**1**) in all three, only the middle lug was bearing; and (**2**) a shear force created by 3X design pressure was exerted upon the one bearing lug. The bottom lug sheared off the 5th barrel because of insufficient lower barrel/slide clearance (the barrel could not fully link down). Exterior stress cracks shown in both slides, below, originate at/near square inside corner cuts. Both breech faces show evidence of pressure abuse and firing pin port mislocation in the cutaway sides, at bottom. Barrel lug engagement surface corners are battered/rounded-off in the slide section at bottom right. This damage occurred in a high vertical stack, long barrel link pistol with insufficient slide/top barrel lug clearance at linkdown.

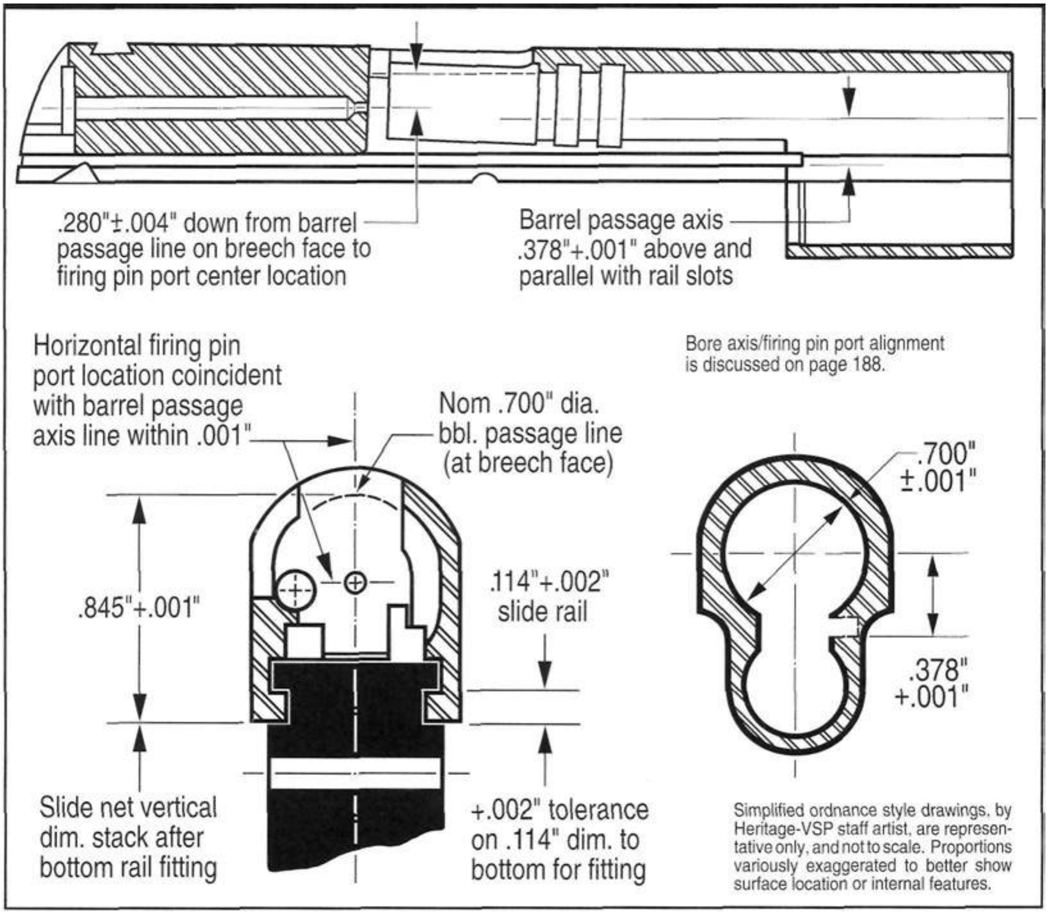


Figure 173- Ordnance style sectional illustrations by Heritage-VSP staff artist show proposed ideal barrel passage and firing pin port locations, slide rail dimensions, and net vertical bottom rail to barrel passage dimension (after final slide rail fitting) in an optimum performance M1911 type slide.

About Ml911 optimum performance slide dimensions- The several dimension and/or tolerance changes proposed in this section are not a presumptive attempt to redesign the M1911 slide. What is being proposed is a whole lot simpler- namely that several of the most critical dimensions, shown above and on the following pages, should be restandardized (nearly all within ordnance specifications) and the rest held at approx, mid. ordnance spec, in order to provide a best, or *optimum* grade, M1911 competition pistol slide. Many of the reasons such slides are sorely needed have been discussed in previous sections of this book. Seepage 122, for example. Some of these are: (**1**) in hand built Ml911 Pistols with custom barrels fit to link/cam up to 100% vertical lug engagement, the rear of the barrel is elevated higher than typically would be the case in an ordnance std. M1911 or M1911A1 Pistol. With ordnance std., (nom .290" bore axis to lug slot dim.) barrels, bore axis elevation can be increased approx. .017" to .026" (at 100% vertical lug engagement), and approx, zero to .014" with .302"+.005" NM spec, barrels- depending on aggregate parts dimensions, slide barrel passage parallelism, and slide/barrel length. The resulting barrel angle correspondingly changes where the bore axis line vertically intersects the breech face. This point, ideally, is where the center of the firing pin port should be. (See firing pin port/bore axis alignment on page 188 & the holy grail of barrel/slide fitting on page 125.) Although the experts crunch the numbers a tad differently, they come up with the same basic answer- i.e., that in 5" slides, for example, the center of the firing pin port should be located approx. .020" higher than nominal ordnance spec, when ordnance std. lug slot depth barrels are used, and approx, zero to .005" higher when nom. .302" barrels are used. (**2**) Although it may seem heretical to some, referencing the firing pin port downward from the .above .700" barrel passage diameter line is suggested because it's simpler in slides that are intended to be used with 100% vertically locked barrels. (**3**) Slide barrel passage height variation and non parallelism both affect barrel link radius length- and, the longer the barrel link the greater the potential for link down problems. Left/right skewing of the barrel passage also causes lateral firing pin misalignment and all kinds of barrel link down problems including: *breech section of barrel hits the slide on barrel link down.*

