

Damascus Anomalies & Defects

Syracuse Arms Co. The right barrel has the “New Twist” pattern; but is roll-stamped “Improved Damascus”. The left barrel is “Washington” and correct to grade. Courtesy of Tom Archer.



La Chasse Au Fusil “An Essay On Shooting”

Gervis Francois Magne’ de Marolles **1789**

The imperfections to which a barrel is liable in the forging, are of three kinds, viz. the **chink**, the **crack**, and the **flaw**. The chink is a solution of continuity, running lengthwise in the barrel. The crack is a solution of continuity more irregular in its form than the chink, and running in a transverse direction, across the barrel. The flaw differs from both; it is a small plate or scale, which adheres to the barrel, by a narrow base, from which it spreads out as the head of a nail does from its shank, and when separated, leaves a pit or hollow in the metal.

Shooting: Its Appliances; Practice; and Purpose, James Dalziel Dougall, 1875
<http://books.google.com/books?id=-ToCAAAAQAAJ&pg=PA25&dq>

There are various kinds of flaws in barrels, such as “cracks,” “sand-holes,” and what are technically termed “grays.” The first two are comparatively rare, but the last is the great annoyance of the barrel-forgers and gun-makers; and, in fact, may be said to exist more or less in all barrels. They are those little specks in the iron which may be seen more readily after a gun has been used, from the rust showing more upon them than upon the smoother surface. In themselves, unless very numerous, “grays” lead to no insecurity in the barrels, and are not real flaws; but the freer barrels can be made from them the better, as, unless when kept clean and well-oiled, they may in course of a long time deteriorate the barrel. As a rule they cannot be detected while the work is in progress, and only make their appearance on the barrels being browned. Conversely, strange as it may appear, most frequently they become less apparent in course of time, and on the barrels requiring to be browned a second time, disappear altogether. The reason why the first browning causes them to appear is that the infinitesimal quantity of oil they contain neutralizes the chemicals, and the mark is then for the first time made visible. The reason why they eventually disappear is their extreme shallowness. The very finest of barrels may therefore, and often have been, rashly condemned by sportsmen for harmless spots which no foresight could prevent. Were they actual flaws, they would appear during the process of filing.

The “sand-hole” is a thorough flaw; and if the barrel stand the proof at all when it exists of any size, still it cannot be quite safe, as the hole will often run in a tortuous direction for a considerable length under the surface, being, as its name imports, full of fine sand, or probably of the powder used as a flux to promote complete adhesion in welding the barrel, which has adhered to the iron, and been closed upon in the act of forging. The Damascus barrels, in contradistinction to “laminated steel”, I have always found in my experience the most free from “sand-holes”. Indeed of late years I have not known an instance of this flaw, through using Damascus barrels in preference to all others. Many an annoying instance I had in the days when “laminated steel” was put up, and when, after a gun was nearly finished, a “sand-hole” would be discovered, into which I could insert a piece of fine flattened wire and pass it half-way round the barrel between the laminae.

The “crack” is the worst of all flaws. This is a separation of the fibres of the iron from overstraining of the twist; and consequently every discharge of the gun must, by the expansion of the metal, more or less widen the crack, until it run right round the barrel. The same “dissolution of continuity” may also exist from imperfect

forging, and the same result takes place. The author has repeatedly taken old double barrels asunder, with a crack in one of them so lengthened through time that the barrel was nearly separated into two parts. When this crack runs round the barrel the danger of bursting is exceedingly remote; but should it have a longitudinal direction, or if there be two near to each other, the danger is much increased, and, sooner or later, the barrel will give way. The longitudinal crack almost never occurs; and all the varieties of Damascus barrels are the most free from this kind of flaw. **A hole right through a barrel would be much more safe than any kind of crack; and, in point of fact, many barrels are safely used for years with a small hole right through them.** A crack may at once be detected by suspending the barrels, and striking them with a piece of wood, when, if faulty, they will not emit the clear, ringing sound they otherwise do.

The outside of barrels should be well filed and polished. The smoother they are, they will remain the more free from rust, through the closing of the pores; and consequently they will last longer. The filing should also be regular, leaving no hollows, but retaining an equable strength, and allowing a regular expansion throughout the entire length when fired.

