# Ordnance Information Relevant to Fort Massachusetts

NOTE: Letter and page number references in the text of this booklet indicate the sources from which the information was extracted. A letter has been assigned to each of the source books listed in a bibliography on the last page.

# COLUMBIADS: GENERAL

- Definition: A large calibre gun used for seacoast defense. Designed to fire solid shot or shells. Invented by Colonel George Bomford in 1848. The name "Columbiad" derives from the Columbia Foundry in the District of Columbia, where most of the early Columbiads were cast. There is no authoritative, precise definition of the term "Columbiad." It was a vague term, and was loosely applied to various large cannons. The preceding definition, therefore, is a "consensus definition" drawn from many sources.
- The smallest Columbiad had an eight inch bore diameter. The largest had a twenty inch bore diameter.
- They were all originally cast as smoothbores, although some were later rifled.
- Confederates had no fifteen inch Columbiads, [C: P.82]. The largest gun cast by them seems to have been a twelve inch Columbiad.
- Columbiads cast by Confederate foundries were distinguished ~~the~~ from those cast by Union foundries by their exterior finish. Union Columbiads were turned on a lathe after casting, which added nothing to the weapon's effectiveness, but was done solely for appearance sake, i.e. to produce

# COLUMBIADS: GENERAL

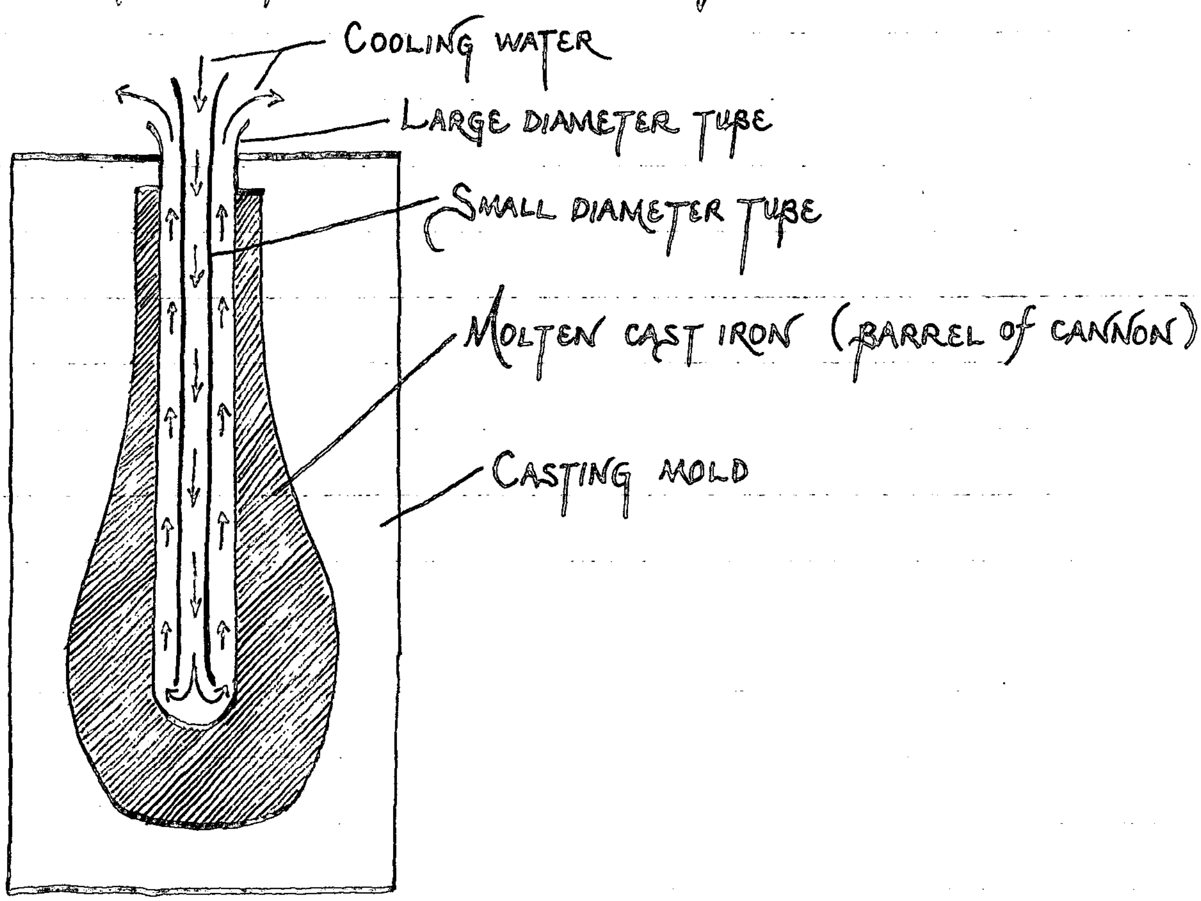
a smooth surface. This attention to cosmetics was eschewed by the South, which could not afford the time or money on such luxury, [C: P. 83].

