GARDINER'S EXPLOSIVE MUSKET SHELL

By: John D. Hamilton

Figure 1. John Jacob (1812-1858). (www.myjacobfamily.com.)

The concept of an explosive musket shell evolved prior to the American Civil War. It was the brainchild of British Major John Jacob (1812-1858; Figure 1) as a byproduct of the development of a four-groove long range rifle (based upon the Brunswick two-groove system of a belted ball) and perfected by the time of the Indian Mutiny of 1857 to fire both solid and shell projectiles (Figure 2).

Jacob's explosive shells were specifically designed to blow up mutinous Indian artillery caissons at long range, essentially over 1,000 yards. Jacob's solid projectile had a conical bullet with a pointed nose, round base and four studs to engage the special four-groove rifling (Figure 3).

Figure 3. Muzzle of Jacob rifle showing four-land rifling and matching four-lug explosive projectile. (www.gunrightsmedia,The Jacob Rifle)

Jacob's exploding device relied upon a pointed, copper percussion tube nose insert, resembling a .22 cal. long rifle cartridge case, but filled with fulminate of mercury (Figures 4 and 5). These were manufactured by the Ely Brothers of London. This fitted into the hollow nose of his "explosive" bullet variant. The composition of the explosive element was variable. W.W. Greener had this to say regarding the explosive compound for shells: "This should be mixed as follows; - Take sulphuret of antimony and chlorate of potash, pounded separately and mix carefully equal parts by weight with a bone knife, on a plate or other smooth surface"[1] For additional information on the Jacob rifle please see Carlson.[2]

It is quite probable that a number of imported Jacob rifles had already found their way to sportsmen in the northern and southern states before the fall of Fort Sumter. These few individuals could have acquired a Jacob rifle from any of the numerous New York City military and sporting goods establishments such as Schuyler Hartley & Graham (Figure 6) and others who were also sales agents for fine English firearms. Samuel Gardiner, Jr. of New York

Figure 2. Double-barreled Jacob Rifle by Swinburn & Son, London, 1861. (Photo courtesy of Stuart Mowbray and Bob Carlson[2])

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City might have acquired knowledge of the exploding cartridge concept at such an arms retailer. The Jacob rifle's reputation among a limited civilian group of sportsmen may have provided Gardiner with the idea for a variation of an explosive projectile that could be adapted to military use in the standard Model 1861 U.S. Rifled Musket that was already utilizing a government produced .58 caliber, 540 gr. Bullet (Figures 7-10).

Figure 4. Jacob bullet with fulminate of mercury filled explosive inserts (Bob Carlson[2])

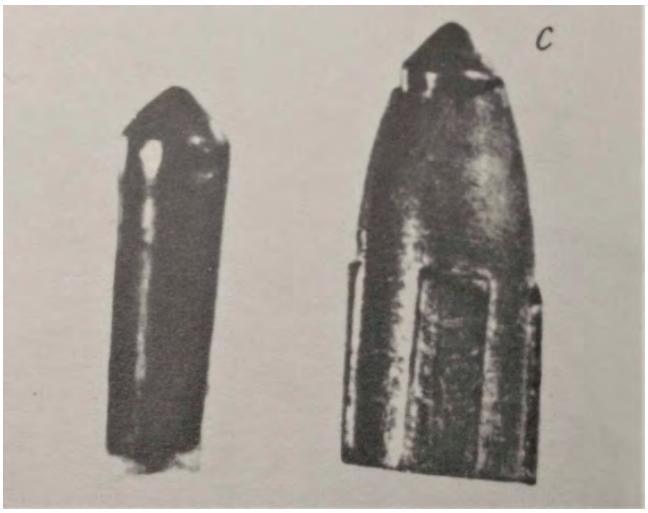

Figure 5. Jacob explosive bullet with its copper nose insert.[3]

Figure 6. 1864 view of the Schuyler, Hartley & Graham sales emporium at 19 Maiden Lane and 22 John Street, New York, N.Y.[4]

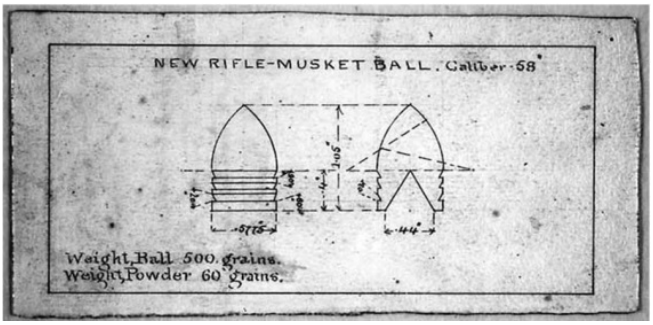

Figure 7. Minié type hollow base projectile designated as the "New Rifle-Musket Ball. Caliber .58 " made at Harpers Ferry Arsenal, an operation that was under the direction of armorer Capt. James H. Burton (1823-1894).

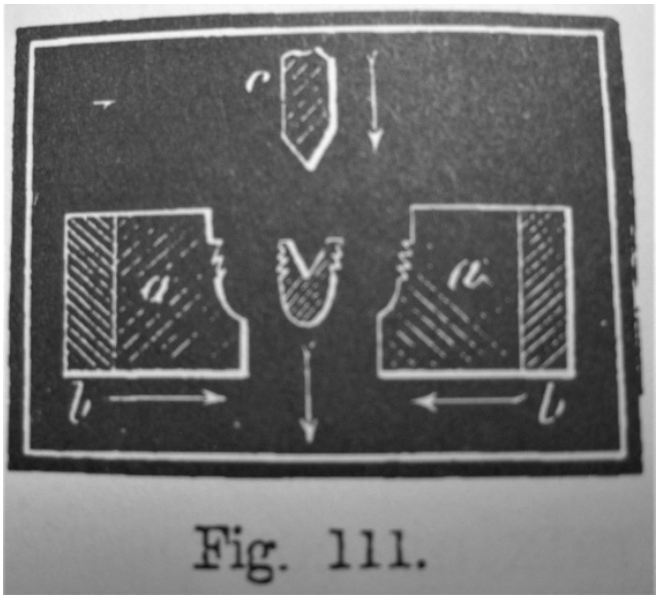

Figure 8. Textbook illustration of the arrangement of the dies and punch-pressing process in the series of automated mechanical presses and punches forming short billets of lead into finished Minié bullet projectiles, capable of being made at a rate of 3,000 bullets an hour at Harper's Ferry.[5]