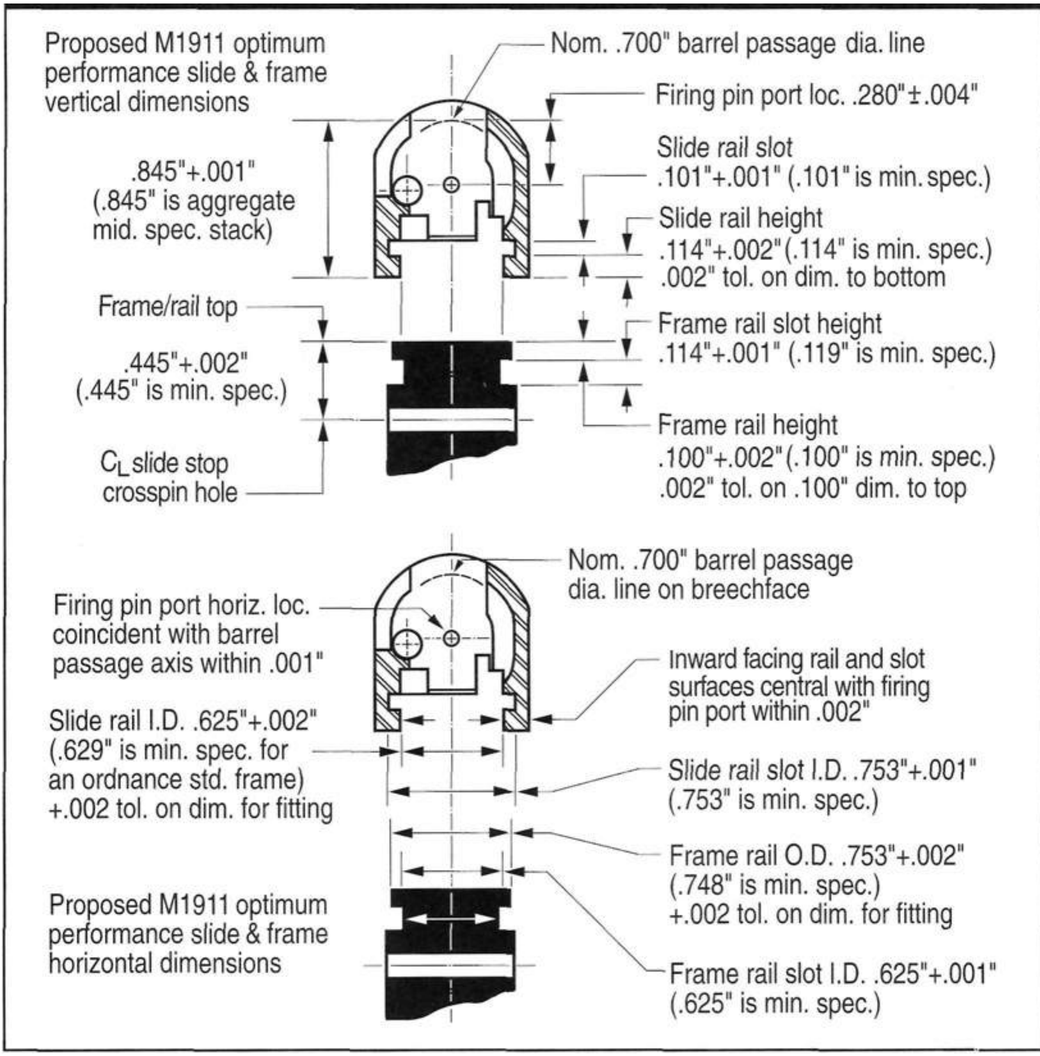


Figure 174- Detail illustrations by Heritage - VSP staff artist, show vertical and horizontal M1911/ M1911A1 slide/frame dimension/tolerance changes suggested for incorporation into optimum performance grade M1911 frames and slides. Needless to say, none of this data is really new. The idea of commercially restandardizing a competition version of the M1911, based on the above suggested, or similar, dimensions/tolerances, has been kicked around and seriously proposed by armorers, pistolsmiths, and designers - and turned down by marketing departments before. The above proposal is, in fact, a reassemblage of ideas that have been around for many years. Manufacturers have historically responded that it's too much trouble and too costly to hold these (particularly slide) tolerances. Not so with current CNC equipment. Although reintroducing this idea in published form is a *dark and dirty job and somebody has to do it, etc.*- and one that's bound to draw some amount of flack from vested interests- the subject is worthy enough to toss out there once more. There are now a fair number of quality oriented, high grade Ml911 component manufacturers who might, perhaps, be interested- but, as a friend used to say, "you never know". If this section serves, by default, only to sharpen the component cherry picking skills of pistolsmiths dedicated to building better M1911's, it will have, indeed, done its job.

Optimum performance M1911 slide and frame dimension/tolerance notes:

1. Plus/minus tolerances on rails and/or rail slot mating surfaces, suggested above, necessarily depart from standard ordnance tolerance notation where hand adjustment to final fit is required.

2. As discussed earlier, other M1911/M1911A1 slide and frame dimensions/tolerances (there are more than two hundred) are not, and need not be, specifically mentioned in this section. As far as most of these are concerned- and there are a few exceptions- holding approx, mid ord. spec tolerance is sufficient and what you would expect from a quality manufacturer.

3. Ordnance specified locations for critical frame pin holes are actual (not toleranced).

4. Optimum performance dimension M1911 barrels already exist and are discussed on pages 112 and 189.

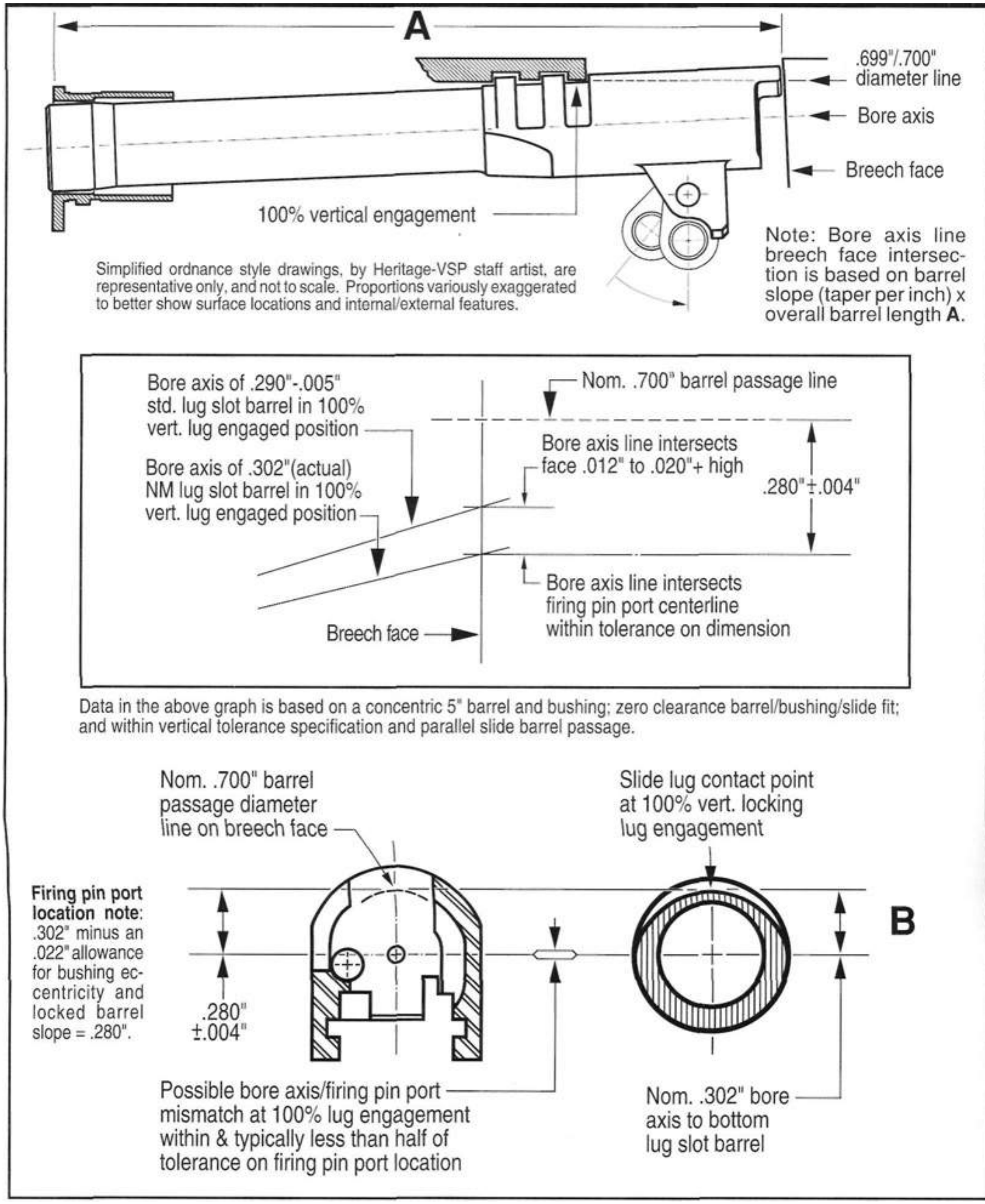


Figure 175- Ordnance style principle illustrations by Heritage - VSP staff artist show bore axis line-firing pin port misalignment that occurs when std. .290"-.005" rear lug slot barrels are linked up to 100% vertical lug engagement. This problem was solved at Springfield Armory in the early 1950's with the development of the nom. .302" rear lug slot #7791414 M1911A1 NM barrel. The above drawings are included (less a raft of supplemental ordnance statistical details and with the previously suggested top down firing port location plugged-in) to illustrate the point that performance development work on the M1911A1 has been ongoing since 1930-32, and big time since the mid 1950's. To those who have seen the original ordnance drawings the above illustrations are styled after, our qualified apology for not including the supplemental data from the originals. This was intentionally done for two essentially practical reasons: (**1**) this book is not a historical record of M1911 development; and (**2**) extra data would serve only to clutter the basic issue. **Dimensional note:** The above .290" and .302" lug slot references are bore axis to bottom of lug slot dimensions, as illustrated at **B**. Also see pages 109 -112. The one M1911 barrel related problem that wasn't addressed by ordnance was that of lug failures caused by unequal lug bearing, compounded by the firing of cartridges in the 2X to 3X plus design pressure range.

