

The Rifle-Musket vs. The Smoothbore Musket, a Comparison of the Effectiveness of the Two Types of Weapons Primarily at Short Ranges.

JUSTIN STANAGE

Communicated by: Dr. Donald B. Marty
Department of History

ABSTRACT

"The gun has played a critical role in history...an invention that has been both praised and denounced...served hero and villain alike...and carries with it moral responsibility. To better understand the gun is to better understand history" (Tales 1999). This paper was written out of curiosity, wondering whether the rifle was really better than the smoothbore musket. The original intent was to demonstrate that the smoothbore was better overall than the rifle, but it turned out to be the other way around at ranges greater than 100 yards.

The Civil War rifle-musket was a very good weapon, capable of hitting targets at ranges over 400 yards. This is not in dispute. What is in dispute here is the effectiveness of the rifle-musket at ranges less than 200 yards, which is the listed battle range of the British Brown Bess smoothbore musket. It is at these ranges that a debate exists concerning the different weapons' comparative effectiveness. Which would be better, the smoothbore or the rifle-musket?

Many smoothbore weapons were used during the Civil War. The Model 1816 Musket (Fig. 1) was used by many of the state militias during the 1840s and 1850s (Earl 8). As such it was used during the opening two years of the war, despite using a flintlock ignition system, rather than percussion.

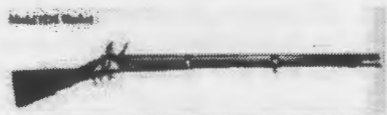


Figure 1. Model 1816 Musket Length: 56.75" Weight: about 9 lbs. Caliber: .69 (Earl 8)

The Model 1842 Musket (fig. 2) was another example of a smoothbore weapon that was used during the Civil War. Over 250,000 of them were produced and many of these ended up in the hands of state militias. These, too, were used extensively during the opening two years of the war. Indeed "many volunteer regiments from both the North and the South still carried this weapon into battle at Gettysburg in 1863" (Earl 10).

The rifle-musket was the primary arm of the Civil War infantry soldier, the most famous of which is the Model 1861 Springfield.



Figure 2. Model 1842 Musket. Length: 57.75" Weight: about 9lbs. Caliber: .69 (Earl 10).

The Model 1861 rifle musket was the classic arm of the Civil War infantry soldier. During the war, it was the standard against which all other Civil War shoulder arms were judged. (Earl 16)



Figure 3. Model 1861 Musket. Length: 56" Weight: about 9lbs. Caliber: .58 (Earl 19).

Accuracy and reliability were two reasons the Model 1861 was among the best arms of the war. As testimony to the popularity of the weapon, between the Springfield armory and several different contractors, more than 700,000 of these arms were produced between 1861 and 1865. Many regiments preferred the Model 1861 over any other muzzle-loading weapon for "there is no known incident of those so armed exchanging the model 1861 for any other muzzle-loading weapon" (Earl 16).

The British Pattern '53 "Enfield Rifle Musket" (Fig. 3), better known as the Enfield, "bears the distinction of being the second most widely used infantry weapon in the Civil War" (Earl 19). This weapon was very good in service, serving "in every major battle from Shiloh in 1862 to the final engagements of 1865" (ibid 19). This weapon was a

favorite of both North and South, each exchanging standard or obsolete weapons for Enfields "requisitioned" from the battlefield.

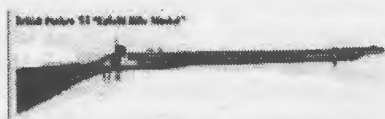


Figure 4. British Pattern '53 Enfield Length: 55.3" Weight: about 9 lbs. Caliber: .577 (Earl 19).