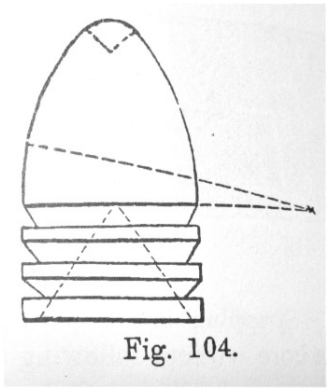

Figure 9. Benton's textbook diagram of the then current U.S. service Minié type bullet with conoidal oblong nose, grooved body to hold lubricating grease to ease in loading, and a conical cavity in the base that expands upon firing to fill the rifling grooves from which it receives rotary motion that stabilizes its flight.[6]

Benton (Figure 11) was the Ordnance Department officer assigned as instructor of the course on ordnance and gunnery at the United States Military Academy at West Point from 1857 to 1861. He was the author of the U.S.N.A. Ordnance and Gunnery textbook (1st edition printed in 18595) and from 1861 to 1866 served in Washington, D.C. as Principle Assistant to the Chief of Ordnance, General James Wolf Ripley (1794-1870). While serving

under Ripley, Benton becomes embroiled in the pros and cons associated with the use of exploding bullets. Benton noted that *"A distinguishing feature of this bullet is, that no patch of any kind is used in loading; in nearly all other modern bullets a greased patch of cloth , or paper, envelopes them when placed in the bore."* Benton discussed the use of other projectiles such as Hale's rockets (then in U.S. service) and the advantage of their *"terror and noise and fiery trail produce against mounted troops"*, but he also stated *"The numerous conditions to be fulfilled in their construction in order to obtain accuracy of flight, and the uncertainty of preserving the composition uninjured for a length of time, are difficulties not yet entirely over-come, and which have much restricted their (rockets) usefulness for general military purposes."*

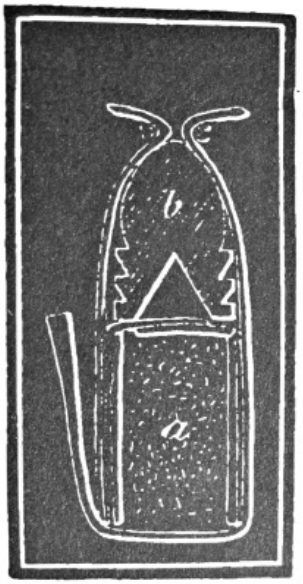

Fig. 112.

Figure 10. Benton's textbook illustration - U.S regulation three-part Minié Cartridge: (a) greased bullet, (b) cylinder containing powder, (c) paper wrapper unites cylinder with bullet and protects lubricant in bullet's grooves. Fold of wrapper is torn off to pour powder into bore, then break off bullet from cylinder and insert in bore. Its distinguishing feature is a conical cavity in its base; and that no patch is used in loading.[7]

James G. Benton
U.S. Ordnance Dept.

Figure 11. Capt. James Gilchrist Benton (1820-1881). Ordnance Department officer assigned as instructor of the Course of Instruction in Ordnance and Gunnery at the United States Military Academy at West Point from 1857 to 1861.

It is also possible that Gardiner had seen a copy of Benton's textbook wherein the Jacob cartridge and its employment was examined. It could have inspired Gardiner's idea, identified on his patent, as an "Improvement in Explosive Projectiles for Muskets and other Small-Arms." The time lapse between the publication of Benton's text first edition in 1859, or second edition in 1862, and the awarding of Gardiner's patent in 1863 might suggest that the formers inspired the latter.

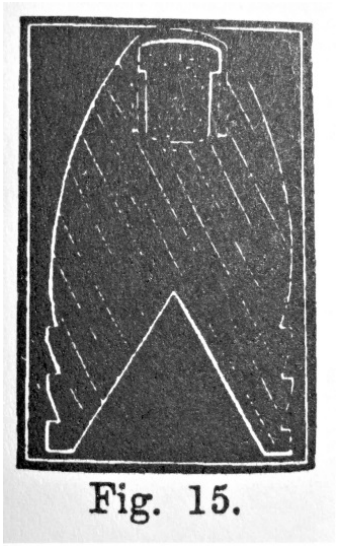

Fig. 15.

Figure 12. Benton's textbook illustration of a "Percussion bullet" or Jacob type explosive bullet "used to blow up caissons, and boxes containing ammunition at very long distances."[8]

By 1862 explosive bullets were already included in the ordnance and gunnery course curriculum taught by Benton in his 1862 second edition textbook.[6] Benton illustrated essentially a diagram of the Jacob exploding bullet (Figure 12). He further explained that it *"may be made by placing a small quantity of percussion powder enclosed in a copper envelope* (resembling a .22 rim fire cartridge case), *in the point of an ordinary rifle-musket bullet, or by casting the bullet around a small iron tube, which is afterward filled with powder and surmounted with a percussion cap"*. Benton concluded that *"These projectiles can be used to blow up caissons, and boxes containing ammunition, at very long distances."*[9]

The crux of Gardiner's invention, as disclosed in his patent letter of specification, consisted of forming and casting a Minié type conical bullet, complete with a fuse channel leading from the center of its hollow-base to a small copper cup made of two halves soldered together to form the chamber that will hold the secret explosive substance or compound. The chamber will be suspended within the center of the mold's cavity while the molten metal is being poured by means of a tiny mandrel supporting the small explosive chamber with its small access tube leading from the fuse to that chamber. The nature of Gardiner's invention as described in his patent's Letter of Specification reads: "consists in manufacturing musket and other small-arms shells, forming and casting the shell complete and at one operation, which is done successfully by forcing the heated metal into the mold by *a force pump placed in connection with the reservoir of heated metal. The machine is similar to a squirt used by type-manufacturers* (author's emphasis). The material used in manufacturing the shell is lead or any other material that will expand enough to fill grooves in the gun, and at the same time, when the explosion takes place, to break into several parts…. the fuse-mixture can be so arranged as to explode in one, two, or more seconds."