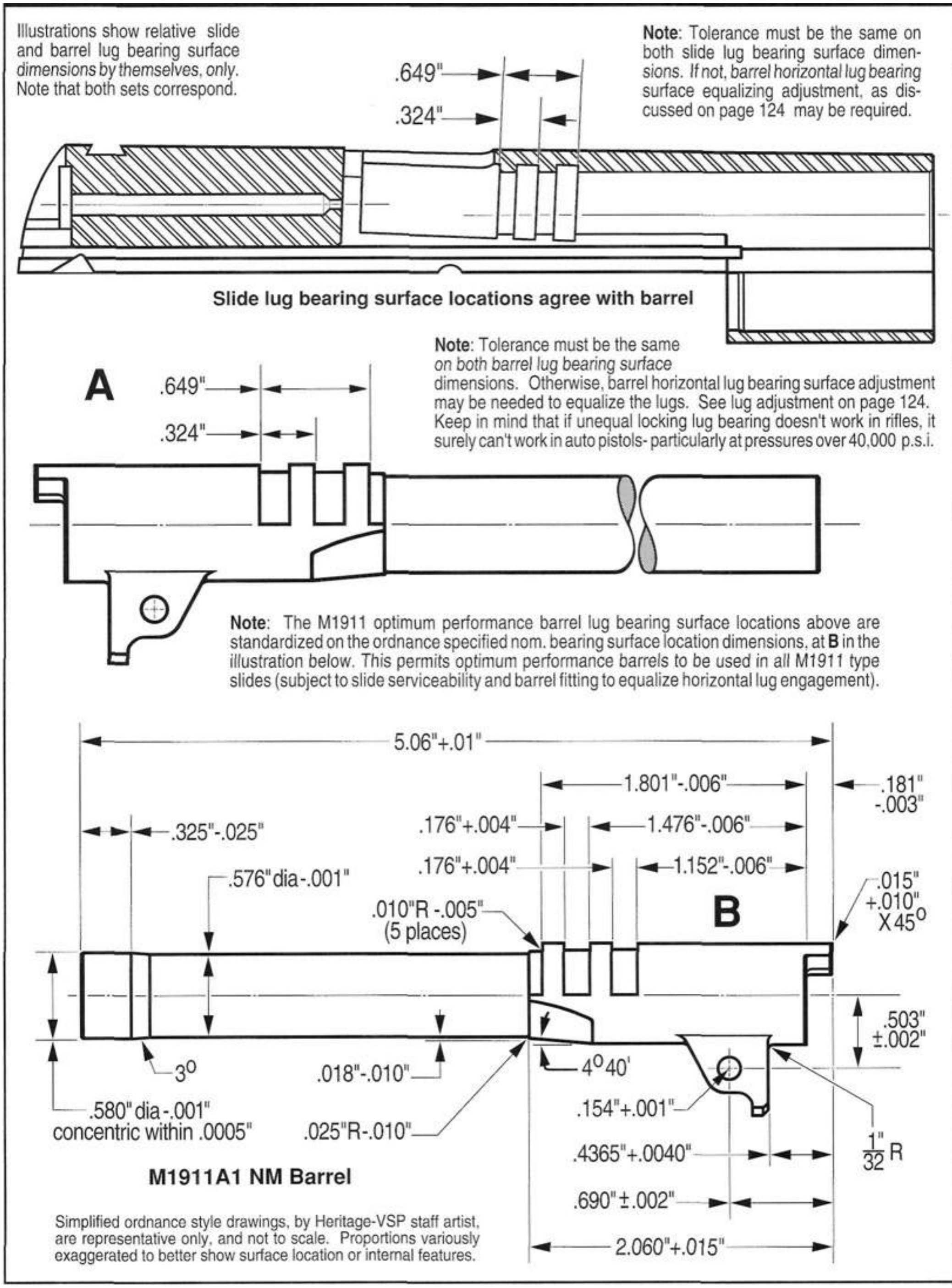


Figure 176- Ordnance style principle illustrations by Heritage - VSP staff artist, at top, show matching slide and barrel lug bearing surface locations proposed for optimum performance Ml911 slides and barrels. Correspondingly equal slide/barrel lug bearing surface locations and equal tolerances on both the barrel and slide lug bearing surfaces permit all 3 slide and barrel lug bearing surfaces to bear uniformly in the horizontal plane (less a lug surface contact area deduct for barrel elevation angle). Relative optimum performance barrel lug bearing surface locations, at **A**, are the same as those shown in the NM barrel illustration at **B**, but in simplified form without dimensional reference to the recoil surfaces. **Note:** If lug bearing surfaces are not equal in higher than design pressure pistols, or at least close enough to effectively pressure seat without damaging the barrel, lug failures as shown on page 185 will sooner or later result.

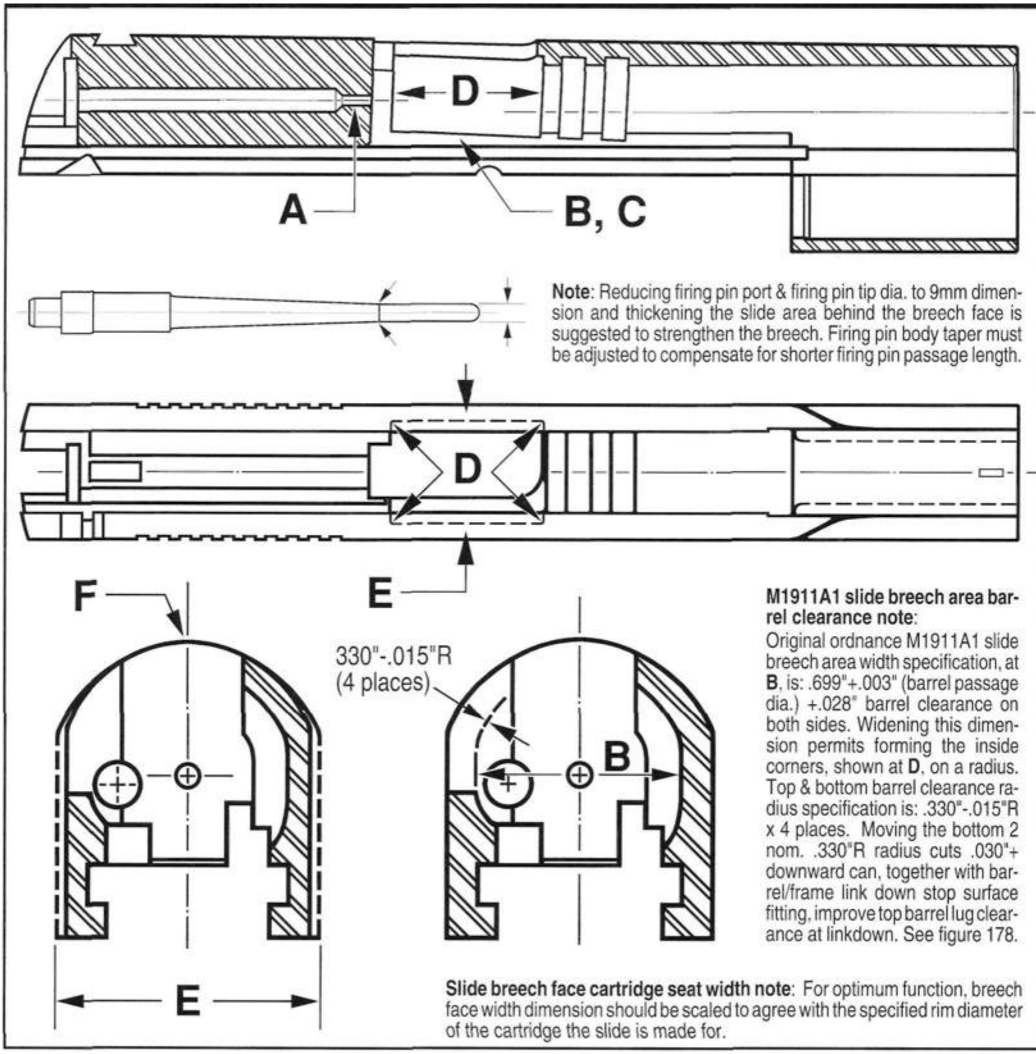


Figure 177- Ordnance style sectional illustrations by Heritage - VSP staff artist show suggested areas where optimum performance Ml911 slides, especially slides to be used with higher than design pressure cartridges, should be reinforced and slide breeching/barrel clearance area internal dimensions slightly changed to permit inside vertical radius cuts instead of square corners. Proposed reinforcement and dimensional changes include, but need not be limited to:

1. Increasing breech support by reducing the length of the main (.219"+.004" dia.) firing pin passage, at **A**, (to thicken the breech) and standardizing firing pin port dia. on the defacto 9mm / .38 Super port std. of .070" dia. (this also helps minimize primer extrusion when an .069" tip dia. firing pin is used). **Note:** Shortening the main firing pin passage requires corresponding firing pin body taper adjustment.

2. Thickening the sides of the slide, at **E**, to then fractionally widen the internal barrel clearance area, at **B**, in order to provide the room needed to substitute vertical radius cuts for square corners, at **D**, and thereby reduce stress crack potential. **Note:** Corner radius dimension determines the extent to which the breeching area must be internally widened beyond the specified nom. .699"+ .028"/+ .028" and, correspondingly, establishes the min. amount the slide must be widened, at **E**. The top of the slide, at **F**, can remain at standard height to accommodate existing commercial sights.

3. Fractionally lowering the bottom of the slide's barrel clearance area (moving the bottom nom. .330" radius cuts slightly downward), at **C**, to provide .015" slide/top barrel lug static clearance and eliminate *barrel hits slide* problems on (dynamic) link down with non link down clearanced barrels. See illustration in figure 178. **Slide reinforcement note:** None of the above proposals are new. Some M1911 variant manufacturers have already produced pistols with thicker and/or otherwise reinforced slides. Optimum performance M1911 slides can be reinforced in keeping with conventional styling, as shown above, or beefed up further and optionally restyled to create a distinctive new appearance.