A comparison of battlefields where these weapons were used help to demonstrate the relative effectiveness of the smoothbore musket and rifle-musket. When combat was initiated, the range could be quite short, dependent on the battlefield. The Battle of Seven Pines had a large amount of close range action. Gustavus Smith, author of the 1891 book *The Battle of Seven Pines*, writes about the ranges at which the battle actually occurred. According to the British military historian Paddy Griffith,

In Gustavus Smith's book on Seven Pines there are seventeen usable references to the ranges of musketry fire, although unfortunately only three of them make the important distinction between 'maximum' and 'decisive' range (respectively 100 and 40 yards, 50 and 10 yards, 300 and 30 yards).... In a good number of cases, however, it is specified that this was the range at which fire was opened. (Paddy 146)

By itself, this means very little, but when combined with "the average range for the seventeen fights was 68 yards, or very considerably less than the 200 yards quoted by British experts as the battle range of the Brown Bess [Fig. 4] smoothbore musket," (Ibid 146) it means that the smoothbore and the rifled musket were both fired at the same short ranges.



Figure 5. British Brown Bess Musket Length: Unavailable Weight: 13lbs for .75 caliber Caliber: .684 to .758 (Hurst 102).

With this fact added into the equation, it can be shown that the rifle-musket was not always the most effective weapon. If the 68 yard range is indeed the true average of weapons fire, then the fire from a smoothbore musket like the Model 1842 would have been more effective as it could have been loaded with the lethal combination of "buck and ball." This means that the musket would be loaded with a combination of standard ball ammo and two or three buckshot pellets. This in effect turned the musket into a shotgun and increased the chances of hitting the target.

Several different paper cartridges were used during the war, of which buck and ball was only one. A great many existed, used for many different types of weapons, but they were very similar in type. The four cartridges (Fig. 5) are representative of those used.

CURRY DIAGRAMS OF Muzzle-LOADING CARTRIDGES.

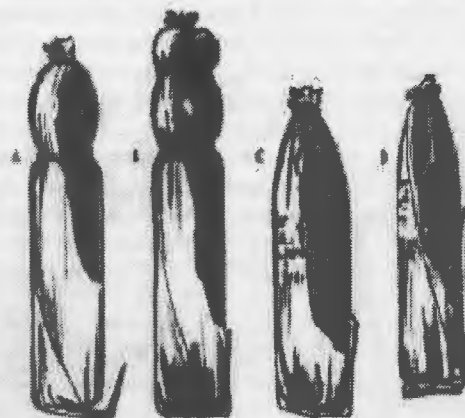


Figure 6. Four types of paper cartridges. The cartridges are, in order: "A. .69 caliber ball, B. .69 caliber buck and ball-one ball and three buckshot, C. .69 caliber Minie ball with wooden plug, and D. .58 caliber Minie ball" (Coggins 33).

Of these cartridges, A and B were used in the smoothbore muskets, C was used in a rifled version of the same muskets and D was used in the Springfield, the Enfield and many other arms of that same caliber. The .58 caliber Minie ball was very commonly produced, for it is known that "During the war the Ordnance Department secured by purchase and fabrication 470,851,079 of these cartridges" (Fuller ix). Unfortunately production figures for the other cartridges were unavailable. Cartridges A and B, while in different calibers, were the same type as that fired by the Brown Bess Musket.

The smoothbore musket would have been useful on other occasions, too. For example, the Round Tops (Fig. 6), where an important part of the Battle of Gettysburg was fought, were fairly heavily wooded, resulting in large amounts of obstructions to fire, including trees and the ground itself. Firing up the hill would have been difficult for the attacking troops, because if they aimed only a little high their shots would just go overhead.



Figure 7. "Little Round Top" (Cole)

Shots aimed a little low would bury in the dirt. With only one projectile coming out of the barrel of the rifle-musket, the shooter had a large chance of missing his target. With a smoothbore, firing buck and ball, he had a much larger chance of hitting someone with one of his projectiles. Even if the buckshot didn't kill, the man who was hit would be down at least for a few moments. He might only have been lightly wounded and able to get back into the fray, but for those few moments, his enemy was safer. Firing down the hill would be good for the defender, although they would have similar problems of firing high and low.

Day 3 of Gettysburg, particularly Pickett's Charge, is a good example of when the rifle-musket could be used to great effect. A long, deep line of troops approaching the Union position was a perfect target for large volleys of fire for several minutes.