The inside should be as bright as a mirror, and free from flaws. Slight marks or rings, left by the boring bit, can hardly be avoided, and may be found in the best barrels; but there should be no hole likely to retain dirt or damp of any kind, which can corrode the iron.

Since the introduction of breech-loaders these slight marks form a frequent subject of remark. The tube, being open, is glanced through, and the presence of such a mark is detected, whereas with a muzzle-loader this might never have occurred. Timid sportsmen fancy there is danger where none exists. In the first place, writing of course of these unavoidable marks only, no good gunsmith would permit any barrel with a real flaw to leave his hands. His final loss would be greater than his first. But besides that, in the tentative process of making a gun shoot well, he is bound by necessity to leave the barrel as it is the moment he has developed its shooting powers to a recognized standard. Hence he is debarred from polishing out any mark or discoloration for the mere sake of appearances. In breech-loaders the master-gunsmith enjoys the same opportunities to detect flaws as the sportsman, who may rest assured that the confidence put in the good faith and judgment of the former is not misplaced. The same minute marks existed in muzzle-loaders, and were known to do so by all gun-makers and by most experienced sportsmen, yet no one thought of challenging them; they were taken as a matter of course. The facility of looking through the barrels of breech-loaders has caused these utterly harmless marks of boring to be considered something new and improper. The spots are infinitesimal in size or depth, and are only visible through

contrast with the bright polish of the general tube. The barrel never deteriorates with time through their presence.

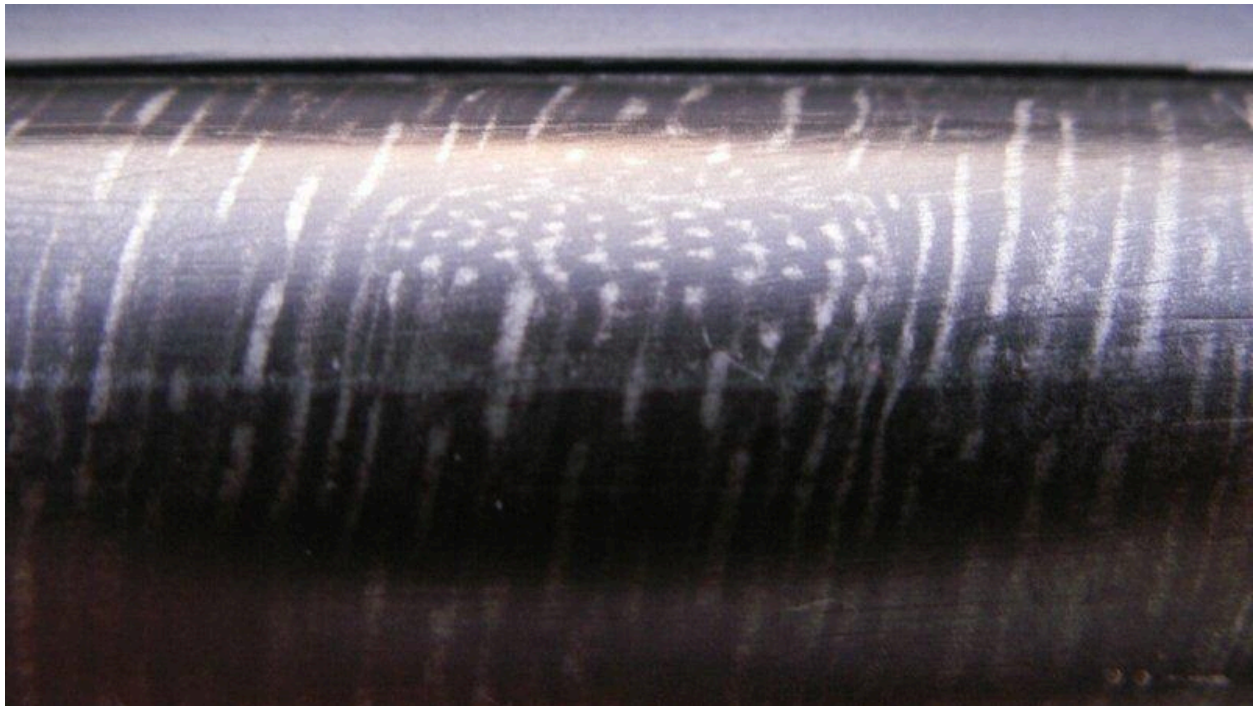
Good barrels will often, when subjected to the same circumstances which would burst an inferior article, bulge, or swell out, like a glass tube heated at one part and blown into. **When the bulge is not very large it may be partly hammered down, but no barrel so treated can be called truly safe, until subjected to a fresh "proof."**