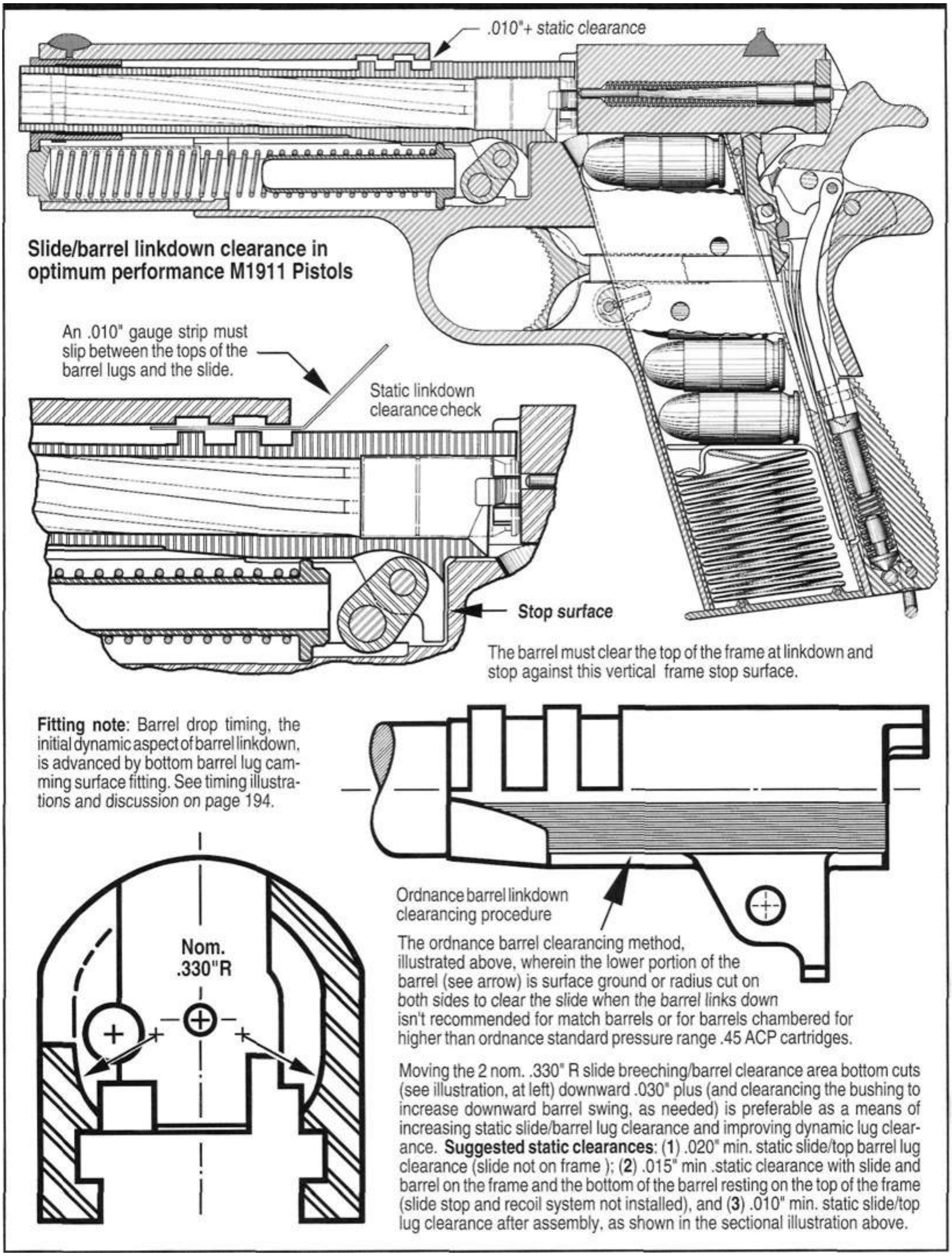


Figure 178- Ordnance style sectional illustration by Heritage - VSP staff artist, at top, shows suggested slide/barrel lug static clearance in an assembled optimum performance M1911 Pistol. Interior slide clearancing to improve static and dynamic slide/barrel lug clearance at link down is shown below. Two basic lug clearance conditions must be met: (**1**) Static- the barrel must link down and stop against the frame's vertical stop surface- and link down far enough to allow the slide to clear the barrel lugs. (**2**) Dynamic - the barrel must be able to link down fast enough from the vertical + horizontal lug engaged position to permit the slide to clear the corners of the top barrel lugs on recoil. **Dynamic requirements:** (**1**) faster link down timing (one reason for combining a mid vert, stack slide, a .302" lug barrel, and a shorter link); (**2**) eliminate link down interference by clearancing as above and on page 194; and (**3**) retard initial slide movement as much as possible. Also see barrel-slide-frame fitting for optimum reliability on page 195.

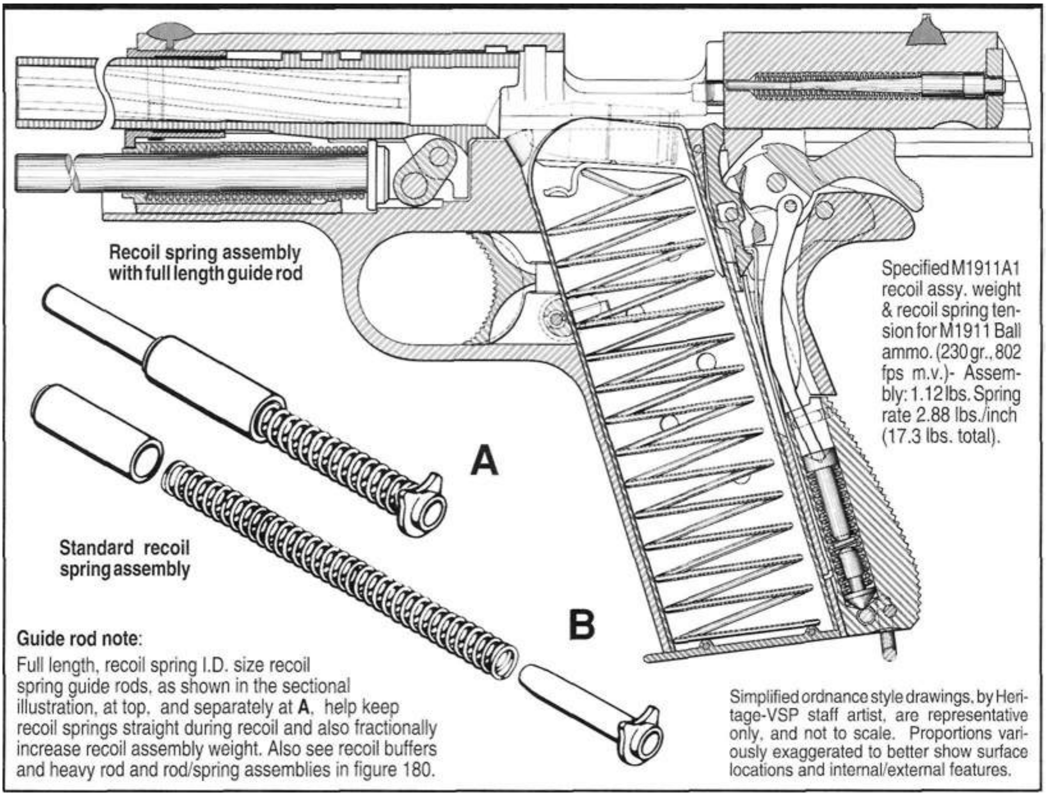


Figure 179- Ordnance style sectional illustration, by Heritage - VSP staff artist shows an M1911Al Pistol with a full length recoil spring guide rod installed and with the slide in the approx, full recoil position. **Note:** Actual rearward slide position at max. recoil depends on bullet energy and recoil spring length and tension. With lighter/shorter springs, recoil ends when the slide stops against the recoil spring guide plate (or buffer, if used). Long guide rod and std. recoil assemblies are shown for comparison, at **A** and **B** below.

About recoil assembly weight, slide recoil, and barrel link down-

Link down clearancing, as discussed on page 191 and earlier, and existing recoil systems can only do so much to improve dynamic link down when high energy bullets are fired in M1911 type pistols. Beyond this, initial slide movement has to be retarded enough to permit the barrel link to pull the horizontally engaged locking lugs (custom fit barrels) downward/rearward before the slide rides over the top corners, or hits, the barrel lugs. Dusting off an old rule of thumb that dates back to early artillery and ships cannon design may help shed light on why dynamic link down is different than static in M1911 Pistols, particularly when high energy bullets are fired. The method referenced is the projectile energy to recoil assy, weight quick ratio used by designers and ballisticians in estimating inertial effects on cannon and mount wherein the energy (in foot pounds) of a projectile at departure velocity was divided by the weight of the recoil assembly. Applying this ratio to an M1911 recoil assembly (the complete slide/barrel/recoil spring assy.) and presuming (1) 350 ft/lbs. and (2) a total recoil assembly weight of 1.120 lbs. works out to about 312 ft/lbs per 1 pound of slide assy, weight. Since this was a bit much for the intended purpose, and greater weight wasn't desirable, an approx. 17.3 lb. recoil spring was employed. Applying this rule of thumb a step further, i.e., with respect to a higher muzzle energy- for example a .357 or 9mm bullet, at a m.v. of 1450 fps = 583 ft/lbs., and given the same recoil spring rate, the slide assy would have to be roughly 1.666 times heavier (or weigh 1.87 lbs.). Without this added recoil assy, weight (or a more exact estimate), the difference would have to be made up with considerably higher recoil spring tension, dual springs, hydraulic dampeners, etc. The point being made is that, whatever the combination, initial slide movement in high bullet energy M1911 Pistols should not be substantially faster than in pistols firing factory hardball 45 ACP ammunition. **Note 1:** The dynamic link down problem is complicated by relative motion- the barrel changes direction as it links down and stops as the slide moves rearward. **Note 2:** Adding more than a few ounces to barrel weight can add to a link down problem, particularly in long link radius pistols. **Note 3:** Keep in mind that all rules of thumb work to the extent that your thumb isn't in the way. Although mixing table data to form ratios, such as the above, works within the intended brackets, the experts are quick to scorn general use- hence the need for more precise recoil assembly weight figures.