## 15 INCH RODMAN COLUMBIAD

- The term "Rodman" refers to cannons which were cast according to a particular design and process developed by Thomas J. Rodman in 1861. Capt. Rodman developed a pressure curve which manifested itself in the contour of the barrel, which had a distinctive "bottle" shape, [B: P. 104]. In addition, T. J. Rodman developed a casting process whereby the barrel of the cannon was cast around a hollow tube which was closed at one end. A smaller diameter tube, open at both ends, was inserted into the wider tube. Cooling water entered the smaller diameter tube and flowed out through the larger diameter tube. Coals were heaped around the outside of the casting mold to insure that the barrel was cooled from the inside out. This "inside-out" cooling method meant that each succeeding layer of the hot barrel was shrunk tightly on the layer under it, i.e. the layer closer to the cooling core, [C: PP. 78-79; B: P. 101].

# 15 INCH RODMAN COLUMBIAD

- Diagram of Rodman's casting process:




- First 15 inch Rodman was cast in 1860 at the Fort Pitt Foundry in Pennsylvania, [C: P. 80]
- Standard service charge was established to be fifty pounds of black powder, [C: P. 80]. More, or less, powder could be used, depending upon circumstances.
- No 15 inch Rodman was ever fired in belligerent activity, [C: P. 80].

# 15 INCH RODMAN COLUMBIAD

- Vertical aiming range was from (−) 5° depression to (+) 39° elevation, [D: p. 165; B: p. 101].
- For a gun crew of seven men [D: p. 165], an average time of one minute and ten seconds was required for loading and firing the cannon, [C: p. 228]. This time rate excludes any change in horizontal aim, a slow and laborious chore. As an example, an additional two minutes and twenty seconds were needed to re-aim the cannon ~~trough~~ through an arc of ninety degrees, [B: p. 107]
- A gun crew of as many as twelve men could be involved in the operation of the cannon.
- A shot from a 15 inch Rodman, ~~a~~ as large and powerful as it seems, would still have been insufficient to pierce an ironclad warship. Says Bruce Catton, eminent historian of the Civil War: "It developed, as the war wore along, that the only way to deal with an ironclad was to fire solid shot from the largest smoothbore cannon available — 15 inch, if possible — at the closest possible range. These would not exactly pierce good iron sheathing, but repeated blows might ~~c~~ crack it so that other projectiles could pierce it." [Short History of the Civil War, Chapter five. Dell Publ. Co., N.Y., 1960]

# 15 INCH RODMAN COLUMBIAD

- Cannon dimensions and statistics [mostly from C: p. 369 and D: p. 164, unless otherwise indicated]:

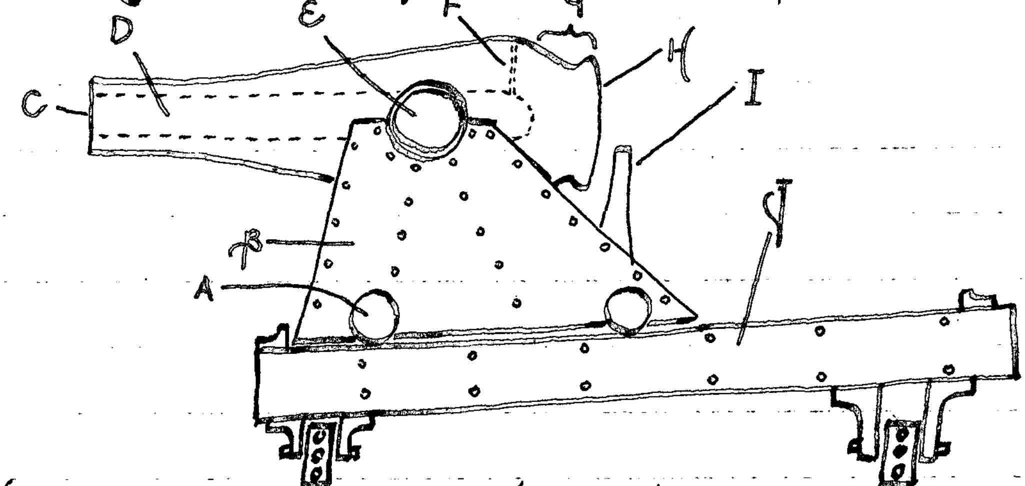
BARREL LENGTH: 16 ft. 0 in.
BORE LENGTH: 13 ft. 11 in.
BORE DIAMETER: 15 in.
MAX. EXTERNAL DIAMETER of BARREL: 4 ft.
WEIGHT of BARREL: 50,000 LBS (APPROX. AVERAGE)
DIAMETER of PROJECTILE (SHOT OR SHELL): 14.9 in.
WEIGHT of SHELL: 302-360 LBS (VARIABLE) [C: p. 179; D: p. 164]
WEIGHT of POWDER CHARGE IN SHELL: 17 LBS.
WEIGHT of SOLID SHOT: 440 LBS. [C: p. 80]
WEIGHT of CORED SHOT: 400 LBS. [C: p. 179]
RANGE (40 LBS. POWDER, 28.5° ELEVATION, 320 LB. SHELL): 3¼ MILES (= 5,730 YARDS), [D: p. 164]

# 10 INCH RODMAN COLUMBIAD

- Cannon statistics [C: pp. 369, 379]:

BARREL LENGTH: 11 ft. 4.6 in.
BORE LENGTH: 10 ft. 0 in.
BORE DIAMETER: 10 in.
WEIGHT of BARREL: 15,000 LBS (APPROX. AVG.)
DIAMETER of PROJECTILE: 9.9 in.
WEIGHT of SHELL: 102 LBS.
WEIGHT of SOLID SHOT: 128 LBS.
RANGE (20 LBS. POWDER, 39.25° ELEVATION, 128 LB. SHOT): 3.2 MILES (= 5,654 YARDS)

# Anatomy of a Columbiad




A. Carriage wheel: These wheels were on eccentric ~~of~~ axles. When the wheels were put in position to support the weight of carriage and barrel, cannon could be rolled forward on chassis into firing position. When carriage wheels were thrown out of position, bottom of carriage was in direct contact with chassis, which created friction to slow recoil of cannon when fired.

B. Carriage

C. Muzzle: Mouth, or opening of bore.

D. Bore

E. Trunnion with Rimbase: Trunnions are the two lateral, cylindrical extensions from the barrel which support the barrel on the carriage. The areas of attachment of the trunnions to the barrel ~~is~~ are named rimbases. The position of the trunnions near the barrel's center of gravity makes vertical aiming a less strenuous chore.

# Anatomy of a Columbiad

F. VENT: Tube leading from top of the barrel to the bore for use in igniting the powder charge. Two vents may be found on some cannons. One of the vents would not be drilled all the way through to the bore until the functioning vent had, through use, dialated to ~~th~~ a width which made it unsafe to use. It was then plugged, and the other vent was drilled completely to the bore for service. The vent hole was the aperature into which the friction primer was inserted. The vent was usually only one-fifth of an inch in diameter.

G. BREECH: Rear end of barrel.

H. BASE OF BREECH: Rear surface of barrel.

I. RATCHET POST: Utilized in conjunction with a series of indentations in the breech base to set the elevation of the gun.

J. CHASSIS

# Rifled Ordnance: General

- Rifling - definition: A method of imparting spin, or rotation, to a projectile as it moved through the bore. This spin is achieved by a spiraling configuration of the bore. The spiral configuration consists of indentations (grooves) and raised portions (lands). [C: p. 355].
- Purpose ~~&~~ and significance of rifling: 1) Increased accuracy, 2) Increased range, 3) Increased impact when projectile struck target.

