BLACK POWDER MANUAL
NATIONAL PARK SERVICE
GULF ISLANDS NATIONAL SEASHORE
FLORIDA

635/0-210

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GULF ISLANDS NATIONAL SEASHORE - FLORIDA DISTRICT

BLACK POWDER MANUAL

Purpose and Scope

This manual has been prepared as a reference tool for those attending the annual black powder training session, and as a general guide for those involved in rifle firing demonstrations in the park. It should not be considered a complete guide nor the last word on how to conduct a demonstration. It is only intended to be a general reference. For additional information on powder handling, cartridge making, weapons, tactics, organizations, and preparing and presenting living history programs, more complete materials may be found at both Fort Pickens and Barrancas. Please make use of the many good resources available and your own creativity.

BLACK POWDER

History and Effect

As the oldest known explosive and propellant, black powder drastically changed man's ability to make war and accelerate world change. A form of gunpowder was used by the Chinese as early as 300 A.D. In Europe, a 9th century Latin manuscript contained a formula for gunpowder. Crude cannon appeared in China at least as early as the 12th century - perhaps earlier. The Moors were using gunpowder firearms in Spain in 1118. Black powder was used in all firearms until the invention of smokeless and other type propellants in the late 1800's.

By 1890, nitrocellulose and nitroglycerin-based powders generally replaced black powder as a propellant. Although black powder is no longer used as a military propellant, it is still used as an igniter or booster for the main propellant. It is also used in time fuzes, saluting charges, and squibs (fireworks that hiss). Gunpowder weapons did not immediately replace catapults and crossbows due to the inferior quality of the powder, weapons and projectiles.

By the 16th century, shoulder firearms were becoming somewhat more practical and forced a gradual elimination of heavy and expensive body armor. The development of more efficient cannon forced a change in fortification design. Elaborate castles with exposed walls could too easily be battered down. Walls now needed to be shielded by outer walls, covered with masses of earth. Fortifications came to be dug down as much as built up. With more effective smallarms (repeaters, rifles, breechloaders), tactical formations came to be more extended.

Properties and Manufacture

Black powder is a mechanical mixture of 75 parts saltpeter (potassium nitrate), 15 parts charcoal, and 10 parts sulphur by weight. Today, bituminous coal and sodium nitrate are frequently substituted for charcoal and potassium nitrate, respectively.

Black powder explodes because the mixture contains the necessary oxygen for its own combustion. When it burns, it releases smoky gases (mainly nitrogen and carbon dioxide) which occupy some 300 times as much space as the powder itself. The 75-15-10 formula was a refinement of the 19th century. Early "recipes" called for equal parts of the three ingredients. This early formula burned slow and produced low pressure -- a result also of the mixture being in the form of powder or dust (hence the name gunpowder).

About 1450, powder was "corned" or formed into larger grains which increased the speed of burning and produced greater pressure and velocity. A fine grained powder was milled for small arms; coarse for cannon.

Manufacture:
1) pulverize and mix the ingredients
2) compress into cakes
3) cut into corns or grains
4) roll in barrel to polish corners
5) remove dust

Black powder is sensitive to friction, flame, spark and temperatures above about 540°F. It is also sensitive to impact. It is relatively stable when dry and retains its explosive properties indefinitely as long as it remains dry. Black powder is highly susceptible to moisture, even from the air and will deteriorate. If dried out, wet black powder will regain some of its explosive properties.

Combustible materials which have absorbed liquids leached from black powder constitute a fire hazard. Black powder may be desensitized by placing it in water and discarding the water separately from the residue.

Safety

Regulations governing the safe use and handling of black powder are in standards set forth by the Bureau of Alcohol, Tobacco and Firearms (ATF) Treasury Department and the Occupational Safety and Health Administration (OSHA) of the Labor Department. There are two main NPS safety objectives for black powder:

1) Prevent black powder from getting into the hands of unauthorized persons.

2) Prevent the injury of persons and destruction of property from the accidental explosion of black powder.

For storage (indoor) of 50 pounds of black powder or less, a type four magazine is acceptable (metal box with wood lining). Magazines and black powder use must be supervised by a career or career-conditional employee (21 or older) who is responsible for safety. Theoretically, magazines should be located in uninhabited buildings 50' from any inhabited building (VC, office, museum, quarters, etc.). For example, the igloo north of Fort Pickens would be legal; there is really no legal place at Barrancas.