When the Rebels got closer, though, buck and ball would have been useful because there were fewer obstructions and thus more of the close range shots would hit. Also, if a man fell wounded he had a slight chance that the men behind him would trample him and aggravate the wound. Men could also be tripped up if they were too close to their fallen comrade, resulting in more men falling and thus breaking up the cohesion of the unit, reducing the strength of the attack and weakening the moral of the men.

The relative accuracy of the rifle-musket can not be denied. At longer ranges, beyond about 100 yards, the lone man with a smoothbore musket is not likely to hit a lone enemy target. At the same time, the rifle-musket can hit easily at those ranges, assuming the man firing the weapon is proficient in its use. To illustrate this, data and photographs from 1860 comparative firing of the "New Rifled Musket, Calibre .58" (Fuller 57) which might have been the model 1861 Springfield, and the "Smoothbore Musket, calibre .69" (Ibid 57) which might have been the 1816 model but was more likely the 1842 model, is available in the national archives. The author, Claude Fuller, used this data to write *The Rifled Musket* (see targets).

At 100 yards, the Springfield hit between 48 and 50 times out of 50 shots per target, getting less than 50 hits only once. Accuracy fell off, though; at 200 yards, the hit rate ranges from 41 down to 32. At 300 yards accuracy is worse, between 23 and 29 hitting the target. At 500 yards the hit rate was between 12 and 21. A moderate wind existed during all firings of the Springfield (Ibid 59-65).

The smoothbore musket was tested in two categories, with and without buckshot. At 100 yards, again with 50 shots of ball being fired, between 37 and 43 hit, a hit rate that was not as good as the Springfield, but respectable. At 200 yards, the accuracy fell dramatically, with only 18 to 24 hitting. At 300 yards, accuracy was even worse, with no more than 9 shots hitting the target.

With buckshot added to the firing, the hits jumped dramatically. All cartridges fired had 1 ball and 3 buckshot in them. Still firing 50 times, the accuracy with buckshot at 100 yards ranged between 79 and 84 hitting, while the balls hit between 31 and 36 times. Note the reduction in the number of balls hitting, but the increase in overall hits because of the number of projectiles. At 200 yards, between

19 and 31 buckshot and 18 to 22 balls hit. There were no buckshot firings beyond 200 yards (Ibid 73-78).

Assuming that the range of 100 yards was typical for combat firings, a comparison can be made, the smoothbore musket firing ball alone was not much worse than the rifle-musket. With buckshot the effectiveness of the smoothbore was much greater. Beyond that, accuracy with either load dropped considerably. At 200 yards, some of the buckshot failed to penetrate the targets. This meant that the number of seriously damaging hits from buckshot would be very small. This demonstrates the relative usefulness of the two arms. At some point beyond 100 yards, the rifle-musket would be better because in the hands of skilled troops it was more accurate. At 100 yards and closer, the smoothbore would have been much more deadly when firing "buck and ball." If it was firing just ball ammo, then the rifle-musket was again the superior, because all or almost all of its shots hit at 100 yards.

Buck and Ball and the smoothbore musket had strong support either during or shortly after the Civil War from Major G.L. Willard, who is quoted by historian Claud Fuller. Willard made several points in a pamphlet entitled *Comparative Value of Rifled and Smooth-Bored Arms*. In writing about infantry defending against a cavalry charge, he assumed that the soldier opened fire at 500 yards with a rifle-musket. This means that the sight on the gun "is elevated to the third notch-the horses now get over 4 yards per second so that the dangerous space is passed in seven seconds" (Fuller 9). The reason for a danger zone is that the bullet from a rifle-musket would rise in flight naturally and then come down. Before a soldier was in the danger zone the shot would land in front of him and once he was beyond it the shot would pass overhead and land behind him. To have accurate fire at a closer range it would have been necessary to lower the sight as the enemy closed. Willard wrote that a soldier:

Will wisely do away with the ELEVATED SIGHT, and will wait until the enemy are within point blank range ... from this point, and in proportion as the distance decreases, the smooth-bore, used against masses, acquires a real superiority over the rifled musket. The soldier armed with the first, if he aim directly at the line which gallops towards him ... sees his chances of hitting increase with each second whilst the one armed with the rifle musket, sees them diminish in the same proportion unless he changes the sight before every shot. (ibid)

While infantry vs. infantry combat occurs at a slower pace, the same principals can be applied. As the enemy gets closer, the man armed with a rifle-musket must change how he aims or he will miss. The man armed with a smoothbore has to do nothing except wait for the enemy to get closer and then he can fire effectively, for all he has to do is load, point, and shoot.

The main reason why the soldier might miss a target can be quite interesting. The bullet fired by a rifle-musket would arc to various degrees, depending upon the sighting that the soldier made. If a soldier were to set his sights on a man 300 yards away and he was firing kneeling, then the shot would reach its zenith at 83 inches above the ground. From

a sight line at 40 inches above the ground, this means that the shot would rise 43 inches. Assuming a 5 foot tall man, or 60 inches, he would be in danger for 75 yards and then the bullet would pass over his head, not becoming a threat again until the target was about 250 yards away from the shooter. At this point, soldiers were in danger for about another 110 yards. "Sighted for 500 yards, at midrange the bullet would pass well overhead of a horseman, with the danger spaces quite small." (Coggins 38-39).



The weapons and ammunition are admittedly key to all of this discussion, but something that would be even more so would have to be the training that the men received before going into battle, as training helps to determine the weapon's battle effectiveness. Target training was nearly non-existent. "Few Civil War regiments seem to have experienced any sort of convincing 'battle inoculation' for live firing in close order" (Griffith 87). This implies that the troops, prior to going into battle, might not have any idea of what their weapons would sound like next to their ears, nor know their recoil. It stands to reason:

Whether firing a Model 1863 muzzle-loader or a gas-operated M1, the average citizen cannot hit the proverbial bull in the behind with a bass fiddle. Training helps, but training in marksmanship was something woefully lacking in most commands during the Civil War. Little time or ammunition was allocated to actual range practice - and many recruits went into battle without having fired a single practice round. (Coggins 39)

Instead, the men knew how to load the weapons, how to maintain the weapons, and how to fire the weapons in theory, but they didn't know anything about them in actual combat. A case in point would have to be the 24th Michigan. "We find that it was sent to the front within a very few weeks of its formation in July 1862, and in its only recorded target practice during that time three men were wounded and one died of a heart attack" (Griffith 88). This would be the only target practice until four months later, which again wasn't followed up. It was only after Gettysburg where the unit suffered 80 percent casualties, that serious target practice was given the men. This lack of training demonstrates that the combat performance of the weapons was less than it could have been. A soldier who is inexperienced with his weapon can not use it to the fullest potential, reducing accuracy and effectiveness.

Training also had an effect on the safety zones that an enemy would encounter. Assuming an open field of fire, as the Union had at Pickett's charge, the soldiers firing could adjust their fire as the enemy got closer, thus eliminating

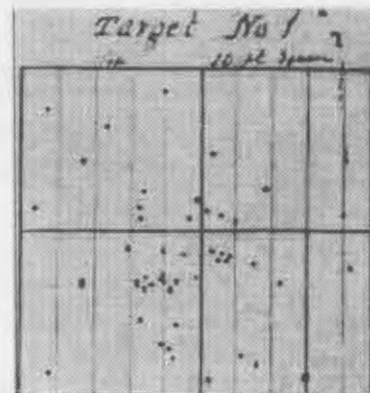
the safety zones. Unfortunately, this was not usually the case. If the winds weren't strong enough, after a few shots the smoke cloud would be so dense as to make it impossible to see the enemy or at least it would obscure their outlines. This would mean that the soldiers would be firing blind, so an enemy could find that safe area, stay there while his opponent emptied his cartridge box, and then they could continue to close. This doesn't mean that the area was completely safe, for some shots could still hit, but most would

just pass overhead or burrow into the earth. The corollary to this is that the winds might be able to blow the smoke away enough for the soldier to see his target, but he would suffer from the effects of the wind on his shot, reducing the accuracy. Either way it was something of a hit or miss proposition, for the lack of wind could make it impossible to see your enemy and thus fire accurately, or a strong wind could make it impossible to reliably hit your enemy, because your shot is blown off course.

