Intermediate Enfield

Shooting original and replica Enfields

Controversy, Accuracy, Authenticity, Critiques and Reproductions

BULLETS USED IN ENFIELD TEST FIRING
Pritchett bullets were cast in original moulds

by Bill Adams

WARNING! Being exposed to educational material might cause one to become interested in history, heritage, and the culture of the Civil War era. While most persons may find this to be educational, enlightening or even enjoyable, there are some that may be offended. Please read this caveat to them.

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Bill Adams

Two questions that stir debate are "What shoots better, an Enfield or a Springfield?" and "How come I can't get *my* Enfield to hit anything?" Controversy between Enfield and Springfield shooters has probably raged since 1855 when the United States adopted what was effectively the same calibre weapon as the Pattern 1853 Enfield rifle musket. Ironically, the Model 1855 through 1864 US rifle muskets have almost the very same rifling as the Type III P53 Enfield that was used in the American Civil War. Original Springfields and Enfields are rifled with progressive depth rifling that is .015" deep at the breech tapering to .005" deep at the muzzle. The P53 has a twist of one turn in 78" and the M1855 US .58 has a twist of one turn in 72". The US arms had 40" long barrels while the standard P53 had a 39" barrel. Many of the original Enfields were rifled on American-made rifling machines.

Each country used a different style of bullet. The US used a lubricated grooved hollow based bullet, while the British used a longer, heavier smooth sided hollow based bullet with a lubricated paper patch. The US arms used a smaller service charge. The elevating long-range sights of the 1855 US rifle muskets were similar to those of the P53 Enfields. The US sights were secured with a screw while the Enfield sights were soldered to the barrel. The differences in bullet weights and powder charges resulted in differences in sight calibrations and profiles.

Given their similarities, the arms should shoot the same, but shooters argue that they do not. The disparity in accuracy in favor of one or the other arms often lies in the shooter, the stock profile, or the quality of the individual weapon. By the time of the Civil War, the long range sights on the 1855 US arms had been superseded with three leaf sights placed closer to the breech. The 1858 and 1861 US sights had 100, 300 and 500-yard increments. The US arms thus had a longer sight radius, but shorter eye relief that resulted in a blurred sight picture for some shooters. The elevating P53 sights had longer eye relief and were adjustable to 800, 900, 1000 or 1100 yards depending upon the maker and period of manufacture (some rifle sights went to 1250 yards). The Enfield sights provided a better sight picture and a longer effective range than the US arms with their 3-leaf sights.

Few shooters that complain of accuracy problems with Enfields shoot original arms; they shoot reproductions that only superficially resemble Enfields. Most repro "Enfields" resemble mixed model arms assembled during arsenal refurbishing and downgrading rather than actual Royal Small Arms Manufactory Enfields. The buyer of a foreign manufactured repro Enfield or other replica CW military long arm often pays more for his weapon than does the buyer of a mass produced American made muzzleloader or bolt action centerfire rifle. A new American-made centerfire rifle or muzzleloader comes with a warranty and can be expected to perform reliably. It does not have to be tuned, honed, glass bedded or exorcised in order to deliver its projectiles with reasonable accuracy at 50 or 100 yards. A .50 calibre rifle will have the same bore diameter as the other weapons of that calibre from the same manufacturer, not vary up to .020" of an inch from rifle to rifle as may be the case with replica Civil War muzzleloaders.[1] Guns from the same replica manufacturer may have different rifling twists and numbers of grooves and different bore diameters within the same model series.

Most reproductions are not rifled like the original arms, the sights on many of them are incorrect (i.e., rifle sights on rifle muskets/improperly made sight components), and there are other inaccuracies. The bullet, charge and lube that works well in an original .577 P53 with a 1:78" twist and progressive depth rifling may not work well in a reproduction with .005" uniform depth rifling with a 1:48" twist or a 1:66" twist and a bore size of .595". Those arms can usually be made to shoot well, but not necessarily with the same loads as other arms of the same model even if from the same maker.

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[1] A check of 5 rifle muskets from one maker disclosed bores sizes from .575" to .595". Three rifle muskets from another maker varied from .580" to .595".

The original arms were designed with a point blank of 100 yards and were made to neutralize enemy soldiers, not break clay pigeons. The originals are easily capable of hitting a clay pigeon at 100 yards, but the heavy regulation service loads and resultant recoil would not make for a pleasant day at the range. A shooting writer of the era advised that dumping out part of the service charge lessened the recoil without lowering short-range accuracy. Shooters have commented that the Enfield stock configuration feels awkward. The low comb of the Enfield and the nearly flat tapered butt plate seem to transfer the full recoil to the shooter, partly because the shooter often holds the butt plate too high on his or her shoulder, or off the shoulder near the bicep. Both practices result in bruises and flinches. The Enfield was designed to be fired from the British position, not the American position. That leads to yet another controversy that started during the decades before the Civil War. The British used a different shooting position than did Americans. Shooting writers of the 1840's through the 1870's commented about the differences in shooting stances on opposite sides of the Atlantic. Americans had a tendency to stand almost at a right angle to their targets and thrust back one foot, while British riflemen stood in a position wherein their shoulders and feet were more parallel to their targets. The Enfield is more "user friendly" in the English position.

Enfields do not lend themselves to easy use by persons with short necks as even in the English position the shooter must get his face over and down onto the stock. The Brits solved that problem by "bending" the stock. Competitive shooting with military arms was a major sport in England and Volunteer marksmen purchased their own "Enfield" rifles and rifle muskets. The Volunteers often had their stocks configured with a "cast off" which is a sideward and sometimes downward curve to the buttstock, such as one might encounter today on a custom made shotgun. Cast off stocks were relatively common on private contractor Enfields. The arms with cast off stocks "shoulder" and align quickly, and are quite comfortable to shoot. There is another partial solution if you just can't seem to be able to get your face down far enough to see through the Enfield sights: move the elevator slide bar on the rear sight up to the first or second step on the base. The front sight blade will have to be raised an equal amount to compensate, but you can then hold your head up to half an inch higher and see the sights easier.