Some common sense precautions for black powder handling are:

- No smoking around powder

- No open flames around powder

- No sparks around powder
- No unauthorized handling of powder by visitors or other employees
- Keep your powder dry
- Make up only as many cartridges as needed for one day's demonstrations
- Store cartridges in bottom compartment of cartridge box tin until needed

Historical note: The amount of powder to use in a gun (cannon) has varied over the centuries from equaling the weight of the shot to being 1/8 or 1/9 the weight of the projectile. Contributing factors have been the quality of the powder, the type of gun (smoothbore or rifle) and projectile, and the desired effect -- for example, hot shot was fired with a smaller charge so that the velocity at impact would splinter wood for easier combustion rather than penetrate to a depth where combustion would be more difficult. A good rule of thumb for Civil War era is about one fourth the weight of the shot for a smoothbore. Less powder was needed for a rifle because less gas "slipped" by the projectile. "A greater quantity of powder does not necessarily produce a greater effect".

Weapons Classification

Black powder weapons may be classified by:

1) The manner of loading

   A. Muzzleloader
   B. Breechloader (19th century)

2) Type of bore

   A. Smoothbore
   B. Rifle (19th century)

3) Ignition System

   A. Matchlock (1500-1600)
   B. Wheellock (1500-1600)
   C. Flintlock (1600-1700)
   D. Percussion (19th century)
   E. Metalic cartridge with built-in primer (rimfire, centerfire)

During the American Revolution, the basic shoulder arm was a smoothbore, flintlock muzzleloader -- slow loading and ineffective beyond 100 yards. During the Civil War, the basic shoulder arm was the muzzleloading percussion rifle -- faster loading and effective well beyond 100 yards. Later, breechloading repeaters and smokeless powder became standard.

Enfield Rifle-Musket, Pattern of 1853

This weapon was one of the best of the foreign arms supplied to both North and South during the Civil War.

Caliber:	.577 inch
Weight:	8 pounds 14½ ounces
Length:	About 54" (barrel 39")
Grooves:	Three, with a pitch of one turn in 6½ feet
Diameter of Bullet (Minie):	.568"
Weight of Bullet:	530 grains
Powder Charge:	70 grains (60 for NPS)
Sighted:	1100 yards, but not accurate beyond 700

Enfields were made chiefly at the Royal Small Arms Factory in Enfield, England. The U.S. government purchased some 428,000 in the early months of the war. The C.S.A. received some 400,000 in 1861-62. The Enfield factory had machinery identical to that at the armory in Springfield, Massachusetts, but many were not made by the British government or for the British government, and were made by hand, so parts were not always interchangeable. Soldiers generally liked the Enfield. The ramrod head is slotted and knurled for a cleaning rag. Spring bands replaced screw fastened ones in 1856. There are three main parts of a rifle-musket: 1) Lock - hammer, springs, trigger assembly, cone, etc., which fits into the 2) Stock - wood frame holding lock, and 3) Barrel - tube to hold charge and projectile. Other fittings are: Bands and springs to hold the barrel tight to the stock, sling, rammer, and butt plate - to protect wood stock from wear or splintering.

Safe Handling of Weapon

ALWAYS treat a weapon as if it is loaded. NEVER point it at anyone. Carry the weapon to the demonstration area in a safe manner (i.e., a military manner): shoulder arms, right shoulder shift, or support arms. At the demonstration area, the weapon should always be pointed "up and down range". Do not permit visitors to handle weapons or explosives. Do not put any part of your body over the muzzle of the rifle.

Range Requirements: For small arms demonstration using blanks, the range should be at least 50 yards in length with a target area 60 yards wide. There must be a visible barrier between visitors and range (area down range of demonstrator), and no one should be permitted beyond muzzle of weapon during

demonstration. No visitors should be permitted within five (5) yards of demonstrator. If someone is down range, or any other safety hazard is noticed, call "stop!", and stop demonstration until hazard is removed. Anyone (Ranger, Demonstrator, or Visitor) may call stop to a demonstration. Visitors should be warned of noise during demonstration -- especially those with small children or infants who may be startled by the powder charge. Also warn people with hearing aids.

If the weapon repeatedly misfires, remove it to a pre-determined area at port arms -- weapon pointed up and down range. Interpreter will explain the situation and procedures to visitors and keep them at a safe distance until the weapon is discharged or removed from the area.