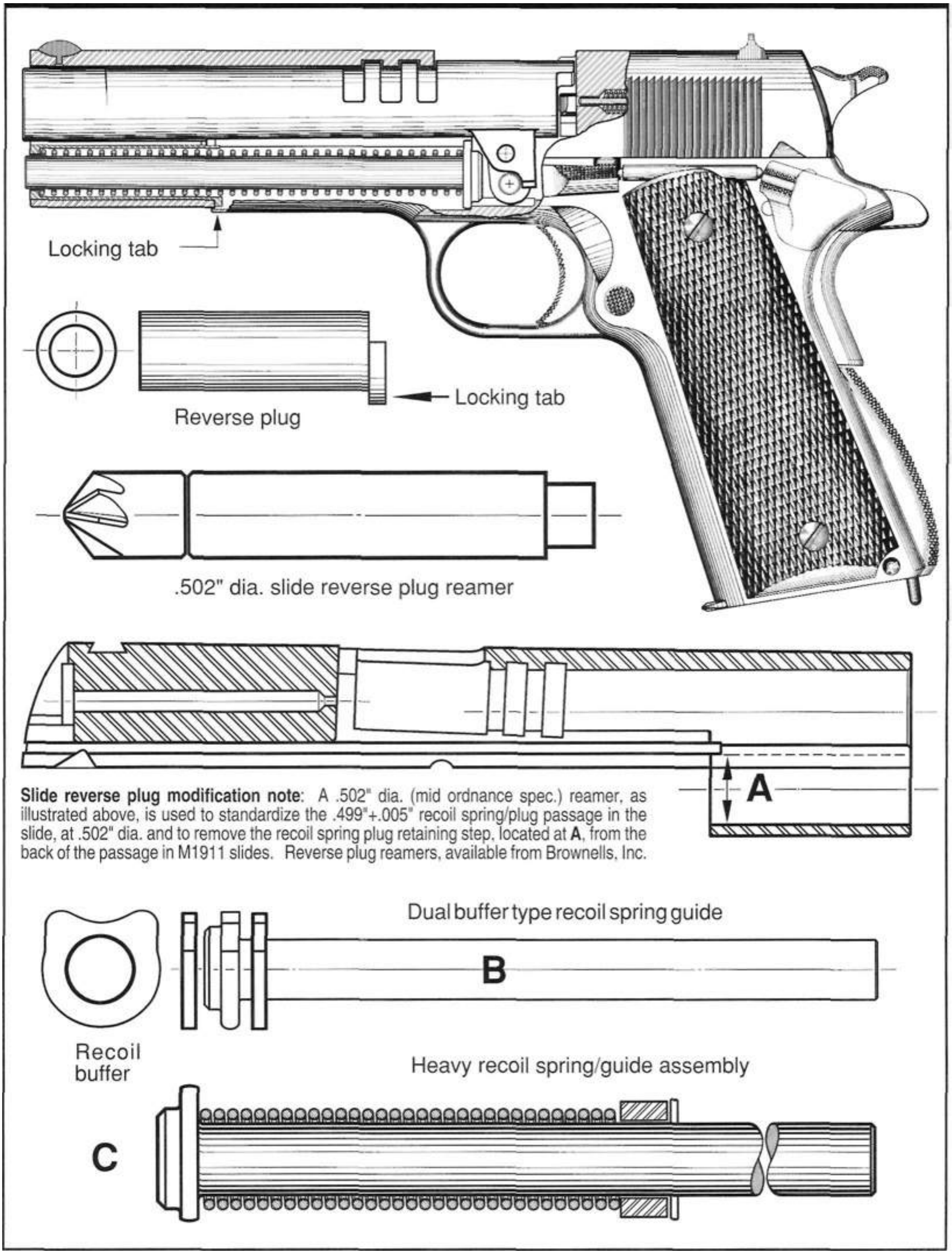


Figure 180- Ordnance style sectional illustration by Heritage - VSP staff artist, at top, shows an M1911Al Pistol with a full length recoil spring guide rod and reverse spring plug installed. Ml911 slides must be modified (by reaming) to accept reverse plugs as shown, at **A**, in the sectional illustration, at center. A dual buffer type recoil spring guide rod is shown, at **B**, and a heavy commercial recoil guide/spring assembly is shown at **C**. Heavy recoil spring/guide assemblies can, by themselves, add up to 5 ounces to total recoil assembly (total slide assy.) weight. Heavy recoil spring/guide assemblies aren't new. This idea dates back to ordnance development work wherein recoil assy, weight was experimentally increased to inertially compensate for various attachments, including silencers, installed on barrels. Slide reverse plug conversion reamers, reverse plugs, assorted full length recoil spring guide rods, recoil buffers (buffer pads), and heavy recoil guide/spring assemblies, illustrated above, are available from Brownells, Inc.