The increased accuracy of rifles over smoothbores is a property of the spinning motion of the projectile. Spinning motion involves angular momentum, which manifests itself as directional stability or directional accuracy - (gyroscopic principle).
The increased range and impact were properties attributable to the shape of the projectiles fired from rifles. Unlike the spherical cannonball fired from a smoothbore cannon, rifles shot elongated, bullet-~~shape~~ shaped projectiles which had better aerodynamic qualities.

- "For many years artillerists had coveted the accuracy of the rifled small arm, but they had been hampered because no projectile had been designed that could be loaded easily yet fit the bore tightly enough in firing to take the

# Rifled Ordnance: General

spin imparted by the spiral grooves of the rifling. Finally, just about at mid-century (1850's), a number of projectile designers suddenly succeeded almost at the same time," [B: p. 92].

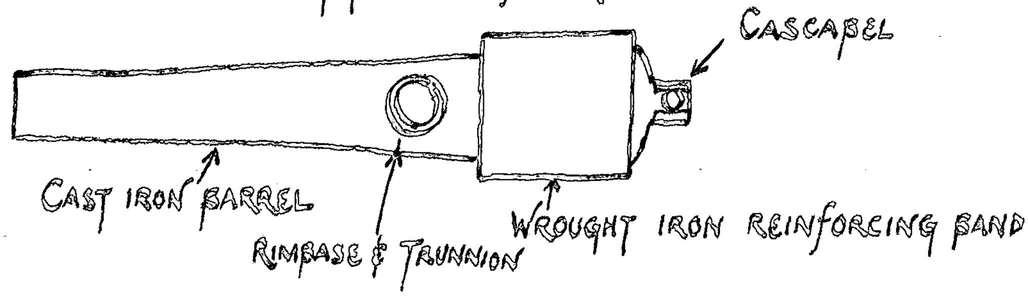
- The most successful type of rifled projectiles developed had a soft-metal ring attached to the base of the projectile. The soft metal, brass or copper, expanded upon firing. Thus, they could be loaded loosely, yet fit tightly as they left the bore. [B: p. 110; C: pp. 289-342; D: pp 510-532].
- Although rifled cannons were used as early as 1859 by Napoleon III in his Italien Campaign, successful development and use of rifled cannons didn't occur until the American Civil War, [A: p. 184].
- Rifled artillary ~~was~~ still remained somewhat untrustworthy during the Civil War, and the great mass of heavy artillary used during the Civil War were smoothbores, [A: p. 140]. Also, smoothbores were better suited for some purposes, e.g. antipersonel work, when shrapnel shells or cannister fired from smoothbores were most effective. In addition, in sea-operations or naval warfare, cannonballs could be skipped

# Rifled Ordnance: General

along the surface of the water until reaching the target, whereas rifled projectiles would ricochet off the surface at unpredictable angles which required precise aim and a direct hit. [C: p. 118].

- The first truly significant and successful employment of rifled cannon was in February, 1862, during the Union attack on the Confederate-held Fort Pulaski, in Georgia. The Union established their rifled cannons in a battery one mile away from the fort. Less than 48 hours after bombardment ~~com~~ commenced, a thirty foot breach in the fort wall was opened, with a hundred-foot wide portion of the wall generally destroyed. The Confederates hastily surrendered. It was the first example of the breaching power and impact of rifled ordnance at a reasonably long range. [Battles and Leaders of the Civil War, vol. II. Johnson, Robt., and Clarence Buel editors. The Siege and Capture of Fort Pulaski, pp. 1-12]
- Both North and South made and used rifled cannons during the Civil War.

# Parrott Rifles




- The Parrott Rifle consisted of a cast iron barrel with a reinforcing wrought iron band around the breech. It was a muzzle loader, although some were converted to breech loading pieces. [A: p. 140; C: p. 110]
- Parrott Rifles were not the first rifled cannons developed, nor the first rifles with a reinforcing band. The distinctive feature of the Parrott Rifle, developed and patented by Robert Parker Parrott, was the method of attaching the reinforcing band. In most banding methods, the band was heated (in order to expand the metal) and slipped on the barrel, then allowed to cool (causing metal band to contract). The barrel, throughout the procedure, remained stationary. ~~Parrotts~~ Parrott's method was identical, except that the barrel tube was rotated (around its long axis), while the reinforcing band cooled around the breech. The contracting band clamped itself uniformly to the breech instead of ~~a~~ hanging from one spot and cooling there first as it would if the tube were stationary.