For Employee Safety:
1) Follow approved manuals
2) Wear natural fiber clothing
3) Use hearing protection if needed

General Regulations:
1) Use only reproduction weapons
2) Fire only blank loads
3) Persons involved in historic weapons firing must be trained and/or checked out and declared competent to perform the necessary drills by the area's certified historic weapons firing supervisor.

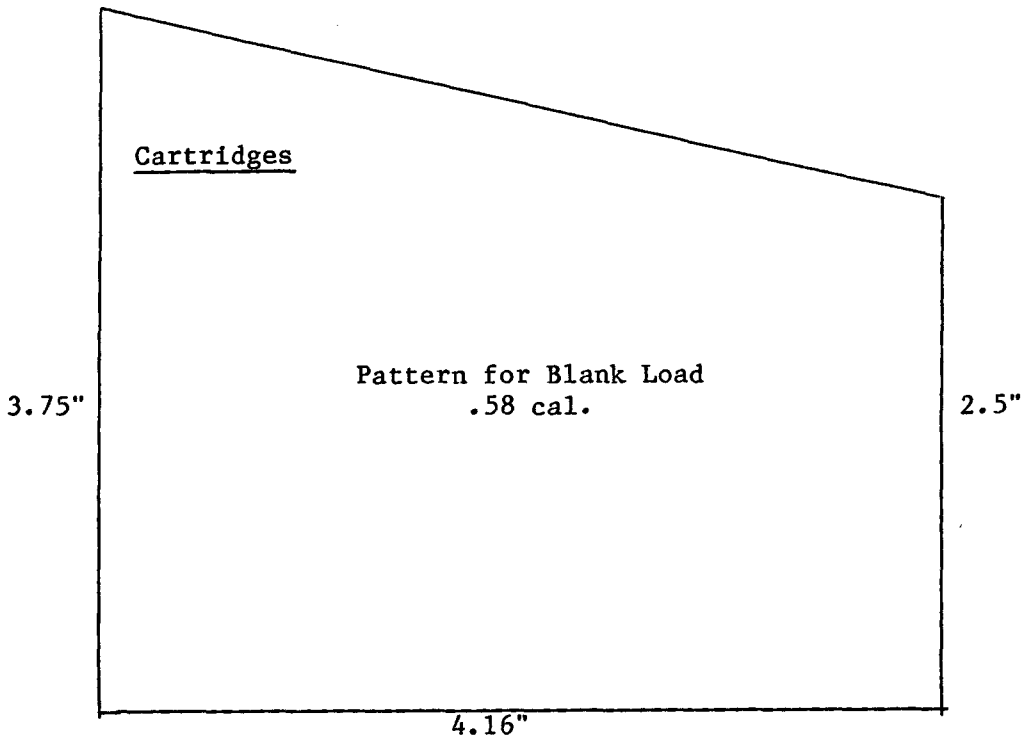
Musket Inspection

Is it unloaded? What is your first impression?

- Stock: Look for cracks, splits, splinters, tight fitting hardware, burrs on metal parts (plates, guards, bands, screws, etc.), tight joining of sections on two-piece stocks.

- Lock: Smooth working? Are the positions of the hammer firm, i.e., half-cock (safety position) and full cock? Is the trigger pull right, not heavy and not "hair"? Good fit in the stock? Check the striking face of the hammer for evenness. It should strike the cap or cone squarely.

- Barrel: Check for proper fit in the stock, dents, cracks, cone well seated and not battered, vent hole clear, shoulder not worn down, corrosion around cone and vent, tight bands, rammer (straight, clean, free of burrs).



Roll with former from bottom, twist left end and tie off with string.
Load with 60 grains FFG black powder.
Fold in and over, and crimp right end.

Note: A grain is the smallest unit in the U.S. and U.K. system of weights. One (1) grain = .0648 gram; One (1) gram = 1/28 ounce; One (1) 60-grain charge = about 1/5 ounce. Origin of grain: Weight of a grain of wheat.

Materials for cartridge making and rifle demonstration:

paper (medium grade)
pencil
scissors
former (1/2" dowel tapered at one end, 5" long)
string
powder measure
black powder
winged percussion caps
black powder solvent
oil
RIG (metal preservative)
cleaning patches

cleaning rod with plastic brush
cone wrench
funnel
detergent
brass cleaner

Organization (on paper) of Infantry Units - Civil War

- Squad or Section - 2 per platoon - 25 men (soldiers were numbered and divided into squads for purposes of training, quartering, and supervision in camp)
- Platoon - 2 per company (1st and 2nd, from right) - 50 men
- Company - 10 per regiment - 100 men (the basic tactical formation)
- Regiment - 4 or more per brigade - 1,000 men
- Brigade - 2 to 4 per division - 2,000+ men
- Division - 2 to 4 per corps - 4,000+ men
- Corps - Generally 2 or more per army - 8,000+ men
- Army - One or more per country - Civil War armies were named for the regions in which they usually operated, i.e., Army of Northern Virginia, Army of the Potomac, etc.