Reproduction Enfields are copies of machine made RSAM government Enfields or *London Armoury Company* Enfields (note the correct spelling of the firm name). Two companies make arms that have locks marked Enfield 1853. No original production P53 Enfields were marked that way. Despite the 1853 date on the locks, the arms from one manufacturer are copies of the Type IV P53 that did not exist until 1862. While allegedly made with original gauges, the internal lock components are undersized and the hammers are not shaped properly. The Enfield marked arms from the other maker also have incorrect hammers, the rear sights are rifle sights, not rifle musket sights, and the arms are a Type III that did not exist until 1858. The guns from both companies have ramrod spoons and straight shank ramrods which did not exist on the early P53 Enfields. True Type III and Type IV RSAM Enfields did not have line engraving on their lock plates or hammers. The arms from both of these makers resemble Pimlico Arsenal refits circa 1862 when many early P53's were rebuilt and restocked. Some repro Enfields have "London Armory" marked locks with Birmingham Small Arms Trade stampings in the stock – a complete fantasy.

Repro Enfields marked London Armory are actually copies of the early Parker Hale repros. The hammer and the internal lock components are smaller than on original arms and the letters P-H are faintly visible on the lock bridle, suggesting that Parker Hale parts were used for casting patterns. These arms are also replicas of the machine made Type IV P53. The irony is that the original long arms that were marked *London Armoury* were Type III grade 2 *hand made* arms. Those pieces had squared "wings" on their side lock washers and were fitted with Palmer Patent bands. The later arms with locks marked LACo were machine made and fully interchangeable with true RSAM Enfields. Whereas original arms marked *London Armoury* have line engraved locks and hammers, true LACo marked arms do not have engraving on the locks or hammers.

What do all of these details mean? Whenever someone complains that "I can't get my Enfield to shoot," the problem is seldom with an *Enfield*; the problem is with a replica that generically resembles an Enfield. Let's consider a few details concerning authenticity and getting the weapon to shoot well: Some of the companies that make replica Enfields also make replica Springfields. It appears that the arms share the same barrels with different breeches. The arms thus have the same rifling but it's not the same depth or twist as the rifling on original arms. The barrels on some of the repros are much heavier than are original

barrels because they are not fully tapered as were the originals. The barrels are heavier and the stocks are often slightly oversized and made of dense hardwood. The weapon may weigh a pound more than an original arm. A machinist could taper a barrel properly to lighten it, but then it would be too small for the barrel channel and the gap would have to be filled with bedding, thus replacing some of the removed weight. The P53 repros from two manufacturers do have properly tapered barrels, yet the stocks from one of those companies are not profiled properly. That company also offers a two-banded rifle built on a shortened rifle musket stock with resultant incorrect band placement. The only practical way to trim weight from most repros is to remove some of the bulk from the oversized areas of the stock. You'll only save a few ounces, but the stock will look better and will feel more comfortable when shooting. Removing the excess wood from the sides of the buttstock may also enable you to get your face closer to the sights.

Most reproduction Enfields have spot (electric) welded rear sights. It seems that the welding or clamping process used to affix the sights has on occasion affected the bores. Several repro arms that accumulated fouling, loaded with difficulty or would not consistently group were found to have bores that were out of round, rough, or constricted in the area of the rear sights. Possible corrections are lapping, rerifling, relining, or replacing the barrel.

After market parts are available to make repro Enfields look more authentic. One may ponder why it is necessary to spend more money to make what is advertised as an authentic replica into something that more closely resembles an original arm. With the exception of correcting the sights, making the weapon appear authentic superficially will not make it shoot better. Basic tuning and load development will help either an original or repro arm shoot better, but once the mechanics of the arm are correct, it is the shooter that is most responsible for group size.

Ironically, although America was the Nation of Riflemen, military rifle matches were a very popular national pastime in England during the Victorian era. The most used arms in those matches were service rifles and rifle muskets and some outstanding shooting was accomplished with the P53 Enfield. Guidelines mandated a minimum 6-pound trigger pull. After market sights and sight adjusters were allowed, yet most shooters used the government sights as issued. Writers of the era jokingly called the service arms "government gas pipes," yet conceded that they were quite accurate out to 600 yards. The small-bore .451 rifles that resembled Enfields dominated the longer-range matches. The London Armoury Company long Enfield was a favorite arm of the P53 shooters. Many were purchased by Volunteer marksmen as they could use them in both Volunteer musters and military target matches. The LAC arms were superior quality, interchanged with the government RSAM Enfields, and could be privately purchased. All RSAM Enfields were government property (no true Enfield P53's were used in the Civil War). Another advantage of the interchangeable LAC arms was that a LAC made Kerr or Turner barrel could be purchased and dropped right into an LAC P53 so the owner could shoot it in both the service calibre and the small bore matches. LAC had a contract to produce arms for the British government, but arms produced in excess of the monthly delivery quota were sold to Volunteers and the Confederacy, and a few thousand were sold to the Federals. LAC also produced superb long-range small-bore rifles, including the Kerr rifle that was used by Confederate sharpshooters. The accuracy of the Whitworths, Kerrs, and other English small-bore rifles is legendary, yet the typical Confederate sharpshooter used a standard "Enfield."