Apparently the composition of Gardiner's explosive substance was a carefully guarded secret. Recently, a contract letter has been offered for sale on e-BAY dated November 19, 1861 revealing that Gardiner sold a one-eighth right to his secret of manufacturing the exploding compound used in his projectiles. This legal transaction seems to indicate that he was in the process of forming a manufacturing operation or finding financial support before he had a government contract in hand. Gardiner swore the party of the second part to not divulge or make known the secret of manufacturing said compound.

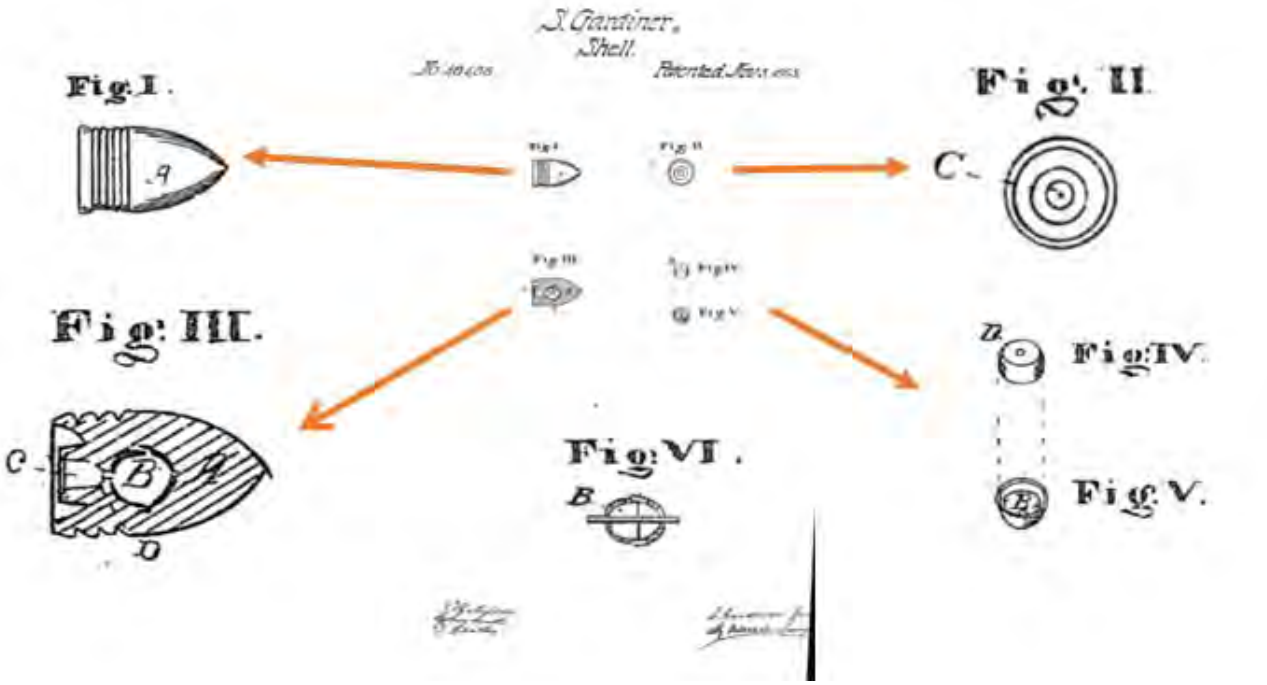

Figure 13. Samuel Gardiner, Jr.; U.S. Pat. # 40,468 on Nov. 3, 1863. – Improvement in Constructing Hollow Projectiles. Manufacture of Explosive Projectiles for Muskets and Other Small-Arms, as Also for Cannon of Small or Large Caliber. Note* No date of filing the patent application was recorded, only the date of issue, which is in error (November 23) on the patent office Letter of Specification, but correct on the patent drawing as "Nov. 3, 1863".

After casting, the copper chamber could then be filled with an explosive compound of phosphorus and fulminate via the fuse channel. The fuse in the projectile's hollow base was lit upon discharge of the paper-wrapped cartridge, and after a variable flight time of 1 – 3+ seconds, it detonated the internal explosive substance in the copper chamber. Unlike the Jacob projectile that had to strike a solid to detonate, Gardiner's shell fuse could be set to burst in mid-air over the caissons, or personnel in trenches.

Figure 14. Side-by-side view of an arsenal Minié ball and a Gardiner explosive shell.

Arsenal ball	caliber: .5772	weight: 487.8 gr.	length: 1.128 in.
Gardiner shell	caliber: .572	weight: 407 gr.	length: 1.130 in.

In order to provide a more brittle metal than soft lead that would yield a fragmentation effect, the shell was cast of a hard lead alloy, such as zinc or pewter. The hollow base expanded to fill the grooves of rifling and its annular rings ensured a tight bore fit providing range and accuracy. The nozzle of the fuse channel emitted flame producing a tracer effect in that, under the right light conditions, its flight path could be followed by the naked eye. To external appearances, Gardiner's shell otherwise resembled a Minié bullet in requiring a paper wrapped powder cartridge to provide the propellant (Figure 14) and had "Samuel Gardiner Jr. Shell Patent Secured" in raised letters along the bottom edge (Figure 15). After the bullet was cast the explosive compound was inserted into the chamber, and then fuse material of variable length or composition could be inserted and then the completed projectile was paper-wrapped.

Figure 15. Edge of the base ring of this example of Gardiner's Shell cast with "Samuel Gardiner Jr. Shell Patent Secured." in fine raised lettering with fuse tube and its fusible material still intact. (author's collection)

Gardiner probably based his refined bullet-casting machine upon an earlier "Machine for Casting Printing-Types" patented by David Bruce, Jr. of Bordentown, New Jersey (Figure 16). Bruce devised, constructed and fully tested a new "Machine for Casting Printer's Types" but with some original patented alterations to reflect the special aspects of synchronizing the movement of various parts of the machine. These alterations included six original changes claimed by Bruce. Gardiner then appears to have based his force pump casting machine on Bruce's design, but with changes to the mold enabling a positioning of the explosive chamber and fuse channel within the body of the projectile during casting. A discharger loosened the cast from the mold allowing the

casting to drop away from the mold upon opening. A steam engine-driven blower system, that cools the mold and could simultaneously supply air blast to many machines allowed them to cast more rapidly. These changes indicate his complicated casting operation was geared for mass-production as evidenced by his pricing of the product at $38.00 per 1,000 shells.