Engines Of War: or, Historical and Experimental Observations on Ancient And Modern Warlike Machines And Implements, Including the Manufacture of Guns, Gunpowder, and Swords with remarks on Bronze, Iron, Steel, &c.

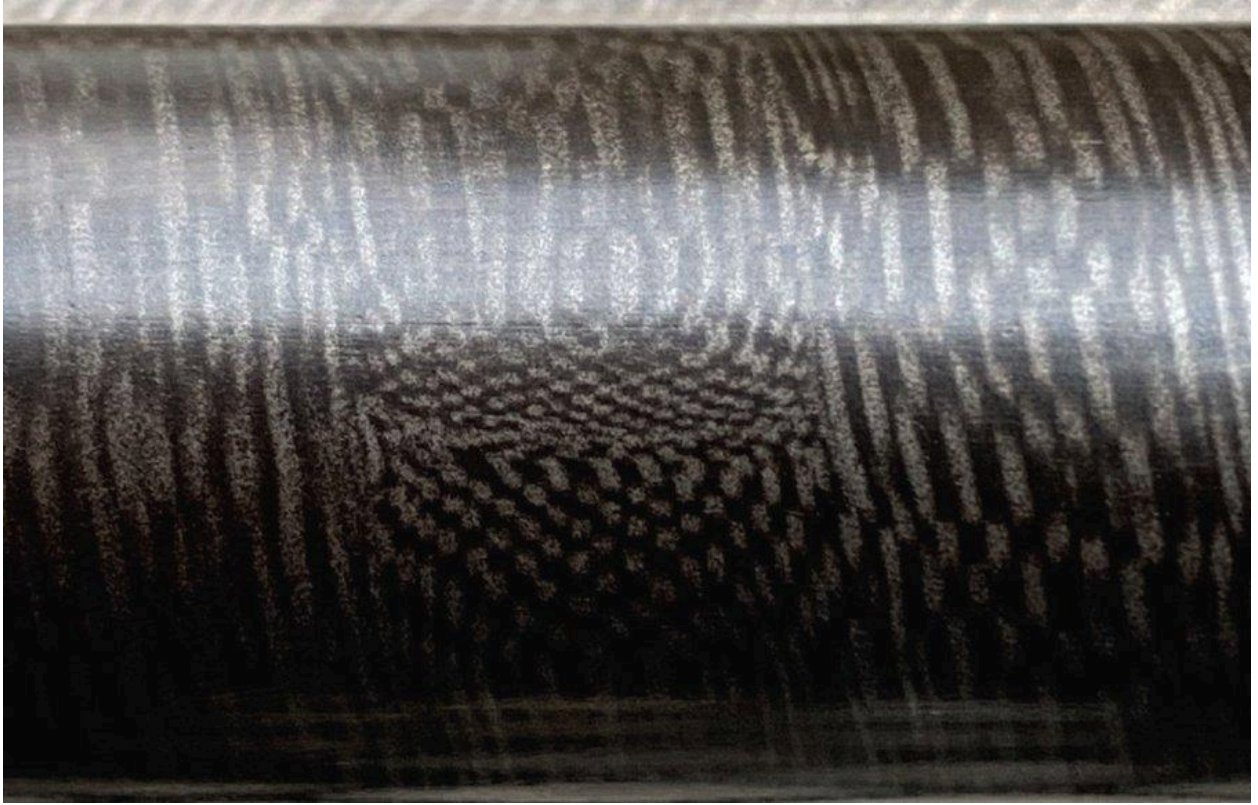
Henry Wilkinson **1841**

The spiral thus formed is raised to a welding heat, and dropped onto a cylindrical rod, which being struck forcibly on the ground (called jumping) the edges of the spiral unite, and the welding is then completed by hammering on the anvil. The other spirals are added according to the length of the barrel, and the forging is finished by hammering regularly all over. **The ends of the spirals should be turned up and united at each junction of spirals, to avoid the confusion in the twist occasioned by merely dropping one spiral on another.**