Can you get your reproduction Enfield to shoot as well as a high-grade original Enfield? Possibly. Any rifle should shoot well once a proper bullet and load combination is developed for the rifling configuration and the arm is set up properly. Today's shooter actually has fewer options than were available to marksmen of the P53 era when shooting was a major sport. While the NSSA rules permit a lighter trigger pull than was used in period target competitions, there was a wider range of accessories, ammunition, and rifling options available to the tens of thousands of marksmen that competed with the P53 Enfield.

Most shooters in the original matches bought factory made match grade cartridges. Shooting suppliers offered ammunition that at least rivaled the excellent quality British government ammunition. Few shooters cast their own bullets - those that did not purchase prepared cartridges usually bought projectiles. The bullets were made by compression, not casting. Weights and diameters were kept within tight tolerances. The government was so concerned about ammunition tolerances that garrisons were issued "rectifying machines" to size any cast bullets that might have to be used if compressed bullets were not available. P53

Enfields did not fire Minie' bullets. A true Minie' ball has grease grooves and has an iron cup insert in the hollow base.[2] The P53 Enfield fired a Pritchett bullet with smooth sides. Some iron cupped Pritchett bullets were issued with the earliest .577 P53 rifle muskets sent to the Crimea. Those projectiles were quickly superseded by what would remain the standard bullet during the era of the P53. The government Pritchett bullets were generally quite heavy, often 530 grains or more. Instead of an iron base cup, the Pritchett bullets used a base plug shaped like a flat topped cone. The early plugs were made of boxwood, which was later superseded by moulded burnt clay plugs. The plugs aided in expanding the bullet into the rifling and also prevented the skirts from being easily deformed. One of the secrets of the Pritchett bullet was that it was paper patched, just like the bullets used in high-grade target rifles of the era. The early P53 bullets were .564" in diameter and the later projectiles used with the improved J2 powder were .550" in diameter. The lubricated paper patch took up some of the difference between bullets and bore diameters. The .550" bullets were found to be more accurate than the larger bullets. The projectile did not ride on the bore; thus there were no leading problems. Paper patches are not used in NSSA competition. There is apparently a misconception that the paper patch presents a fire hazard, loading danger, or cook-off hazard. In the hundreds of battles fought with paper patched bullets and tens of millions of rounds fired in combat and competition with that ammo, there is no known instance of a fire being started by a bullet patch. Ranges were not consumed in flames, nor were the American prairies ignited by buffalo hunters firing paper patched Sharps bullets.

Grease grooved bullets were seldom used by P53 shooters in England, probably due to the availability of Pritchett bullets and the fact that the Pritchett bullet was the standard government projectile. The Lyman 575213 "Minie" bullet is basically a Pritchett bullet with grease grooves and is a close duplicate of the bullet used in the Snider breechloading conversions of the P53. Nearly identical bullets saw some use in the Civil War. The bullet design works very well in muzzle loading Enfields.

Experiments by target shooters produced the hollow point projectile long before the appearance of the dreaded Dum-Dum bullet. P53 era target shooters discovered that the Enfield bullet could be made even more accurate by using a hollow point in conjunction with a hollow base. Variants included filling the hollow point with charcoal, or inserting a long wooden plug in the bullet nose and "spinning" the edges of the cavity over the plug.

The Wilkinson compression bullet performed very well in government experiments with P53 Enfields. The Wilkinson bullet tested with the P53 has a longer bearing surface than the design that was adopted for use in the Austrian Lorenz. Like the Pritchett bullet, the Wilkinson was originally fired with a paper patch.

Results of period experiments, battles, and matches established that the original P53 shot well with heavy bullets with a bearing surface longer than the bore diameter. Those bullets also work well with reproduction Enfields with progressive depth rifling and in many arms with uniform depth rifling. Theories of inertia, ogive profiles, and rifling twists calculated through the Greenhill formula duly considered, the effectiveness and accuracy of the Pritchett style bullet has been proven on countless battlefields and target ranges around the world during the last 150 years.

Some years ago I ran a limited series of tests to determine what bullet and charge combination would work well in an Enfield. The tests were done for my own information and did not compare all bullet designs. I paid for the moulds, guns, and supplies used; there were no factory or dealer samples. Both original and repro Enfields were test fired with various bullets, lubes, and charges. Bullets tested ranged from 315 grain semi-wad cutters up to 530 grain paper patched Pritchett bullets cast in original moulds. A very few behemoth 630 grain shallow cavity Pritchetts were tried. The RCBS pointed nose wad cutter style bullets

[2] The so-called minie-ball of the Civil War was actually a bullet designed by James H. Burton while he was working at Harpers Ferry Armory.

and the repro compression bullets were not fired at the time of the original tests, but were subsequently tested in five weapons. During the initial tests no attempts were made to closely fit bullets to bore diameters. Most bullets were fired as cast after being passed through a .577 sizer, so diameters ranged from .550 to .577 depending upon the bullet size as it came from the mould. All lube was applied by dipping the projectiles base down in melted lube. No lube was used in the hollow bases during the Enfield tests. No fouling problems were encountered. The weapons were not brushed or wiped during the five and ten shot strings. Several commercial lubes were tried as well as home made lubes made from 50/50 beeswax and Mobil I synthetic motor oil, 60/40 beeswax and Crisco, and 50/50 beeswax and peanut oil. Original formula lubricant made with beeswax and tallow was also used. All of the home made lubes out-performed the commercial lubes, with the best all around lube being the original formula beeswax and tallow mixture.

The weapons used in the initial tests were two original LAC P53's, an original P56 2-band rifle, a 1st generation Parker Hale repro P61 musketoon, a 1st generation P-H P53, an early P-H P58 rifle (5 grooves), a early Euroarms LACo marked P53, a later Euroarms P53 with 3 groove .005 rifling, and a Euroarms 3 groove 2 band rifle. Subsequent tests included two original 5-groove Enfield rifles and several other repro and original 3 and 5 groove rifles and musketoons, and an Armisport P53. Of the repro arms tested, the early Euroarms P53, the early P-H rifle musket and the later production Armisport were fired as they came "out of the box." All other repros had the locks honed & polished or tuned so they would function smoothly.