# Parrott Rifles

Parrott felt that his procedure augmented the strength of his rifles, [C: P. 110]

- Parrott rifles were produced at the West Point Foundry; the first being made in 1860.
- Six sizes of Parrott rifles were made: 10-, 20-, 30-, 100-, 200-, and 300-pounder. At the end of the Civil War a 60-pounder was developed. The names of the rifles derive from the appoximate weight of the projectile which they fired, [C: P. 109]
- The 100-pound Parrott Rifle was first produced in the summer of 1861, [C: P. 109].
- Parrott Rifles had an alarming tendency ~~to~~ of bursting, actually flying apart into fragments, during service. Most upsetting was the unpredictability of when the cannon would break: e.g. a 30-pounder Parrott Rifle used in the siege of Charleston in 1863 burst when firing the 4,606TH round, fragmenting into seven pieces. However, a 200-pounder Parrott Rifle which was also being used in the siege burst at only the 36TH discharge of the cannon. Two 100-pounders which were also being used at Charleston burst on the 122ND round and the other on the 1,151ST round.

# Parrott Rifles

Despite their shortcomings, most military men assessed the Parrot Rifles as a worthwhile risk. The advantages of the Parrott Rifle were: 1) It was easy to operate by inexperienced ~~can~~ cannoneers; 2) it was tough — "break off a piece of the muzzle, chip it back, and keep on firing;" 3) it was cheap to manufacture; 4) it could be produce quickly and in quantity when rifled artillery was desperately needed. In summary, as one author wrote: "The Parrott wasn't the best, but it was good enough. If heavy rifles burst killing their cannoneers on the platforms, far more ~~enemy~~ of the enemy died on the target." [C: CHAPTER 6]

- Cannon statistics for 100-pounder Parrott Rifle [C: P. 371]

BORE DIAMETER: 6.4 IN.
BORE LENGTH: 130 IN. (≅ 10 ft. 10 IN)
BARREL LENGTH: 155 IN. (≅ 12 ft. 11 IN)
~~B~~ WEIGHT OF BARREL: 9,700 LBS.
STANDARD POWDER CHARGE: 10 LBS.
WEIGHT OF SHOT (HOLLOW): 80 - 86 LBS [A: P. 179; C: P. 371]
WEIGHT OF SHELL: 101 LBS
RANGE (35° ELEVATION, SHOT (HOLLOW)): ~4.8 MILES (= 8453 YDS.)

# AMMUNITION: PROJECTILES

- Smoothbore cannons ~~cou~~ could fire solid shot, shells, or case shot. Types of case shot were shrapnel, cannister, and grape shot, [A: p. 177]
- Solid shot: Solid iron spheres which were designed to cause destruction by their sheer weight and force of impact. A form of ~~solid~~ shot, called "cored shot," ~~to~~ consisted of an iron sphere containing a small hollow cavity. Cored shot contained neither powder or fuse, and was especially suited for large ~~&~~ caliber gun, e.g. the 15-inch Rodman. Solid and cored shot were designed to be used for destruction of heavy walls of fortifications, [A: p. 176; C: pp 255-257].
- Hot shot: Heating solid shot in a "hot shot furnace" transformed the projectile into an incendiary. Hot shot was especially effective against wooden ships, and were found in most coastal fortifications. For a 24-pounder shot, it required about an hour and a quarter to bring the furnace and shot to the point of being red hot. With furnace already hot, only 25 minutes were needed to heat cannon balls. Larger balls required only a few minutes more to heat, [C: pp 257-258]. By the outbreak of the Civil War, hot shot had mostly been supplanted by explosive shells [C: pp 257-8].

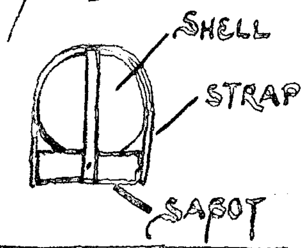
# AMMUNITION: PROJECTILES

- Shells: a hollow shot filled with powder and containing a hole into which a fuze would be inserted. When fired at works or buildings, the fuze would be sawed off to a length to allow enough time to elapse for the shell to penetrate the target before bursting. When fired at troops, shells were prepared to burst over their heads. [D: p. 551; A: pp 178, 180].