Meriden with 'end on' Twist rod courtesy of Doug Craig



Parker with 'end-on' Twist rod courtesy of Breck Gorman



Damascus Twist with several iron-steel-iron-steel rods seen 'end on'



J. Forsyth hammer gun "Horseshoe" pattern with an end-on section of the ribband at the breech. The 'lopin' or billet started out as 12 alternating thin plates of 6 iron and 6 steel.



C grade Parker with what appears to be the end of a 3 Iron Bernard II ribband that was folded over when hammer welded to the next ribband



Shooting Simplified James Dalziel Dougall **1865**

There are various kinds of flaws in barrels...what are technically termed “**grays.**” They are those little specks in the iron...from rust showing more upon them than upon the smoother surface.

The Gun W.W. Greener 8th Edition 1907

By tracing the twist, a confusion will be found to exist for about an eighth of an inch, every six or seven inches; and from this appearance you may conclude that, for a barrel so joined, the welder had not the best price."

The numerous twistings and weldings of gun-iron rods and ribands are fully detailed...and it must have occurred to the reader that the Damascus barrel is one mass of welds from breech to muzzle. This is so. Unfortunately a certain amount of burnt metal, or scale, is imbedded within some of the welds, and in the finished barrel this fragment of scale forms a "grey"...which will not colour in harmony with the other part of the barrel, but is made more apparent by the finishing processes of polishing and browning. These "greys" may appear some time after the gun has been in use, the hard metal composing the barrel being eaten into by rust...They are developed in the inside by the chemical action of powder gases, and are almost ineradicable. The harder the Damascus the greater the liability to "greys"...

Parker 0 Grade Lifter with tiny inclusions in Plain Twist barrels courtesy of Austin Hogan



From a booklet published by *E. Heuse-Lemoine*, "Manufacture of Damascus Gun Barrels"

Our barrel industry only reached this enormous productions and gained such an extent on account of its excessive cheapness which results partly from the low rate of wages paid even to the most skilful workmen; and partly from the advantageous geographical situation of this part of our country which in a small area combines all indispensable elements to this industry. Indeed the river 'La Vesdre' and all its affluents are driving a great number of hydraulic wheels which economical motive power is used for boring, polishing, turning and grinding the barrels.

The coal pits of the Highland of Herve are situated close at hand which furnish the

necessary fuel to the Damascus works; and it is worthy to be noted that these mines furnish a special kind of coal, scarcely to be found anywhere else and is very suitable for our barrel-smiths who we dare say are very skillful to their art, having never done anything else in their life.

It is not to be that these men must become first rate Masters in the art of forging, if we consider that the average number of heatings to soldering heat, a barrel receives at least 150 for the fine Damascus tube being 300 heatings for a double barreled and that if one of these heatings has not well succeeded, that is to say that the barrel has not received its rigorous precise temperature, the tube may be spoiled, either by the alteration of the Damascus, or by the traces of even the smallest want of soldering; you can easily imagine the skill which these workmen possess.

Commercial Relations of the United States with Foreign Countries During the Year 1903

By United States Bureau of Foreign Commerce, United States Dept. of Commerce and Labor. Bureau of Statistics, United States Bureau of Manufactures

<http://books.google.com/books?id=piEZAAAAYAAJ>

“Gun Barrel Industry in Liege”