Projectiles fired included the Lyman 575213, Lyman 575213 OS, several variant wad cutters, a replica CS Gardner bullet cast from a mould made during the 1940's, the Lyman Garrett bullet, and several weights of Pritchett bullets. Another bullet tested was from a Lyman 575213 mould that had .090" milled off the top, thus producing a flat nosed bullet of 490 grains. I have used the shortened Lyman 575213 mould for over 35 years and it still makes a perfect bullet. None of several moulds from one company were "true" as purchased – they apparently have a special machine that makes oval cavities and elliptical base plugs. The powder used was Goex Fg, FFg, and FFFg. The FFFg powder came from the same keg. The FFg powder was all from the same five pound bag, and the Fg powder was purchased in one pound cans. Navy Arms German and Brazilian musket caps were used. Firing was done at 50 and 100 yards from sand bag rests. Most of the firing was done on days with low humidity with the temperature between 70 and 80 degrees and no wind. All arms were fired with the ramrods in place. After much measuring, weighing, and shooting, several workable combinations evolved.

The 530-grain Pritchett bullets fired with a paper patch lubed with beeswax and Mobil I and 70 grains of Fg powder were devastatingly powerful and accurate in all arms with progressive depth rifling. The load grouped well, but the recoil was abusive. An interesting incident occurred when a 630-grain Pritchett bullet was fired out of a musketoon at a fresh 5" particleboard stake at 50 yards. The first shot hit dead center in the black line on the stake with a resounding loud crack and broke the stake in half! A few observers were deeply impressed with the destructive power of the bullet. I was equally awed by the recoil and spent some time convincing myself that neither my jaw nor shoulder were broken - I did not fire any more of the 630 grain bullets from the musketoon.

The tests showed that a heavy bullet performed very well in original type rifling and grouped adequately in most of the reproduction arms. The Lyman 575213 bullet and the modified version of that bullet, and the Gardner bullet performed excellently in progressive depth rifled arms when used with powder charges of 41 to 43 grains of FFFg powder and either the Mobil I lube or original formula lube. A comparable charge was 50-55 grains of FFg powder. One hole groups were common at 50 yards. A Pritchett bullet of .567" diameter with a deep truncated cavity was directly lubed with a thick beeswax mixture and fired from one of the original P53's without using a paper patch. Despite being grossly undersize, the bullets grouped in the black at 50 yards although the weapon's report sounded feeble. A few sample groups were fired with large wadcutters, Parker-Hale bullets and other designs. Some of those bullets performed well. The P-H bullet performed well in arms with progressive depth rifling.

The early Euroarms P53 marked LACo was extremely accurate at 50 yards, "cloverleafing" with Lyman 315 grain semi wadcutter bullets and 28 to 35 grains of FFFg powder. Varying the powder charge moved the location of the group up and down, but did not dramatically affect group size. Varying the powder

charges used for many of the arms produced similar results. The bullet holes still "cut" each other, but the groups moved horizontally and/or vertically. Another interesting facet of the tests was that switching from German to Brazilian caps sometimes affected vertical group placement. The original arms seemed to be more consistent with Brazilian caps, while the repro arms seemed more consistent with German caps. That may be due to the fact that all of the original arms also had original nipples that had different design flame passages than the repros.

Only limited shooting was done with compression bullets and that was after the original series of tests. Recovered compression bullets had fully taken the rifling, but insufficient testing was done to develop useful loading data.

The original arms performed better overall than did the repros. That can be attributed to a number of factors that included better “fit,” better sights, progressive depth rifling, and smoother locks with better let off and faster lock times. Original iron mounted Army rifles and some high grade original P53’s had “double freed” tumblers that reduced friction and sped up the hammer fall. Double freeing consisted of cutting away part of the sides of the tumbler so the area rubbing against the lock plate and bridle was smaller. Although not on any of the arms tested, patented anti-friction locks and fly tumblers were available on some of the original Enfields. Limited shooting with an original high quality Volunteer Type II P53 with .015” deep uniform depth rifling produced poker chip sized groups at 100 yards with 575213 bullets and 42 grains of FFFg.

The most accurate P53’s in the tests were the original Type III and Type IV LAC’s. The LAC arms are a pleasure to shoot. Their fit, finish, and functioning are outstanding and they shoot well with almost any bullet. It is easy to see why they were a favorite of target shooters and were lauded by Caleb Huse and Josiah Gorgas as the finest infantry arms in the world.

The early Parker Hale (6xx range) and the early Euroarms LACo (3xx range) with multigroove rifling were excellent performers overall and shot nearly as well as the original P53’s. For general skirmishing purposes, they were outstanding. The early P-H shot tight groups at 50 yards and with the same powder charge and sight picture, it grouped all shots in the 9 and 10 rings at 100 yards. The Lyman 575213 bullet worked fine and the .090” shorter version of that bullet was just as good. Despite the difference in weight and nose configurations, both bullets shot to the same point of impact with the same powder charges. The repro “London Armory” P53 with .005 deep rifling was an excellent shooter once the lock was tuned and the sights were modified. The Lyman 575213 bullet delivered adequate accuracy, but the RCBS bullet shot better. Although accurate, the repro “London Armory” might benefit from losing some weight. The Armisport P53 fired loose 4-6” groups to the high right with both light and heavy projectiles. The sight ladder would not depress fully due to the screw and spring tensioner on the slide. Removing the slide dropped the groups down to 3 o’clock. The loose groups were partially due to lock problems and the fact that caps would not fully seat on the nipple. Firing the same loads in an Armisport M1861 Springfield with a tuned lock produced tight groups in the black.