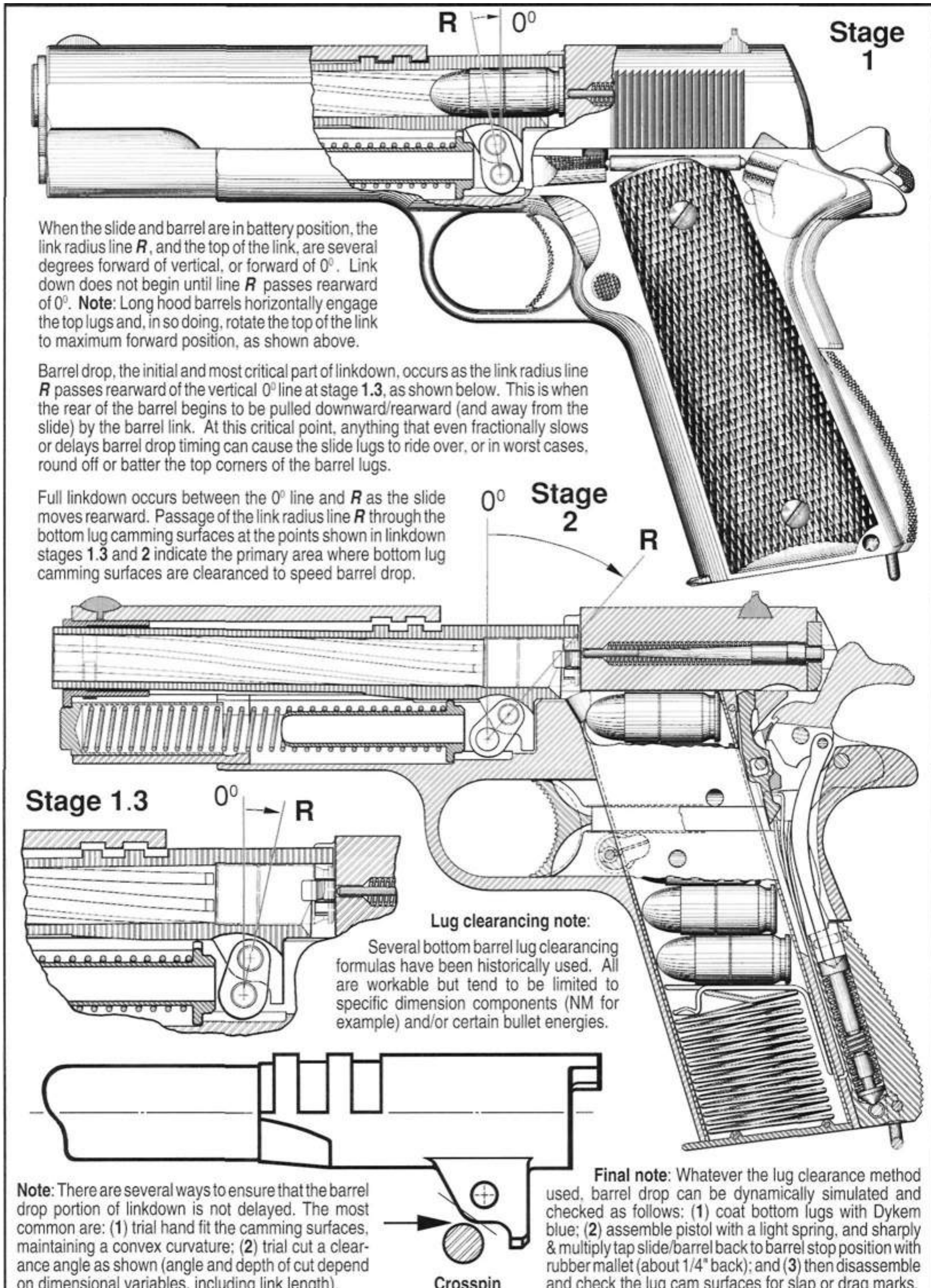


Figure 181- Illustrations depict barrel link down in freeze-framed stages. In stage **1**, the link radius line ***R*** moves rearward to 0° with initial slide recoil. In stage **1.3**, line ***R*** passes 0° and unlock and barrel drop occurs. At stage **2**, link down ends as the back of the bottom barrel lug comes to rest against the frame's vertical stop surface. Stage **1.3** timing is critical, and doubly so when high energy bullets are fired. A related dynamic link down problem, *delayed link down* (wherein the barrel is held upward longer than necessary by the bottom barrel lug), most commonly found in tall vertical tolerance stack/long link pistols, is caused by excessive material (relative to link radius length) on the bottom barrel lug camming surfaces.

Ml911 Barrel-slide-frame fitting for optimum reliability

Editors note: The following reprint of the latest, as of publication, Schuemann 1911 timing (l i n k down timing) test kit instructions is included as an appropriate postscript to this section because of its direct bearing on optimum performance Ml911 Pistols and long term M1911 reliability. We would suggest reading these instructions several times with pistol in hand- or better yet, with an M1911 Pistol & timing test kit. 1911 Timing Test Kits are available from Schuemann Barrels. See source listing on page 48.

1911 Timing Test Kit- Schuemann Barrels March, 1997- Courtesy Wil Schuemann

Probably the hardest job when gunsmithing a 1911 is determining if the barrel, link, frame, and slide are adjusted so that upon firing, the timing of their relative motions allows the gun to function reliably and to last for many tens of thousands of rounds. These instructions, combined with the associated spring and pieces of shim stock[1], can be used to determine if a 1911 is properly timed. This procedure does not require the services of a gunsmith to perform and any gun owner can perform the tests and determine if their 1911 has been properly built.

Before a 1911 is fired, the slide is forward and the barrel is locked to the slide via the meshing of the upper lugs on the barrel into the matching grooves in the slide. The barrel is hooked to the frame via a link, the bottom end of which is connected to the slide stop pin. The link is vertical when the slide and barrel are forward. When the gun is fired, the slide and barrel begin moving rearward together. As the barrel moves rearward, the link rotates about the slide stop pin and starts pulling the barrel down, thereby beginning the unlocking of the barrel from the slide. After the link pulls the barrel downward sufficiently, the barrel becomes completely unlocked from the slide. Then the back of the lower lugs on the barrel will hit the impact surface[2] in the frame, which will stop the barrel's rearward motion, and combined with the link, the barrel's downward motion. The slide freely continues rearward to complete the ejection of the fired case and then moves forward to load the next round into the barrel.

If the gun is not timed properly, the above description of functioning is modified in one of two ways.

Possible problem number one is created if the impact surface in the frame, that the barrel's lower lugs hit, is too far forward. This changes the above description in the following way. As the slide and barrel move rearward, the link rotates about the slide stop pin and starts pulling the barrel down, thereby beginning to unlock the barrel from the slide. But, just before the barrel is completely unlocked from the slide, the lugs on the bottom of the barrel prematurely hit the impact surface in the frame. The barrel is now partially locked to the moving slide and simultaneously hitting the impact surface in the frame. The resulting crash damages both the barrel's upper and lower lugs. The crash shears metal off the upper lug's corners, finally allowing the slide to get free of the barrel and continue to the rear to eject the case and load the next round. The slide loses some velocity because of the crash and reliability usually suffers. This crash will be repeated every time the 1911 is fired. The result is a characteristic polishing and reshaping of the upper lug corners which, especially under a binocular microscope, clearly shows evidence of the problem. The barrel's upper or lower lugs will typically shear off within about 5,000 rounds.

Possible problem number two is created if the impact surface in the frame, that the barrel's lower lugs hit, is too far rearward. This changes the above description in the following way. As the slide and barrel move rearward, the link rotates about the slide stop pin and starts pulling the barrel down, thereby unlocking the barrel from the slide. After the barrel is completely unlocked from the slide, the barrel continues moving downward and rearward, and has its vertical motion stopped when the bottom of the barrel hits the top of the frame. The link then stops the barrel's rearward motion before the barrel's lower lugs can contact the impact surface because the impact surface is too far rearward in the frame. The link is not designed to stop the rearward motion of the barrel, and the extra stress will eventually break the link. Either when the link breaks, or certainly when a subsequent shot is fired, the above description changes in the following way. As the barrel moves rearward, the broken link cannot pull the barrel down. The barrel's upper lugs stay fully meshed, locking the barrel to the slide, and in this condition the barrel's lower lugs hit the impact surface in the frame. The resulting crash seriously damages both the barrel's upper lugs and lower lugs. The slide is unable to get free from the barrel and the 1911 jams. Because of the severe damage caused to the barrel's lugs by this one crash, either the upper or lower lugs, but usually the lower lugs, will typically shear off within the next 1,000 to 2,000 rounds.

Unfortunately, with either problem, the 1911 will hand cycle as though nothing is wrong, independent of whether the impact surface in the frame that the barrel's lower lugs hit is too far forward or too far rearward. Except for possible "unreliable functioning" or reshaping and polishing of the barrel's upper lug corners, as mentioned above, there will be no symptom of a problem until the barrel lugs fail.

The following tests work on Officer. Commander, Government, and Six Inch 1911 's.

Before beginning these tests, verify that the 1911 is unloaded

Test 1: to determine if the impact surface in the frame, that the barrel's lower lugs hit, is too far forward.

Disassemble the 1911. Set aside the recoil spring, spring guide rod, spring plug, and slide stop. Reassemble the 1911 without these parts (slide, barrel, and frame, no slide stop). With the slide approximately 0.25 inch aft of the in-battery position determine that there is a minimum of 0.015 inch clearance between the top of the barrel and the inside of the slide at the front of the ejection port, using the 0.015 inch strip of shim stock. If the clearance is insufficient, remove metal from the frame bridge and/or interior of the slide until the 0.015 inch clearance is obtained. Then, insert the slide stop and insert the test spring into the dust cover hole[3] in the front of the 1911 with the S shaped end of the spring entering the dust cover hole first, the tip of the S being upward and the long flat portion of the spring at the bottom of the dust cover hole. Push the spring rearward into the 1911 until the tip of the S contacts the barrel's lower lugs. Then put the muzzle against the edge of a table with the forward end of the spring extending under the table. While gripping the frame, move the barrel rearward by pressing the muzzle against the table. Simultaneously move the muzzle end of the 1911 upward until the test spring is pushed downward to the bottom of the dust cover hole. Continue to push the muzzle firmly against the table while keeping the test spring at the bottom of the dust cover hole.

What we have done is: (**1**) pushed the barrel up with the spring, thereby assuring that all the slack is taken out of the link and (**2**) pushed the barrel rearward by pressing the muzzle against the table until the barrel is simultaneously as fully rearward and upward as possible. This is the condition the barrel is in when the barrel hits the impact surface in the frame during normal firing. To achieve the best reliability and longest barrel lug life, we want a minimum of 0.010 inch clearance between the top of the barrel and the inside of the slide in the above condition. To review, push the barrel rearward using the table, with the spring simultaneously pushing the barrel upward, and with the slide about 0.2 inches rearward from the battery position insert the supplied piece of 0.010 shim stock between the top of the barrel and the inside of the slide at the front of the ejection port. The shim stock should slide freely between the top of the barrel and inside of the slide. If the 0.010 inch shim goes into the gap between the top of the barrel and inside of the slide, but not freely, the gun does not pass the test because likely the shim stock is forcing the barrel downward against the test spring giving an erroneous indication of clearance. If *the* 0.010 inch shim does slip freely into the gap, the 1911 passes test A and the impact surface in the frame, that the tower lugs hit, is not too far forward. If it does not pass test 1 the impact surface in the frame will have to be moved rearward by removing metal from the frame impact surface. The additional distance the barrel will move downward when performing test 1 will be approximately 0.7 times the thickness removed from the impact surface in the frame. Continue repeating test one until a minimum of 0.010 inches of clearance is obtained.

Test 2: to determine if the impact surface in the frame, that the barrel's lower lugs hit, is too far rearward.