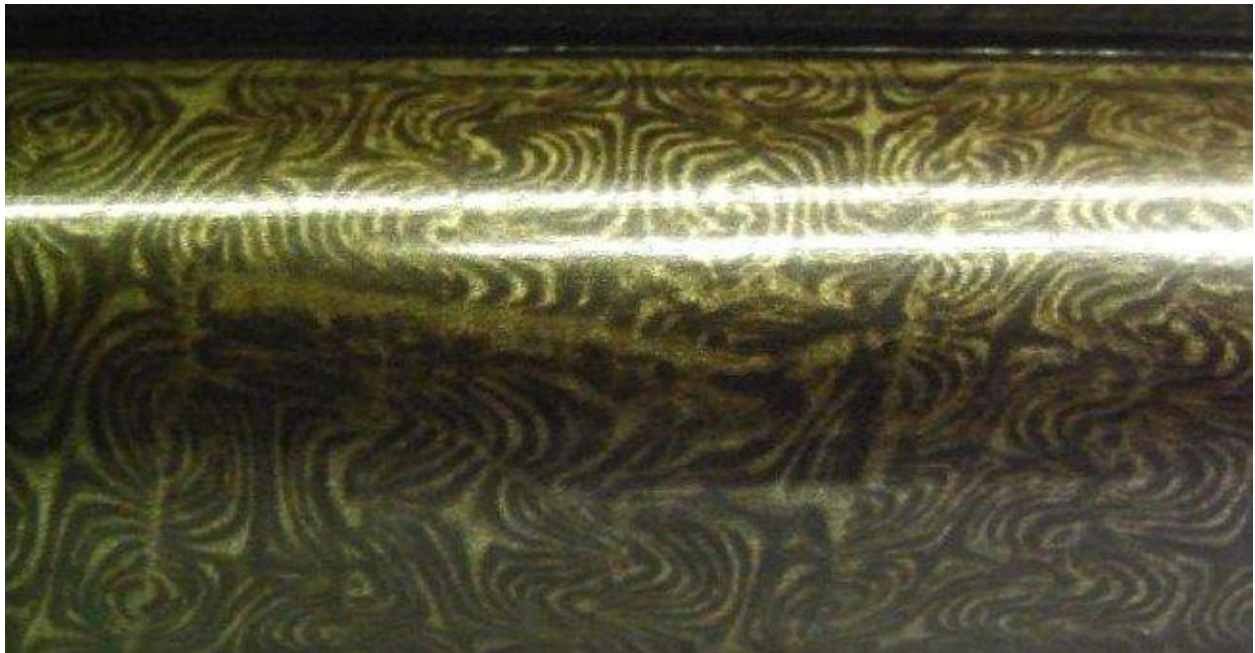
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Unless due care is exercised this sleeve (the ‘chemise’) can be the cause of great damage to the gun barrel, for, in its various hammering and the reduction of the finished barrel to the proper gauge, parts of this sleeve adhere to the inside of the tube, and the shooter will notice the scaling off of this foreign substance, which is called **splinters**. It is not part of the barrel proper, and is the result of carelessness. This happens only with the barrel of inferior make. With the higher grade of barrels the minute examination of the same would invariably reveal this defect.

Steel Decarburization

Courtesy of Steve Culver:

Decarburization of the steel element in the damascus is due to it being exposed to the forge fire for an extended amount of time. Whenever steel is in the forge fire, carbon is being burnt out of it. The decarbed steel becomes simple iron and etches white.



Nov. 30, 1895 *Sporting Life* "How Shot Guns Are Made and the Process Through Which They Pass Fully Explained"

The beginning of the manufacture of a gun is the barrels, and it is generally known that no barrels are made in this country except the rolled steel, which is used on the

Winchester gun. All gun barrels are now imported, although an attempt was made a few years ago to produce them in this country, but with only partial success.

England, Germany and Belgium supply most of the barrels, the latter country doubtless producing the larger quantity.

All gun barrels, whether imported direct from the makers in Belgium, or through an importer in this country to the gun manufacturer, are received in rough tubes, which very much resemble a couple of gas pipes, but being somewhat larger at one end than at the other. These barrels or “tubes” as they are called, are merely tied together in pairs, with small wire and 40 to 50 pairs are packed in a box.

The U.S. makers were dependent on the Liege tube makers to properly pair tubes for pattern. It is very difficult to discern the pattern of “rough forged tubes”.



1922 Lefever Arms Co. Nitro Special (introduced in 1921) with fluid steel right and 3 Iron “Oxford” left tube stamped IHR, likely *Heuse-Riga Fils* known to supply damascus tubes on Flues models. Barrels originally blued.

Courtesy of Brad Bachelder.