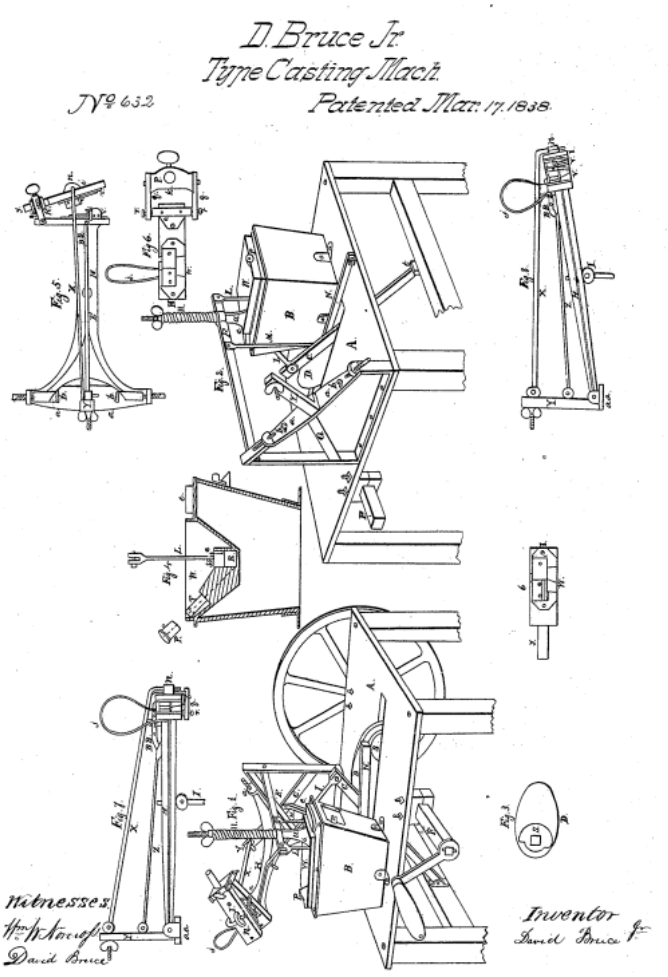

Figure 16. – David Bruce, Jr. U.S. Patent # 632 issued March 17, 1838 for Casting Printing Types, known by its motions as a "pivotal" machine; basically an automated hand mold attached to a "force pump." There was no single brand, each foundry made them for their own use.

Gardner Gets a Bad Name

Samuel Gardiner's patent for his exploding shell was filed on May 11, 1863, but not issued until November 3, 1863, but earlier in April of that year, the Commissioner of Public Buildings Benjamin B. French, a New York acquaintance of Gardiner's and friend of President Lincoln, leaked Gardiner's time-fused explosive bullet to the attention of Peter H. Watson, then Assistant Secretary of War, who in turn passed the information on to Chief of Ordnance, General James W. Ripley (1794-1870). In May, Ripley's principal assistant and former Instructor of Ordnance and Gunnery at the U.S. Military Academy, Capt. James G. Benton, related the results of the trial of a musket shell that had taken place at the Academy by Capt. Stephen Vincent Benét, who had relieved Benton as Ordnance & Gunnery instructor in 1861. Because Benton had used a Jacob projectile in a trial and as a teaching tool for the cadets and illustrated it in his Ordnance & Gunnery textbook published in 1862, the question arises as to whether Benton fully informed Ripley about the Gardiner shell's original construction and effectiveness.

In his patent application, Gardiner did not elaborate on the use to which his explosive shell was intended to be utilized. Ultimately Gardiner's application was referred to General Ripley by Lincoln, but from the outset, Ripley was dead set against the idea of using explosive bullets on the battlefield, in as much as he firmly believed their use in war was inhumane regardless of any other tactical use. Ripley does all he can to sabotage its acceptance and throughout the war continues to react as though it is primarily an anti-personal weapon to be shunned instead of a special purpose artillery projectile.[10]

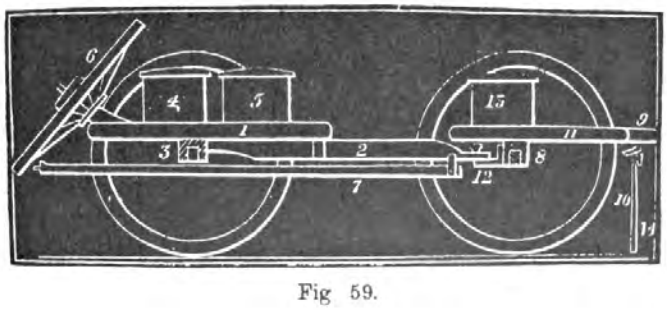

Figure 17. Illustration from Benton's text: an artillery caisson with three ammunition chests; two mounted on the body, and one on the limber. For a 6 pdr. each chest contained powder for 50 rounds, the number of rounds varied with the caliber of the piece being served making it a very desirable target for a Jacob or Gardiner bullet.[11]

Gardiner may have made this known during a personal visit he had with President Lincoln in an effort to promote the use of his musket shell. Lincoln subsequently proved supportive of its issue to the troops as an improvement on solid shot. Gardiner's application contained the following Presidential endorsement: *"Will General Ripley consider whether this explosive shell will be a valuable missile in battle ?"* Through French's influence with Assistant Secretary Watson, the bullet had already been tested by Captain Benét at West Point, and Benét had made no generalizations, but his report showed that the bullets tended to burst open in one piece rather than shatter into fragments. After getting Lincoln's note, Ripley then asked Benét rather than Benton to give his overall judgment of the bullet. Pointing out that a fixed time fuse was impracticable with varying ranges, and that a Minié would put a man out of action just as surely and less brutally, the captain declared emphatically that the shell had *"no merit as a service projectile."* General Ripley petulantly parroted Benét's reply to Lincoln. *"… it had no value as a service projectile."*[12]

Lincoln's efforts to equip the Union Army during the Civil War with weapons evolved from latest technology was a deciding factor in gaining a fair trial for Gardiner's shell. Fascinated by mechanical gadgetry, Lincoln favored the introduction of aerial reconnaissance, breechloaders, repeating firearms, machine guns (the Rafael Repeater), and promoted the use of incendiary weapons.