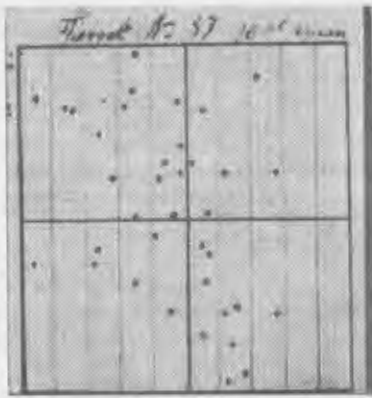
Above all, it can be said that the rifle-musket was superior to the smoothbore musket. If all one had for ammunition were cartridges that had one bullet on top of the powder, the soldier wanted the rifle-musket because it was possible to reliably hit a target at 500 yards and up. However, if they could pick their weapon and ammunition for a particular battle and they had an idea that there would be large amounts of action at ranges less than 100 yards, the soldiers would have been better served by smoothbores, provided they could get buck and ball. If they could not get that, a rifle-musket would have been the optimum weapon.

The range for all three of these targets is 100 yards.

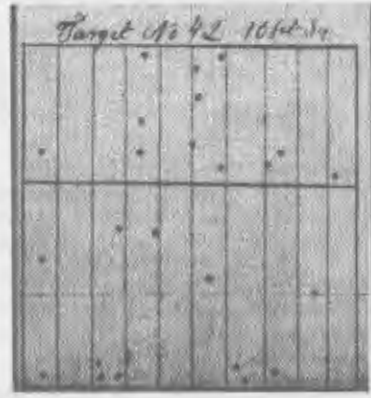
The first target is for the "New Rifled Musket, Calibre .58." Out of 50 shots fired, 48 hit, an accuracy rate of 96%.



The second target is for the "Smooth bore musket, calibre .69." Out of 50 shots fired, 37 hit, an accuracy rate of 74%, not as good as the rifle musket but still decent.

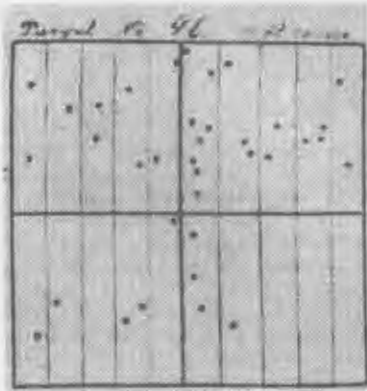


The fifth target is for the "Smooth bore musket, calibre .69." Out of 50 shots fired, 18 hit, an accuracy rate of 36%, which is only a little less than half of the rifle musket.



The third target is for the smoothbore musket, firing buck and ball. In all cases there is 3 buckshot for every ball fired. Out of 50 shots fired, 36 balls and 79 buckshot hit the target. This gives an accuracy of 72% for the balls and 53% accuracy for the buckshot. While the balls are slightly less accurate than the straight ball firing musket, the increase in overall number of hits increases relative effectiveness.

The next target is for the smoothbore musket, firing buck and ball. Out of 50 shots fired, 18 balls and 31 buckshot hit the target, although not all of the buckshot penetrated the presumably wooden target. This gives an accuracy of 36% for the balls and about 20.3% accuracy for the buckshot. At this range it can be seen that one would want buck and ball because the balls lost no accuracy compared to the straight ball shots, but the buckshot would close to double the number of hits achieved.

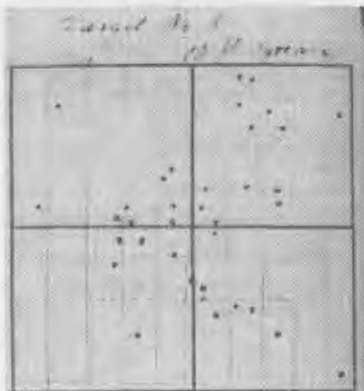


For these next targets the range was 200 yards.