Production Flaws

Mis-matched Tube Segments

Remington 1900 KD courtesy of Casey Chlebowski with a clear a transition (and weld line) from “Oxford 2 S.J.” Two Iron Crolle at the breech to a “Boston 2 S.J.”, on both tubes.

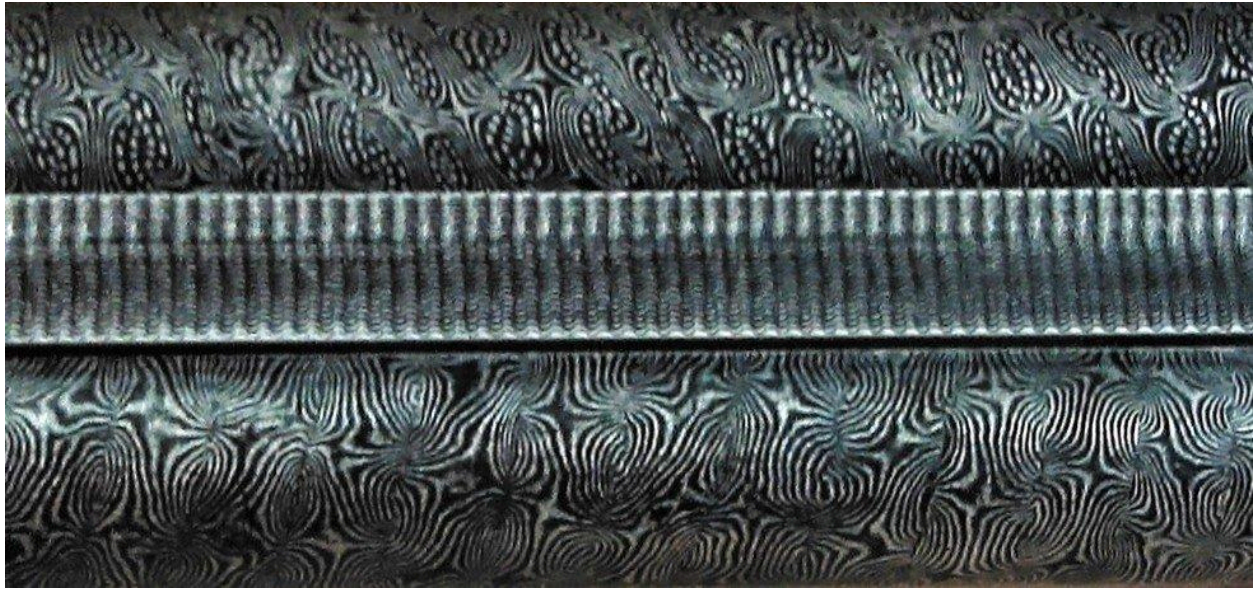


Mis-matched Barrels

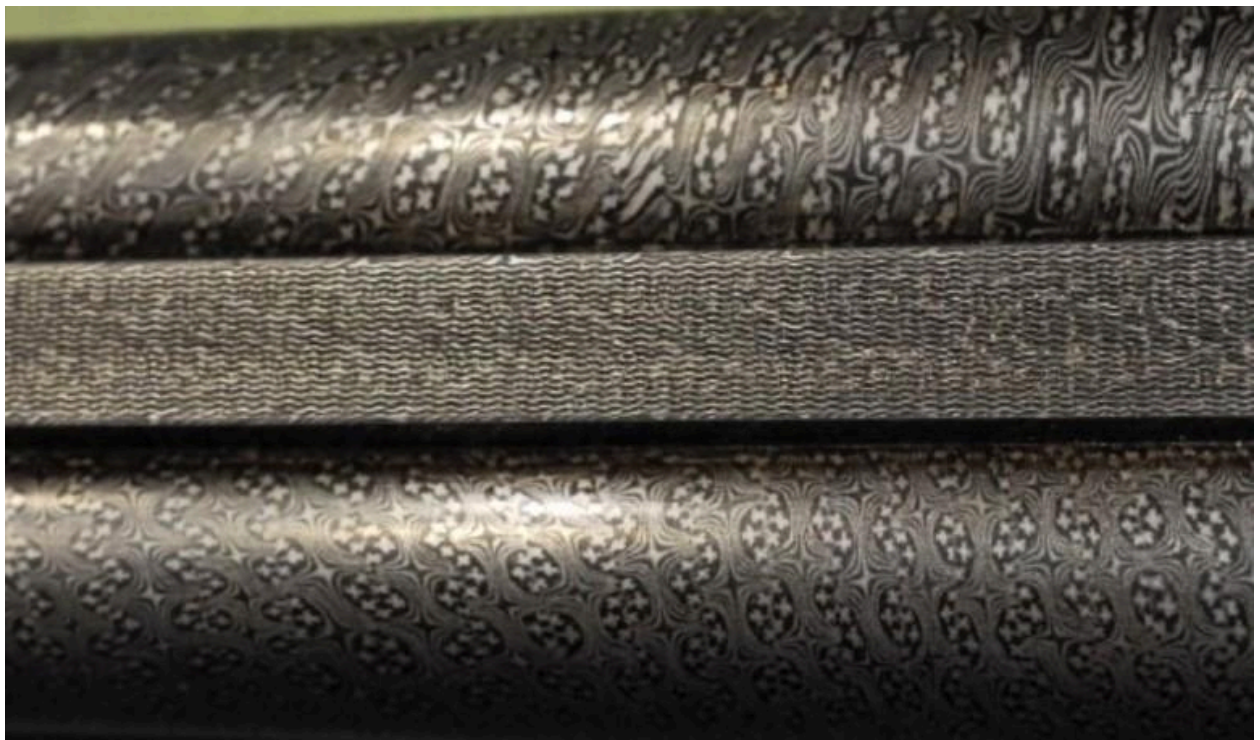
Husqvarna 49 Mis-matched 2 Iron.
Refinished by Mark Beasland.



“Washington” right; 2 Iron Crolle left