Chief of Ordnance Gen. James W. Ripley had been coerced by Lincoln's intercession into an extremely hostile evaluation regarding the Gardiner shell. In November, 1862, possibly at the behest of President Lincoln, Assistant Secretary of War Christopher P. Wolcott, who had replaced Assistant Secretary Tucker, ordered 100,000 Gardiner shells; 75,000 were to be of .58 caliber for infantry rifled muskets and 25,000 of .54 caliber for cavalry service. This order was for the cast

projectiles themselves, not for loaded cartridges. Acting under duress, Ripley finally placed the order on December 19, 1862 for 100,000 of the cartridges at Gardiner's price of $38.00 per thousand shells.[13]

As knowledge of the availability of the shell became known to field commanders there were a few takers. In June 1862, Brig. Gen. Rufus King (1814-1876) commanding I Corps Army of the Potomac at Fredericksburg, made a requisition for some of the Gardiner musket shells and for a second time Ripley recorded his disapproval of their issue saying "it was not advisable to furnish any such missiles to the troops at present in service." In September, 1862, Chief of Ordnance of the 11th Corps submitted a request for Gardiner's shells through Assistant Secretary of War Wolcott, who ordered 10,000 rounds to be purchased and made into cartridges. Of this number, 200 were issued for trial by 11th Corps. The shells received for trial were of inconsistent manufacture. This caused mixed reviews of the results. In October, 1862 the 11th Corps, then in reserve at Fairfax, sent in a requisition for 20,000 Gardiner musket shells and cartridges. Ripley, for a third time, again went on record as disapproving of such issue. Nevertheless, a lesser issue was made to 11th Corps of the remaining 9,800 shells and cartridges from the 10,000-round previous order, less the 200 rounds expended for trials.[14]

In June 1863, the 2nd New Hampshire Volunteers made a requisition for 35,000 of these shells, and again, by order of the Assistant Secretary of War, they received 24,000.[15] Of this number 10,060 had been abandoned by the 2nd New Hampshire in Virginia, but the remaining 13,940 were distributed to the regiment. Subsequent reports from that unit reflect that in the third quarter of 1863 – from July 1st to October 1st - about 4,000 of these shells had been used in trials and test firing, and about 10,000 remained to be used in various subsequent actions including when the 2nd New Hampshire Regiment was engaged at the battle of Gettysburg. These activities reflect that as of that point in time, of the 110,000 Gardiner explosive musket shells procured by the War Department, 35,000 were issued to troops in actual service, leaving 75,000 on hand in arsenal storage at the close of the war. However, as a Civil War equivalent of a modern "Black Rhino" cartridge, its effects on a human were gruesome as was attested to by both sides at the battle of Gettysburg.[16]

Although Lincoln himself turned away from them, certain new weapons for which he stood as godfather went on in their military careers – some obscurely, some triumphantly."[17]

As for explosive bullets or "musket shells," General Grant denounced their alleged use by the rebels at Vicksburg as "barbarous, because they produce increased suffering without any corresponding advantage to those using them," and the *Scientific American* was of like mind. Both were still unaware, it seems, of Assistant Secretary of War Watson's Yuletide order of 1862 for the Gardiner bullets, which were used later both in Sherman's march through Georgia and in Grant's Richmond campaign. Watson's order was the last by Union authorities. After the Civil War, European nations outlawed such bullets; and in 1868 General A. B. Dyer, as Chief of Ordnance, condemned them as "inexcusable among any people above the grade of ignorant savages."[18]

Confederate Use

The use of Gardiner's shell by the Confederates was purely by chance and quite probably stemmed from having captured a goodly number of shells (10,060) at Fairfax when they were abandoned by departing Union troops. In as much as the loaded shells were similarly packaged as were the standard issue Minié ball musket rounds, they could have subsequently been inadvertently used by the Confederates, in the belief that they were normal regulation U.S. issue.

The Civil War memoirs of Private Alfred Bellard, who served in Co. G, 5th Regt., New Jersey Volunteers during the skirmish at Oak Grove in Henrico County, Virginia, on June 25, 1862 (after the battle of Fair Oaks ending June 1, 1862 during the Peninsular Campaign) had witnessed their use. His memoirs contained this brief note: *"The night of the 17th [June, 1862] the rebs made a grand rush on Sickles's brigade driving them back and capturing some 40 of their men. In this affair the rebels used explosive bullets, one of them exploding over our heads as we lay in reserve at the lookout tree."*[19]

Confederate use/non-use was explored in depth in Southern Historical Society Papers, Vol. 8: one of the subjects treated at some length was "Explosive or poisoned musket or rifle balls *** were they authorized and used by the Confederate States army, or by the United States army during the Civil War ?- a slander refuted by the Reverend Horace E. Haydon." [21]

The Rev. Horace E. Hayden's "Refutation of the Charges Made Against the Confederate States of America of having authorized the use of explosive and poisoned musket and rifles balls during the late Civil War of 1861-65"[20] was published in 1879 and traced the convoluted path of the employment of Gardiner's shells. Hayden went to particular lengths to absolve the Confederate States of having authorized the use of explosive or poisoned musket or rifle balls by obtaining written statements in 1879 from both

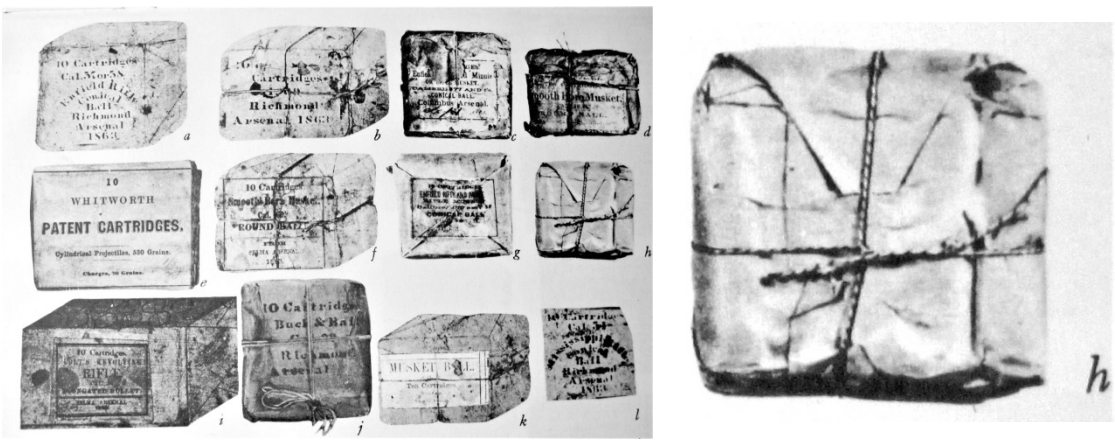

Figure 18. - Package of CSA Ammunition. explosive bullets, and an unmarked package of cartridges.[21]