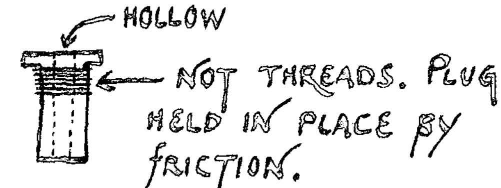
Fuze had to point outward, away from powder cartridge, when seated at the bottom of the bore of a cannon after being loaded. If the fuze was turned toward the cartridge, it might be driven into the shell at discharge and explode within the cannon. Therefore, to seat the shell properly, a cylindrical block of wood was strapped to the shell on the side opposite the fuze. This wooden block was called a "sabot," [C: p. 258]. Fuzes consisted of a hollow tube (fuze plug) into which the actual fuze (a burning composition encased in paper) was inserted. The filled, wooden fuze plug was then inserted into a hole in the shell after being sawed to an estimated appropriate length. Large cannon shells had brass fuze plugs which were not sawed, ~~but were fulminates of different compositions~~ but were filled with fulminates of varying compositions

# AMMUNITION: PROJECTILES

which burned at different speeds, [D: pp 319-320; C: p. 275].

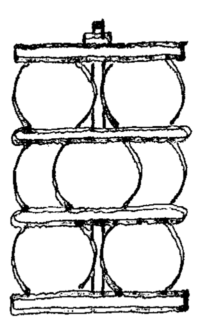



SHELL & SABOT

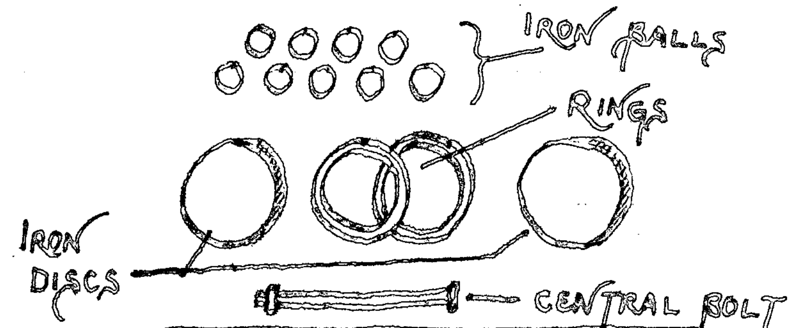



BRASS FUZE PLUG

- Shrapnel: similar to shells, except shrapnel has thinner walls, and is filled with small iron musket balls as well as gun ~~powt~~ powder. [A: p. 177]
- Grape shot: True grape shot had been supplanted by cannister and shrapnel shells by the 1840's. Although soldiers still refered to being ~~shot &~~ hit by "grape" in ~~colls~~ common colloquy, no actual grape was use during the Civil War, [B: p. 107; C: pp 264-265]. Grape shot consisted of nine iron balls, top and bottom iron discs, two rings, and a long bolt, [D: pp 325-326; C: pp 264-265].



GRAPE SHOT




ELEMENTS OF GRAPE SHOT

# AMMUNITION: PROJECTILES

- Cannister: Cannister is essentially enclosed grape shot: the enclosure formed by a sheet of tin. The balls filling the cannister were smaller ~~that~~ than the four to eight inch diameter balls used with grape shot. Each cannister contained twenty to forty balls normally, which were separated into tiers by wood discs. Often cannisters were just packed with the balls imbedded in sawdust. The external appearance of cannister resembled a large tin can. § Neither cannister or grape shot contained a bursting charge. They simply shattered at the muzzle of the cannon and were useful for antipersonel work, somewhat like an amplified shotgun blast, [A: p. 177; C: pp. 267-268].
- Time fuzes were not completely reliable. The cannon ball fuze often was extinguished during flight or upon impact, and the bursting charge, which was intended to cause the damage, would not explode, [A: p. 178].
- ~~Rifled or~~ Rifle projectiles fall into two categories: shells and bolts. All of these projectiles were more or less bullet-shaped, and had a some type of soft-metal band or base which would expand upon firing, or they had flanges which