The P-H P61 musketoon was accurate and was the correct weight. It shot better than two repro Enfield musketoons by other makers that were tested later in that it did not require lock and sight work before it would hit the target. All of the current reproduction musketoons are copies of the P61 and no P61 musketoons were used in the Civil War. The P61 grouped best with the Lyman 575213, the short version of that bullet, and with the repro CS Gardner bullet – all with 42.5 grains of FFFg Goex.

The P56 rifle and one of the original 5-groove rifles were superbly accurate. Both were original Confederate issue arms with mint bores, one with a barrel by Henry Clive and the other with a barrel by Thomas Turner, a noted target shooter and gun maker of the CW era. Both rifles consistently fired ragged one hole 5 shot groups. The original 3 groove P56 rifle shot excellently with heavy bullets and 42 grains of FFFg powder. The P56 also shot very well at 100 yards with 42 grains of FFFg and the Lyman 575213OS bullet. The P56 shot best with Garrett bullets and a charge of 35 grains of FFFg or 40 grains of FFg. The 405-grain Garrett bullet resembles a Pritchett bullet with two wide shallow grease grooves and a very deep hollow base. The Garrett bullet also produced excellent results in most of the repro arms with shallow

three-groove rifling. The downside of the Garrett is that it is difficult to cast and the thin skirts deform easily.

One 5-groove repro rifle and one 3-groove repro rifle were fired in the initial tests and several of each type rifle were fired in later tests. For aging eyes, the rifles have better sight pictures than the rifle muskets. Whether repro or original, the 5 groove 1:48" twist rifles are temperamental. Most shoot adequately with the 500 grain 575213 bullets, but some work well only with FFg powder, while others do best with FFFg powder. The Garrett bullet worked better in 3 groove rifles. The RCBS bullet did not perform well in all of the 5 groove rifles, but when it did work, it was magnificent. The RCBS bullet and a 42-grain FFFg charge are a medal winner in most 5-groove rifles and in 3 groove shallow rifled P53 (and Springfield) rifle muskets. That bullet and charge also works well in most rifle muskets with progressive depth rifling. Three repro rifles did not fire a tight group with any bullet or charge tested. Two were 3 groove rifles and one was a 5-groove rifle. The large groups with the rifles might be attributed to the bores being affected when the bayonet lugs were welded on. That was a problem experienced during production of some original rifles. Two original 5 groove rifles with fine bores would not group less than 4" at 50 yards.

Limited testing with a ballistic chronograph produced a few surprises. The theory that a longer barrel produces higher velocities may have only applied to very early black powder arms when the gunpowder itself was of poor quality. The chronograph supported the results of experiments conducted by the British Army that concluded that arms with multiple rifling grooves produced higher velocities than three groove rifles due to lower friction. The 33" barrel 5 groove Parker Hale averaged 86.2 fps faster than a 3 groove rifle musket when fired with the same bullet and powder charge. There was less variation in velocities from shot to shot in a given arm when the caps fit the nipple properly. When the caps were tight and did not fully seat or "bottom" on the nipple, velocities varied up to 50 fps. Those caps also either split or spread, suggesting that some pressure was being lost. The caps started spreading as the hammer drove them down onto the oversized nipples.

The tests confirmed that most repros could shoot well. All of the repro P53's tested were easily capable of shooting pigeon breaking groups. As mentioned, only three of the repro arms were fired as they came out of the box. The others had the locks at least mildly tuned before test firing. Some repro arms grouped 6 or 8 inches from the point of aim. Numerous articles in *Skirmish Line* have dealt with how to tune locks and adjust sights and can be consulted for further information.

Examination of dozens of disassembled repros disclosed that the quality of some of the repro lock components was quite poor, with misaligned components and tumbler arbors that were too small for the bridles. Some sear noses had casting flaws. On some locks the hammers could be rocked from side to side when the mainsprings were removed. The fit of some tumblers is so poor that the locks require bushing or a sleeve has to be placed over the tumbler shafts to eliminate "play." On a randomly selected lock, the tumbler arbor was found to be .020" smaller than the arbor holes on both the bridle and the lock. An original Enfield was checked for comparison and found to be only .0015" smaller than the arbor holes. Tightening the bridle screws caused some of the tumblers to bind. The screws on some locks were poorly threaded and out of round. Many lock screws were soft. Some locks dramatically benefited from retapping and installing US screws.

The mainspring mounting lug is too small on the repros by one maker – it's basically a groove in the spring that does not firmly wedge under the boss on the lockplate. The mounting pin near the front of the spring is much smaller than the hole that it engages. The end of the spring moves in and out away from the lockplate over 1/16" each time the lock is cycled. The inletting in the lock mortise is too deep to hold the spring in place against the lock. The inside edge of the spring is rough and the long arm of the spring drags against the rough surface of the lock as it moves up and down. The combination of drag, misalignment, and shifting components due to loose tolerances results in excessive lock time. That is exaggerated by a slightly oversized nipple that keeps the cap from fully seating until smashed down by the hammer – lots of milliseconds of motion and delays requiring excellent follow through for consistent shooting.

The elevator ladders moved from side to side in some of the rear sights – sometimes over 1/16". That affects group placement. Sometimes the flange at the ladder hinge is so large that it obscures the sighting

notch and must be grooved. The same unauthentic elevator slide is used on all Enfield repros. The slide is attached with a spring and screw that often keep the elevator from lying flat, thus causing the weapon to shoot high. The small long-range sights on the repro musketoons have similar problems. The correct rear sights for the P53 Enfield carbines that were used in the Civil War had flip up leaves.