Jefferson Davis and former Chief of Ordnance of the Confederate States, General Josiah Gorgas. In a letter to Hayden, Davis pointedly stated that *"Our Government certainly did not manufacture or import such balls, and if any were captured from the enemy, they could probably only have been used in the captured arms for which they were suited."* General Gorgas went so far as to aver that *"to his knowledge the Confederate States never authorized or used explosive or poisoned rifle balls during the late war."* Gorgas was only partly right. If some of the captured Gardiners were used, it would have been unknowingly, in as much as they were U.S. arsenal wrapped like regular cartridges with only colored wrapping string to differentiate between the two. (Figure 18).

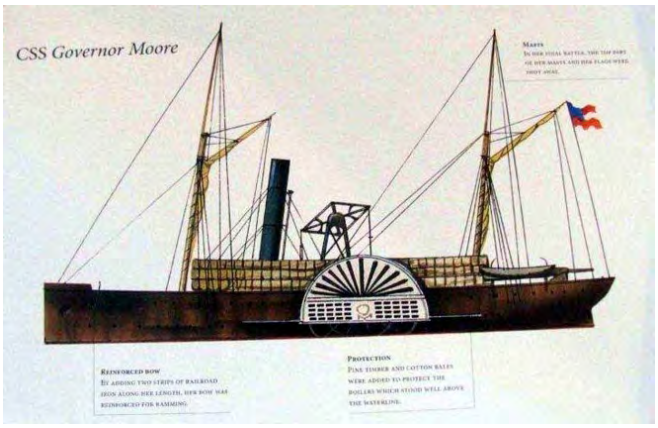

Figure 19. – CSS Governor Moore (www.navsource.org, contributed by Tommy Trampp)

Author William B. Edwards[22] (Civil War Guns) cited the existence, and attempts to use explosive bullets, during the Mississippi River naval engagement known as the Battle of New Orleans due to an order for 100,000 rounds of explosive musket shells placed by Lt. Beverly Kennon, Jr., C.S.N. (1830-1890). Kennon was senior officer of Louisiana's navy and commanding officer of the State of Louisiana "cottonclad" CSS Governor Moore, a wooden sidewheel steamer of the Louisiana River Defense Fleet whose armament consisted of two 32-pdr. rifled guns (Figure 19). Edwards states that 39,000 explosive rounds eventually wound up at the Naval Laboratory at Atlanta, Georgia. Loaded with fulminate of mercury these shells of the Jacob type (nose-cap detonated) were very dangerous to use. They were subject to exploding when being rammed into a muzzle-loading gun barrel without benefit of a specially tipped ramrod. The Confederate Ordnance Officer in charge of the district's Bureau of Ordnance & Hydrography, Commander George Minor, C.S.N., wisely refused to authorize their use. The Kennon shells in .69 musket caliber and .54 caliber had no small primer but were entirely filled with fulminate; a most dangerous idea. Lt. Kennon intended them for anti-personnel use against Union frigate foretopmen handling ship's sails aloft. Aside from this limited trial, they were infeasible.[23]

Rev. Hayden reportedly examined The Medical and Surgical History of the Rebellion[24] issued by the U.S. Medical Department to shed any light on treatment of Gardiner shell type wounds and failed to find any case of such wounds, but of a table (Vol. II, pg. 91) of 4,002 cases of gunshot wounds of the scalp, two (2) were attributed to explosive musket balls, probably as a result of premature air-bursts. However, our other speaker, Paul Johnson[25] will prove actual employment of the Gardiner was far greater than has theretofore been thought possible, yielding quite horrible effects on the human body.

Rev. Hayden was spurred by reckless comments penned by historian Benson J. Lossing[26] in his *"Pictorial History of the Civil War …"* published in 1868. On page 78 of Vol. III, Lossing described his visit to the Gettysburg battlefield and hospital. He deplored the carnage caused *"every conceivable way by every kind of weapon and missile, the most fiendish of which was an explosive and a poisoned bullet… procured from the battlefield there by the writer."* He illustrates two engravings of the bullets that he picked up on the battlefield (Figure 20), shown as his figures (a) and (b.). "One (figure a) was made to explode in the body of a man, and the other (figure b) to leave a deadly poison in him…."[27]


78 MEMENTOES OF THE BATTLE.

with the name and regiment marked on each, and planted a small evergreen close by, a tender memorial of heavenly emotions in the midst of the hellish deeds of war. We passed on to the peach-orchard so prominent in the records of the battle, and then rode back to Gettysburg, observing the fields on our right, over which Pickett swept with his division to the attack of Hancock,[1] thickly strewn with the graves of men and horses, the former marked by small head-boards, and the latter distinguished by large mounds.[2]

Expecting to revisit Gettysburg soon, we did not then go over the Confederate line of battle. The remainder of the day was spent in visiting the head-quarters of the benevolent Commissions, already mentioned; the hospitals of the National wounded, in the town, and the College where the Confederate sick and wounded lay. Sad, indeed, were the sights that met us. Many, mostly young men, were maimed in every conceivable way by every kind of weapon and missile, the most fiendish of which was an explosive and a poisoned bullet, represented in the engravings a little more than half the size of the originals, procured from the battle-field there by the writer. These were sent by the Confederates. Whether any were ever used by the Nationals, the writer is not informed. One (figure *a*) was made to explode in the body of a man, and the other (figure *b*) to leave a deadly poison in him, whether the bullet lodged in or passed through him.[3]

Among the Confederates wounded at the College were boys of tender

a b

[1] See page 72. [2] See page 77.