# AMMUNITION: PROJECTILES

would follow the spiral grooves in the bore of a rifle, [C: P. 290]. Bolts were either solid or cored, but contained no bursting charge. Shells had a hollow cavity filled with a charge of powder. A time fuze or a fuze that would detonate upon impact would be screwed into the nose of the shell. Percussion fuzes came into existence with the invention of the rifle, because it was possible to know with certainty which end of the projectile would strike the target, thus making feasible a fuze that would explode on impact. Round shot used with smoothbores could strike in any position, and hence required the exclusive use of time fuzes, [B: P. 113].

# AMMUNITION: POWDER

- Gunpowder of the Civil War was a mixture of charcoal, saltpeter (~~pot~~ potassium nitrate), and sulfur in the proportions 76-14-10 by weight, [C: P. 241].
- Gunpowder was packed 100 pounds to a barrel, and these wooden powder barrels were then stacked and stored in the magazines of a fort. (The word "magazine" was borrowed and distorted from ~~the~~ an Arabic term meaning "storage room," [C: P. 243]

## Ammunition: Powder

- Gunpowder was often pre-packed in wool or flannel cartridge bags before being ~~st~~ put in the wooden barrels. These barrels, with their ready-to-load cartridge bags, were then stored in the smaller and more conveniently located "service magazines" or "ready rooms" of a fort. [C: pp 243], 227]
- Magazine sentinels made sure that anyone entering a powder magazine removed swords, canes, shoes with nailed-on soles, and any other metallic object which might cause a spark or generate static electricity. [C: p. 243].

## Firing Procedure of a Muzzle-Loader

- Vent cover and tampion (which covered the muzzle-end of the bore) were removed.
- The bore of the cannon was sponged clean. This was also done periodically between firing to extinguish and remove any smoldering debris. The sponge resembled a ramrod, with the exception of its large, rounded, wool covered head. Sponges were used wet and dry. Wet sponges were more effective for extinguishing smoldering material, but they formed a paste of charred material in the bore. During sponging, the vent hole was often covered by the gloved finger of a cannoneer to prevent smoldering ashes from being pushed up

# Firing Procedure

into the vent creating the possibility of premature ignition of the gun powder.

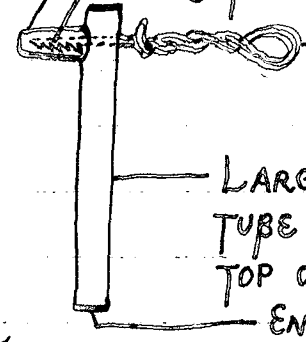
- Cartridge bag containing powder was inserted into bore and rammed to breech.
- Cannon ball was loaded and rammed into gun.
- A pointed wire (priming wire) was inserted into vent and a hole was pricked through the cartridge bag.
- Cannon was aimed laterally and vertically. The sighting device (or devices) were not permanently attached to barrel, but were put into position on top of the barrel, then removed before firing.
- Lanyard (a long line with a handle on one end) was attached to friction primer (the igniting device that ~~was~~ would set off the main charge of powder), and friction primer was inserted into vent hole.
- At the command "~~Fire!~~" "fire," lanyard was yanked and gun was fired.
- If needed, an iron implement named a "worm" was available to extract unfired cartridge bags or other debris from bore. A worm had the appearance of a corkscrew on the end of a long pole.

Reference for "Firing Procedure:" [C: Chapter 11]

# FIRING PROCEDURE

- Firing hot shot: If the projectile to be ~~fired~~ loaded and fired was hot shot, the glowingly hot cannonball could not be abutted against the cartridge bag. Instead, after the cartridge bag was loaded into the bore, a dry "wad" would be inserted after it. A "wad" was a compacted mass of hay. Following the dry wad, a wet wad was inserted. The cannon was the elevated slightly, and the hot cannonball was allowed to roll down the bore against the wet wad. Finally, another wet wad was inserted to hold the ball securely in place, [C: p. 258].
- A single ~~dy~~ dry wad was sometimes inserted after a shot or shell which was not heated. The function of the wad, in this case, was to hold the cannonball in place — especially if the vertical aim of the cannon was at a slight downward inclination. It would otherwise be somewhat embarrassing for the ball to come dribbling out of the barrel as the ~~cor~~ cannoneers prepared to shoot, [C: p. 226].