Some of the problems that affect repro Enfields can be attributed to poor inletting. The barrel channels on some have a ridge or a flat area up the middle of the barrel channel and gaps around the sides of the barrel that can allow moisture to creep in and warp the stock or create rust. The ramrod spoon on some of the repros sticks up above the bottom of the barrel channel and lifts up the breech of the barrel. If it is obvious that the ramrod spoon is pressing against the barrel, take it out of the stock and test fire the arm without the spoon. If the groups tighten or move toward the black, then either leave the spoon out or grind away the portion that was contacting the barrel before replacing the spoon. The most serious inletting problem is related to the trigger plate. Back the tang screw out several turns and while it is still attached, press down firmly on the screw head – does the screw move downward? You may notice that as the tang screw is moved up and down the trigger plate moves with it – it shouldn't. If it does, you're going to have problems, as the trigger plate inletting is sloppy. An Enfield trigger plate is not attached to the trigger guard - the tang screw threads into a mount on the forward portion of the trigger plate. If the inletting under the trigger plate is too deep, tightening the tang screw draws the plate upwards and affects the trigger pull. Sloppy machine inletting can be dangerous. Tightening the tang screw may pull up the plate so far that the sear may not detent into full cock. The correction is to fill in the extra space above the trigger plate. If the lock mortise is poorly inletted the lock will move slightly as the trigger is pulled. That can sometimes be corrected by shimming with veneer. Some reproduction ramrods are made in two pieces and pressed together. Original rods had iron heads welded to steel shafts. The slot in the ramrod head was for inserting the screwdriver blade of the combination tool to twist the ball screw and to pull on the ramrod when removing a ball. Doing that on a repro rod will likely twist off the jag head, leaving the shaft stuck in the bore. There have been failures wherein the rods came apart while a patch was being used on the jag head or as the weapon was being loaded.

Advertisements may tout ordnance steel barrels, but the barrels on some repro arms seem to be made of free machining steel, which is an alloy created to do just what its name implies. It cuts easily with machine tools, thus saving wear and tear on the manufacturer's equipment. The barrels do shoot well initially, but some shooters have discovered that their 5-groove rifle became a shotgun after a few seasons of shooting. Pulling the nipples on some arms disclosed that the bolster threads went deeper than the flame passage leading into the barrel. The nipple threads in the bolster are sometimes oversized and/or the nipples don't really fit properly. The poor machining tolerances allow powder to get into the area under the nipple and cause not only a carbon build up, but the hot powder gases cut around the bolster threads in the investment cast breeches that may be softer than the barrels.

Many of the problems with repro Enfields are also encountered on other models of reproduction long arms. All of the problems can be corrected, but did you purchase the repro as a kit, a repair project, or a complete and serviceable arm?

The shooting tests were to develop a load that would perform well in the various Enfields. A secondary purpose was to see if a reproduction Enfield could shoot as well an original. The conclusion was that there is no wonder bullet or load that will work well in all Enfields. The best all around load combination for the various arms tested was the Lyman 575213 bullet with a charge of 42.5 grains FFFg Goex powder lubed with beeswax and tallow. The RCBS bullet with 40-42 grains of FFFg Goex grouped well in most repros and in many original arms. Other shooters may get different results.

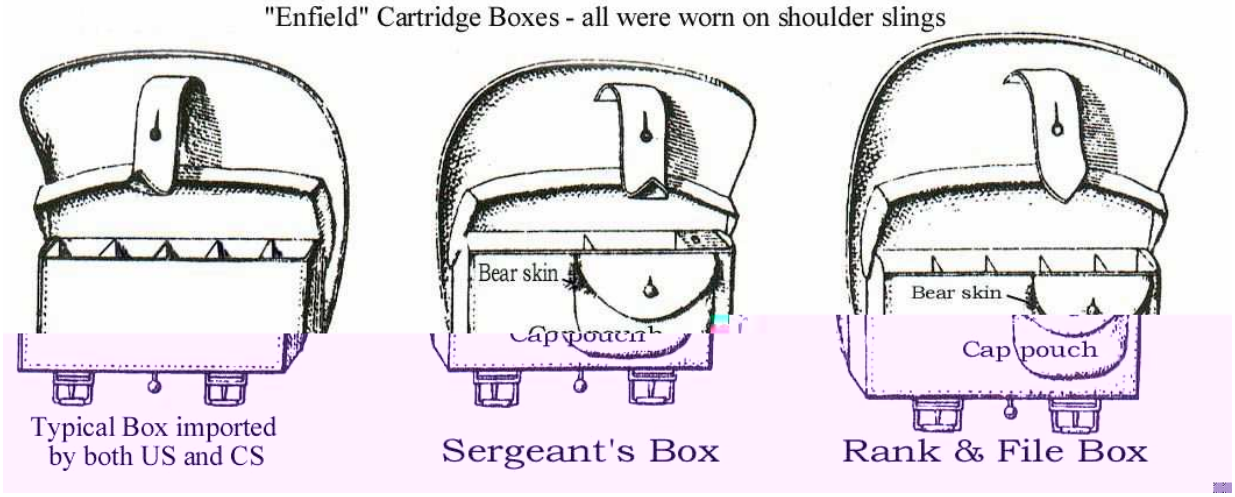
Can the repros shoot as well as originals? Some can indeed shoot quite well "out of the box." Most repros can be made to look and shoot like the originals, but may require lock, stock, and sight work and parts replacement to achieve that goal. In fairness to the manufacturers, perhaps only one in twenty repro Enfields is sold to a shooter, and the fate of an empire does not depend on their quality. Further, many of the handmade Enfield clones that were sold on the international arms market in the 1860's would have failed British government inspection. On the other hand, even if only used to shoot blanks, a reproduction of a "Civil War Enfield" should be a copy of something that was actually used in the Civil War. The

original machine made arms from RSAM Enfield and London Armoury Company were made to exacting standards - Is it unreasonable to expect a reproduction weapon produced with modern machinery and materials to be as accurate and reliable as a 140 year old original?