A full strength company was composed of 97 enlisted men and 3 commissioned officers:

One (1) Captain
Two (2) Lieutenants
One (1) First Sergeant
Four (4) Sergeants
Eight (8) Corporals
Two (2) Musicians
One (1) Wagoner
Eighty-two (82) Privates

Recruits were generally between 18 and 40 years old, enlisting for 5 years in the Regular Army, or 3 years in the volunteers. They were instructed three times a day in the School of the Soldier (boot camp). First drills were in position of the soldier -- with and without arms.

Terms used in drill manuals:

Piece = Weapon
Guard = Trigger Guard
Carry = Move
Cock = Hammer of Weapon
Handle of the Piece = Small of the Stock
Detach = Remove
Seize = Grasp
Quit = Release
Fingers Extended and Joined = Fingers straight out and not separated

For our purposes, the following positions will be executed in this order:

Position of the soldier (without arms)

With Arms -
Shoulder Arms

Support Arms
Rest
Attention

Shoulder Arms

Order Arms
Rest
Attention

Shoulder Arms

Right Shoulder Shift Arms

Shoulder Arms

Load in Nine Times

Position of the Soldier:

- Heels on the same line, feet forming something less than a right angle,
- Toes equally turned out;
- Knees straight without stiffness;
- Body erect on the hips, upper part inclining a little forward;
- Arms hanging naturally, elbows near the body;
- Palm of the hand turned a little to the front, little finger behind the seam of the pantaloons or center of thigh;
- Face to the front, chin a little drawn in without constraint;
- Eyes striking ground at distance of 15 paces.

Facings:

Right Face or Left Face - Raise right foot a little off the ground and turn on left heel to right or left.

About Face - On command "About" point left foot straight forward and carry right foot to the rear of left foot (hollow of right resting against and behind heel of left foot); on command "Face" pivot on left heel and turn to right, ending in the position of the soldier described above but facing in the opposite direction.

Positions With Arms:

Each command is executed in one time but for instructional purposes, each time is divided into motions ("by the numbers") the better to make known the mechanism. The first word of a command is preparatory, to alert the recruit of the movement expected. The last word is the command of execution and decides the brisk execution of the first motion of each time. Commands "2, 3, 4" etc., decide execution of other motions. After sufficient training, time should be executed without resting on different motions.

Positions with arms will be executed from the Shoulder Arms position.

Shoulder Arms: Assume position of the soldier; grasp piece with right hand -- thumb and forefinger around guard, remaining fingers around small of the stock behind cock; arm hanging naturally and holding piece against right shoulder.

Support Arms: One (1) Time, Three (3) Motions

1) Bring piece to front, between eyes; grasp at lower band with left hand; grasp at small of stock with right hand.

2) Turn piece with right hand and place in left shoulder while passing left forearm under cock and across breast, fingers of left hand extended and joined.

3) Return right hand to side.

"Rest": Grasp small of stock with right hand; drop right foot slightly; not required to be silent or steady.

"Attention": Direct attention to instructor

"Squad": (detail, company, etc.) Return to third (3rd) motion of support arms.

Shoulder Arms: One (1) Time; Three (3) Motions

1) Grasp piece at small of stock with right hand under and against left forearm; seize piece with left hand at lower band, thumb and fingers extended, palm against rammer; detach piece slightly from shoulder, left forearm along stock.

2) Carry piece to right shoulder changing position of right hand so as to embrace the guard; slip left hand (fingers extended and joined) to height of shoulder.

3) Drop left hand to side.

Order Arms: One (1) Time; Two (2) Motions

1) Seize the piece briskly with left hand near the upper band; detach slightly from shoulder with right hand; loosen grasp of right hand above the lower band, the little finger in rear of the barrel, butt about 4" from the ground; drop left hand by side.

2) Let piece slide through fingers of right hand to ground.

"Rest": Carry right foot to rear of and somewhat perpendicular to left foot; with heel of butt in place, allow piece to rest against body, left hand grasping barrel above right hand.