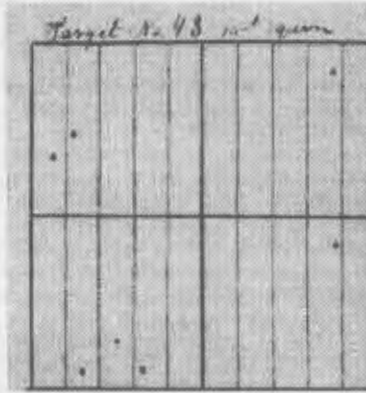
The fourth target is for the "New Rifled Musket, Calibre .58." Out of 50 shots fired, 37 hit, an accuracy rate of 74%.

These targets are at 300 yards.

The seventh target is for the "New Rifled Musket, Calibre .58." Out of 50 shots fired, 23 hit, an accuracy rate of 46%.

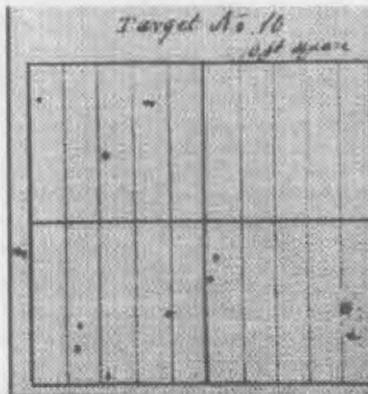


The next target is for the "Smooth bore musket, calibre .69." Out of 50 shots fired, 7 hit, an accuracy rate of 14%, which is a little more than one-third that of the rifle musket. This indicates that for all practical purposes the smoothbore musket is ineffective at 300 yards and greater. While it can hit a target, the odds are not good enough to warrant firing. Apparently the smoothbore loaded with buck and ball had an even worse accuracy rate, because there does not appear to be information for it.



This last target is at 500 yards.

The last target is for the "New Rifled Musket, Calibre .58." Out of 50 shots fired, 12 hit, an accuracy rate of 24%.



No data was available for the smoothbore at this range. These targets help to demonstrate the potential effectiveness of the rifle musket vs. the smoothbore musket. The smoothbore with only ball is obviously worse than the rifle musket, while the smoothbore with buck and ball is better than the rifle musket at 100 yards and is better than the smoothbore with ball alone at 200 yards. Beyond 200 yards one should definitely use the rifle musket. An interesting note is that the rifle musket has the same accuracy at 200 yards as the smoothbore with just ball is at 100 yards.

REFERENCES

- Coates, Earl J. and Dean S. Thomas. *An Introduction to Civil War Small Arms*. Gettysburg PA: Thomas Publications, 1990.
- Coggins, Jack. *Arms and Equipment of the Civil War*. New York: Barnes & Noble Books, 1990.
- Cole, Dan. *Little Roundup*. Taken at the 135th Anniversary Gettysburg Reenactment.
- Fuller, Claud, E. *The Rifled Musket*. New York: Bonanza Books, 1958. (Source of Targets 1-9)
- Griffith, Paddy. *Battle Tactics of the Civil*. New Haven: Yale University Press, 1989.
- Hogg, Ian V. *The Encyclopedia of Infantry Weapons of World War II*. London: Bison Books, 1977.
- Hurst, Michael. *GURPS High-Tech, A Sourcebook of Weapons and Equipment Through the Ages*. Austin, TX: Steve Jackson Games, 1988.
- Tales of the Gun*. The History Channel. 1999-2000. All Episodes.

JUSTIN is currently a sophomore History major, scheduled to graduate in 2002. His paper was written for A348, *Civil War and Reconstruction*. He became interested in the topic due to a favorite show, *Tales of the Gun*, on the History Channel. "It heightened my interest in studying weapons of the American Civil War." Justin hopes to become a historical interpreter.