Sources:
Regulations for Conducting the Musketry Instruction of the Army, Her Majesty's Stationery Office, 1859
Bart: *The Art of Shooting with the Rifle*, London, 1888
Bury(editor): *Manual of Rifling and Rifle Sights*, London, 1864 (reprint by Ray Riling, 1971)
Fuller: *The Rifled Musket*, New York, 1958
Hans Busk: *Handbook for Hythe*, London, 1860; *The Rifle and How to Use It*, London, 1860; *Rifle Volunteers: How to Organize and Drill Them*, London, 1861.
Chapman: *Instructions to Young Marksmen* aka *Improved American Rifle*, NY, 1848
Cleveland: *Hints to Riflemen*, NY, 1864.
Pease: *The Rifleman's Hand-Book, Designed for the use of the Massachusetts Rifle Club*, Boston, 1862
Roads: *The British Soldiers Firearm, 1850-1864*, London, 1964
Russell: *Handbook of Rifle Shooting*, Toronto,1869 (reprint by Museum Restoration Service, 1989).
Wilcox: *Rifles & Rifle Practice*, NY, 1859.
Wilkinson: *Observations (Theoretical and Practical) on Muskets, Rifles and Projectiles*, London, 1852

Excavated and Newly Cast Bullets for Enfields and Lorenzs

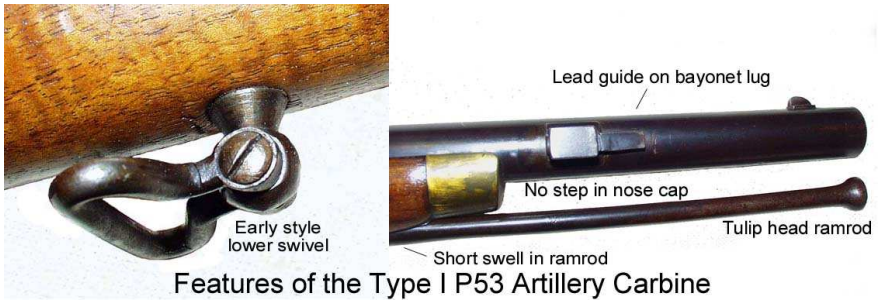
Top row: Iron cup .75 cal Minie bullet for rifled P42 musket; Standard .550 Pritchett with boxwood plug; .562 Pritchett, conical cavity; Pritchett from original mould; .562 Pritchett with iron cup from Crimea; short Pritchett with truncated cavity cast in original mould.
Bottom row: True Austrian issue compression bullet excavated at Koniggratz; Bullet cast in original Wilkinson mould – style used in British tests; .42 calibre Wilkinson bullet; "New Austrian" Lorenz bullet; Edington Lorenz bullet.



While called cartridge boxes, these are actually reserve ammunition pouches. Loading was to be done from an "expense" pouch holding twenty rounds that was worn on the right front of the waist belt.

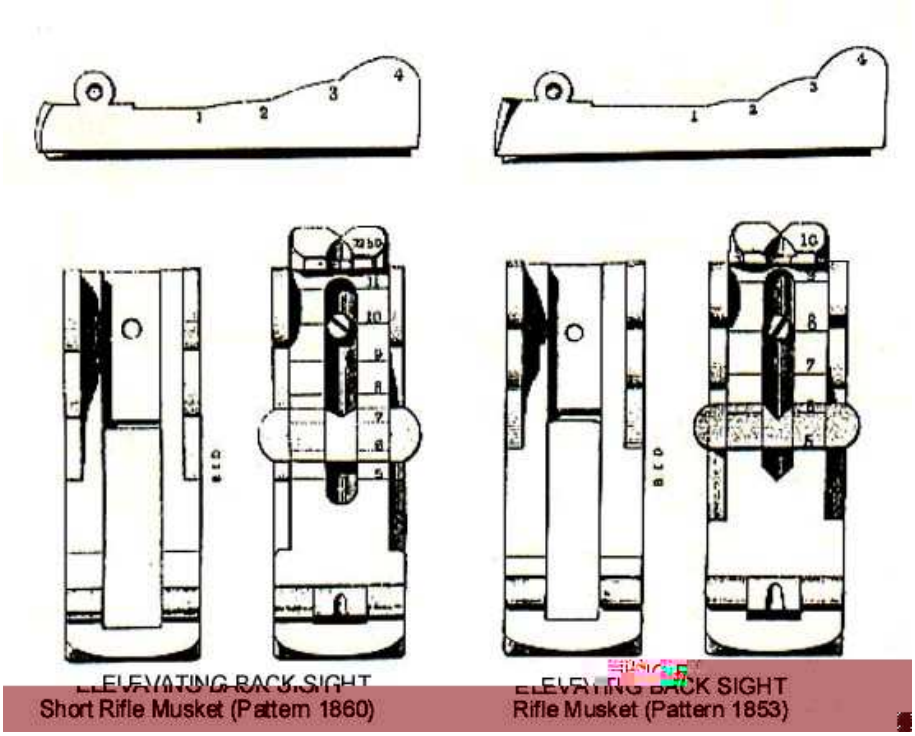
The standing position was somewhat modified once rifled arms became standard issue in the British Army. Soldiers were required to qualify with their weapons out to the maximum range on the sights. The kneeling position was mandated from 400 to 600 yards. The "Hythe" standing position is described as "Face the target, and after making a half turn to the right, advance the left foot ten inches to the left front, (six to the front and eight to the left), toes pointing to the front, and right foot pointing to the right. The left elbow well under the rifle and close to the body; hand firmly, but without constraint, grasping the rifle just behind the lower band. The right elbow to be raised nearly square with the rifle – right hand holding the small of the butt lightly, thumb pointing to the muzzle. The centre (rather higher than lower) of the butt to be pressed firmly to the shoulder with the left hand, the top of the butt being as nearly as possible with the top of the shoulder, and the body firm and upright." If you can get into that position, you will be able to see through the sights, yet the *Field Excercises* manual continues: "should the above position feel constrained, some slight modifications can be resorted to with advantage." It was further suggested to "hold the head as far back as convenient from the sights, which will make them appear more distinct." What about that left elbow close to the body? Wimbledon regulations stipulated that in shooting standing, the left elbow could be rested against the body provided that the "little finger of the left hand is in front of the projection in front of the lock-plate..." Resting the elbow against the side was considered "ungraceful and unsoldierlike."