"Attention": Direct attention to instructor; return left hand to side and hold piece with right hand in upright position.

"Squad": Return to order arms position.

Shoulder Arms: One (1) Time, Two (2) Motions

1) Raise piece vertically with right hand and grasp with left hand below right; release right and grasp at small of stock, thumb and forefinger embracing the guard; press piece into shoulder with left hand.

2) Drop left hand to side.

Right Shoulder Shift Arms: One (1) Time; Two (2) Motions

1) Detach piece from shoulder with right hand and seize with left between lower band and sight; raise piece until left hand is at height of shoulder; place at same time right hand on butt, toe of butt between first two fingers.

2) Quit piece with left hand, raise and place piece on right shoulder with right hand, guiding with left (lock plate up, piece nearly vertical); drop left hand by side.

Shoulder Arms: One (1) Time; Three (3) Motions

1) Press in with right hand towards the body, bringing the piece up and away from the shoulder; extend right forearm to full length, elbow at 90° angle; as the piece comes away from the shoulder, the rammer should be to the front; at the same time seize the piece with left hand between lower band and sight.

2) Quit butt with right hand and embrace guard; lower piece to shoulder arms position, sliding left hand to height of shoulder.

3) Drop left hand to side.

Load in Nine Times (Preparatory command; recruit should be at Shoulder Arms)

1) Load: Command of execution; place the piece, barrel to the front, directly before the body, butt between the feet, muzzle pointing slightly away from the body; slap cartridge box.

2) Handle - Cartridge: Reach into cartridge box and remove one cartridge; place folded end between teeth.

3) Tear - Cartridge: Tear open the cartridge as close to the powder as practicable; position open cartridge above but to the right side of the muzzle.

4) Charge - Cartridge: Pour powder down bore; seize head of rammer with thumb and forefinger of right hand.

5) Draw - Rammer: Draw half-way out and steady in position with left thumb; grasp rammer near muzzle with tips of fingers and thumb of right hand, little finger up; clear rammer from pipes and turn, the little end passing near left shoulder; touch head of rammer to right side of muzzle, keeping clear of muzzle.

6) Ram - Cartridge: Insert rammer and press charge home; draw rammer out by grasping at little end with forefinger and thumb tips of right hand; pull out about half-way, steady rammer with left thumb at muzzle, re-grasp with right fingertips and thumb; clear the bore and turn, head passing near the left shoulder, and insert in pipes until right hand reaches the muzzle.

7) Return - Rammer: Force rammer home with little finger; pass left hand down barrel to extent of arm.

8) Prime: Raise piece with left hand to height of eye; grasp small of stock with right hand; half-face to right, placing right foot behind and at right angle to left -- left heel against right hollow; slip left hand to lower band, thumb along stock, left elbow against body; bring piece to right side, butt below right forearm, small of stock against body and 2" below right breast, muzzle on level with eye; half-cock; remove old cap and replace with new; return right hand to small of stock.

9) Ready: Pull hammer back to full cock; keep fingers outside guard.

   Aim: Bring piece up to eye level; place finger on trigger.

   Fire: Pull trigger.

If the instructor does not desire the recruit to fire, he will command "Recover - Arms" while the recruit is at Aim. At the command "Recover", the recruit will remove his finger from the guard; at the command "Arms", he will assume the "Ready" position. The instructor may then, at his discretion, cause the recruit to "Aim" and "Fire".

After the piece is discharged, the recruit will hold himself in the firing position until commanded to assume the "Shoulder Arms" position. From here, the instructor will command "Order Arms" and then "Spring Rammer".

Spring - Rammer: From "Order Arms" bring the piece to the front as in the first motion of loading; remove rammer and insert in the bore, head up; either instructor or recruit will lightly "spring" rammer on breech end of bore to ensure the piece has been discharged; return rammer to pipes; assume "Order Arms" position.

"Spring - Rammer" should be done informally before the firing demonstration and formally at the conclusion. While it is fairly obvious whether a single weapon has discharged or not, it may be less so in demonstrations involving two or more weapons. Springing rammers is an additional safety device to avoid accidental discharges and double-loading.

Misfire Procedures: If the weapon fails to discharge (i.e. the cap fires but the charge doesn't, or both), demonstrator or instructor will call "Misfire". Demonstrator will hold steady at "Aim" position for ten (10) seconds. Instructor will then command in succession: "Recover Arms - Prime" (try a new cap) - "Ready" - "Aim" - "Fire". Repeat these steps as many times as seems appropriate. If the weapon still fails to discharge, remove it to a pre-selected safe area at port arms (muzzle up and away from visitors).