# FIRING PROCEDURE




FRICTION PRIMER — DIAGRAM IS ENLARED. ACTUAL DIAMETER OF LARGER BRASS TUBE IS ONLY 3/16 (0.19) INCH WIDE.

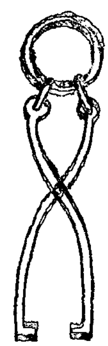
– The friction primer, illustrated above, consisted of two brass tubes. The smaller tube, open at one end, was inserted into a hole drilled into the larger tube. The smaller tube was filled with a paste of friction composition. Embedded within the friction composition was the serrated (toothed) end of a wire. The opposite, looped end of the wire would be connected to a line, or "lanyard" – (not illustrated). The friction composition in the small tube was contiguous with ~~musket~~ gun powder which filled the larger brass tube. When the wire was pulled out of the primer device (by yanking on the lanyard), the serrations on the wire ignited the friction composition, which in turn ignited the powder in the larger brass tube, which finally set off the main charge of powder in the cartridge bag, [C: p.233; B: pp. 116-117].

# Miscellaneous

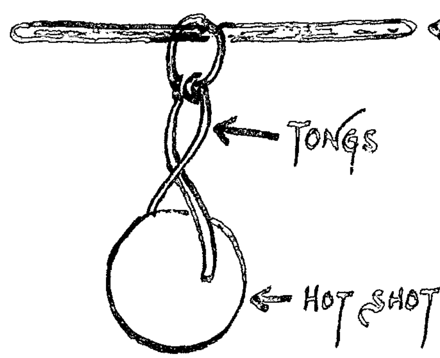
- All cannons made during the Civil War were test fired before leaving the foundry at which they were manufactured. The testing generally consisted of firing three rounds with powder charges approximating the maximum used in service. [C: P. 245].
- Muzzleloaders were generally supplanted by breech loading cannons after the Civil War.
- The ~~practise~~ practice of skipping cannonballs over the water's surface was utilized in ship-to-ship warfare and land-to-ship warfare. This procedure had the advantage of only requiring accurate lateral aim, in contrast to precise vertical as well as lateral aiming. Writes one author: "... wood ships were extremely vulnerable to hot shot which could ricochet several times on the water and still retain sufficient heat to accomplish their incediary ends. Against such shipping, hot shot were fired with reduced charges to limit ~~pentration~~ penetration to a depth of ten or twelve inches. If shot buried deeper, combustion was curtailed through lack of air." [C: PP 258, 275]

# Miscellaneous

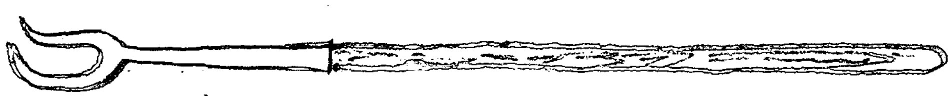
– Handling hot shot, [B: p. 115; C: p. 226]:



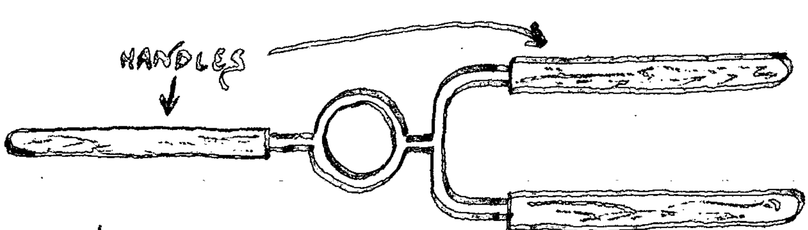
SHELL TONGS




← STANDING ON OPPOSITE ENDS OF THIS POLE, 2 TO 4 MEN COULD GRASP THE POLE AND LIFT THE HOT SHOT.



FORK, WITH WHICH HOT SHOT WAS EXTRACTED FROM FURNACE




LADLE, BY WHICH HOT SHOT WAS CARRIED FROM FURNACE TO CANNON. SHOT WOULD SIT ON RING.

# Fort and Ordnance Bibliography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