[3] Figure *a* represents the explosive bullet. The perpendicular stem, with a piece of thin copper hollowed, and a head over it, of bullet metal, fitted a cavity in the bullet proper, below it, as seen in the engraving. In the bottom of the cavity was fulminating powder. When the bullet struck, the momentum would cause the copper inverted disk to flatten, and allow the point of the stem to strike and explode the fulminating powder, when the bullet would be rent into fragments which would lacerate the victim. In figure *b* the bullet proper was hollowed, into which was inserted another, also hollow, containing poison. The latter, being loose, would slip out and remain in the victim's body or limb, with its freight of poison, if the bullet proper should pass through.

Figure 20. Lossing's "explosive" (a.) and "poisoned" (b.) bullets.[26]

Adding to controversy whether the Confederacy used exploding bullets, Lossing added the following gratuitous, erroneous and inventive footnote to his illustrations:[26]

"[3] Figure a represents the explosive bullet. The perpendicular stem, with a piece of thin copper hollowed, and a head over it, of bullet metal, fitted a cavity in the bullet proper, below it, as seen in the engraving. In the bottom of the cavity was fulminating powder. When the bullet struck, the momentum would cause the copper inverted disk to flatten, and allow the point of the stem to strike and explode the fulminating powder, when the bullet would be rent into fragments which would lacerate the victim. In figure b the bullet proper was hollowed, into which was inserted another, also hollow, containing poison. The latter, being loose, would slip out and remain in the victim's body or limb, with its freight of poison, if the bullet proper should pass through."

Lossing's (Figures 20a, 21) "explosive bullet" is actually a "cleaner" bullet patented by Elijah D. Williams of Philadelphia, Pennsylvania, U.S. Pat. #37,145 issued Dec. 9, 1862.[28] It was designed to obtain a good hold in the grooves and obtain extremely accurate shooting. Having a headed pin and a concave expending

disc with the disc having its concave side against the base of the bullet, when the charge is fired behind the bullet, the explosive force acting against the head drives the pin forward into the cavity of the bullet, thus causing expansion of both bullet and disc. The bullet, by being flattened by the head of the pin, expands both the lead bullet and the cupped zinc disc, which by flattening both, acts to fill the rifling and scrape firing debris from the bore, thus acting as a bore cleaner. For this later purpose it was proposed that one Williams bore cleaner be included in each packet of regular Minié balls.

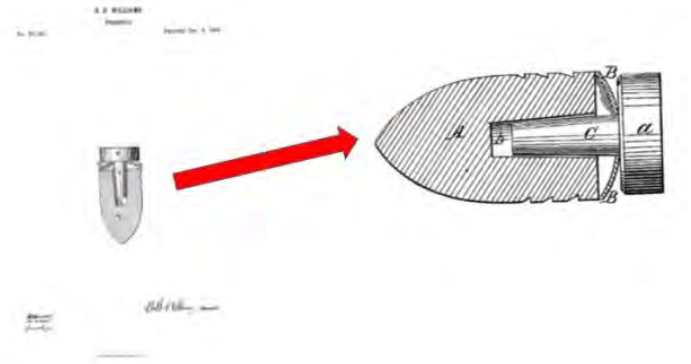

Figure 21. E.D. Williams "Cleaner" bullet patent issued Dec. 9, 1862.[28]

Fig. 113.

Figure 22 . U.S. Buck & Ball arsenal cartridge.[29]

Lossing's (Figure 20b) "poison bullet" is actually an improved buck & ball projectile patented by Reuben and Ira Schaler of Madison, Connecticut.[30] It was intended to realize advantages on the well-known regulation U.S. "Buck & Ball" cartridge (Figure 22) but without the disadvantages of wildness of direction, shortness of flight and intensity of recoil. For buck and ball cartridges, multiple balls are stacked over each other atop a tube of powder, wrapped in paper, and string-tied to maintain a cylindrical form that can be rammed down a musket or rifle barrel. Upon firing, the wrapper is shed and the bullets are free to travel as a somewhat expanded group. While effective at short range, this loading loses distance rapidly and disperses radically. The U.S. arsenal produced cartridge (Figure 22) is shown in comparison to another Buck & Ball "improved" concept created by Ruben and Ira Schaler of Madison, Connecticut (Figure 23).

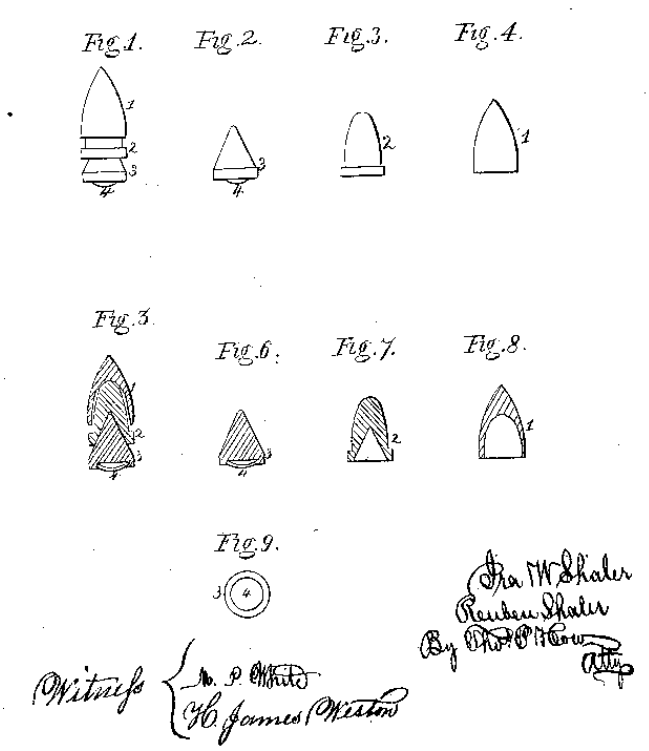

Figure 23. Reuben and Ira Schaler's Buck and Ball bullet U.S. Patent No. 36,197 issued Aug. 12, 1862.[30]