Procedures to Discharge or Disarm Weapon: Remove cone and clean vent with pick (needle, safety pin, paper clip, etc.), replace cone, prime and fire. If that doesn't get it after a few tries, remove cone, add a small amount of powder in the vent, replace cone, prime and fire. If that doesn't work, pour water down the barrel to neutralize the charge.

Example of possible steps in a rifle demonstration:

Demonstrator: Snap cap prior to program; assume "Shoulder Arms" position behind instructor.

Instructor: Welcome, introduction, safety message.
Commands: "Support - Arms"

"_____ steps forward - march"

"Shoulder - Arms"

"Order - Arms"

"Rest"

Explanation of uniform, weapon, equipment, tactics, etc.; Introduction to firing demonstration.
Commands: "Attention - Squad"

"Shoulder - Arms"

"Load in Nine Times - "

"Load etc..." (Instructor will explain each step)

"Fire"

"Shoulder - Arms"

"Fire at Will"

"Shoulder - Arms"

"Order - Arms"

"Spring - Rammers"

Conclusion.

Some possible topics for rifle demonstration:

The American Civil War has been called the last of the old-fashioned wars and the first modern war because of an overlapping of old tactics and new weapons and devices, i.e., railroad artillery, submarine, torpedoes, land mines, aerial reconnaisance (balloons), repeating rifles, rifled artillery, fixed ammunition, ironclad ships, revolving gun turrets, machine guns, etc.

Many of the innovations, however, were experimental and it was primarily the old tactics and weapons which remained in use, i.e. single shot, muzzleloading weapons, tight troop formations, emphasis on fire discipline (probably a result of so many volunteers), and the notion, even late into the war, that shock rather than firepower would "carry the day" - in other words, that a body of men could form 100 - 150 yards from the enemy and charge, being fairly sure that the enemy could get off only one ineffective volley before their line would be struck by the irrepressible weight of the attacker.

The rifle-musket changed all that. Instead of an effective range of 100 yards, the rifle could carry and kill at 1/2 mile, thus forcing troops to form up at greater distances and advance under fire (more accurate fire) for greater distances.

The rifle-musket was modern compared to the muskets of the American Revolution and Napoleonic Wars, but obsolete compared to breechloading repeaters that came to be used during the Civil War. Both the Union and Confederate governments were slow to recognize the importance of repeating arms, and were more concerned with dependability (i.e. rely on old standard), ammunition usage (soldiers with repeaters would "waste" ammo), and fire discipline. Many government and army leaders were slow to change old ways and as a consequence, may have extended the length of the war and the number of lives lost.

Drill was intended (then as now) to instill discipline and to transform an individual into a working part of a machine - a war machine, efficient, effective and deadly. Bruce Catton put it this way: "Training camp...is a place where recruits are worked over until they are fit to go out and be killed with proper military formality." To get the green recruit from the green stage to efficiency, he was trained in stages, by the numbers, until by habit, the motions and maneuvers are executed without thinking. "You learn to do things by the numbers, you keep your mouth shut...you are thoroughly indoctrinated in the army's way of doing things. [If not]...you will probably behave disgracefully when it is time to go out and get killed." - Bruce Catton

Some Notes On U.S. Springfield Rifle-Musket:

- Principal weapon of the Union Army during the Civil War; by the end of 1863, most Union soldiers were armed with either the Springfield or Enfield.
- Weight: About nine (9) pounds
- Cost in 1861 -- $14.93
- All parts interchangeable

- Between 1861 and 1864, 640,000 Springfields were manufactured and delivered to the Union Army.

- Muzzle Velocity: 950 feet per second (1903 Springfield had muzzle velocity of 2300 feet per second).

Cleaning the Rifle-Musket:

Place short length of plastic hose on nipple; using a funnel, pour hot soapy water down the bore allowing it to run completely through the bore and vent. Use cleaning rod with brush to help loosen and remove powder residue. When water comes out clear, swab out the bore with rammer and worm and patches. Use solvent to remove any remaining powder residue, then clean patch, and finally patch soaked in oil or RIG. Use solvent to clean exterior metal parts that have powder residue on them (cone, hammer, rammer) and coat with oil or RIG. Brass cleaner may be used on brass fittings to make the piece shine, and wood polish for the stock. Clean after each day's firing.