Disassemble the 1911 and thoroughly clean the area of the frame around where the barrel's lower lugs will be located and the area of the barrel around the barrel's lower lugs. Coat the rear surfaces of the barrel's lower lugs with a black marking pen. Reassemble the 1911 (without the recoil spring parts but with the slide stop installed). Hold the 1911 with the muzzle vertically upward, the rear of the frame on your leg, and move the slide to a position about 0.5 inches rearward of the battery position. With the slide in this position, take a plastic mallet and hit the muzzle several times. Then disassemble the 1911 and inspect the black coating on the back of the barrel's lower lugs. If the coating has been removed, the barrel's lower lugs are hitting the impact surface in the frame. This proves that the surface in the frame is not too far rearward and the barrel's motion is being stopped by the barrel's lower lugs, not by the link. If coating removal only occurs over a somewhat limited area, the 1911 passes test 2 but the lifetime of the barrel will be shortened due to uneven contact between the rear of the barrel's lower lugs and the frame. If the black marking on the rear of the barrel's lower standing lugs is not removed the lower lugs are not contacting the impact surface and the barrel's rearward motion is being stopped by the link. This will eventually produce link failure which will irreparably damage the barrel. If the impact surface is too far rearward, all the surfaces adjacent to the lower standing lugs on the barrel will have to be painted with the black marking pen and test 2 redone to determine where the barrel is prematurely hitting the top of the frame or the interior of the slide. The offending frame or slide surface(s) will have to be removed until the barrel's lower standing lugs are properly contacting the impact surface in the frame. The offending surfaces will have to be removed a minimum of 0.005 inch more than the minimum amount needed to just allow the rear of the barrel's lower standing lugs to hit the impact surface. The reason for the additional metal removal will become clear when performing test 3.

Test 3: to determine if the upper surface of the frame and the inner surface of the slide are clear of the barrel when the barrel is fully linked down.

Assemble the 1911 without the recoil spring parts, without the test kit spring, and with the slide stop installed. Move the slide aft of the in-battery position approximately 0.25 inch. Using combinations of the supplied shim stock strips determine how much clearance there is between the top of the barrel and the inside of the slide at the forward end of the ejection port. Then remove the slide stop pin and with the slide and barrel in the same positions again measure the clearance between the top of the barrel and the inside of the slide. The measurement with the slide stop pin removed should be at least 0.005 inch greater than the measurement obtained with the slide stop pin installed. If the gun passes this test there is a minimum of 0.005 inch between the bottom of the barrel, in its fully linked down position, and the top of the frame and the inside of the slide. If the gun does not pass this test then remove the barrel from the gun, paint the bottom of the barrel with a black marking pen, reinsert the barrel into the gun (without the slide stop installed), position the slide and barrel as above, and use a plastic mallet to hit the top of the barrel in the ejection port several times. Remove the barrel from the gun and determine where the barrel is contacting the frame or slide by observing where the black marking has been removed. Remove metal from the frame or slide where indicated and redo test 3. Continue this process until the gun passes the test. This ensures that when the barrel links down it will neither hit the moving slide, which would cause the gun to be unreliable, nor hit the top of the frame, which would increase the impact loads experienced by the barrel and frame when the barrel comes to rest. The rearward motion of the barrel will have been stopped by the barrel's lower lugs hitting the frame impact surface and the downward motion of the barrel will have been stopped by the link in compression.

Miscellaneous comments:

Because gun timing can be affected by many factors including: link length, barrel lockup, distance between slide rails and slide bore, distance between frame rails and slide stop pin hole, distance between the impact surface and the slide stop hole, etc., small variations in each of these measurements can add up to significant variations from gun to gun. While our barrel dimensions are controlled to be reproducible well within 0.001 inch, the frame and slide manufacturers are not able to maintain such close tolerances. For this reason, the proper location of the frame impact surface relative to the slide stop hole will vary up to 0.020 inch from gun to gun. Optimum reliability can only be achieved by performing these tests as the gun is being built and modifying the frame accordingly.

Under no circumstances should any metal be removed from the barrel's lower lugs, rather than from the frame, to correct any discovered problems. Removing metal from the rear of the barrel's lugs will weaken the lugs and void the barrel warranty.

Compensators significantly increase the total weight of the barrel and compensator assembly. One consequence of the weight increase is that the barrel's upper and lower lugs must carry a proportionately higher load. A typical compensator/barrel assembly will weigh approximately three times the weight of a bushing type 1911 barrel. This increased weight increases the stresses in the upper and lower lugs by the same factor of approximately three. This is an enormous increase in lug stress. Such increased stresses can be responsible for premature upper or lower lug failure, especially if the gun's timing is not perfectly adjusted.

Compensators also reduce reliability because the weight distribution between the slide and barrel is adversely affected. The momentum imparted to the slide and barrel/comp assembly is shared between the two in accordance with the slide's and barrel/comp assembly's respective percentages of the total slide/barrel/compensator weight. The momentum absorbed by the barrel/comp assembly contributes nothing to the operation of the gun and is dissipated when the barrel/comp assembly hits the frame impact surface. The momentum absorbed by the slide is responsible for the operation of the gun. Since the barrel/comp weight is approximately three times more than a standard barrel, the percentage of the total momentum absorbed by the barrel/comp assembly is increased. Therefore the momentum absorbed by the slide is decreased. This momentum decrease reduces the ability of the slide to operate the gun, which necessitates use of a weaker recoil spring, which increases the chance of a failure to feed.

Any slide weight reduction, in an attempt to reduce slide cycle time for instance, further reduces the momentum absorbed by the slide, forcing the use of an even weaker recoil spring. The somewhat lighter slide combined with the much lighter recoil spring needed for the gun to run, can increase slide cycle time, which is the opposite of the desired effect.

Occasionally it may be necessary to restore the curvature of the spring's middle bend, to maintain sufficient upward force of the spring on the barrel while testing.

[1]1911 Test Kit items; [2] frame barrel stop surface; [3]recoil spring passage

Index listing by component name- reference numbers keyed to illustrations on pages 199 & 200

Drawing Ref. # -	Part or assy. Name	Ordnance Drawing and Part Number
1.	Barrel	7791193 7791414 (NM)
2.	Barrel Bushing	6008596 7267718 (NM)
3.	Barrel Link	5013198 7790893 (NM)
4.	Barrel Link Pin	5013199
5.	Disconnector	6008603
6.	Ejector	6019024 11010485(NM+lates
7.	Ejector Retaining Pin	5013203
8.	Extractor	6008598
9.	Firing Pin	6008599
10.	Firing Pin Spring	5013204
11.	Firing Pin Stop	5013205
12.	Frame (Receiver)	6535359 7790368 (NM mod.)
13.	Grip Safety	6501828
14.	Hammer	5503839 7790803 (NM)
15.	Hammer Pin	5013206
16.	Hammer Strut	6008600
17.	Hammer Strut Pin	5013207
18.	Magazine Body (Basic Tube)	5508695
19.	Magazine Follower	6008608
20.	Magazine Spring	6008607
20A.	Magazine Base/Tube Assy., pinned	6147114
20B.	Magazine Base/Tube Assy., crimped	7265559
20C.	Magazine Base	6008606 7310043 (crimp type
20D.	Magazine Base Pin	5013216
21.	Magazine Catch (Catch body)	6008609
22.	Magazine Catch Lock	5013218
23.	Magazine Catch Spring	5013217
24.	Mainspring (Hammer Spring)	5013208
25.	Mainspring Cap	5013209
26.	Mainspring Cap Pin	5013210
27.	Mainspring Housing	5503841
27A.	Mainspring Housing Lanyard Loop	5013214
27B.	Mainspring Housing Lanyard Loop Pin	5013215
28.	Mainspring Housing Pin	5013212
29.	Mainspring Housing Pin Retainer	5013213
30.	Plunger Tube	6008594
31.	Plunger Spring (Safety/Slide Stop)	5013194
32.	Recoil Spring	5013200
33.	Recoil Spring Plug	5013201
34.	Recoil Spring Guide	6008597
35.	Safety Lock (Thumb Safety Lever)	5503840
36.	Safety Lock Plunger	5013195
37.	Sear	7268068
38.	Sear Pin	5013211
39.	Sear Spring	6008602
40.	Slide	7790314 7791435 (NM)
41.	Slide Stop	6008595
42.	Slide Stop Plunger	5013193
43.	Sight, Front, Fixed	5013197 7268316 (NM)
44.	Sight, Rear, Fixed	5013196
45.	Sight, Rear, Adj. (Not shown, see note 1)	11010180 (NM)
46.	Stock, (grip) Panel, Left	5564063 7790350 (NM)
46A.	Stock, (grip) Panel, Right	5564062 7790349 (NM)
47.	Stock Screw (4)	6019023
48.	Stock Screw, Bushing (4)	6019022
49.	Trigger Assembly, Standard	6147780
49A.	Trigger Adjusting Screw	7791069 (L) 7791070 (S) (NM)
49B.	Trigger Assembly, NM, Adjustable, Short	7790351 (NM)
49C.	Trigger Assembly, NM, Adjustable, Long	7790348 (NM)

Note 1: Commercial M1911 components including discontinued collet style barrel bushings (ref. #2A) and NM/Gold Cup Model rear sight components (ref. #45 and #45A ~45l) are shown in the parts section beginning on page 47. The 11010180 NM adjustable rear sight part number, above, categorically covers any of several sights by commercial vendors, including Bomar.