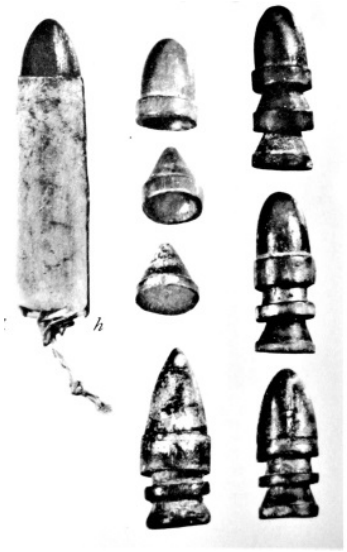

Figure 24. Schaler's sectional bullet, with five variants.[31]

Schaler's projectile utilizes three-sections by stacking one hollow-based projectile upon another fitting one behind the one ahead, each a different conical shape with a different purpose designed to fill the grooves of the rifled barrel (Figures 23, 24). The bases of all three are the same and are secured in position by the paper wrapper of the cartridge. The portions are designed to separate in flight. The forward one takes the usual line of ballistic projection, the others turn aside slightly from the path of their predecessors, sufficiently so to be available as separate projectiles, though not with that wild and injurious deviation which is common in the use of the U.S. buckshot cartridge. Lossing was wrong on both characterizations of exploding and poisoned bullets, but in so doing was instrumental in giving legs to tales that the confederates used anti-personal exploding and poisoned bullets.

International Prohibition

The subject of the use of such nasty weapons of war as Gardiner's shell was not included in Lincoln's General Order No. 100 - Instrument for the Government of Armies of the United States in the Field, signed by him on April 24, 1863 (a.k.a. The Lieber Code).[32] International treaties pertaining to the rules of war, such as the first Geneva Convention of 1864, did not address the use of weapons of war, although Article 4 of the 1864 Geneva document stated that the signatories were "strictly guided by the principles of justice, honor, and humanity." Fortunately, such explosive projectiles as Gardiner's shell were considered barbarous and inhumane to the point they eventually would be disavowed by international treaties. "Though evidence proves explosive bullets were issued by both sides, the post-war charges that the South was barbarous by so doing were not particularly well-founded. Isolated use of musket shell against personnel were few. But there was enough to demand some consideration at the St. Petersburg, Russia, convention of 1867 which tried to get warfare back to a gentlemanly basis."[33]

Figure 25. St. Petersburg,, Russia. Site of the 1868 international convention to renounce the use of explosive bullets in warfare. (Wikipedia./org/wiki/ Saint Petersburg Declaration of 1868).

The first real movement in this direction occurred in 1863 as a result of Russia having perfected a fulminating musket ball that could explode when it hit a hard target that was initially designed to blow up powder magazines or ammunition wagons. By 1867 the Russians had also perfected an improved explosive musket ball that would detonate on impact, on even soft targets like people and animals. Imperial concern about how knowledge of this "advance" would affect diplomatic relations with other European nations prompted Russia to negotiate a ban on the development, creation and use of such weapons before they found themselves in a grisly European arms race. Thus, a conference was convened in December 1868 at Saint Petersburg to consider existing rules of warfare (Figure 25). The attending plenipotentiaries of seventeen states adopted a document that, along with the 1863 Liber Code and the accords of the 1864 Geneva Convention, renounced the use in time of war, explosive projectiles under 400 Grams weight.

"The result of these deliberations resulted in The Saint Petersburg Declaration of 1868 which went into effect 11 December that year. Eventually 22 signatory nations acceded to fixed technical limits at which the military necessities of war ought to yield to the requirements of humanity by renouncing the use in time of war "any explosive projectiles of a weight below 400 grams, which were charged with fulminating or inflammable substances" (Gardiner's shell only weighs 26.4 grams). Additionally, a definite distinction was made between "explosive" and "fulminating" bullets. The latter were described as containing a small, unstable, high explosive charge designed to shatter into fragments after impact or inside a wound and had a potential to detonate when jarred or while being removed, complicating medical first aid or surgery. The delegates acknowledged that to render an enemy hors de combat, the kinetic energy of a projectile weighing less than 400 grams should be sufficient and that explosive, incendiary or any other additional effects should not unnecessarily be allowed to exacerbate injuries from projectile (bullet) strikes."[34]

The United States, not considered a major power at that time, was not invited to attend and thus had no presence nor vote in this event. However, leading from the St. Petersburg movement, a letter to Secretary of War J.M. Schofield from the Chief of Ordnance Bvt. General Alexander B., Dyer stated that he "considered their use "barbarous and no more to be tolerated by civilized nations than the universally reprobated practice of using poisoned missiles… I strongly advocate an agreement or treaty binding all civilized nations to discontinue and forever abandon the use in war of that class of missiles or projectiles which may be used in small arms and be so sensitive as to explode on contact with animal flesh." From 1868 until the subject came under explicit examination in Hague Conventions of 1899, 1907 and 1925, under the category of small caliber tracer munitions, further interest in explosive projectiles dwindled.

Gardner Redeemed

After the war, with American public opinion against their use, stocks of Gardiner shells held at various arsenals were subsequently destroyed. It is noteworthy that not long after the cessation of hostilities (May 26th), The New York Times announced on October 23, 1865 the names of prize winners at the American Institute's New York Fair in the fall of 1865. Among them was "Samuel Gardiner at 171 Broadway, New York City" who was awarded a beautiful silver medal in the Firearms category for his "bullet and shell machine" (Figure 26). The Fair was inaugurated by Maj. Gen. Daniel E. Sickles, and was visited by General Hooker who had employed Gardiner's shells during the war. This particular Fair was noted for its wealth of "Peculiar Specimens of American Ingenuity Queer Ideas and Singular Exhibitions."

Figure 26. Silver medal awarded annually by the American Institute to inventors in competition for recognition of their new or improved products. The Institute's logo on the obverse was struck by engraver Robert Lovett Jr. (1818-1874). This medal series by Lovett was awarded to recipients from 1858 until 1868 and would have been the design awarded to Gardiner in 1865.

The institute was established in 1808 to promote the Encouragement of Science and Invention and held its first annual fair in 1828 to "act as a clearing house for innovative ideas and new techniques; as a sponsor for an annual fair, which would recognize and reward people with creative new products and a catalyst for further growth of our new and free nation".[35] It's a wonder that despite its unsettling history, Gardiner's shell and shell machine could win silver recognition in such an esteemed humanitarian competition.

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