Husqvarna Model 43 refinished by Ken Marburger



Remington Model of 1894 C grade with mis-matched Etoile' at the breech



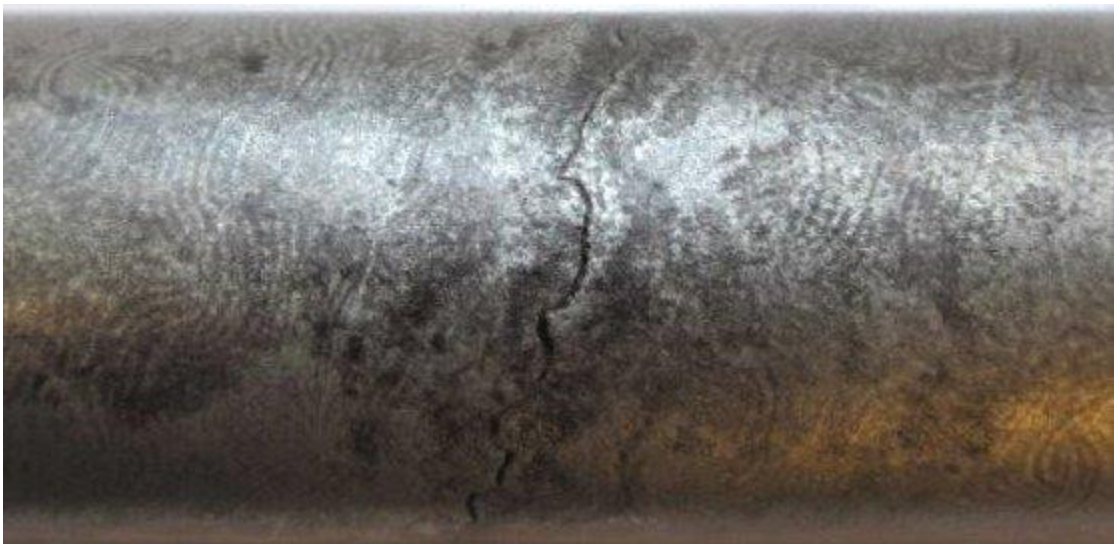
Pattern Welded Barrel Fractures

Crack upon attempting to raise a dent



2 Iron Crolle

Straight ribband edge weld lines with fractured 'zipper' weld between crolle rods



Damascus Twist fracture



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