Note 2: Commercial series 80 components 8A, 9A, 11 A, and 50-53 are shown on page 200 in this section.

Note 3: M15 Pistol component differences are shown on pages 136 and 137.

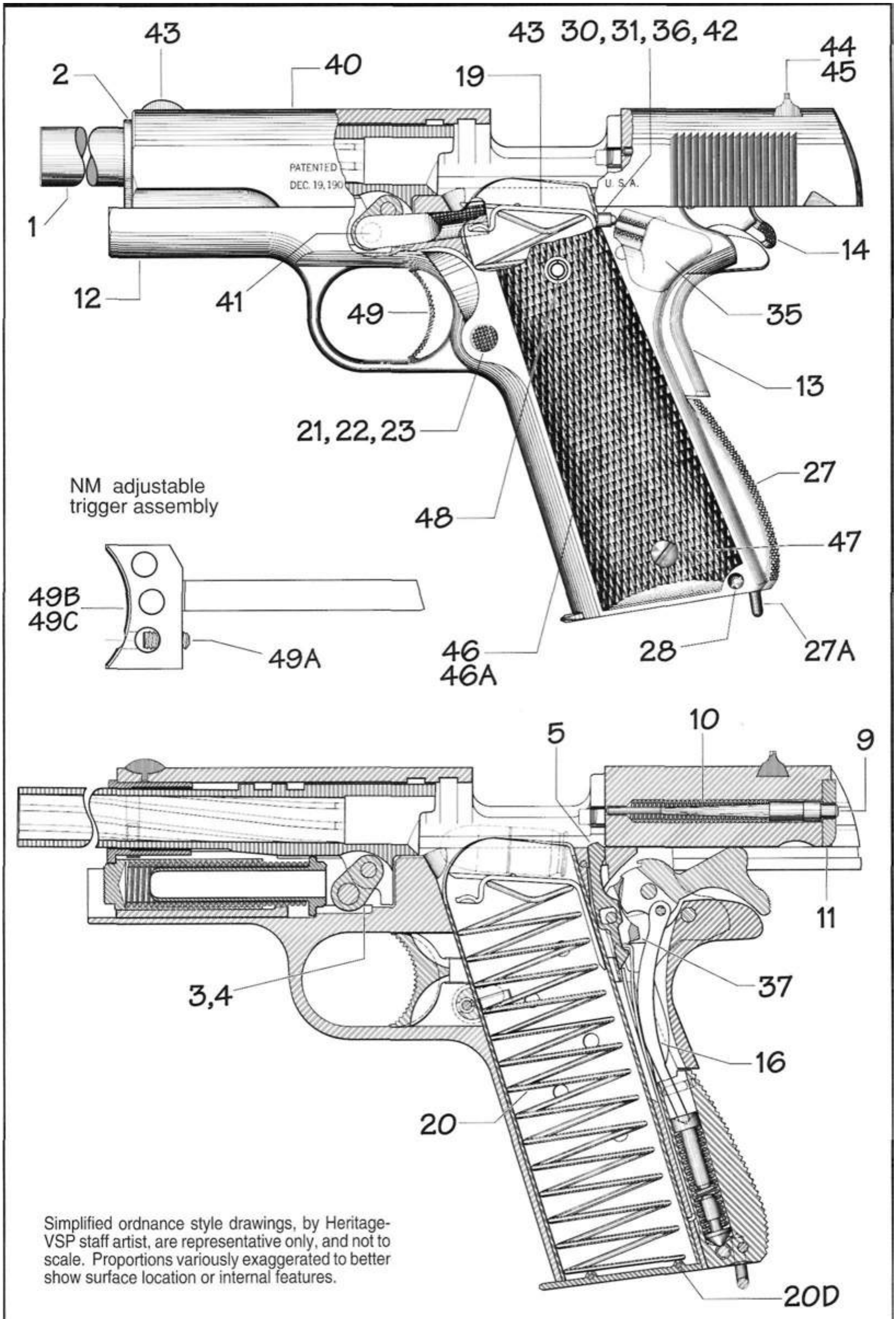


Figure 182- Component reference numbers in the ordnance style M1911A1 Pistol phantom and sectional illustrations by Heritage - VSP staff artist, above, are keyed to the component name index listing on page 198 and also to components shown in exploded views in the parts section beginning on page 47.

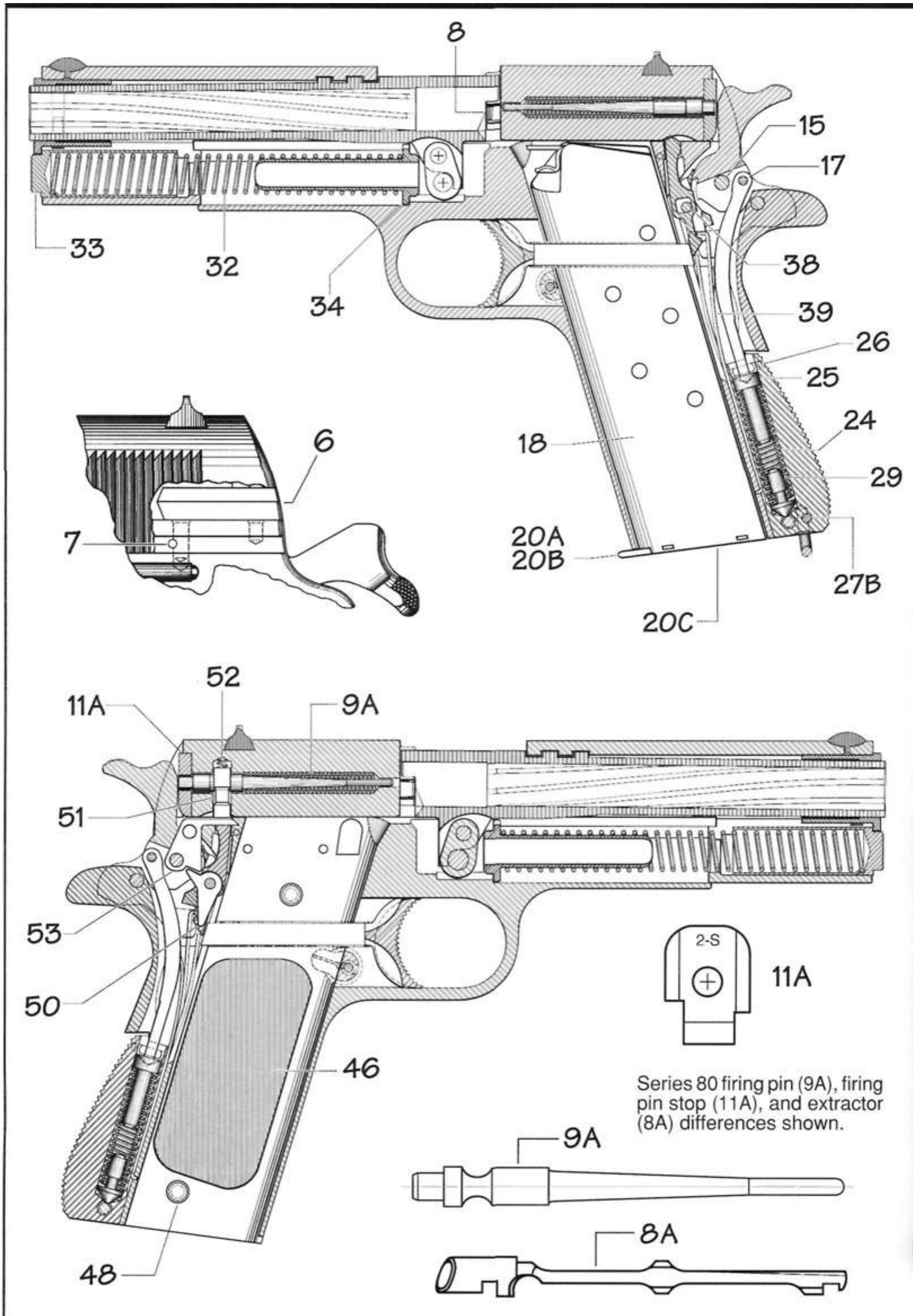


Figure 183- Component reference numbers in the ordnance style M1911A1 Pistol phantom and sectional illustrations by Heritage - VSP staff artist, above, are keyed to the component name index listing on page 198 and also to components shown in exploded views in the parts section beginning on page 47. Colt Series 80 components are shown separately in pertinent parts section illustrations and as installed in the sectional illustration, at bottom. See index by part name beginning on page 201.

The U.S. M1911/M1911A1 Pistols

and commercial M1911 type pistols

A Shop Manual

M1911/45 AUTO VOL II

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