Detail of hammers showing line engraving on Grade 2 hammer and lock plate. Machine made interchangeable parts arms did not have line engraved hammers or lock plates.

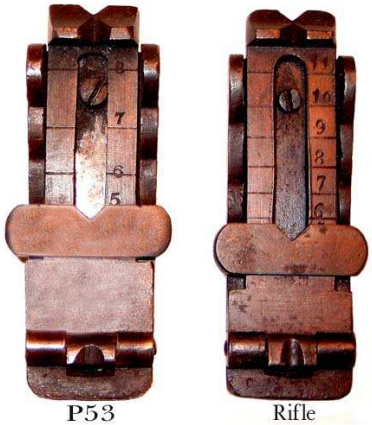


Features of the Type I P53 Artillery Carbine

TUMBLERS: Top left – original Enfield, note the"double freed" anti-friction shoulder. Top right – Armisport. Bottom – Euroarms.



Rifles have different sight bases and elevators than rifle muskets



Bullets in B&W

Excavated and Newly Cast Bullets for Enfields and Lorenzs

Top row: Iron cup .75 cal Minie bullet for rifled P42 musket; Standard .550 Pritchett with boxwood plug; .562 Pritchett, conical cavity; Pritchett from original mould; .562 Pritchett with iron cup from Crimea; short Pritchett with truncated cavity cast in original mould.
Bottom row: True Austrian issue compression bullet excavated at Koniggratz; Bullet cast in original Wilkinson mould – style used in British tests; .42 calibre Wilkinson bullet; "New Austrian" Lorenz bullet; Edington Lorenz bullet.

LOCKS: Upper – repro showing casting roughness. Lower – forged original Enfield.

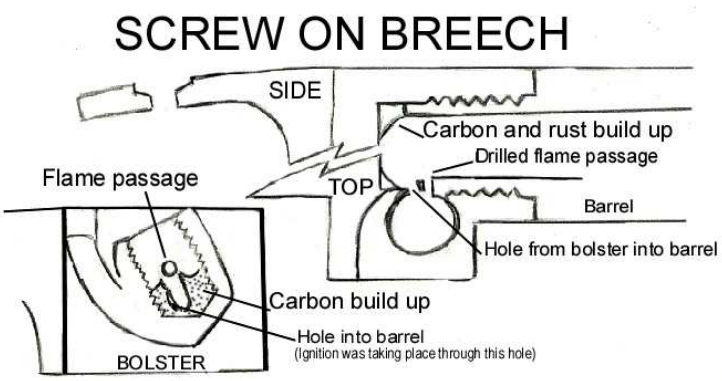
Locks in color – same shot as previous.

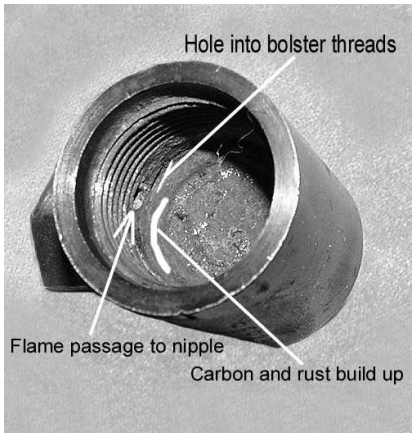
Enfield Trigger Plate

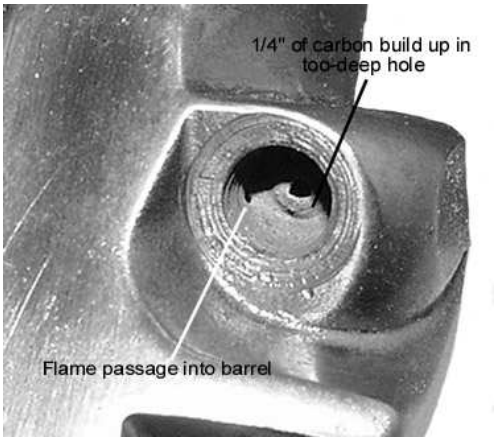
The Enfield trigger plate sets into the stock and is not secured to the trigger guard. Sloppy inletting under the trigger guard causes the trigger to be pulled against the sear when the tang screw is tightened.

Reproduction Enfield Breech

Barrels made without removable breech plugs may have design or machining flaws that contribute to carbon build up or other problems. This does not mean that all such breeches are defective; however, some do exhibit poor quality control.







In the style of breech shown above, the breech section containing the bolster is threaded onto the end of the barrel. There is a short gap between the end of the barrel and the bottom face of the breechplug. That gap fills up with carbon or fouling. The flame passage from the bolster leads into the gap. In the breech above, a second flame passage was created by poor drilling and machining. The nipple hole in the bolster was drilled too deep, and when it was threaded, the tap broke into the gap between the barrel and the breech face. The nipple blocked the true flame passage and ignition took place through the second hole. Carbon built up from the bottom of the bolster up to the bottom of the nipple.